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Table of Contents

List of Figures

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Executive Summary

This document describes the collection of data included in the Spanish National Forest Inventory and Spanish Forest Map, and the status of the OWL ontologies and vocabularies created to represent the collected data.

A total of five core ontologies have been created. Two of the core ontologies allow to represent the data of the Spanish National Forest Inventory and the Spanish Forest Map, while the other three permit to represent positions and measures, which are needed in the first two ones. These ontologies are interrelated between them and enriched linked to external ontologies. In addition of these ontologies, two modules to keep track of the provenance of the data, and several alignment modules to external ontologies are in development.

The goal of these ontologies is to serve as the schema for the data that will be generated in the next steps of activity 2. The ontologies and data, in addition to being published for public use, will be used as input data for the pilots generated as a result of activity 3: FRAME *(Forest fiRes Advanced ModElization)* and CAMBrIc *(CAlidad de la Madera en Bosques mIxtos)*.

1 Introduction

Forest inventories and maps exist in all European countries, and are common all around the globe. Inventories follow sampling methodologies to extrapolate the stock of forest resources in the country, while the maps (sometimes included in more general maps) are created through orthophotography and photography interpretation to create cartographical information about those resources. The exact methodology varies from country to country, but the results are comparable.

Countries need to devote resources to create forest inventories and maps, in the form of money, work and time. In the case of Spain, each version of both the inventory and the map take more than a decade to be completed. The 2nd inventory had an estimated cost of 24 million euros, and for the last inventory (still to be completed) the cost of the region of Catalonia have had a cost of around 4 million euros.

However, the majority of the results of the inventories and maps are usually either non-accessible, or published in formats that make them not available to the general public. In the case of Spain, the inventory is published in access databases with obscure schema, while the maps are published in GIS *("Geographic Information System")* [1] shape files that, while an international standard, are difficult to use outside the GIS community.

Semantic Web technologies have emerged in the last decades as a way to publish heterogeneous data in a standard and interoperable way. These technologies allow to publish data in a self-describing way that can connect with data provided by the same or different entities. [2] In the forestry domain, it permits to open the data to the general public, and link with related ontologies about geographical and political territory, or description of species. The result of that kind of publication benefits governmental and non-governmental agencies, companies, and individuals. More information about the Semantic Web can be found in the seminal article [3]. There are also books such as "Semantic Web for the Working Ontologist" [4] that are specially recommended.

The foundational technologies, standardized by the W3C, of the Semantic Web are:

- RDF [5], that allows to represent heterogeneous information as statements. In RDF the data is structured as triples in the form (subject, predicate, object), where the subject is the resource being described, the predicate gives a property about the resource, and the object sets the value of the description. A set of RDF triples is a labeled directed graph, with subjects and objects as nodes, and predicates as edges.
- RDFS [6], that allows to describe and categorize data represented in RDF. RDFS allows to create classes and their relations, and define simple restrictions on the properties such as their domain and range.
- OWL [7], that allows to create complex ontologies with high expressivity in RDF. An OWL ontology can destribe things like cardinality, disjointess or combination of classes, and special characteristics of properties.
- SPARQL [8], a language to query data in RDF. SPARQL is essentially a declarative language based on graph-pattern matching with a SQL-like syntax. Graph patterns are built on top of Triple Patterns (i.e., triples in which each of the subject, predicate and

object may be a variable). These triple patterns are grouped within Basic Graph Patterns (BGPs), leading to query subgraphs in which variables must be bounded. Other constructions, such as alternative (union) and optional patterns, can be specified in a query.

This task is framed within the Crossforest project, which aims to develop Digital Service Infrastructures services oriented towards forest fires control through precise information on combustible materials, forestry maps and propagation models that need HPC resources to run properly and forestry evolution models on Country-Level. The goal of this activity (*"Data collection, Data quality, Ontologies and Vocabularies"*), the creation of a series of ontologies to model forest inventories and maps of Spain and Portugal. These ontologies will be used to represent the foundational data that will be published and used by the rest of the project. In this step we focus in Spanish data, with the intention of extending them first to Portuguese data. Spain produces the Spanish National Forest Inventory (*"Inventario Forestal Nacional",* **IFN** from now on) [9] and the Spanish Forest Map (*"Mapa Forestal Nacional",* **MFE** from now on) [10]. The aim of the ontologies is, however, to make them usable by the international community.

The rest of this document is organized as follows: Section 2 briefly describes how the data of the Spanish inventory and map are gathered and published. Section 3 provides a detailed description of the current state of the ontologies. Section 4 provides a summary of the work, some conclusions, and future steps. Annexes can be found at the end providing a list of abbreviations and the complete ontologies.

2 Contributions

The main contribution of the current task is a set of five ontologies. Each of these ontologies have been developed to address a specific domain within forestry data in general, and the IFN and MFE in particular. These ontologies are enumerated down below, and described in detail in Section 3.

- Simple Positions Ontology: This ontology allows to represent positions of entities, whether they be absolute in a specific Coordinate Reference System, or relative to another position.
- EPSG ontology: This ontology contains a description of existing Coordinate Reference System, needed to specify absolute positions using the Simple Positions Ontology.
- Simple Measures Ontology: This ontology allows to characterize measures taken on entities, describing their value and their units.
- IFN ontology: This ontology allows to describe the data of the Spanish National Forest Inventory, including for the moment patches and trees, including their species. Their positions and measures are described using the Simple Positions Ontology, EPSG ontology, and the Simple Measures Ontology.
- MFE ontology: This ontology allows to describe the data of the Spanish Forest Map. Data about species are described using the IFN ontology, data about their positions are described using the Simple Positions Ontology and EPSG ontology, and data about measures are described using the Simple Measures Ontology.

In addition, a number of additional modules is being developed:

- Two modules to keep track of the provenance of the data (that is, where in the original tables the data can be found), one for the IFN and the other for the MFE.
- A set of modules to link the created ontologies to external ontologies and datasets. These modules allow to make safe reuse of external content.

Note that, while in their current state, the IFN and MFE ontologies aimed to describe the Spanish Forestry data, they have been developed with the idea of being able to describe data in the forestry domain in general. While this is not possible yet, they are easily extensible. In the short term, we take into account the Portuguese data in the ontologies. In the long term, we will generalize the ontology for international use.

3 Data Collection

This Section provides a brief summary about how the data from the Spanish National Forest Inventories and the Spanish Forest Maps have been collected in the first place, and how they are currently stored and published.

In this step, due to data availability, we focus on the Spanish datasets. Portuguese data is

collected in a similar fashion, but the published data is less detailed

3.1 Spanish National Forest Inventory

The Spanish National Forest Inventory contain sampling information about trees and shrubs in the Spanish territory. It is updated regularly, and collecting the data for update is a 10-years process. Currently, data for the 4th update is being gathered.

The sampling methodology for the Inventory is the following: The territory is divided in a grid of one square kilometer. For each cell of this grid is represented by a plot, which is a point at its center that represent one square kilometre around it. Trees are sampled depending on their height and distance to the center, taking measures such as their height or diameter. Figure 1 shows a representation of the plot grid and sampled trees in a plot.

The collected data is currently split in several files. These files are published in a SQL database, with an ad-hoc schema, and in proprietary format (Microsoft Access). This makes hard to use the data for people outside of the forestry domain, and even for people in the domain that is not knowledgeable of the specific methodology used to collect the data.

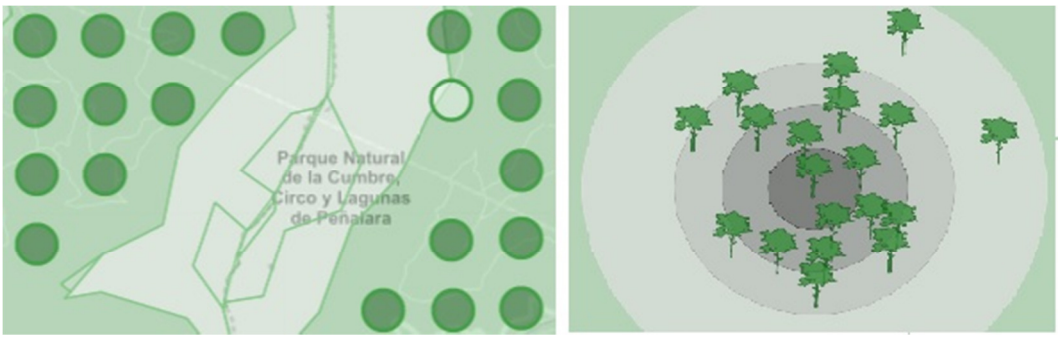

Figure 1: Representation of Plots.
Left: Grid of Plots. Right: Trees Sampled in a Plot.

3.2 Spanish Forest Map

The Spanish Forest Map contains cartographical information about the spatial distribution of forest land, described using polygons over the territory. In a similar fashion to the IFN, it is updated regularly, and collecting the data for each update takes around 10 years. Currently, the 3th version (with a scale of 1:25000) is in the final stages of being collected.

The generation of each update of the MFE is based on photointerpretation of digital images. These images are taken from different external sources, and are used to identify patches and their characteristics (such as species, structure, or canopy cover) over the Spanish territory. Some of them are later on visited in person to verify the correctness of the photointerpretation. In Figure 1 we show an example of a image of the territory with te division in patches.

The collected data is currently split in several GIS shape files, where each patch is characterized by a polygon. While these files are a common format for the GIS community, it is not easy for users outside the community to interpret their contents.

Figure 2: Division in Patches

4 Description of the Ontologies

In this Section, we describe the ontologies that have been created within the current task, and that will be used to generate the data in future steps.

The ontologies have a modular design. They are divided in three main groups:

- 5 core modules, used to describe the data of forest inventories and maps. From those, two of them (`ifn-core` and `mfe-core`) are devoted fo forestry data, while the other three (`position-core`, `measures-core`, and `epsg-core`) are higher level ontologies to describe needed concepts about measures and positions, and can of interest outside of forestry domain.
- 2 modules that we call “raw”. The goal of these ontologies is to give provenance data about where in the original tables was the data. This helps to ensure correctnes and reproducibility of the task.
- A number of alignment modules to link data of the core modules to external ontologies or datasets. These modules make use of the Subproperty of an external Property [11] and Subclass of an external Class design patterns [12]. They are divided in three for each pair (core module, external ontology):
    - Tbox links: These modules link the schema of the module with the schema of an external ontology, making use of `rdfs:subPropertyOf`, `rdfs:subClassOf`, `owl:equivalentProperty`, and/or `owl:equivalentClass` properties.
    - sameAs links: These modules link the individuals of a module with the individuals of an external dataset, using the `owl:sameAs` property.
    - Abox links: These modules link the indivuduals of a module with the individuals of an external dataset, using `schema:sameAs` (or a specialization of it) property.

This design two main goals:

1. Increase the reuse by external agents: Each of the ontologies is easier to understand separately, and the separation makes it possible for any user to load the data they need, disregarding the rest. Additionally, since several ontologies and datasets exist for the domains we use (see in the subsections below the main external ontologies considered), by creating our own terms and linking them to several external ontologies we don't limit the user to one of them: they can choose the set of alignment modules of their preference.
2. Make safe reuse [13] of external ontologies and data. While reuse of data is a well-known principle in the Semantic Web, making explicit alignment (that is, linking the terms of the ontology with terms of the external ontology by means of the properties mentioned before) is considered a better practice that direct reuse of the terms [14]. Direct reuse has the risk of what is known as o*ntology hijacking* [15], that is, giving additional semantics to external terms that can negatively impact the semantics of the data (e.g., generating undesirable inferences). Avoiding ontology hijacking is also the reason why the links with the owl:sameAs property are kept separate, since they can add inferences that can be undesirable to some users [16].

The ontologies make use of the Data on the Web Best Practices [17] and Spatial Data on the Web Best Practices [18], and common patterns are used across them. These patterns try to provide a balance between semantics and usability (as, again, those can vary with the goal of the user). The ontologies make heavy use of metamodeling and punning [19], since many of the classes need to be formally described and categorized, as well as used in a descriptive way in some patterns, where they need to act as an individual. The set of ontologies and their relations can be seen on Figure 1, and are further described in the following subsections.

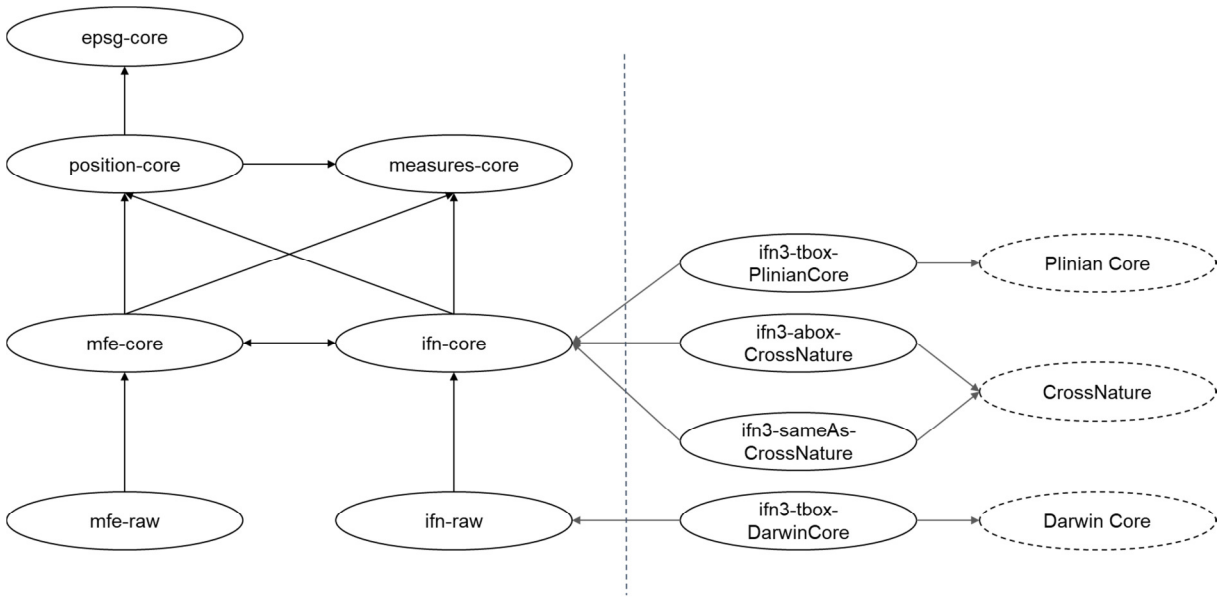

Figure 3: CrossForest Ontologies.The ontologies on the left are core and raw modules. The modules on the right connect the core modules with external ontologies and datasets.

4.1 Simple Positions Ontology

The positions ontology contains properties and classes needed to describe physical positions of entities. These positions can be absolute (using any Coordinate Reference System) or relative (from a reference position). Both kind of positions are commonly used in the Forestry domain.

4.1.1 Description

The Simple Positions Ontology contains a total of 16 classes, 19 object properties, and 4 datatype properties. We describe below the main classes and properties. The complete ontology can be found in Annex B.

The main classes are the following:

- `SpatialEntity`: Individuals of this class represent entities that exist in the real world. They can be a physical being, such as a tree, or a place, like a Plot or a Patch.
- `Position`: Individuals of this class represent positions in the real world. These positions can be of one of those types:
    - `GeocentricPosition`: Positions relative to earth. They are described using a Coordinate Reference System and a set of coordinates.
    - `EgocentricPosition`: Positions relative to another position. They are described using direction and distance from the reference position.
    - `AllocentricPosition`: Positions relative to one or more other positions. They can be described in a similar way as an `EgocentricPosition` or using a set of coordinates using another positions as reference points.
- `ReferencePosition`: A subclass of position. Individuals of this class represent positions that serve as reference for an `EgocentricPosition`.
- `Polygon`: A subclass of Position that represents positions over an area instead as a point.
- `Bound`: Determines a bound in a specific axis of the Position. Normally used with polygons. There are four different bounds defined: `UpperBound`, `LowerBound`, `LeftBound`, and `RightBound`.
- `Layer`: A layer in which a set of positions is described. Different layers usually have different precision and/or grouping of positions of lower layers.
- `Direction`: Represents the direction of an `EgocentricPosition` from its `ReferencePosition`. It is a subclass of Measure (see measures in subsection 3.2).
- `Distance`: Represents the distance of an `EgocentricPosition` from its `ReferencePosition`. It is a subclass of Measure (see measures in subsection 3.2).

The main properties are the following:

- `hasPosition`: Connects a `SpatialEntity` with its `Position`. Depending of the position they can be further described as `hasGeocentricPosition`, `hasEgocentricPosition`, or `hasAllocentricPosition`.
- `hasPolygon`: Subproperty of `hasPosition`; connects a `SpatialEntity` with a `Polygon`.
- `hasReference`: Connects an `EgocentricPosition` with a `ReferencePosition`.

- `isReferenceOf`: Inverse property of `hasRerefence`. Connects a `ReferencePosition` with one EgocentricPosition.
- `hasBound`: Connects a `Position` with a `Bound`. Depending of the Bound, it can be further specified as `hasUpperBound`, `hasLowerBound`, `hasLeftBound`, or `hasRightBound`.
- `hasArea`: Used to provide an area for a `Position`. This position can be the area of a `Polygon`, or the area that a `Position` represents. Connects a `Position` with a `Measure` of the Position (see measures in subsection 3.2).
- `hasDirection`: Connects an `EgocentricPosition` with a `Direction`. It is a subproperty of `hasMeasure` (see measures in subsection 3.2).
- `hasDistance`: Connects an `EgocentricPosition` with a Distance. It is a subproperty of `hasMeasure` (see measures in subsection 3.2).

In the following figures we can see the main classes of the ontology and how they are related among themselves (Figure 2), and how geocentric positions (Figure 3) and egocentric positions (Figure 4) are represented.

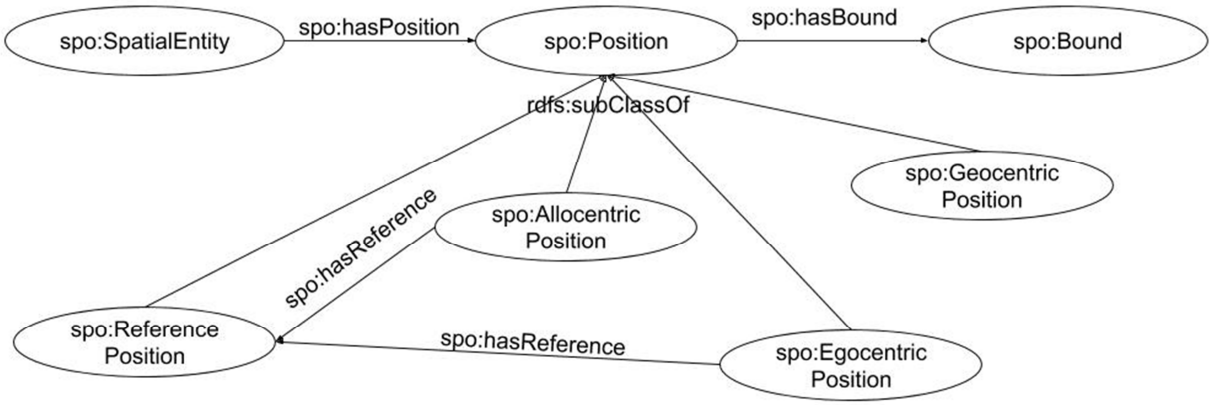

Figure 4: Classes of Simple Positions Ontology

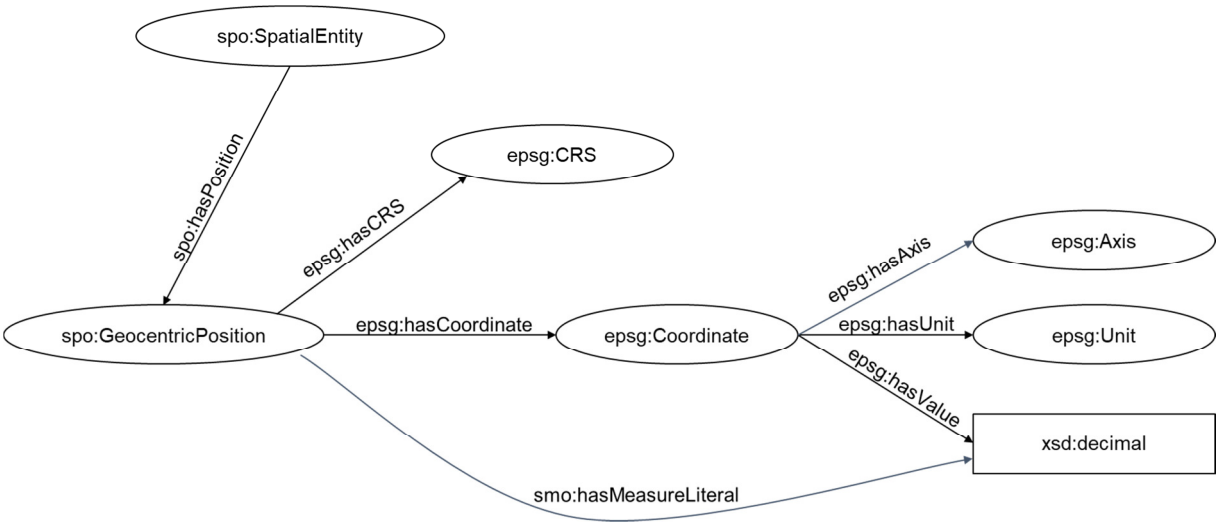

Figure 5: Geocentric Positions

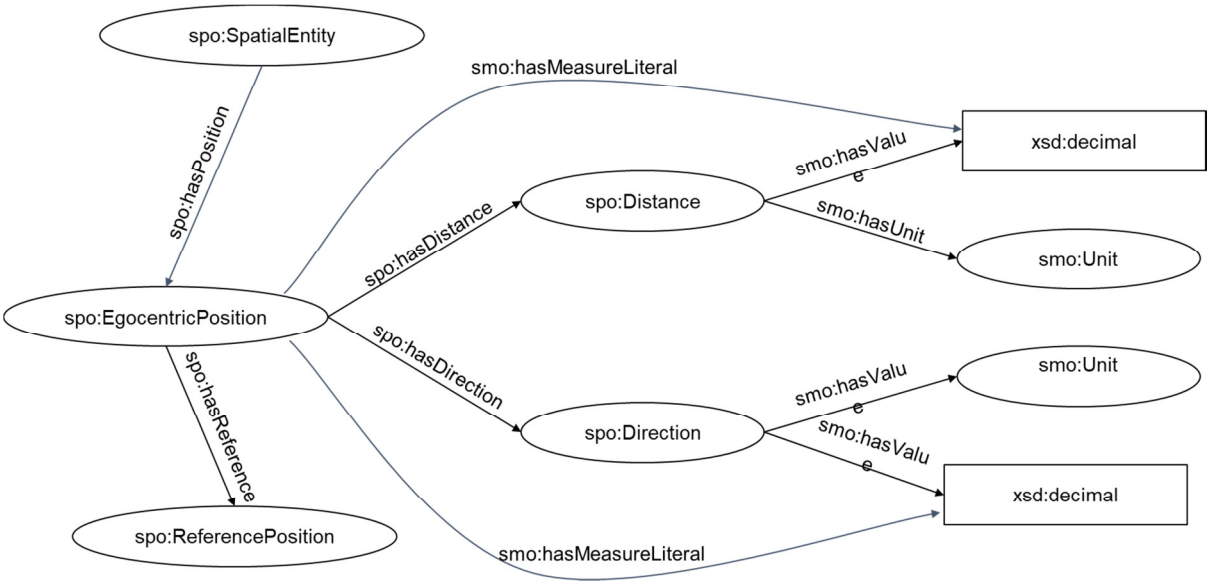

Figure 6: Egocentric Positions

4.1.2 Links with other Ontologies

The Simple Positions Ontology ontology is planned to have links with the following ontologies using the alignment ontologies described at the beginning of Section 6.

- *W3C Geospatial Vocabulary* [20]: a W3C basic ontology and OWL vocabulary for representation of geospatial properties for Web resources.
- *GeoSparql* [21]: An OGC standard supports representing and querying geospatial data on the Semantic Web.

4.2 EPSG ontology

The EPSG ontology is a transformation of the EPSG dataset [15] to OWL. This dataset contains the description of all Coordinate Reference Systems maintained by the International Association of Oil & Gas Producers (IOSP) [16]. This ontology can be used together with the Simple Positions Ontology to describe geographical positions. The complete ontology can be found in Annex C.

4.2.1 Description

The development of this ontology is currently in progress. At the moment of writing, it contains a total of 35 classes, 20 object properties, 12 datatype properties, and 20,867 named individuals. We describe below the main classes and properties.

The main classes are the following:

- `CoordinateReferenceSystem`: Individuals of this class represent a concrete coordinate reference system (CRS from now on) in which a geocentric position is represented. A `CoordinateReferenceSystem` is always one of the following:

    - GeographicCRS: Coordinate Reference System used define locations on Earth using an ellipsoid that approximates it.
    - ProjectedCRS: Coordinate-based system to define locations on Earth using a flat, two-dimensional surface.
    - VerticalCRS: One-dimensional coordinate reference system used for gravity-related height or depth measurements.
    - CompoundCRS: CRS created using a combination of two other, generally a ProjectedCRS or GeographicCRS with two dimensions, and a VerticalCRS.
- CoordinateSystem: Represents coordinate systems (i.e., systems to represent positions by means of coordinates). A coordinate system (CS from now on) can be used in multiple CRSs. It can be, among others, one of the following:
    - EllipsoidalCS: Two-dimensional orthogonal coordinate system in which the coordinate lines are confocal ellipses and hyperbolae.
    - CartesianCS: Coordinate system that gives the position of points relative to a system of perpendicular axes.
- Datum: Set of parameters that determine the location, orientation, and scale of the origin of a CRS. Can be one of the following:
    - GeodeticDatum: Datum to relate a ellipsoidal coordinate system to the Earth.
    - VerticalDatum: Datum for vertical positions, normally over an ellipsoid that represents the Earth.
- Axis: Coordinate axis in a coordinate system. Includes axis name, orientation, and unit.
- AxisName: Coordinate axis name in a Coordinate System, including its abbreviation.
- Orientation: Orientation of a Coordinate Axis.
- Ellipsoid: Ellipsoid that approximates the geoid (surface with equal gravity potential) of the Earth.
- PrimeMeridian: Meridian at which longitude is defined to be zero.

The main properties are the following:

- hasCoordinateReferenceSystem: Connects a Position (see Subsection 3.1) with the CRS in which it is represented.
- hasCoordinate: Connectes a Position (see Subsection 3.1) with one of its coordinates.
- hasCoordinateSystem: Connects a CRS with the CS it uses.
- hasSourceGeographicCRS: Connects a ProjectedCRS with the GeographicCRS is uses as source.
- hasAxis: Connects either a coordinate or a CS to one of their axes.
- hasAxisName: Connects an Axis with its AxisName.
- hasOrientation: Connects an Axis with its Orientation.
- hasDatum: Connects a CRS with its Datum.
- hasEllipsoid: Connects a GeodeticDatum with its Ellipsoid.
- hasPrimeMeridian: Connects a GeodeticDatum with its PrimeMeridian.

Figure 5 shows the main classes and properties of the ontology.

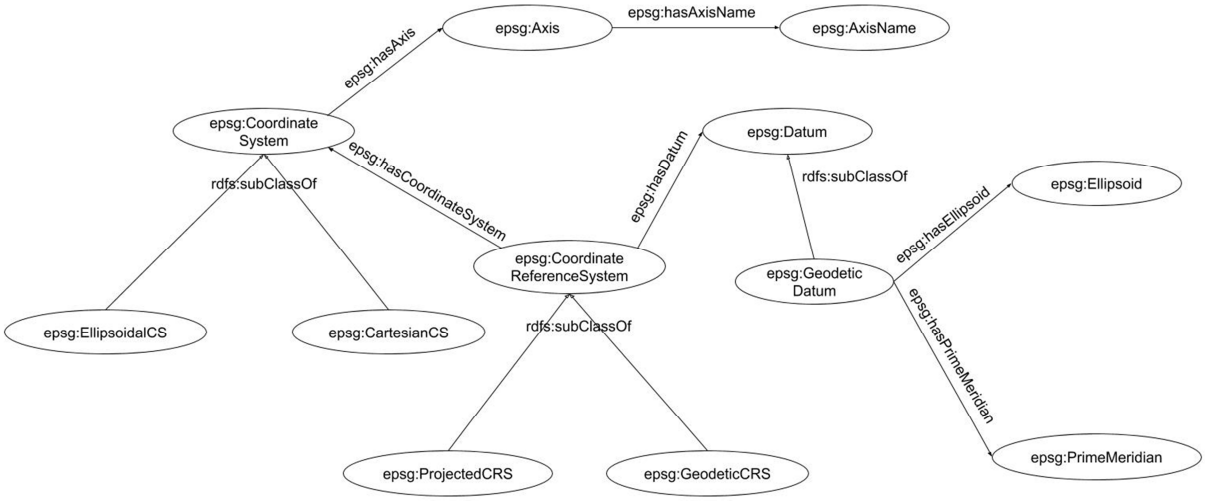

Figure 7: EPSG Ontology

4.2.2 Links with other Ontologies

The EPSG ontology is planned to have links with the following ontologies using the alignment ontologies described at the beginning of Section 6.

- *W3C Basic GEo Vocabulary* [22]: a basic RDF vocabulary that provides the Semantic Web community with a namespace for representing lat(itude), long(itude) and other information about spatially-located things, using WGS84 as a reference datum.
- *GeoSparql* [21]: An OGC GeoSPARQL standard supports representing and querying geospatial data on the Semantic Web.
- *Program Location Ontology* [23]: A W3C vocabulary that provides a minimum set of classes and properties for describing any place in terms of its name, address or geometry.

4.3 Simple Measures ontology

The Measures ontology contains the properties, classes, and individuals needed to describe a measure and its units.

4.3.1 Description

The MFE ontology contains a total of 19 classes, 2 object properties, 11 datatype properties, and 13 named individuals. We describe below the main classes and properties. The complete ontology can be found in Annex D.

The main classes are the following:

- `Unit`: Represents the unit in which the measure is taken. The ontology includes multiple named individuals for units, such as Meters, Decimeters, Degrees, or Gradians.

- `MeasurableEntity`: Individuals of this class represent entities from which a measure or a number of measures is taken. Depending of the units using the measure, it can be further specialised in `MeasurableEntityInMeters`, `MeasurableEntityInDecimeters`, `MeasurableEntityInDegrees`, and so on.
- `Measure`: Represent measures taken with a value and expressed used some concrete units. Depending on the units it can be further specialised in `MeasureInMeters`, `MeasureInDecimeters`, and so on.

The ontology contains only two object properties, which are the following:

- `hasMeasure`: Connects a `MeasurableEntity` with a `Measure`.
- `hasUnit`: Connects a `Measure` with its `Unit`.

The ontology contains the following datatype property, needed to know the value of a measure:

- `hasValue`: Connects a Measure with its value in decimal value.

In addition, the ontology makes heavy use of shortcuts to the value. While those lack the semantics of the pattern indicating value and unit, they provide flexibility and increased performance when accessing the data. For each unit an associated datatype property exists, such as `hasMeasureInMeters`, `hasMeasureInDecimeters`, etc. All these properties are subproperty of `hasMeasureLiteral`. The final structure of a measure can be seen in Figure 6.

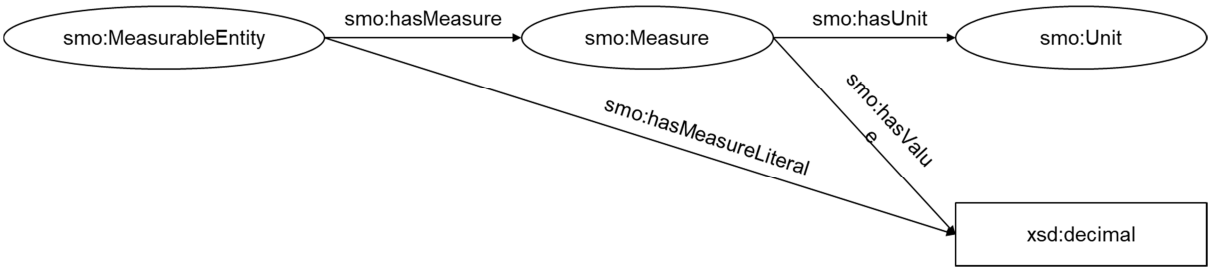

Figure 8: Structure of a Measure using the ontology

4.3.2 Links with other Ontologies

The Simple Measures Ontology is planned to be linked with the following ontologies using the alignment ontologies described at the beginning of Section 6.

- *QUDT* [24]: A set of ontologies for Units of Measure, Quantity Kinds, Dimensions and Types.
- *Semantic Sensor Network Ontology* [25]: A W3C ontology for describing sensors and their observations, the involved procedures, the studied features of interest, the samples used to do so, and the observed properties, as well as actuators.

4.4 IFN ontology

The IFN ontology contains the properties, classes, and individuals needed to represent the data of the Spanish National Forest Inventory. In its current state, it allows to represent plots, trees, and their data (such as species, height, DBH, Volume, etc.).

4.4.1 Description

The MFE ontology contains a total of 54 classes, 32 object properties, 3 datatype properties, and 52 named individuals. We describe below the main classes and properties. The complete ontology can be found in Annex E.

The main classes are the following:

- `Plot`: Individuals of this class represent plots (i.e., spatial entities with a position that represents an area around them, see Subsection 3.1). A plot can be one of these:
  - `PrimaryPlot`: A plot used to calculate global statistics
    - `Plot-NN`: Plots that are erected for the first time in the current IFN.
    - `Plot-A1`: Plots that were erected in the previous IFN and have the same position in the new one.
    - `Plot-A3E`: Plots that were erected in the previous IFN, but in a wrong position. This plot is erected in the correct position.
    - `Plot-A4`: Plots that were erected in the previous IFN, but cannot be located for the new one. This plot is erected in the correct position.
  - `SecondaryPlot`: A plot not used to calculate global statistics. Normally, it is used to compare the plot with its state in a previous inventory.
    - `Plot-A3C`: Plots that were erected in the previous IFN, but in a wrong position. This plot is erected in the same position.
    - Plot-R: Support plots, erected in addition to a primary plot in its surroundings.
- `Plant`: Individual of this class represent physical plants. They can be one of the following:
  - `Tree`: Individual of this class represent physical trees.
  - `Bush`: Individual of this class represent physical bushes.
- `BasalArea`: The area of a cross-section of a tree, including bark, at 1.3 m height. Basal area of a forest stand is the sum of the basal areas of all individual trees in the stand, usually reported as square meter per hectare. It is a subclass of Measure (see Subsection 3.3).
- `Volume`: Volume of wood in a Tree or a Plot. It is a subclass of Measure (see Subsection 3.3).
- `DiameterAtBreastHeight`: Diameter at breast height (130 cm,) of a tree. It is a subclass of Measure (see Subsection 3.3).
- `Height`: Height of a Tree. It is a subclass of Measure (see Subsection 3.3).
- `NumberOfTrees`: Number of Trees in a Plot. It is a subclass of Measure (see Subsection 3.3).
- `Taxon`: The taxon to which a Plant can belong to. If follows this structure:
  - `Class`: Subdivision of Phylum that groups different Families

    - `Family`: Subdivision of Class that groups different Genus.
    - `Genus`: Subdivision of Family that groups various species.
    - `Species`: Species of a Plant.
- `ScientificName`: Scientific name of a `Taxon`, divided in name and author strings. It can be one of the following:
    - `AcceptedName`: The accepted scientific name of a `Taxon`.
    - `ScientificSynonym`: A scientific synonym for a `Taxon`.
- `Use`: Use given to the land, such as Forest, Farms, Artificial, etc.

The main properties are the following:

- `isInPlot`: Connects a `Plant` with its `Plot`.
- `hasBasalArea`: Connects a `Plot` with its `BasalArea`.
- `hasVolume`: Connects a `Plot` with its `Volume`.
- `hasDiameterAtBreastHeight`: Connects a `Plot` with its `DiameterAtBreastHeight`.
- `hasHeight`: Connects a `Plot` with its `Height`.
- `hasNumberOfTrees`: Connects a `Plot` with its `Height`.
- `hasScientificName`: Connects a `Taxon` with its `ScientificName`. It can be one of the following:
    - `hasAcceptedName`: Connects a `Taxon` with its `AcceptedName`.
    - `hasScientificSynonym`: Connects a `Taxon` with one of its `ScientificSynonym`.

Note that for each measure, a shortcut is created following the pattern described in Subsection 3.3. In the following figures we can see how trees and plots (Figure 7), and the taxon (Figure 8) are represented in the ontology.

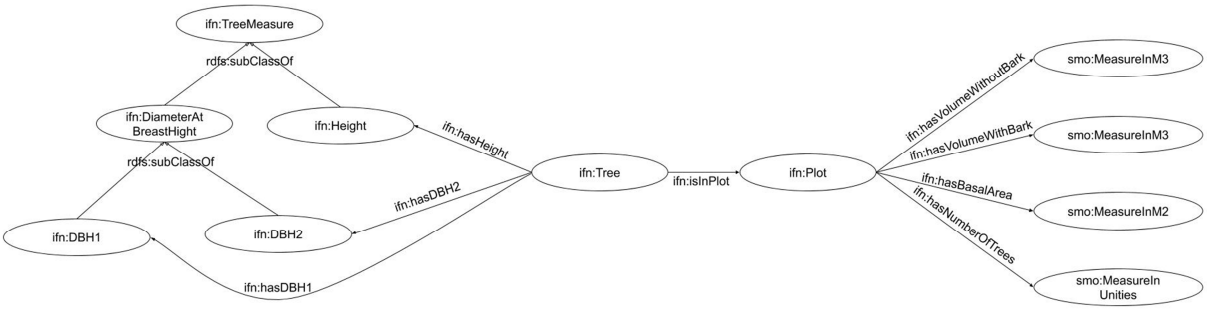

Figure 9: Trees and Plots Representation in the Ontology

Figure 10: Taxon Representation in the Ontology

4.4.2 Links with other Ontologies

The taxonomic hierarchy of the IFN ontology is linked with the following ontologies using the alignment ontologies described at the beginning of Section 6.

- *NCBI Organismal Classification* [26]: A curated classification and nomenclature for all of the organisms in the public sequence databases of the National Center for Biotechnology Information [22]
- *Wikidata* [27]: a collaboratively edited knowledge base hosted by the Wikimedia Foundation [24]
- *Darwin Core* [28]: A standard intended to facilitate the sharing of information about biological diversity by providing identifiers, labels, and definitions.
- *Plinian Core* [29]: A set of vocabulary terms that can be used to describe different aspects of biological species information.

4.5 MFE ontology

The MFE ontology contains the properties and classes needed to represent the data of the Spanish Forest Map. In its current state it allows to represent the complete data of the MFE-50[1]. It will require minimum adjustments to represent the data of MFE-25[2].

4.5.1 Description

The MFE ontology contains a total of 170 classes, 18 object properties, and 5 datatype properties. We describe below the main classes and properties. The complete ontology can be found in Annex F.

The main classes are the following:

[1] Spanish Forest Map at scale 1:25,000
[2] Spanish Forest Map at scale 1:50,000

- Patch: Individuals of this class represent patches of terrain with similar characteristics
- CanopyCover: Represents the canopy cover of the vegetation structure. It can be one of the following:
    - CanopyCoverTotal: Canopy cover of all the vegetation structure of the patch.
    - CanopyCoverTrees: Canopy cover of the trees of the patch.
- VegetationStructure: Represents the different kinds of structure that the vegetation can adopt in the patch, such as forest, plantation, treeless, etc.
- SpatialDistribution: Represents the spatial distribution of the vegetation of the patch, such as uniform, discontinuous, irregular, etc.
- PatchShape: Represents the shape of the patch, such as regular (polihedrical), irregular, or line.
- StandDevelopment: Represents the current state of the vegetation of the patch, such as wild forest, replantated, etc.
- BiogeographicRegion: Represents the biogeographical realm to which the patch belongs, such as atlantic, Mediterranean, or alpine.
- SpeciesInPatch: Represents the data about a species in the patch, including the species and its occupation.
- OccupationOfSpecies: Represents the occupation of the species (i.e., what percentage of the patch it covers).
- UsesInPatch: In a merged patch, it represents the data about the use of sub-patches that belong to it, including the use and its proportion.
- RateOfUse: Represents the proportion of the use, relative to the surface area of the patch.
- PatchInPatch: In a merged patch, it represents the data about the sub-patches that conform it, including the sub-patches themselves and their proportion.
- RateOfPatch: Represents in what proportion the sub-patch contributes to the surface of the merged patch.

The main properties are the following:

- hasVegetationStructure: Connects the Patch with its VegetationStructure.
- hasSpatialDistribution: Connects the Patch with its SpatialDistribution.
- hasStandDevelopment: Connects the Patch with its StandDevelopment.
- hasCanopyCover: Connects the Patch with its CanopyCover.
- containsSpecies: Connects the Patch with its SpeciesInPatch.
- hasSpecies: Connects the SpeciesInPatch with its Species (from the IFN ontology, see Subsection 3.4).
- hasOccupationOfSpecies: Connects the SpeciesInPatch with its OccupationOfSpecies.
- containsPatch: Connects the Patch with its PatchInPatch.
- hasPatch: Connects the PatchInPatch with its Patch.
- hasRateOfPatch: Connects the PatchInPatch with its RateOfPatch.
- containsUse: Connects the Patch with its UseInPatch.

- `hasUse`: Connects the `UseInPatch` with its `Use` (from the IFN ontology, see Subsection 3.4).
- `hasRateOfUse`: Connect the `UseInPatch` to its `RateOfUse`.

In the following figures we can see a subset of how non-merged patches (Figure 9), and merged patches (Figure 10) are represented in the ontology.

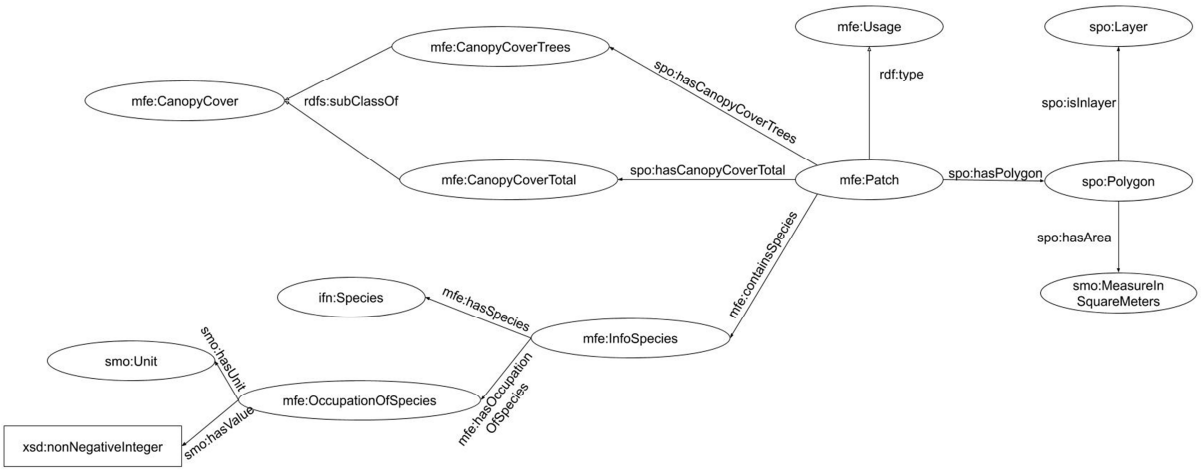

Figure 11: Representation of Original Patches in the Ontology

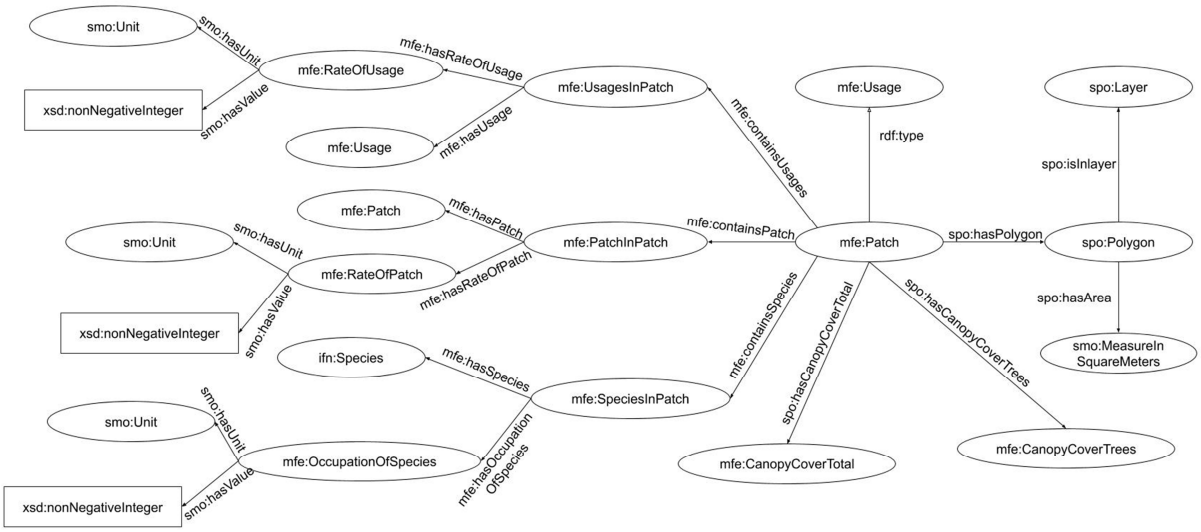

Figure 12: Representation of Merged Patches in the Ontology

4.5.2 Links with other Ontologies

The MFE ontology is not currently linked with any external ontologies.

5 Conclusions

A set of seven ontologies have been created within this task, accruing a total of 295 classes, 91 object properties, 35 datatype properties, and 20,932 named individuals. These ontologies make use of the Spatial Data on the Web Best Practices, as well as design patterns, that guarantee their correctness and usability.

The creation of these ontologies to represent and publish forest inventory and map data will allow any country to publish their forest data in an open and standard format. These data will be self-described and interoperable, allowing it to be used by the general public, and to connect with other data, be it forest data from different places or any other kind of data, enriching its possibilities of use.

Spanish and Portuguese data will be generated and published in future steps, transcending national borders and connecting with other open data published by the two countries, along with domain specific data from reputable sources.

We are confident that these ontologies will allow to open borders, both country-wise and community-wise, in the publication of forestry data, fostering advances in research and collaborations around the globe.

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Annex A: List of Abbreviations

EPSG	European Petroleum Survey Group

GIS	Geographic Information System
HPC	High Performance Computing
IFN	Inventario Forestal Nacional
INEA	Innovation and Networks Executive Agency
IOGP	International Association of Oil & Gas Producers
MFE	Mapa Forestal de España
NCBI	National Center for Biotechnology Information
OWL	Web Ontology Language
RDF	Resource Description Framework
RDFS	RDF Schema
SPARQL	SPARQL Protocol and RDF Query Language
TRAGSA	Empresa de Transformación Agraria, S.A.
UVA	Universidad de Valladolid
W3C	World Wide Web Consortium

Annex B: Simple Positions Ontology

```
@prefix spo: <http://crossforest.eu/position/ontology/> .
@prefix epsg:  <http://epsg.w3id.org/ontology/> .
@prefix smo: <http://crossforest.eu/measures/ontology/> .
@prefix xsd: <http://www.w3.org/2001/XMLSchema#> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .
@prefix owl: <http://www.w3.org/2002/07/owl#> .
@prefix dc: <http://purl.org/dc/elements/1.1/> .
@prefix vann: <http://purl.org/vocab/vann/> .


spo: a owl:Ontology;
  rdfs:label "Spatial Position Ontology"@en , "Ontología de Posiciones Espaciales"@es ;
  rdfs:comment "An ontology to publish data about spatial entities and their positions in various reference systems, including relative positions"@en , "Una ontología para publicar datos sobre entidades espaciales y sus posiciones en múltiples sistemas de referencia, incluyendo posiciones relativas"@es ;
  owl:versionInfo 0.1 ;
  dc:creator <https://www.crossforest.eu/members/josgim> , <https://www.crossforest.eu/members/guiveg> ;
  dc:date "2019-07-17"^^xsd:date ;
  owl:imports smo: ;
  vann:preferredNamespacePrefix "spo" .


###>> Nota: Las cosas de esta ontología relacionadas con CRS están en proceso de desaparecer y ser sustituídas por la ontología del EPSG


#################################################################
#    Classes
#################################################################


spo:SpatialEntity a owl:Class , rdfs:Class ;
  rdfs:label "Spatial Entity"@en , "Entidad espacial"@es ;
  rdfs:comment "Entity with Spatial Position"@en , "Entidad con posición espacial"@es ;
  owl:disjointWith spo:Position , spo:Coordinate , spo:EPSGentity , spo:Axis ;
```



```
  rdfs:isDefinedBy spo: .


spo:ReferenceEntity a owl:Class , rdfs:Class ;
  rdfs:subClassOf spo:SpatialEntity ;
  rdfs:label "Reference Entity"@en , "Entidad de Referencia"@es ;
  rdfs:comment "Entity taken as reference for the position of other spatial entities"@en , "Entidad tomada como referencia para el posicionamient de otras entidades espaciales"@es ;
  owl:equivalentClass [
    a owl:Restriction ;
    owl:onProperty smo:hasPosition ;
    owl:someValuesFrom spo:ReferencePosition ] ;
  rdfs:isDefinedBy spo: .


spo:Position a owl:Class , rdfs:Class ;
  rdfs:label "Position"@en , "Posición"@es ;
  rdfs:comment "Position where a spatial entity can be located"@en , "Posición donde una entidad espacial puede estar situada"@es ;
  owl:disjointWith spo:SpatialEntity , spo:Coordinate , spo:EPSGentity , spo:Axis ;
  rdfs:isDefinedBy spo: .


spo:ReferencePosition a owl:Class , rdfs:Class ;
  rdfs:subClassOf spo:Position ;
  rdfs:label "Reference Position"@en , "Posición de Referencia"@es ;
  rdfs:comment "Position taken as reference for the position of other spatial entities"@en , "Posición tomada como referencia para el posicionamient de otras entidades espaciales"@es ;
  rdfs:isDefinedBy spo: .


spo:GeocentricPosition a owl:Class , rdfs:Class ;
  rdfs:subClassOf spo:Position ;
  rdfs:label "Geocentric Position"@en , "Posición geocéntrica"@es ;
  rdfs:comment "Position that uses a geodetic coordinate reference system" , "Posición que utiliza un sistema geodético de coordenadas de referencia"@es ;
  owl:disjointWith spo:AllocentricPosition , spo:EgocentricPosition ;
  rdfs:isDefinedBy spo: .


spo:AllocentricPosition a owl:Class , rdfs:Class ;
  rdfs:subClassOf spo:Position ;
  rdfs:label "Allocentric Position" , "Posición Alocéntrica" ;
```



```
  rdfs:comment "Position from a set of points"@en , "Posición desde un conjunto de
puntos"@es ;
  owl:disjointWith spo:GeocentricPosition , spo:EgocentricPosition ;
  rdfs:isDefinedBy spo: .


spo:EgocentricPosition a owl:Class , rdfs:Class ;
  rdfs:subClassOf spo:Position ;
  rdfs:label "Egocentric Position" , "Posición Egocéntrica" ;
  rdfs:comment "Position from a point of reference"@en , "Posición desde un punto
de referencia"@es ;
  owl:disjointWith spo:GeocentricPosition , spo:AllocentricPosition ;
  rdfs:isDefinedBy spo: .


spo:Bound a owl:Class , rdfs:Class ;
  rdfs:label ""@es , ""@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:isDefinedBy spo: .


spo:UpperBound a owl:Class , rdfs:Class ;
  rdfs:label ""@es , ""@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:isDefinedBy spo: .


spo:LowerBound a owl:Class , rdfs:Class ;
  rdfs:label ""@es , ""@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:isDefinedBy spo: .


spo:RightBound a owl:Class , rdfs:Class ;
  rdfs:label ""@es , ""@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:isDefinedBy spo: .


spo:LeftBound a owl:Class , rdfs:Class ;
  rdfs:label ""@es , ""@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:isDefinedBy spo: .


spo:Layer a owl:Class , rdfs:Class ;
  rdfs:label ""@es , ""@es ;
```



```
  rdfs:comment ""@en , ""@es ;
  rdfs:isDefinedBy spo: .

spo:Polygon a owl:Class , rdfs:Class ;
  rdfs:subClassOf spo:Position ;
  rdfs:label ""@es , ""@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:isDefinedBy spo: .

spo:hasCoordinateReferenceSystem a owl:ObjectProperty , rdf:Property ;
  rdfs:label "coordinate reference system"@en , "sistema de coordenadas de referencia"@es ;
  rdfs:comment "coordinate reference system used for the position"@en , "sistema de coordenadas de referencia usado para la posición"@es ;
  rdfs:domain spo:Position ;
  rdfs:range epsg:CoordinateReferenceSystem ;
  rdfs:isDefinedBy spo: .

spo:hasCoordinate a owl:ObjectProperty , rdf:Property ;
  rdfs:label "coordinate"@en , "coordenada"@es ;
  rdfs:comment "coordinate of the position"@en , "coordenada de la posición"@es ;
  rdfs:domain spo:GeocentricPosition ;
  rdfs:range epsg:Coordinate ;
  rdfs:isDefinedBy spo: .



#################################################################
#    Object Properties
#################################################################

spo:samePosition a owl:ObjectProperty , rdf:Property , owl:SymmetricProperty , owl:ReflexiveProperty ;
  rdf:label "same position as"@en , "misma posición que"@es ;
  rdfs:comment "same phisical position, probably in a different coordinate reference system"@en , "misma posición física, probablemente en un sistema de coordenadas de referencia diferente" ;
  rdfs:domain spo:Position ;
  rdfs:range spo:Position ;
  rdfs:isDefinedBy spo: .

spo:hasPosition a owl:ObjectProperty , rdf:Property ;
```



```
  rdfs:label "has location"@en , "situada en"@es ;

  rdfs:comment "the spatial entity has this location"@en , "la entidad espacial
tiene esta posición"@es ;

  rdfs:domain spo:SpatialEntity ;

  rdfs:range spo:Position ;

  rdfs:isDefinedBy spo: .


spo:hasGeocentricPosition a owl:ObjectProperty , rdf:Property ;

  rdfs:subPropertyOf spo:hasPosition ;

  rdfs:label "has geocentric position"@en , "tiene posición geocéntrica"@es ;

  rdfs:comment "the spacial entity has this position in a geodetic CRS"@en , "la
entidad espacial tiene esta posición en un Sistema de Coordenadas de Referencia
Geodésico"@es ;

  rdfs:range spo:GeocentricPosition ;

  rdfs:isDefinedBy spo: .


spo:hasEgocentricPosition a owl:ObjectProperty , rdf:Property ;

  rdfs:subPropertyOf spo:hasPosition ;

  rdfs:label "has egocentric position"@en , "tiene posición egocéntrica"@es ;

  rdfs:comment "the spatial entity has this position from a point of reference
(which is probably the posicion of another spatial entity)"@en , "la entidad
espacial tiene esta posición desde un punto de referencia (que es probablemente la
posición de otra entidad espacial)"@es ;

  rdfs:range spo:EgocentricPosition ;

  rdfs:isDefinedBy spo: .


spo:hasReference a owl:ObjectProperty , rdf:Property ;

  rdfs:label "from reference"@en , "desde la referencia"@es;

  rdfs:comment "the position is w.r.t. this position of reference"@en , "la
posición es relativa a esta posición de referencia"@es ;

  rdfs:domain spo:EgocentricPosition ;

  rdfs:range spo:ReferencePosition ;

  rdfs:isDefinedBy spo: .


spo:referenceOf a owl:ObjectProperty , rdf:Property ;

  rdfs:label "is reference of"@en , "es referencia de"@es ;

  rdfs:comment "the position for which the entity is used as a reference"@en , "la
posición para la cual la entidad se usa como referencia"@es ;

  rdfs:domain spo:ReferencePosition ;

  rdfs:range spo:EgocentricPosition ;

  owl:inverseOf spo:fromReference ;

  rdfs:isDefinedBy spo: .
```



```
spo:egocentricPositionOf a owl:ObjectProperty , rdf:Property ;
  rdfs:label "egocentric position of"@en , "posición egocéntrica de"@es ;
  rdfs:comment "target entity of the egocentric position"@en , "entidad objetico
de la posición egocéntrica"@es ;
  rdfs:domain spo:EgocentricPosition ;
  rdfs:range spo:SpatialEntity ;
  owl:inverseOf spo:hasEgocentricPosition ;
  rdfs:isDefinedBy spo: .

spo:hasPolygon a owl:ObjectProperty , rdf:Property ;
  rdfs:subPropertyOf spo:hasPosition ;
  rdfs:label "has polygon"@en , "tiene polígono"@es ;
  rdfs:comment "the spatial entity is located in this polygon"@en , "la entidad
espacial está en este polígono"@es ;
  rdfs:range spo:Polygon ;
  rdfs:isDefinedBy spo: .

spo:hasBound a owl:ObjectProperty , rdf:Property ;
  rdfs:domain spo:Position ;
  rdfs:range spo:Bound ;
  rdfs:isDefinedBy spo: .

spo:hasUpperBound a owl:ObjectProperty , rdf:Property ;
  rdfs:subPropertyOf spo:hasBound ;
  rdfs:range spo:UpperBound ;
  rdfs:isDefinedBy spo: .

spo:hasLowerBound a owl:ObjectProperty , rdf:Property ;
  rdfs:subPropertyOf spo:hasBound ;
  rdfs:range spo:LowerBound ;
  rdfs:isDefinedBy spo: .

spo:hasRightBound a owl:ObjectProperty , rdf:Property ;
  rdfs:subPropertyOf spo:hasBound ;
  rdfs:range spo:RightBound ;
  rdfs:isDefinedBy spo: .

spo:hasLeftBound a owl:ObjectProperty , rdf:Property ;
  rdfs:subPropertyOf spo:hasBound ;
```



```
  rdfs:range spo:LeftBound ;
  rdfs:isDefinedBy spo: .


spo:hasDirection a owl:ObjectProperty , rdf:Property ;
  rdfs:label "direction"@en , "rumbo"@es ;
  rdfs:comment "direction of the position from the position of reference"@en , "rumbo de la posición respecto a la posición de referencia"@es ;
  rdfs:domain spo:EgocentricPosition ;
  rdfs:range smo:Measure ;
  rdfs:isDefinedBy spo: .


spo:hasDistance a owl:ObjectProperty , rdf:Property ;
  rdfs:label "distance"@en , "distancia"@es ;
  rdfs:comment "distance from the position to the position of reference"@en , "distancia de la posición a la posición de referencia"@es ;
  rdfs:domain spo:EgocentricPosition ;
  rdfs:target smo:Measure ;
  rdfs:isDefinedBy spo: .




#################################################################
#    Datatype Properties
#################################################################


spo:hasDirectionInDegrees a owl:DatatypeProperty , rdf:Property ;
  rdfs:subPropertyOf smo:hasMeasureInDegrees ;
  rdfs:label "direction"@en , "rumbo"@es ;
  rdfs:comment "direction in degress of the position from the position of reference"@en , "rumbo en grados de la posición respecto a la posición de referencia"@es ;
  rdfs:domain spo:EgocentricPosition ;
  rdfs:isDefinedBy spo: .


spo:hasDistanceInMeters a owl:DatatypeProperty , rdf:Property ;
  rdfs:subPropertyOf smo:hasMeasureInMeters ;
  rdfs:label "distance"@en , "distancia"@es ;
  rdfs:comment "distance in meters from the position to the position of reference"@en , "distancia en metros de la posición a la posición de referencia"@es ;
  rdfs:domain spo:EgocentricPosition ;
```



```
rdfs:isDefinedBy spo: .
```


Annex C: EPSG ontology

```
@prefix epsg: <http://epsg.w3id.org/ontology/> .
@prefix xsd: <http://www.w3.org/2001/XMLSchema#> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .
@prefix owl: <http://www.w3.org/2002/07/owl#> .
@prefix dc: <http://purl.org/dc/elements/1.1/> .
@prefix vann: <http://purl.org/vocab/vann/> .

epsg: a owl:Ontology;
  rdfs:label "EPSG Ontology and Data"@en ;
  rdfs:comment "Ontology and Data from the IOGP’s EPSG Geodetic Parameter Dataset"@en ;
  owl:versionInfo 0.1 ;
  dc:creator <https://www.gsic.uva.es/members/josgim> ;
  dc:date "2019-07-17"^^xsd:date ;
  vann:preferredNamespacePrefix "epsg" .

#################################################################
#    Classes
#################################################################

#Do the disjoints at the end

epsg:Position a owl:Class , rdfs:Class ;
  rdfs:label "Position"@en , "Posición"@es ;
  rdfs:comment "Position on Earth that can be described using EPSG data"@en , "Posición en la Tierra que puede ser descrita usando datos EPSG"@es ;
  rdfs:isDefinedBy epsg: .

epsg:Coordinate a owl:Class , rdfs:Class ;
  rdfs:label "Coordinate"@en , "Coordenada"@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:isDefinedBy epsg: .

epsg:EPSGentity a owl:Class , rdfs:Class ;
```



```
  rdfs:label "EPGS Entity"@en , "Entidad EPGS"@es ;

  rdfs:comment "Entity that belongs to the EPSG standard maintained by the IOGP (International Association of Oil & Gas Producers)" , "Entidad perteneciente al estándar EPSG mantenido por la IOGP (International Association of Oil & Gas Producers)"@es ;

  rdfs:equivalentClass [

    a owl:Restriction ;

    owl:onProperty epsg:hasEPSGcode ;

    owl:someValuesFrom xsd:nonNegativeInteger ] ;

  rdfs:isDefinedBy epsg: .


epsg:CoordinateReferenceSystem a owl:Class , rdfs:Class ;

  rdfs:subClassOf epsg:EPSGentity ;

  rdfs:label "Coordinate Reference System"@en , "Sistema de Coordenadas de Referencia"@es , "CRS"@en ;

  rdfs:comment "Coordinate-based system to define locations on Earth"@en , "Sistema basado en coordenadas para definir posiciones en la Tierra"@es ;

  rdfs:isDefinedBy epsg: .


epsg:CRS2d a owl:Class , rdfs:Class ;

  rdfs:subClassOf epsg:CoordinateReferenceSystem ;

  rdfs:label "2D CRS"@en , "CRS 2D"@es ;

  rdfs:comment "Coordinate Reference System of 2 dimensions"@en , "Sistema de Coordenadas de Referencia de dos dimensiones"@es ;

  rdfs:subClassOf [

    a owl:Restriction ;

    owl:onProperty epsg:hasAxis ;

    owl:qualifiedCardinality 2 ;

    owl:onClass epsg:Axis ] ;

  rdfs:isDefinedBy epsg: .


epsg:CompoundCRS a owl:Class , rdfs:Class ;

  rdfs:subClassOf epsg:CoordinateReferenceSystem ;

  rdfs:label "Compound CRS"@en , "Sistema de Cooordenadas Compuesto"@es ;

  rdfs:comment ""@en , ""@es ;

  owl:disjointWith epsg:ProjectedCRS ;

  epsg:isEPSGtype "compound";

  rdfs:isDefinedBy epsg: .


epsg:GeographicCRS a owl:Class , rdfs:Class ;

  rdfs:subClassOf epsg:CoordinateReferenceSystem ;
```



```
  rdfs:label "Geodetic CRS"@en , "Geographic CRS"@en , "Sistema de Cooordenadas Geográfico"@es ;

  rdfs:comment "Coordinate Reference System used define locations on Earth using an ellipsoid that approximates it"@en , "Sistema de Coordenadas de Referencia usado para definir posiciones en la Tierra utilizando un elipsoide como aproximación"@es ;

  owl:disjointWith epsg:ProjectedCRS ;

  rdfs:isDefinedBy epsg: .


epsg:Geographic2dCRS a owl:Class , rdfs:Class ;

  rdfs:subClassOf epsg:2dCRS , epsg:CoordinateReferenceSystem ;

  rdfs:label "Geodetic 2D CRS"@en , "Geographic 2D CRS"@en , "Sistema de Cooordenadas Geográfico 2D"@es ;

  rdfs:comment "Coordinate Reference System used define locations on the surface of the Earth using an ellipsoid that approximates it"@en , "Sistema de Coordenadas de Referencia usado para definir posiciones en la superfice de la Tierra utilizando un elipsoide como aproximación"@es ;

  epsg:isEPSGtype "geographic 2D";

  rdfs:isDefinedBy epsg: .


epsg:Geographic3dCRS a owl:Class , rdfs:Class ;

  rdfs:subClassOf epsg:CoordinateReferenceSystem ;

  rdfs:label "Geodetic 3D CRS"@en , "Geographic 3D CRS"@en , "Sistema de Cooordenadas Geográfico 3D"@es ;

  rdfs:comment "Coordinate Reference System used define locations in three dimensions on the Earth using an ellipsoid that approximates it"@en , "Sistema de Coordenadas de Referencia usado para definir posiciones en tres dimensiones en la Tierra utilizando un elipsoide como aproximación"@es ;

  rdfs:subClassOf [

    a owl:Restriction ;

    owl:onProperty epsg:hasAxis ;

    owl:qualifiedCardinality 3 ;

    owl:onClass epsg:Axis ] ;

  epsg:isEPSGtype "geographic 3D";

  rdfs:isDefinedBy epsg: .


epsg:ProjectedCRS a owl:Class , rdfs:Class ;

  rdfs:subClassOf epsg:2dCRS , epsg:CoordinateReferenceSystem ;

  rdfs:label "Projected CRS"@en , "Sistema de Coordenadas de Referencia Proyectado"@es ;

  rdfs:comment "Coordinate-based system to define locations on Earth using a flat, two-dimensional surface"@en , "Sistema basado en coordenadas para definir posiciones en la Tierra utilizando una superfice plana en dos dimensiones"@es ;

  epsg:isEPSGtype "projected";
```



```
  rdfs:isDefinedBy epsg: .


epsg:VerticalCRS a owl:Class , rdfs:Class ;
  rdfs:subClassOf epsg:CoordinateReferenceSystem ;
  rdfs:label "Vertical CRS"@en , "Sistema de Coordenadas de Referencia Vertical"@es ;
  rdfs:comment "One-dimensional coordinate reference system used for gravity-related height or depth measurements"@en , "Sistema de coordenadas de referencia de una dimensión usado para alturas o profundidades relativas a la gravedad"@es ;
  epsg:isEPSGtype "vertical";
  rdfs:isDefinedBy epsg: .


epsg:Datum a owl:Class , rdfs:Class ;
  rdfs:subClassOf epsg:EPSGentity ;
  rdfs:label "Datum"@en , "Datum"@es ;
  rdfs:comment "Set of parameters that determine the location, orientation, and scale of the origin of a CRS"@en , "Conjunto de parámetros que determinan la localización, orientación y escala del origen de un CRS"@es ;
  owl:disjointWith epsg:CoordinateReferenceSystem , epsg:CoordinateSystem , epsg:Ellipsoid , epsg:AxisName , epsg:Orientation , epsg:PrimeMeridian ;
  rdfs:isDefinedBy epsg: .


epsg:GeodeticDatum a owl:Class , rdfs:Class ;
  rdfs:subClassOf epsg:Datum ;
  rdfs:label "Geodetic Datum"@en , "Datum Geodésico"@es ;
  rdfs:comment "Datum to relate a ellipsoidal coordinate system to the Earth"@en , "Datum para relacional un sistema de coordenadas elipsoidal"@es ;
  epsg:isEPSGtype "geodetic" ;
  rdfs:isDefinedBy epsg: .


epsg:VerticalDatum a owl:Class , rdfs:Class ;
  rdfs:subClassOf epsg:Datum ;
  rdfs:label "Vertical Datum"@en , "Datum Vertical"@es ;
  epsg:isEPSGtype "vertical" ;
  rdfs:comment ""@en , ""@es ;
  rdfs:isDefinedBy epsg: .


epsg:EngineeringDatum a owl:Class , rdfs:Class ;
  rdfs:subClassOf epsg:Datum ;
  rdfs:label "Engineering Datum"@en , "Datum de Ingeniería"@es ;
  epsg:isEPSGtype "engineering" ;
```



```
  rdfs:comment ""@en , ""@es ;
  rdfs:isDefinedBy epsg: .

epsg:AreaOfUse a owl:Class , rdfs:Class ;
  rdfs:subClassOf epsg:EPSGentity ;
  rdfs:label "Area of Use"@en , "Área de uso"@es ;
  rdfs:comment "Area of use of a CRS."@en , "Área de uso de un SCR"@es ;
  rdfs:isDefinedBy epsg: .

epsg:CoordinateSystem a owl:Class , rdfs:Class ;
  rdfs:subClassOf epsg:EPSGentity ;
  rdfs:label "Coordinate System"@en , "Sistema de Coordenadas"@es , "CS"@en ;
  rdfs:comment "Set of rules that specifies how coordinates are assigned to
points"@en , "Conjunto de reglas que especifica cómo se asignan coordenadas a
puntos"@es ;
  rdfs:isDefinedBy epsg: .

epsg:AffineCS a owl:Class , rdfs:Class ;
  rdfs:subClassOf epsg:CoordinateSystem ;
  rdfs:label "" ;
  rdfs:comment "" ;
  epsg:isEPSGtype "affine" ;
  rdfs:isDefinedBy epsg: .

epsg:CylindricalCS a owl:Class , rdfs:Class ;
  rdfs:subClassOf epsg:CoordinateSystem ;
  rdfs:label "" ;
  rdfs:comment "" ;
  epsg:isEPSGtype "cylindrical" ;
  rdfs:isDefinedBy epsg: .

epsg:EllipsoidalCS a owl:Class , rdfs:Class ;
  rdfs:subClassOf epsg:CoordinateSystem ;
  rdfs:label "" ;
  rdfs:comment "" ;
  epsg:isEPSGtype "ellipsoidal" ;
  rdfs:isDefinedBy epsg: .

epsg:LinearCS a owl:Class , rdfs:Class ;
  rdfs:subClassOf epsg:CoordinateSystem ;
```



```
  rdfs:label "" ;
  rdfs:comment "" ;
  epsg:isEPSGtype "linear" ;
  rdfs:isDefinedBy epsg: .

epsg:PolarCS a owl:Class , rdfs:Class ;
  rdfs:subClassOf epsg:CoordinateSystem ;
  rdfs:label "" ;
  rdfs:comment "" ;
  epsg:isEPSGtype "polar" ;
  rdfs:isDefinedBy epsg: .

epsg:SphericalCS a owl:Class , rdfs:Class ;
  rdfs:subClassOf epsg:CoordinateSystem ;
  rdfs:label "" ;
  rdfs:comment "" ;
  epsg:isEPSGtype "spherical" ;
  rdfs:isDefinedBy epsg: .

epsg:VerticalCS a owl:Class , rdfs:Class ;
  rdfs:subClassOf epsg:CoordinateSystem ;
  rdfs:label "" ;
  rdfs:comment "" ;
  epsg:isEPSGtype "vertical" ;
  rdfs:isDefinedBy epsg: .

epsg:CartesianCS a owl:Class , rdfs:Class ;
  rdfs:subClassOf spo:CoordinateSystem ;
  rdfs:label "Cartesian Coordinate System"@en , "Sistema de Coordenadas
Cartesiano"@es ;
  rdfs:comment "Coordinate system that gives the position of points relative to a
system of perpendicular axes"@en , "Sistema de coordenadas que da la posición de
los puntos en relación a un sistema de ejes perpendiculares"@es ;
  owl:disjointWith epsg:EllipsoidalCoordinateSystem ;
  rdfs:isDefinedBy epsg: .

epsg:Axis a owl:Class , rdfs:Class ;
  rdfs:label "Axis"@en , "Eje"@es ;
  rdfs:comment "Coordinate axis in a coordinate system. Includes axis name,
orientation, and unit."@en , "Eje de coordenadas en un sistema de coordenadas.
Inlcuye el nombre del eje, orientación, y unidades."@es ;
```



```
  rdfs:isDefinedBy epsg: .


epsg:Ellipsoid a owl:Class , rdfs:Class ;

  rdfs:subClassOf epsg:EPSGentity ;

  rdfs:label "Ellipsoid"@en , "Elipsoide"@es ;

  rdfs:comment "Ellipsoid that approximates the geoid (surface with equal gravity potential) of the Earth"@en , "Elipsoide que se usa como aproximación del geoide (superficie con la misma gravedad potencial) de la Tierra"@es ;

  owl:disjointWith     epsg:CoordinateReferenceSystem     ,     epsg:Datum     , epsg:CoordinateSystem , epsg:AxisName , epsg:Orientation , epsg:PrimeMeridian ;

  rdfs:isDefinedBy epsg: .


epsg:AxisName a owl:Class , rdfs:Class ;

  rdfs:subClassOf epsg:EPSGentity ;

  rdfs:label "Axis Name"@en , "Nombre del Eje"@es ;

  rdfs:comment "Coordinate axis name in a Coordinate System, including its abbreviation"@en , "Eje de coordenadas en un sistema de coordenadas, incluyendo u abreviación"@es ;

  owl:disjointWith     epsg:CoordinateReferenceSystem     ,     epsg:Datum     , epsg:CoordinateSystem , epsg:Ellipsoid , epsg:Orientation , epsg:PrimeMeridian ;

  rdfs:isDefinedBy epsg: .


epsg:Orientation a owl:Class , rdfs:Class ;

  rdfs:label "Orientation"@en , "Orientación"@es ;

  rdfs:comment "Orientation of a Coordinate Axis"@en , "Orientación de un eje de coordenadas"@es ;

  owl:disjointWith     epsg:CoordinateReferenceSystem     ,     epsg:Datum     , epsg:CoordinateSystem , epsg:Ellipsoid , epsg:AxisName , epsg:PrimeMeridian ;

  rdfs:isDefinedBy epsg: .


epsg:PrimeMeridian a owl:Class , rdfs:Class ;

  rdfs:subClassOf epsg:EPSGentity ;

  rdfs:label "Prime Meridian"@en , "Meridiano Cero"@es ;

  rdfs:comment "Meridian at which longitude is defined to be zero"@en , "Meridiano en el que se define la longitud como cero"@es ;

  owl:disjointWith      spo:CoordinateReferenceSystem      ,      spo:Datum      , spo:CoordinateSystem , spo:Ellipsoid , spo:AxisName , spo:Orientation ;

  rdfs:isDefinedBy epsg: .


epsg:CoordinateOperationMethod a owl:Class , rdfs:Class ;

  rdfs:subClassOf epsg:EPSGentity ;

  rdfs:label "Coordinate Operation Method"@en , "Método de Operación de Coordenadas"@es ;
```



```
  rdfs:comment "" ;
  rdfs:isDefinedBy epsg: .

epsg:CoordinateOperation a owl:Class , rdfs:Class ;
  rdfs:subClassOf epsg:EPSGentity ;
  rdfs:label "Coordinate Operation"@en , "Operación de Coordenadas"@es ;
  rdfs:comment "" ;
  rdfs:isDefinedBy epsg: .

epsg:ConversionOperation a owl:Class , rdfs:Class ;
  rdfs:subClassOf epsg:CoordinateOperation ;
  rdfs:label "Conversion Operation"@en , "Conversión de Coordenadas"@es ;
  rdfs:comment "" ;
  epsg:isEPSGtype "conversion" ;
  rdfs:isDefinedBy epsg: .

epsg:TransformationOperation a owl:Class , rdfs:Class ;
  rdfs:subClassOf epsg:CoordinateOperation ;
  rdfs:label "Transformation Operation"@en , "Transformación de Coordenadas"@es ;
  rdfs:comment "" ;
  epsg:isEPSGtype "transformation" ;
  rdfs:isDefinedBy epsg: .

epsg:ConcatenatedOperation a owl:Class , rdfs:Class ;
  rdfs:subClassOf epsg:CoordinateOperation ;
  rdfs:label "Concatenated Operation"@en , "Operaciones Concatenadas de
Coordenadas"@es ;
  rdfs:comment "" ;
  epsg:isEPSGtype "concatenated operation" ;
  rdfs:isDefinedBy epsg: .

#################################################################
#    Object Properties
#################################################################

epsg:hasCoordinateReferenceSystem a owl:ObjectProperty , rdf:Property ;
  rdfs:label "coordinate reference system"@en , "sistema de coordenadas de
referencia"@es ;
  rdfs:comment "coordinate reference system used for the position"@en , "sistema
de coordenadas de referencia usado para la posición"@es ;
```



```
  rdfs:range epsg:CoordinateReferenceSystem ;
  rdfs:isDefinedBy epsg: .

epsg:hasCoordinate a owl:ObjectProperty , rdf:Property ;
  rdfs:label "coordinate"@en , "coordenada"@es ;
  rdfs:comment "coordinate of the position"@en , "coordenada de la posición"@es ;
  rdfs:domain spo:GeocentricPosition ;
  rdfs:range epsg:Coordinate ;
  rdfs:isDefinedBy epsg: .

epsg:hasCoordinateSystem a owl:ObjectProperty , rdf:Property ;
  rdfs:label "coordinate system"@en , "sistema de coordenadas"@es ;
  rdfs:comment "coordinate system of the CRS"@en , "sistema de coordenadas del
CRS"@es ;
  rdfs:domain epsg:CoordinateReferenceSystem ;
  rdfs:range epsg:CoordinateSystem ;
  rdfs:isDefinedBy epsg: .

 epsg:hasAreaOfUse a owl:ObjectProperty , rdf:Property ;
  rdfs:label "area of use"@en , "área de uso"@es ;
  rdfs:comment "area of use of the CRS"@en , "área de uso del CRS"@es ;
  rdfs:domain epsg:CoordinateReferenceSystem ;
  rdfs:range epsg:AreaOfUse ;
  rdfs:isDefinedBy epsg: .

epsg:hasSourceGeographicCRS a owl:ObjectProperty , rdf:Property ;
  rdfs:label "source geographic CRS"@en , "sistema de soordenadas de seferencia
base"@es ;
  rdfs:comment "the Projected CRS has this Geographic CRS as source"@en , "el
Sistema de Coordenadas de Referencia Proyectado tiene este Sistema de Coordenadas
de Referencia como base"@es ;
  rdfs:domain epsg:ProjectedCRS ;
  rdfs:range epsg:GeographicCRS ;
  rdfs:isDefinedBy epsg: .

epsg:hasProjectionOperation a owl:ObjectProperty , rdf:Property ;
  rdfs:label "projection operation"@en , "operación de proyección"@es ;
  rdfs:comment "operation used to convert the Projected CRS from and to the source
geographic CRS"@en , "operación usada para convertir a y desde el CRS geográfico
base"@es ;
  rdfs:domain epsg:ProjectedCRS ;
```



```
  rdfs:range epsg:CoordinateOperation ;
  rdfs:isDefinedBy epsg: .

epsg:hasHorizontalComponent a owl:ObjectProperty , rdf:Property ;
  rdfs:label "horizontal component"@en , "componente horizontal"@es ;
  rdfs:comment "For compound CRSs only, the horizontal component of the Compound CRS."@en , "Para CCRRSS solamente, el componente horizontal del CRS compuesto."@es ;
  rdfs:domain epsg:CompoundCRS ;
  rdfs:range epsg:2dCRS .

epsg:hasVerticalComponent a owl:ObjectProperty , rdf:Property ;
  rdfs:label "vertical component"@en , "componente vertical"@es ;
  rdfs:comment "For compound CRSs only, the vertical component of the Compound CRS."@en , "Para CCRRSS solamente, el componente vertical del CRS compuesto."@es ;
  rdfs:domain epsg:CompoundCRS ;
  rdfs:range epsg:VerticalCRS .

epsg:hasAxis a owl:ObjectProperty , rdfs:Property ;
  rdfs:label "axis"@en , "eje"@es ;
  rdfs:comment "Coordinate axis in a coordinate system"@es , "eje de coordenadas en un sistema de coordenadas"@es ;
  rdfs:domain [ owl:disjointUnionOf ( epsg:CoordinateSystem epsg:Coordinate ) ] ;
  rdfs:range epsg:Axis ;
  rdfs:isDefinedBy epsg: .

epsg:hasAxisName a owl:ObjectProperty , rdfs:Property ;
  rdfs:label "axis name"@en , "nombre del eje"@es ;
  rdfs:comment "Axis name as it is defined in the EPSG dataset, including its abbreviation"@en , "Nombre del eje tal y como está definido en el dataset EPSG, incluyendo su abreviación"@es ;
  rdfs:domain epsg:Axis ;
  rdfs:domain epsg:AxisName ;
  rdfs:isDefinedBy epsg: .

epsg:hasOrientation a owl:ObjectProperty , rdfs:Property ;
  rdfs:label "orientation"@en , "orientación"@es ;
  rdfs:comment "orientation of the coordinate axis"@en , "orientación del eje de coordenadas"@es ;
  rdfs:domain epsg:Axis ;
  rdfs:range epsg:Orientation ;
```



```
  rdfs:isDefinedBy epsg: .


epsg:hasUnitOfMeasure a owl:ObjectProperty , rdfs:Property ;
  rdfs:label "unit of measure"@en , "unit of measure"@es ;
  rdfs:comment "unit of measure of the coordinate axis"@en , "unidad de medida del
eje de coordenadas"@es ;
  rdfs:domain epsg:Axis ;
  rdfs:range epsg:Orientation ;
  rdfs:isDefinedBy epsg: .


epsg:hasDatum a owl:ObjectProperty , rdf:Property ;
  rdfs:label "datum"@en , "datum"@es ;
  rdfs:comment "datum of the CRS"@en , "datum del CRS"@es ;
  rdfs:domain epsg:CoordinateReferenceSystem ;
  rdfs:range epsg:Datum ;
  rdfs:isDefinedBy epsg: .


epsg:hasGeodeticDatum a owl:ObjectProperty , rdf:Property ;
  rdfs:label "geodetic datum"@en , "datum geodésico"@es ;
  rdfs:comment "geodetic datum of the Geodetic CRS"@en , "datum geodésico del
Sistema de Coordenadas de Referencia geodésico"@es ;
  rdfs:domain epsg:GeodeticCRS ;
  rdfs:range epsg:GeodeticDatum ;
  rdfs:isDefinedBy epsg: .


epsg:hasEllipsoid a owl:ObjectProperty , rdf:Property ;
  rdfs:label "ellipsoid"@en , "elipsoide"@es ;
  rdfs:comment "ellipsoid of the geodetic datum"@en , "elipsoide del Sistema del
datum geodésico"@es ;
  rdfs:domain epsg:GeodeticDatum ;
  rdfs:range epsg:Ellipsoid ;
  rdfs:isDefinedBy epsg: .


epsg:hasPrimeMeridian a owl:ObjectProperty , rdf:Property ;
  rdfs:label "prime meridian"@en , "meridiano cero"@es ;
  rdfs:comment "prime meridian of the geodetic datum"@en , "meridiano cero del
datum geodésico"@es ;
  rdfs:domain epsg:GeodeticDatum ;
  rdfs:range epsg:PrimeMeridian ;
  rdfs:isDefinedBy epsg: .
```



```
epsg:hasSemiMajorAxis a owl:ObjectProperty , rdf:Property ;
  rdfs:subPropertyOf smo:hasMeasure;
  rdfs:label "semi-major axis"@en , "eje semi-mayor"@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:domain epsg:Ellipsoid ;
  rdfs:range epsg:SemiMajorAxis ;
  rdfs:isDefinedBy epsg: .

epsg:hasInverseFlattening a owl:ObjectProperty , rdf:Property ;
  rdfs:subPropertyOf smo:hasMeasure;
  rdfs:label "inverse flattening"@en , "aplanamiento inverso"@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:domain epsg:Ellipsoid ;
  rdfs:range epsg:InverseFlattening ;
  rdfs:isDefinedBy epsg: .

epsg:hasUnit a owl:ObjectProperty , rdfs:Property ;
  rdfs:label "units"@en , "unidades"@es ;
  rdfs:comment "units of the coordinate axis"@en , "unidades del eje de
coordenadas"@es ;
  rdfs:domain epsg:Axis ;
  rdfs:range smo:Unit ;
  rdfs:isDefinedBy epsg: .



#################################################################
#    Datatype Properties
#################################################################

epsg:hasEPSGcode a owl:DatatypeProperty, owl:FunctionalProperty , rdf:Property ;
  rdfs:label "EPSG code"@en , "código EPSG"@en ;
  rdfs:comment "code maintained by the EPSG (European Petroleum Survey Group)"@en
, "código mantenido por la EPSG (European Petroleum Survey Group)"@es ;
  rdfs:domain epsg:EPSGentity ;
  rdfs:range xsd:nonNegativeInteger ;
  rdfs:isDefinedBy epsg: .

epsg:hasAbbreviation a owl:DatatypeProperty , rdf:Property ;
  rdfs:label "abbreviation"@en , "abreviación"@es ;
```



```
  rdfs:comment "Abbreviation for the coordinate axis."@en , "Abreviación del eje
de coordenadas."@es ;
  rdfs:domain epsg:Axis ;
  rdfs:range rdf:literal ;
  rdfs:isDefinedBy epsg: .


epsg:hasOrder a owl:DatatypeProperty , rdf:Property ;
  rdfs:label "abbreviation"@en , "abreviación"@es ;
  rdfs:comment "The position of this axis within a Coordinate System: 1, 2, or
3."@en , "Posición del eje en el sistema de coordenadas: 1, 2, o 3."@es ;
  rdfs:domain epsg:Axis ;
  rdfs:range [ owl:oneOf ("0"^^xsd:nonNegativeInteger "1"^^xsd:nonNegativeInteger
"2"^^xsd:nonNegativeInteger) ] ;
  rdfs:isDefinedBy epsg: .


epsg:hasRequest a owl:DatatypeProperty , rdf:Property ;
  rdfs:label "request"@en , "petición"@es ;
  rdfs:comment "A description of the change request."@en , "Descripción de la
petición de cambio"@es ;
  rdfs:domain epsg:Change ;
  rdfs:range rdf:langString ;
  rdfs:isDefinedBy epsg: .


epsg:isReversible a owl:DatatypeProperty , rdf:Property ;
  rdfs:label "is reversible"@en , "es reversible"@es ;
  rdfs:comment "Indication of the validity of the transformation parameters for
the reverse operation; if not, search for an explicit definition of the reverse
transformation."@en ;
  rdfs:domain epsg:CoordinateOperationMethod ;
  rdfs:range xsd:boolean ;
  rdfs:isDefinedBy epsg: .



#################################################################
#    Annotation Properties
#################################################################


epsg:name a owl:AnnotationProperty , rdf:Property ;
  rdfs:subpropertyOf rdfs:label ;
  rdfs:label "same"@en ;
  rdfs:comment "name of the entity"@en ;
```



```
  rdfs:isDefinedBy epsg: .

epsg:description a owl:AnnotationProperty , rdf:Property ;
  rdfs:subpropertyOf rdfs:comment ;
  rdfs:label "description"@en ;
  rdfs:comment "description of the entity"@en ;
  rdfs:isDefinedBy epsg: .

epsg:scope a owl:AnnotationProperty , rdf:Property ;
  rdfs:subpropertyOf rdfs:comment ;
  rdfs:label "scope"@en ;
  rdfs:comment "scope of the entity"@en ;
  rdfs:isDefinedBy epsg: .

epsg:remarks a owl:AnnotationProperty , rdf:Property ;
  rdfs:subpropertyOf rdfs:comment ;
  rdfs:label "remarks"@en ;
  rdfs:isDefinedBy epsg: .

epsg:comment a owl:AnnotationProperty , rdf:Property ;
  rdfs:subpropertyOf rdfs:comment ;
  rdfs:label "comment"@en ;
  rdfs:comment "Supplementary remarks about the request or action taken."@en ;
  rdfs:isDefinedBy epsg: .

epsg:action a owl:AnnotationProperty , rdf:Property ;
  rdfs:subpropertyOf rdfs:comment ;
  rdfs:label "action"@en ;
  rdfs:comment "Description of changes made to data. Limited to 4000
characters."@en ;
  rdfs:isDefinedBy epsg: .

epsg:deprecated a owl:AnnotationProperty , rdf:Property ;
  rdfs:subpropertyOf owl:deprecated ; # Should or should not?
  rdfs:label "is deprecated"@en ;
  rdfs:comment "the element is deprecated"@en ;
  rdfs:isDefinedBy epsg: .
```



```
# Identifiers. I.e., properties that have a literal value that can be parsed to extract entities. To do in a second phase.


epsg:identifier a owl:AnnotationProperty , rdf:Property ;
  rdfs:label "Identifier"@en ;
  rdfs:comment "The literal identifies data in someway. It is usally regular or a set of strings. A Datatype property can be probably created in the future with this information."@en ;
  rdfs:isDefinedBy epsg: .


epsg:informationSource a owl:AnnotationProperty , rdf:Property ;
  rdfs:subpropertyOf epsg:identifier ;
  rdfs:label "Information Source"@en ;
  rdfs:comment "Reference describing the origin of the information to populate this record; e.g. an authoritative publication."@en ;
  rdfs:isDefinedBy epsg: .


epsg:dataSource a owl:AnnotationProperty , rdf:Property ;
  rdfs:subpropertyOf epsg:identifier ;
  rdfs:label "Data Source"@en ;
  rdfs:comment "The organisation, body or person who populated this record; for EPSG supplied reference data: \"EPSG\"."@en ;
  rdfs:isDefinedBy epsg: .


epsg:changeID a owl:AnnotationProperty , rdf:Property ;
  rdfs:subpropertyOf epsg:identifier ;
  rdfs:label "Change ID"@en ;
  rdfs:comment "Unlinked reference to change"@en ;
  rdfs:isDefinedBy epsg: .


epsg:tablesAffected a owl:AnnotationProperty , rdf:Property ;
  rdfs:subpropertyOf epsg:identifier ;
  rdfs:label "Tables Affected"@en ;
  rdfs:comment "A list of tables affected.  GeogCS and ProjCS are subsets of HorizCS."@en ;
  rdfs:isDefinedBy epsg: .


epsg:codesAffected a owl:AnnotationProperty , rdf:Property ;
  rdfs:subpropertyOf epsg:identifier ;
  rdfs:label "Codes Affected"@en ;
```



```
  rdfs:comment "A list of existing codes that are changed.  New codes not
here."@en ;
  rdfs:isDefinedBy epsg: .
```


Annex D: Simple Measures Ontology

```
@prefix smo: <http://crossforest.eu/measures/ontology/> .
@prefix xsd: <http://www.w3.org/2001/XMLSchema#> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .
@prefix owl: <http://www.w3.org/2002/07/owl#> .
@prefix dc: <http://purl.org/dc/elements/1.1/> .
@prefix vann: <http://purl.org/vocab/vann/> .

@prefix unit: <http://crossforest.eu/measures/data/unit/> .

smo: a owl:Ontology;
  rdfs:label "Simple Measures Ontology"@en , "Ontología de Medidas Simples"@es ;
  rdfs:comment "A simple ontology to publish data about measures in different units"@en , "Una ontología sencilla para publicar datos sobre medidas en diferentes unidades" ;
  owl:versionInfo 0.2 ;
  dc:creator <https://www.gsic.uva.es/members/josgim> , <https://www.gsic.uva.es/members/guiveg> ;
  dc:date "2019-07-17"^^xsd:date ;
  vann:preferredNamespacePrefix "smo" .

#################################################################
#    Classes
#################################################################

# MEASURABLE ENTITIES

smo:MeasurableEntity a owl:Class , rdfs:Class ;
  rdfs:label "Measurable Entity"@en , "Entidad medible"@es ;
  rdfs:comment "Entity from which a measure or a number of measures is taken"@en , "Entidad de la cual se toma una o varias medidas"@es ;
  owl:disjointWith smo:Measure , smo:Unit ;
  rdfs:isDefinedBy smo: .
```



```
smo:MeasurableEntityInMeters a owl:Class , rdfs:Class ;
  rdfs:label "Measurable Entity in Meters"@en , "Entidad medible en metros"@es ;
  rdfs:comment "Entity from which a measure in meters is taken"@en , "Entidad de la cual se toma una medida en metros"@es ;
  owl:equivalentClass
    [
      a owl:Restriction ;
      owl:onProperty smo:hasMeasure ;
      owl:someValuesFrom smo:MeasureInMeters
    ] ;
  rdfs:isDefinedBy smo: .


smo:MeasurableEntityInDecimeters a owl:Class , rdfs:Class ;
  rdfs:label "Measurable Entity in Decimeters"@en , "Entidad medible en decímetros"@es ;
  rdfs:comment "Entity from which a measure in decimeters is taken"@en , "Entidad de la cual se toma una medida en decímetros"@es ;
  owl:equivalentClass
    [
      a owl:Restriction ;
      owl:onProperty smo:hasMeasure ;
      owl:someValuesFrom smo:MeasureInDecimeters
    ] ;
  rdfs:isDefinedBy smo: .


smo:MeasurableEntityInCentimeters a owl:Class , rdfs:Class ;
  rdfs:label "Measurable Entity in Centimeters"@en , "Entidad medible en centímetros"@es ;
  rdfs:comment "Entity from which a measure in centimeters is taken"@en , "Entidad de la cual se toma una medida en centímetros"@es ;
  owl:equivalentClass
    [
      a owl:Restriction ;
      owl:onProperty smo:hasMeasure ;
      owl:someValuesFrom smo:MeasureInCentimeters
    ] ;
  rdfs:isDefinedBy smo: .


smo:MeasurableEntityInMillimeters a owl:Class , rdfs:Class ;
  rdfs:label "Measurable Entity in Millimeters"@en , "Entidad medible en milímetros"@es ;
```



```
  rdfs:comment "Entity from which a measure in millimeters is taken"@en , "Entidad
de la cual se toma una medida en milímetros"@es ;
  owl:equivalentClass
    [
      a owl:Restriction ;
      owl:onProperty smo:hasMeasure ;
      owl:someValuesFrom smo:MeasureInMillimeters
    ] ;
  rdfs:isDefinedBy smo: .


smo:MeasurableEntityInSquareMeters a owl:Class , rdfs:Class ;
  rdfs:label "Measurable Entity in Square Meters"@en , "Entidad medible en metros
cuadrados"@es ;
  rdfs:comment "Entity from which a measure in square meters is taken"@en ,
"Entidad de la cual se toma una medida en metros cuadrados"@es ;
  owl:equivalentClass
    [
      a owl:Restriction ;
      owl:onProperty smo:hasMeasure ;
      owl:someValuesFrom smo:MeasureSquareMeters
    ] ;
  rdfs:isDefinedBy smo: .


smo:MeasurableEntityInHectares a owl:Class , rdfs:Class ;
  rdfs:label "Measurable Entity in Hectares"@en , "Entidad medible en
hectáreas"@es ;
  rdfs:comment "Entity from which a measure in hectares is taken"@en , "Entidad de
la cual se toma una medida en hectáreas"@es ;
  owl:equivalentClass
    [
      a owl:Restriction ;
      owl:onProperty smo:hasMeasure ;
      owl:someValuesFrom smo:Hectares
    ] ;
  rdfs:isDefinedBy smo: .


# MEASURES


smo:Measure a owl:Class , rdfs:Class ;
  rdfs:label "Measure"@en , "Medida"@es ;
```



```
  rdfs:comment "Measure with a value and expressed used some concrete units"@en ,
"Una medida con un valor y expresada en unas unidades concretas"@es ;
  owl:disjointWith smo:MeasurableEntity , smo:Unit ;
  rdfs:isDefinedBy smo: .

smo:MeasureInMeters a owl:Class , rdfs:Class ;
  rdfs:subClassOf smo:Measure ;
  owl:equivalentClass [
    a owl:Restriction ;
    owl:onProperty smo:hasUnit ;
    owl:hasValue unit:Meters ] ;
  rdfs:isDefinedBy smo: .

smo:MeasureInDecimeters a owl:Class , rdfs:Class ;
  rdfs:subClassOf smo:Measure ;
  owl:equivalentClass [
    a owl:Restriction ;
    owl:onProperty smo:hasUnit ;
    owl:hasValue unit:Decimeters ] ;
  rdfs:isDefinedBy smo: .

smo:MeasureInCentimeters a owl:Class , rdfs:Class ;
  rdfs:subClassOf smo:Measure ;
  owl:equivalentClass [
    a owl:Restriction ;
    owl:onProperty smo:hasUnit ;
    owl:hasValue unit:Centimeters ] ;
  rdfs:isDefinedBy smo: .

smo:MeasureInMillimeters a owl:Class , rdfs:Class ;
  rdfs:subClassOf smo:Measure ;
  owl:equivalentClass [
    a owl:Restriction ;
    owl:onProperty smo:hasUnit ;
    owl:hasValue unit:Millimeters ] ;
  rdfs:isDefinedBy smo: .

smo:MeasureInDegrees a owl:Class , rdfs:Class ;
  rdfs:subClassOf smo:Measure ;
```



```
  owl:equivalentClass [
    a owl:Restriction ;
    owl:onProperty smo:hasUnit ;
    owl:hasValue unit:Degrees ] ;
  rdfs:isDefinedBy smo: .

smo:MeasureInGradians a owl:Class , rdfs:Class ;
  rdfs:subClassOf smo:Measure ;
  owl:equivalentClass [
    a owl:Restriction ;
    owl:onProperty smo:hasUnit ;
    owl:hasValue unit:Gradians ] ;
  rdfs:isDefinedBy smo: .

smo:MeasureInSquareMeters a owl:Class , rdfs:Class ;
  rdfs:subClassOf smo:Measure ;
  owl:equivalentClass [
    a owl:Restriction ;
    owl:onProperty smo:hasUnit ;
    owl:hasValue unit:SquareMeters ] ;
  rdfs:isDefinedBy smo: .

smo:MeasureInPercentage a owl:Class , rdfs:Class ;
  rdfs:subClassOf smo:Measure ;
  owl:equivalentClass [
    a owl:Restriction ;
    owl:onProperty smo:hasUnit ;
    owl:hasValue unit:Percentage ] ;
  rdfs:isDefinedBy smo: .

smo:MeasureInHectares a owl:Class , rdfs:Class ;
  rdfs:subClassOf smo:Measure ;
  owl:equivalentClass [
    a owl:Restriction ;
    owl:onProperty smo:hasUnit ;
    owl:hasValue unit:Hectare ] ;
  rdfs:isDefinedBy smo: .

smo:MeasureInUnities a owl:Class , rdfs:Class ;
```



```
  rdfs:subClassOf smo:Measure ;
  owl:equivalentClass [
    a owl:Restriction ;
    owl:onProperty smo:hasUnit ;
    owl:hasValue unit:Unities ] ;
  rdfs:isDefinedBy smo: .

# UNITS

smo:Unit a owl:Class , rdfs:Class ;
  rdfs:label "Unit"@en , "Unidades"@es ;
  rdfs:comment "Unit in which a measure is taken"@en , "Unidades en las que se
toma una medida"@es ;
  owl:disjointWith smo:MeasurableEntity , smo:Measure ;
  rdfs:isDefinedBy smo: .



#################################################################
#    Object Properties
#################################################################

smo:hasMeasure a owl:ObjectProperty , rdf:Property ;
  rdfs:label "has measure"@en , "tiene medida"@es ;
  rdfs:comment "has a measure with a value and expressed using some concrete
units"@en , "tiene una medida con un valor y expresada en unas unidades
concretas"@es ;
  rdfs:range smo:Measure ;
  rdfs:isDefinedBy smo: .

smo:hasUnit a owl:ObjectProperty , rdf:Property ;
  rdfs:label "has unit"@en , "tiene unidades"@es ;
  rdfs:comment "units of a measure"@en , "unidades de una medida"@es ;
  rdfs:domain smo:Measure ;
  rdfs:range smo:Unit ;
  rdfs:isDefinedBy smo: .



#################################################################
#    Datatype Properties
#################################################################
```



```
smo:hasValue a owl:DatatypeProperty , rdf:Property ;
  rdfs:label "value"@en , "valor"@es ;
  rdfs:comment "value of a measure"@en , "valor de una medida"@es ;
  rdfs:domain smo:Measure ;
  rdfs:range xsd:decimal ;
  rdfs:isDefinedBy smo: .

smo:hasMeasureLiteral a owl:DatatypeProperty , rdf:Property ;
  rdfs:label "measure"@en , "medida"@es ;
  rdfs:comment "measure expressed as a decimal literal"@en , "medida expresada directamente en un literal decimal"@es ;
  rdfs:domain smo:MeasurableEntity ;
  rdfs:range xsd:decimal ;
  rdfs:isDefinedBy smo: .

smo:hasMeasureInMeters a owl:DatatypeProperty , rdf:Property ;
  rdfs:subPropertyOf smo:hasMeasureLiteral ;
  rdfs:label "value in meters"@en , "valor en metros"@es ;
  rdfs:comment "value of a measure in meters"@en , "valor de una medida en metros"@es ;
  rdfs:domain smo:MeasurableEntityInMeters ;
  rdfs:isDefinedBy smo: .

smo:hasMeasureInDecimeters a owl:DatatypeProperty , rdf:Property ;
  rdfs:subPropertyOf smo:hasMeasureLiteral ;
  rdfs:label "value in decimeters"@en , "valor en decímetros"@es ;
  rdfs:comment "value of a measure in decimeters"@en , "valor de una medida en decímetros"@es ;
  rdfs:domain smo:MeasurableEntityInDecimeters ;
  rdfs:isDefinedBy smo: .

smo:hasMeasureInCentimeters a owl:DatatypeProperty , rdf:Property ;
  rdfs:subPropertyOf smo:hasMeasureLiteral ;
  rdfs:label "value in centimeters"@en , "valor en centímetros"@es ;
  rdfs:comment "value of a measure in centimeters"@en , "valor de una medida en centímetros"@es ;
  rdfs:domain smo:MeasureInCentimeters ;
  rdfs:isDefinedBy smo: .
```



```
smo:hasMeasureInMillimeters a owl:DatatypeProperty , rdf:Property ;
  rdfs:subPropertyOf smo:hasMeasureLiteral ;
  rdfs:label "value in millimeters"@en , "valor en milímetros"@es ;
  rdfs:comment "value of a measure in millimeters"@en , "valor de una medida en
milímetros"@es ;
  rdfs:domain smo:MeasurableEntityInMillimeters ;
  rdfs:isDefinedBy smo: .


smo:hasMeasureinDegrees a owl:DatatypeProperty , rdf:Property ;
  rdfs:subPropertyOf smo:hasMeasureLiteral ;
  rdfs:label "value in degrees"@en , "valor en grados"@es ;
  rdfs:comment "value of an angular meausure in degrees"@en , "valor de una medida
angular en grados"@es ;
  rdfs:domain smo:MeasurableEntityInDegrees ;
  rdfs:isDefinedBy smo: .


smo:hasMeasureinGradians a owl:DatatypeProperty , rdf:Property ;
  rdfs:subPropertyOf smo:hasMeasureLiteral ;
  rdfs:label "value in gradians"@en , "valor en gradianes"@es ;
  rdfs:comment "value of an angular meausure in gradians"@en , "valor de una
medida angular en gradianes"@es ;
  rdfs:domain smo:MeasurableEntityInGradians ;
  rdfs:isDefinedBy smo: .


smo:hasMeasureinSquareMeters a owl:DatatypeProperty , rdf:Property ;
  rdfs:subPropertyOf smo:hasMeasureLiteral ;
  rdfs:label "value in square meters"@en , "valor en square meters"@es ;
  rdfs:comment "value of an meausure in square meters"@en , "valor de una medida
en square meters"@es ;
  rdfs:domain smo:MeasurableEntityInSquareMeters ;
  rdfs:isDefinedBy smo: .


smo:hasMeasureinHectares a owl:DatatypeProperty , rdf:Property ;
  rdfs:subPropertyOf smo:hasMeasureLiteral ;
  rdfs:label "value in hectares"@en , "valor en hectáreas"@es ;
  rdfs:comment "value of an meausure in hectares"@en , "valor de una medida en
hectáreas"@es ;
  rdfs:domain smo:MeasurableEntityInHectares ;
  rdfs:isDefinedBy smo: .


smo:hasMeasureinPercentage a owl:DatatypeProperty , rdf:Property ;
```



```
  rdfs:subPropertyOf smo:hasMeasureLiteral ;

  rdfs:label "value in percentage"@en , "valor en porcentaje"@es ;

  rdfs:comment "value of an meausure in percentage"@en , "valor de una medida en
porcentaje"@es ;

  rdfs:domain smo:MeasurableEntityInSquareMeters ;

  rdfs:isDefinedBy smo: .



#################################################################

#    Individuals

#################################################################


unit:Meters a owl:NamedIndividual , smo:Unit ;

  rdfs:label "Meters"@en, "Metros"@es ;

  rdfs:comment "Meter as unit for a measure"@en , "Metro como unidad de una
medida"@es ;

  rdfs:isDefinedBy smo: .


unit:Decimeters a owl:NamedIndividual , smo:Unit ;

  rdfs:label "Decimeters"@en, "Decímetros"@es ;

  rdfs:comment "Decimeter as unit for a measure"@en , "Decímetro como unidad de
una medida"@es ;

  rdfs:isDefinedBy smo: .


unit:Centimeters a owl:NamedIndividual , smo:Unit ;

  rdfs:label "Centimeters"@en, "Centímetros"@es ;

  rdfs:comment "Centimeter as unit for a measure"@en , "Centímetro como unidad de
una medida"@es ;

  rdfs:isDefinedBy smo: .


unit:Millimeters a owl:NamedIndividual , smo:Unit ;

  rdfs:label "Millimeters"@en, "Milímetros"@es ;

  rdfs:comment "Millimeter as unit for a measure"@en , "Milímetro como unidad de
una medida"@es ;

  rdfs:isDefinedBy smo: .


unit:Degrees a owl:NamedIndividual , smo:Unit ;

  rdfs:label "Degrees"@en , "Grados"@es ;

  rdfs:comment "Degree as a unit for angular measure. A degree is equivalent to
0.017453292519943278 radians"@em ,  "Grado como unidad de medida angular. Cada
grado es equivalente a 0.017453292519943278 radianes"@es ;
```



```
  rdfs:isDefinedBy smo: .


unit:Gradians a owl:NamedIndividual , smo:Unit ;

  rdfs:label "Gradians"@en , "Grados Centesimales"@es ;

  rdfs:comment "Gradians as a unit for angular measure. A gradian is equivalent to
0.015707963267948966192 radians"@em ,  "Gradián como unidad de medida angular.
Cada gradián es equivalente a 0.015707963267948966192 radianes"@es ;

  rdfs:isDefinedBy smo: .


unit:SquareMeters a owl:NamedIndividual , smo:Unit ;

  rdfs:label "Square Meters"@en , "Metros Cuadrados"@es ;

  rdfs:comment "Square meters as a unit for area measure."@em ,  "Metros cuadrados
como unidad de medida de área."@es ;

  rdfs:isDefinedBy smo: .


unit:Unities a owl:NamedIndividual , smo:Unit ;

  rdfs:label "Unities"@en , "Unidades"@es ;

  rdfs:comment "Unity (i.e., the number 1) as a unity of measure"@en , "Unidad
(i.e., el número 1) como unidad de medida"@es ;

  rdfs:seeAlso                    <https://iopscience.iop.org/article/10.1088/0026-
1394/31/6/013/meta> ;

  rdfs:isDefinedBy smo: .


unit:Percentage a owl:NamedIndividual , smo:Unit ;

  rdfs:label "Percentage"@en , "Porcentaje"@es ;

  rdfs:comment "100 as a unity of measure"@en , "100 como unidad de medida"@es ;

  rdfs:isDefinedBy smo: .


unit:M3byHA a owl:NamedIndividual , smo:Unit ;

  rdfs:label "Cubic Meters by Hectare"@en , "Metros cúbicos por hectárea"@es ;

  rdfs:comment "Cubic Meters by Hectare as a unity of measure"@en , "Metros
cúbicos por hectárea como unidad de medida"@es ;

  rdfs:isDefinedBy smo: .


unit:M2byHA a owl:NamedIndividual , smo:Unit ;

  rdfs:label "Square Meters by Hectare"@en , "Metros cuadrados por hectárea"@es ;

  rdfs:comment "Square Meters by Hectare as a unity of measure"@en , "Metros
cuadrados por hectárea como unidad de medida"@es ;

  rdfs:isDefinedBy smo: .


unit:UnitsByHA a owl:NamedIndividual , smo:Unit ;
```



```
  rdfs:label "Units by Hectare"@en , "Unidades por hectárea"@es ;

  rdfs:comment "Units by Hectare as a unity of measure"@en , "Unidades por
hectárea como unidad de medida"@es ;

  rdfs:isDefinedBy smo: .


unit:Hectares a owl:NamedIndividual , smo:Unit ;

  rdfs:label "Hectares"@en , "Hectáreas"@es ;

  rdfs:comment "Hectared as a unity of measure"@en , "Hectáreas como unidad de
medida"@es ;

  rdfs:isDefinedBy smo: .
```


Annex E: IFN ontology

```
@prefix ifn: <http://crossforest.eu/ifn/ontology/> .
@prefix smo: <http://crossforest.eu/measures/ontology/> .
@prefix spo: <http://crossforest.eu/position/ontology/> .
@prefix xsd: <http://www.w3.org/2001/XMLSchema#> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .
@prefix owl: <http://www.w3.org/2002/07/owl#> .
@prefix dc: <http://purl.org/dc/elements/1.1/> .
@prefix vann: <http://purl.org/vocab/vann/> .

@prefix province: <http://crossforest.eu/ifn/data/province/> .


ifn: a owl:Ontology ;
  rdfs:label "Spanish IFN Ontology"@en , "Ontología del IFN de España"@es ;
  rdfs:comment "Ontology to publish data of the Spanish National Forest inventory"@en , "Ontología para publicar datos del Inventario Forestal Nacional de España" ;
  owl:versionInfo 0.1 ;
  dc:creator <https://www.gsic.uva.es/members/josgim> , <https://www.gsic.uva.es/members/guiveg> ;
  dc:date "2019-07-17"^^xsd:date ;
  owl:imports ifn: , smo: ;
  vann:preferredNamespacePrefix "ifn" .



#################################################################
#    Classes
#################################################################

ifn:Province a owl:Class , rdfs:Class ;
  rdfs:subClassOf spo:SpatialEntity ;
  rdfs:label "Province"@en , "Provincia"@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:isDefinedBy ifn: .

ifn:Plot a owl:Class , rdfs:Class ;
```



```
  rdfs:subClassOf spo:SpatialEntity ;
  rdfs:label "Plot"@en , "Parcela"@es ;
  rdfs:comment ""@en , ""@es ;
  owl:disjointWith ifn:Tree , ifn:DBH ;
  rdfs:isDefinedBy ifn: .

ifn:PrimaryPlot a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:Plot ;
  rdfs:label "Plot"@en , "Parcela"@es ;
  rdfs:comment ""@en , ""@es ;
  owl:disjointWith ifn:Tree , ifn:DBH ;
  rdfs:isDefinedBy ifn: .

ifn:SecondaryPlot a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:Plot ;
  rdfs:label "Plot"@en , "Parcela"@es ;
  rdfs:comment ""@en , ""@es ;
  owl:disjointWith ifn:Tree , ifn:DBH ;
  rdfs:isDefinedBy ifn: .

ifn:Plot-NN a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:PrimaryPlot ;
  rdfs:label "New Plot"@en , "Parcela Nueva"@es ;
  rdfs:comment ""@en , "Se levantarán por primera vez en el inventario actual y
serán utilizadas para el cálculo de existencias actuales"@es ;
  owl:disjointWith ifn:Tree , ifn:DBH ;
  rdfs:isDefinedBy ifn: .

ifn:Plot-A a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:Plot ;
  rdfs:label "Existing Plot"@en , "Parcela Existente"@es ;
  rdfs:comment ""@en , "Parcelas levantadas en el inventario anterior que volverán
a ser apeadas en el inventario actual"@es ;
  owl:disjointWith ifn:Tree , ifn:DBH ;
  rdfs:isDefinedBy ifn: .

ifn:Plot-A1 a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:PrimaryPlot ;
  rdfs:label "Plot in the same position as before"@en , "Parcela en la misma
posición que antes"@es ;
```



```
  rdfs:comment ""@en , "Parcelas en las que se localice el rejón y esté bien
implantado. Se utilizarán para la comparación de inventarios y para el cálculo de
existencias actuales."@es ;

  owl:disjointWith ifn:Tree , ifn:DBH ;

  rdfs:isDefinedBy ifn: .


ifn:Plot-A3 a owl:Class , rdfs:Class ;

  rdfs:subClassOf ifn:Plot-A ;

  rdfs:label "Plot in different possition than before"@en , "Parcela en diferente
posición que la anterior"@es ;

  rdfs:comment ""@en , "Parcelas en las que se localice el rejón y esté mal
implantado o bien se hayan producido cambios, en los últimos años, en las teselas
de vegetación colindantes."@es ;

  owl:disjointWith ifn:Tree , ifn:DBH ;

  rdfs:isDefinedBy ifn: .


ifn:Plot-A3C a owl:Class , rdfs:Class ;

  rdfs:subClassOf ifn:SecondaryPlot ;

  rdfs:label "Plot for inventory comparison"@en , "Parcela de comparación de
inventarios"@es ;

  rdfs:comment ""@en , "Parcela para la comparación de inventarios. Se levantará
en el punto donde se encuentre el rejón del inventario anterior. Incluye datos de
identificación y dendrometría, pero no estado fitosanitario."@es ;

  owl:disjointWith ifn:Tree , ifn:DBH ;

  rdfs:isDefinedBy ifn: .


ifn:Plot-A3E a owl:Class , rdfs:Class ;

  rdfs:subClassOf ifn:PrimaryPlot ;

  rdfs:label ""@en , "Parcela para el cálculo de existencias actuales"@es ;

  rdfs:comment ""@en , "Parcelas para el cálculo de existencias actuales. Se
levantarán en el emplazamiento correcto ( Coordenada UTM)"@es ;

  owl:disjointWith ifn:Tree , ifn:DBH ;

  rdfs:isDefinedBy ifn: .


ifn:Plot-A4 a owl:Class , rdfs:Class ;

  rdfs:subClassOf ifn:PrimaryPlot ;

  rdfs:label ""@en , ""@es ;

  rdfs:comment ""@en , "Parcelas en las que no se localice el rejón. Se utilizarán
para el cálculo de existencias actuales."@es ;

  owl:disjointWith ifn:Tree , ifn:DBH ;

  rdfs:isDefinedBy ifn: .
```



```
ifn:Plot-A4C a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:PrimaryPlot ;
  rdfs:label ""@en , ""@es ;
  rdfs:comment ""@en , "Parcelas en las que no se localice el rejón por cambio totales en la cubierta forestal de la tesela que contiene la parcela (pérdida total de la masa muestreada en el inventario anterior o incorporación de una nueva masa forestal inexistente en el IFN2). Se utilizarán para la comparación de inventarios y para el cálculo de existencias actuales."@es ;
  owl:disjointWith ifn:Tree , ifn:DBH ;
  rdfs:isDefinedBy ifn: .

ifn:Plot-A6C a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:PrimaryPlot ;
  rdfs:label ""@en , ""@es ;
  rdfs:comment ""@en , "Parcelas en las que no se localice el rejón por cambios totales en la cubierta forestal de la tesela que contiene la parcela (pérdida total de la masa muestreada en el inventario anterior e incorporación de una nueva masa forestal). Se utilizarán para la comparación de inventarios y para el cálculo de existencias actuales."@es ;
  owl:disjointWith ifn:Tree , ifn:DBH ;
  rdfs:isDefinedBy ifn: .

ifn:Plot-R a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:SecondaryPlot ;
  rdfs:label ""@en , ""@es ;
  rdfs:comment ""@en , ""@es ;
  owl:disjointWith ifn:Tree , ifn:DBH ;
  rdfs:isDefinedBy ifn: .

ifn:Plot-R1 a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:Plot-R ;
  rdfs:label ""@en , ""@es ;
  rdfs:comment ""@en , ""@es ;
  owl:disjointWith ifn:Tree , ifn:DBH ;
  rdfs:isDefinedBy ifn: .

ifn:Plot-R1R a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:Plot-R ;
  rdfs:label ""@en , ""@es ;
  rdfs:comment ""@en , ""@es ;
  owl:disjointWith ifn:Tree , ifn:DBH ;
  rdfs:isDefinedBy ifn: .
```



```
ifn:Plot-R2 a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:Plot-R ;
  rdfs:label ""@en , ""@es ;
  rdfs:comment ""@en , ""@es ;
  owl:disjointWith ifn:Tree , ifn:DBH ;
  rdfs:isDefinedBy ifn: .

ifn:Plot-R2R a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:Plot-R ;
  rdfs:label ""@en , ""@es ;
  rdfs:comment ""@en , ""@es ;
  owl:disjointWith ifn:Tree , ifn:DBH ;
  rdfs:isDefinedBy ifn: .

ifn:Plot-R3 a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:Plot-R ;
  rdfs:label ""@en , ""@es ;
  rdfs:comment ""@en , ""@es ;
  owl:disjointWith ifn:Tree , ifn:DBH ;
  rdfs:isDefinedBy ifn: .

ifn:Plot-R4 a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:Plot-R ;
  rdfs:label ""@en , ""@es ;
  rdfs:comment ""@en , ""@es ;
  owl:disjointWith ifn:Tree , ifn:DBH ;
  rdfs:isDefinedBy ifn: .

ifn:Plantae a owl:Class , rdfs:Class ;
  rdfs:label "Plantae"@la ;
  rdfs:comment "Multicellular living beings with cell walls containing cellulose,
and the ability to carry out photosynthesis with primary chloroplasts"@en ;
  rdfs:isDefinedBy ifn: .

ifn:Plant a owl:Class , rdfs:Class ;
  rdfs:subClassOf spo:SpatialEntity ;
  ifn:scientificName "Plantae"@la ;
  ifn:vulgarName "Planta"@es , "Plant"@en ;
```



```
  rdfs:comment ""@es ;
  rdfs:isDefinedBy ifn: .


ifn:Tree a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:Plant ;
  rdfs:label "Tree"@en , "Árbol"@es ;
  rdfs:comment "Woody perennial plant with an elongated stem supporting
branches"@en , "Planta vivaz (que vive más de dos años, de tallo leñoso, que se
ramifica a cierta altura del suelo"@es ;
  owl:disjointWith ifn:Plot , ifn:DBH ;
  rdfs:isDefinedBy ifn: .


ifn:Bush a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:Plant ;
  rdfs:label "Bush"@en , "Arbusto"@es ;
  rdfs:comment ""@en , ""@es ;
  owl:disjointWith ifn:Plot , ifn:DBH ;
  rdfs:isDefinedBy ifn: .


ifn:PlantSpecies a owl:Class , rdfs:Class ;
  rdfs:label "Plant Species"@en, "Especie vegetal"@es ;
  rdfs:comment "Plant species, as recorded in the inventory. It is possible that
the individuals of this class are not strictly species, but genus, sub-genus, mix
of species, etc."@en , "Especie vegetal, tal y como se ha registrado en el
inventario. Es posible que los indivíduos de esta clase no sean estrictamente
especies. Genus, sub-genus, y mezclas de especies son también indivíduos
posibles."@es ;
  owl:disjointWith ifn:Tree , ifn:Plot , ifn:DBH ;
  rdfs:isDefinedBy ifn: .


ifn:TreeSpecies a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:PlantSpecies ;
  rdfs:label "Tree Species"@en, "Especie arbórea"@en ;
  rdfs:comment "Tree species, as recorded in the inventory. It is possible that
the individuals of this class are not strictly species, but genus, sub-genus, mix
of species, etc."@en , "Especie arbórea, tal y como se ha registrado en el
inventario. Es posible que los indivíduos de esta clase no sean estrictamente
especies. Genus, sub-genus, y mezclas de especies son también indivíduos
posibles."@es ;
  rdfs:isDefinedBy ifn: .


ifn:BushSpecies a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:PlantSpecies ;
```



```
  rdfs:label "Bush Species"@en , "Especie arbustiva"@es ;

  rdfs:comment "Bush species, as recorded in the inventory. It is possible that
the individuals of this class are not strictly species, but genus, sub-genus, mix
of species, etc."@en , "Especie arbustiva, tal y como se ha registrado en el
inventario. Es posible que los indivíduos de esta clase no sean estrictamente
especies. Genus, sub-genus, y mezclas de especies son también indivíduos
posibles."@es ;

  rdfs:isDefinedBy ifn: .


ifn:PlotMeasure a owl:Class , rdfs:Class ;

  rdfs:subClassOf smo:Measure ;

  rdfs:label "Plot Measure"@en , "Medida de parcela"@es ;

  rdfs:comment "Measure of a plot"@en , "Medida de una parcela"@es ;

  rdfs:isDefinedBy ifn: .


ifn:PlotMeasureTotal a owl:Class , rdfs:Class ;

  rdfs:subClassOf ifn:PlotMeasure ;

  rdfs:label "Total Plot Measure"@en , "Medida de parcela total"@es ;

  rdfs:comment "Measure of a whole plot (adding all species)"@en , "Medida de una
parcela completa (sumando las de todas las especies)"@es ;

  rdfs:isDefinedBy ifn: .


ifn:PlotMeasureBySpecies a owl:Class , rdfs:Class ;

  rdfs:subClassOf ifn:PlotMeasure ;

  rdfs:label "Plot Measure"@en , "Medida de parcela"@es ;

  rdfs:comment "Measure of a plot"@en , "Medida de una parcela"@es ;

  rdfs:isDefinedBy ifn: .


ifn:PlantMeasure a owl:Class , rdfs:Class ;

  rdfs:subClassOf smo:Measure ;

  rdfs:label "Tree Measure"@en , "Medida del árbol"@es ;

  rdfs:comment "Measure of a tree"@en , "Medida de un arbol"@es ;

  rdfs:isDefinedBy ifn: .


ifn:BasalArea a owl:Class , rdfs:Class ;

  rdfs:subClassOf ifn:PlotMeasure ;

  rdfs:label "Basal Area"@en , "Área Basimétrica"@es ;

  rdfs:comment "The area of a cross-section of a tree, including bark, at 1.3 m
height. Basal area of a forest stand is the sum of the basal areas of all
individual trees in the stand, usually reported as square meter per hectare."@en ;

  rdfs:isDefinedBy ifn: .
```



```
ifn:Volume a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:PlotMeasure ;
  rdfs:label "Volume"@en , "Volume"@es ;
  rdfs:comment ""@en ;
  rdfs:isDefinedBy ifn: .


ifn:Diameter a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:TreeMeasure ;
  # rdfs:label "Diameter at Breast Hight"@en , "Diámetro a la altura del pecho"@es
, "Diámetro normal"@es ;
  # rdfs:comment "Diameter at breast height of a tree"@en , "Diámetro a la altura
del pecho de un árbol"@es ;
  owl:disjointWith ifn:Plot , ifn:Tree, ifn:PlantSpecies ;
  rdfs:isDefinedBy ifn: .


ifn:DiameterAtBreastHeight a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:Diameter ;
  rdfs:label "Diameter at Breast Hight"@en , "Diámetro a la altura del pecho"@es ,
"Diámetro normal"@es ;
  rdfs:comment "Diameter at breast height of a tree"@en , "Diámetro a la altura
del pecho de un árbol"@es ;
  owl:disjointWith ifn:Plot , ifn:Tree, ifn:PlantSpecies ;
  rdfs:isDefinedBy ifn: .


ifn:DiameterAtRootCollar a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:Diameter ;
  rdfs:label "Diameter At Root Collar"@en , "Diámetro basal"@es  ;
  # rdfs:comment "Diameter at breast height of a tree"@en , "Diámetro a la altura
del pecho de un árbol"@es ;
  owl:disjointWith ifn:Plot , ifn:Tree, ifn:PlantSpecies ;
  rdfs:isDefinedBy ifn: .


ifn:DBH1 a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:DiameterAtBreastHeight ;
  rdfs:label "Diameter at breast height of a tree measured with caliper arms
pointing at the center of the plot"@en , "Diámetro a la altura del pecho de un
árbol medido apuntando la forcípula al centro de la parcela"@es , "Diámetro normal
de un árbol medido apuntando la forcípula al centro de la parcela"@es ;
  rdfs:comment "Generic instance of an observable property representing the
diameter of a tree measured at 1.3 meters above the ground with caliper arms
pointing at the center of the plot."@en , "Instancia genérica de una propiedad
observable representando el diámetro de un arbol a una altura aproximada de 1,3
metros, con la forcípula apuntando al centro de la parcela."@es ;
```



```
  owl:disjointWith ifn:DBH2 ;
  rdfs:isDefinedBy ifn: .

ifn:DBH2 a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:DiameterAtBreastHeight ;
  rdfs:label "Diameter at breast height of a tree measured with caliper arms perpendicular to the center of the plot"@en , "Diámetro a la altura del pecho de un árbol medido con la forcípula perpendicular al centro de la parcela"@es , "Diámetro normal de un árbol medido con la forcípula perpendicular al centro de la parcela"@es ;
  rdfs:comment "Generic instance of an observable property representing the diameter of a tree measured at 1.3 meters above the ground with caliper arms perpendicular to the center of the plot."@en , "Instancia genérica de una propiedad observable representando el diámetro de un arbol a una altura aproximada de 1,3 metros, con la forcípula perpendicular al centro de la parcela."@es ;
  owl:disjointWith ifn:DBH1 ;
  rdfs:isDefinedBy ifn: .

ifn:Height a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:TreeMeasure ;
  rdfs:label "Height"@en , "Altura"@es ;
  rdfs:comment "height of measured tree" , "Altura del árbol medido"@es ;
  owl:disjointWith ifn:DiameterAtBreastHeight ;
  rdfs:isDefinedBy ifn: .

ifn:TotalHeight a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:Height ;
  rdfs:label "Total Height"@en , "Altura total"@es ;
  rdfs:comment "Total height of measured tree" , "Altura total del árbol medido"@es ;
  owl:disjointWith ifn:DiameterAtBreastHeight ;
  rdfs:isDefinedBy ifn: .

ifn:HeightToCrownBase a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:Height ;
  rdfs:label "Height to Crown Base"@en , "Altura hasta el inicio de la copa"@es ;
  # rdfs:comment "Total height of measured tree" , "Altura total del árbol medido"@es ;
  owl:disjointWith ifn:DiameterAtBreastHeight ;
  rdfs:isDefinedBy ifn: .

ifn:HeightToLargestCrownWidht a owl:Class , rdfs:Class ;
```



```
  rdfs:subClassOf ifn:Height ;
  rdfs:label "Height to Largest Crown Widht"@en , "Altura hasta el máximo ancho de copa"@es ;
  # rdfs:comment "Total height of measured tree" , "Altura total del árbol medido"@es ;
  owl:disjointWith ifn:DiameterAtBreastHeight ;
  rdfs:isDefinedBy ifn: .

ifn:HeightToFirstAliveBranch a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:Height ;
  rdfs:label "Height to First Alive Branch"@en , "Altura hasta la primera rama viva"@es ;
  # rdfs:comment "Total height of measured tree" , "Altura total del árbol medido"@es ;
  owl:disjointWith ifn:DiameterAtBreastHeight ;
  rdfs:isDefinedBy ifn: .

ifn:ScientificName a owl:Class , rdfs:Class ;
  rdfs:label "Scientific Name"@en , "Nombre científico"@es ;
  rdfs:isDefinedBy ifn: .

ifn:AcceptedName a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:ScientificName ;
  rdfs:label "Accepted Name"@en , "Nombre aceptado"@es ;
  rdfs:isDefinedBy ifn: .

ifn:ScientificSynonym a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:ScientificName ;
  rdfs:label "Synonym"@en , "Sinónimo"@es ;
  rdfs:isDefinedBy ifn: .

ifn:Use a owl:Class , rdfs:Class ;
  rdfs:label ""@es , ""@en ;
  rdfs:comment ""@es , ""@en ;
  rdfs:isDefinedBy ifn: .

ifn:InfoSpecies a owl:Class , rdfs:Class ;
  rdfs:label ""@es , ""@en ;
  rdfs:comment ""@es , ""@en ;
  rdfs:isDefinedBy ifn: .
```



```
ifn:Taxon a owl:Class , rdfs:Class ;
  rdfs:label "Taxón"@es , "Taxon"@en ;
  rdfs:comment ""@es , ""@en ;
  rdfs:isDefinedBy ifn: .

ifn:Class a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:Taxon ;
  rdfs:label "Clase"@es , "Class"@en ;
  rdfs:comment ""@es , ""@en ;
  rdfs:isDefinedBy ifn: .

ifn:Family a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:Taxon ;
  rdfs:label "Familia"@es , "Family"@en ;
  rdfs:comment ""@es , ""@en ;
  rdfs:isDefinedBy ifn: .

ifn:Genus a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:Taxon ;
  rdfs:label "Género"@es , "Genus"@en ;
  rdfs:comment ""@es , ""@en ;
  rdfs:isDefinedBy ifn: .

ifn:Species a owl:Class , rdfs:Class ;
  rdfs:subClassOf ifn:Taxon ;
  rdfs:label "Especie"@es , "Species"@en ;
  rdfs:comment ""@es , ""@en ;
  rdfs:isDefinedBy ifn: .

ifn:NumberOfTrees a owl:Class , rdfs:Class ;
  rdfs:subClassOf smo:MeasureInUnities ;
  rdfs:label "Número de Árboles"@es , "Number of Trees"@en ;
  rdfs:comment ""@es , ""@en ;
  rdfs:isDefinedBy ifn: .


#################################################################
#    Object Properties
```



```
#################################################################


ifn:isInProvince a owl:ObjectProperty , rdf:Property ;
  rdfs:label "in province"@en , "en la provincia"@es ;
  rdfs:comment "Province in which the entity is located"@en , "Provincia en la que
la entidad está situada"@es ;
  rdfs:domain ifn:SpatialEntity ;
  rdfs:range ifn:Province ;
  rdfs:isDefinedBy ifn: .


ifn:isInPlot a owl:ObjectProperty , rdf:Property ;
  rdfs:label "in plot"@en , "en la parcela"@es ;
  rdfs:comment "Plot in which the tree is located"@en , "Parcela en la que el
árbol está situado"@es ;
  rdfs:domain ifn:Tree ;
  rdfs:range ifn:Plot ;
  rdfs:isDefinedBy ifn: .


ifn:hasHeight a owl:ObjectProperty , rdf:Property ;
  rdfs:subPropertyOf smo:hasMeasure ;
  rdfs:label "has height"@en , "tiene altura"@es ;
  rdfs:comment "height of the tree to a point"@en , "altura del árbol hasta un
determinado punto"@es ;
  rdfs:domain ifn:Tree ;
  rdfs:range ifn:DBH ;
  rdfs:isDefinedBy ifn: .


ifn:hasTotalHeight a owl:ObjectProperty , rdf:Property ;
  rdfs:subPropertyOf ifn:hasHeight ;
  rdfs:label "has total height"@en , "tiene altura total"@es ;
  rdfs:comment "height of the tree to its upmost point"@en , "altura del árbol
hasta su punto más alto"@es ;
  rdfs:domain ifn:Tree ;
  rdfs:range ifn:DBH ;
  rdfs:isDefinedBy ifn: .


ifn:hasDiameterAtBreastHeight a owl:ObjectProperty , rdf:Property ;
  rdfs:subPropertyOf smo:hasMeasure ;
  rdfs:label "has DBH"@en , "tiene DN"@es ;
  rdfs:comment "has diameter at breast hight"@en , "tiene diámetro a la altura del
pecho"@es , "tiene diámetro normal"@es ;
```



```
  rdfs:domain ifn:Tree ;
  rdfs:range ifn:DBH ;
  rdfs:isDefinedBy ifn: .

ifn:hasDBH1 a owl:ObjectProperty , rdf:Property ;
  rdfs:subPropertyOf ifn:hasDiameterAtBreastHeight ;
  rdfs:label "has DBH1"@en , "tiene dn1"@es ;
  rdfs:comment "has diameter at breast hight with the caliper arms pointing at the center of the plot"@en , "tiene diámetro observado a la altura del pecho con la forcípula apuntando al centro de la parcela"@es , "tiene diámetro normal con la forcípula apuntando al centro de la parcela"@es ;
  rdfs:domain ifn:Tree ;
  rdfs:range ifn:DBH1 ;
  rdfs:isDefinedBy ifn: .

ifn:hasDBH2 a owl:ObjectProperty , rdf:Property ;
  rdfs:subPropertyOf ifn:hasDiameterAtBreastHeight ;
  rdfs:label "has DBH2"@en , "tiene dn2"@es ;
  rdfs:comment "has diameter at breast hight with the caliper arms perpendicular to the center of the plot"@en , "tiene diámetro observado a la altura del pecho con la forcípula perpendicular al centro de la parcela"@es , "tiene diámetro normal con la forcípula perpendicular al centro de la parcela"@es ;
  rdfs:domain ifn:Tree ;
  rdfs:range ifn:DBH2 ;
  rdfs:isDefinedBy ifn: .

ifn:hasPlantSpecies a owl:ObjectProperty , rdf:Property ;
  rdfs:label "has species"@en , "tiene especie"@es ;
  rdfs:comment "species of a plant"@es , "especie de una planta"@es ;
  rdfs:domain ifn:Plant ;
  rdfs:range ifn:PlantSpecies ;
  rdfs:isDefinedBy ifn: .

ifn:hasTreeSpecies a owl:ObjectProperty , rdf:Property ;
  rdfs:label "has species"@en , "tiene especie"@es ;
  rdfs:comment "species of a tree"@es , "especie de un árbol"@es ;
  rdfs:domain ifn:Tree ;
  rdfs:range ifn:TreeSpecies ;
  rdfs:isDefinedBy ifn: .

ifn:hasBushSpecies a owl:ObjectProperty , rdf:Property ;
```



```
  rdfs:label "has species"@en , "tiene especie"@es ;
  rdfs:comment "species of a bush"@es , "especie de un bush"@es ;
  rdfs:domain ifn:Bush ;
  rdfs:range ifn:BushSpecies ;
  rdfs:isDefinedBy ifn: .

ifn:hasScientificName a owl:ObjectProperty , rdf:Property ;
  rdfs:label "scientific name"@en ;
  rdfs:domain ifn:Plant ;
  rdfs:range ifn:ScientificName ;
  rdfs:isDefinedBy ifn: .

ifn:hasAcceptedName a owl:ObjectProperty , rdf:Property ;
  rdfs:subpropertyOf rdfs:scientificName ;
  rdfs:label "scientific name"@en ;
  rdfs:range ifn:AcceptedName ;
  rdfs:isDefinedBy ifn: .

ifn:hasScientificSynonym a owl:ObjectProperty , rdf:Property ;
  rdfs:label "scientific synonym"@en ;
  rdfs:range ifn:Synonym ;
  rdfs:isDefinedBy ifn: .

ifn:containsSpecies a owl:ObjectProperty , rdf:Property ;
  rdfs:label "containsSpecies"@en ;
  rdfs:range ifn:InfoSpecies ;
  rdfs:isDefinedBy ifn: .

ifn:hasBasalArea a owl:ObjectProperty , rdf:Property ;
  rdfs:subpropertyOf ifn:hasPlantMeasure ;
  rdfs:label "has basal area"@en ;
  rdfs:range ifn:BasalArea ;
  rdfs:isDefinedBy ifn: .

ifn:hasVolume a owl:ObjectProperty , rdf:Property ;
  rdfs:label "has volume"@en ;
  rdfs:range ifn:Volume ;
  rdfs:isDefinedBy ifn: .
```



```
ifn:hasVolumeWithBark a owl:ObjectProperty , rdf:Property ;
  rdfs:subpropertyOf ifn:hasVolume ;
  rdfs:label "has volume with bark"@en , "tiene volumen con corteza"@es ;
  rdfs:isDefinedBy ifn: .

ifn:hasVolumeWithoutBark a owl:ObjectProperty , rdf:Property ;
  rdfs:subpropertyOf ifn:hasVolume ;
  rdfs:label "has volume without bark"@en , "tiene volumen sin corteza"@es ;
  rdfs:isDefinedBy ifn: .

ifn:hasNumberOfTrees a owl:ObjectProperty , rdf:Property ;
  rdfs:label "has number of trees"@en ;
  rdfs:range ifn:VolumeWithBark ;
  rdfs:isDefinedBy ifn: .

ifn:hasSpecies a owl:ObjectProperty , rdf:Property ;
  rdfs:label "hasSpecies"@en ;
  rdfs:range ifn:Taxon ; # In the data there are species that are not really
species, but classes, families, or genus, so we need to put the most generic class
  rdfs:isDefinedBy ifn: .



#####################################################################
#    Datatype Properties
#####################################################################

ifn:hasHeightInMeters a owl:ObjectProperty , rdf:Property ;
  rdfs:subPropertyOf smo:hasMeasureInMeters ;
  rdfs:label "has height in meters"@en , "tiene altura en metros"@es ;
  rdfs:comment "height of the tree in meters to a point"@en , "altura del árbol en
metros hasta un determinado punto"@es ;
  rdfs:domain ifn:Tree ;
  rdfs:isDefinedBy ifn: .

ifn:hasTotalHeightInMeters a owl:ObjectProperty , rdf:Property ;
  rdfs:subPropertyOf ifn:hasHeightInMeters ;
  rdfs:label "has total height in meters"@en , "tiene altura total en metros"@es ;
  rdfs:comment "height of the tree in meters to its upmost point"@en , "altura del
árbol en metros hasta su punto más alto"@es ;
  rdfs:domain ifn:Tree ;
```



```
  rdfs:isDefinedBy ifn: .


ifn:hasDBHInMillimeters a owl:DatatypeProperty , rdf:Property ;

  rdfs:subPropertyOf smo:hasMeasureInMillimeters ;

  rdfs:label "has DBH in millimeters"@en , "tiene DN en milímetros"@es ;

  rdfs:comment "has diameter in millimeters at breast hight"@en , "tiene diámetro
en milímetros a la altura del pecho"@es , "tiene diámetro normal en milímetros"@es
;

  rdfs:isDefinedBy ifn: .


ifn:hasDBH1InMillimeters a owl:DatatypeProperty , rdf:Property ;

  rdfs:subPropertyOf ifn:hasDBHInMillimeters ;

  rdfs:label "has DBH in millimeters"@en , "tiene DN en milímetros"@es ;

  rdfs:comment "has diameter in millimeters at breast hight with the caliper arms
pointing at the center of the plot"@en , "tiene diámetro en milímetros a la altura
del pecho con la forcípula apuntando al centro de la parcela"@es , "tiene diámetro
normal en milímetros con la forcípula apuntando al centro de la parcela"@es ;

  rdfs:isDefinedBy ifn: .


ifn:hasDBH2InMillimeters a owl:DatatypeProperty , rdf:Property ;

  rdfs:subPropertyOf ifn:hasDBHInMillimeters ;

  rdfs:label "has DBH in millimeters"@en , "tiene DN en milímetros"@es ;

  rdfs:comment "has diameter in millimeters at breast hight with the caliper arms
perpendicular to the center of the plot"@en , "tiene diámetro en milímetros a la
altura del pecho con la forcípula perpendicular al centro de la parcela"@es ,
"tiene diámetro normal en milímetros con la forcípula perpendicular al centro de
la parcela"@es ;

  rdfs:isDefinedBy ifn: .


ifn:hasBasalAreaInM2 a owl:ObjectProperty , rdf:Property ;

  rdfs:subpropertyOf smo:hasMeasureInM2 ;

  rdfs:label "has basal area"@en ;

  rdfs:range ifn:BasalArea ;

  rdfs:isDefinedBy ifn: .


ifn:hasVolumeInM3 a owl:ObjectProperty , rdf:Property ;

  rdfs:subpropertyOf smo:hasMeasureInM3 ;

  rdfs:label "has volume in cubic meters"@en , "tiene volumen en metros
cúbicos"@es ;

  rdfs:range ifn:Volume ;

  rdfs:isDefinedBy ifn: .
```



```
ifn:hasVolumeWithBarkInM3 a owl:ObjectProperty , rdf:Property ;
  rdfs:subpropertyOf ifn:hasVolumeInM3 ;
  rdfs:label "has volume with bark in cubic meters"@en , "tiene volumen con corteza en metros cúbicos"@es ;
  rdfs:range ifn:VolumeWithBark ;
  rdfs:isDefinedBy ifn: .

ifn:hasVolumeWithoutBarkInM3 a owl:ObjectProperty , rdf:Property ;
  rdfs:subpropertyOf ifn:hasVolumeInM3 ;
  rdfs:label "has volume without bark in cubic meters"@en , "tiene volumen sin corteza en metros cúbicos"@es ;
  rdfs:range ifn:hasVolumeWithoutBark ;
  rdfs:isDefinedBy ifn: .

ifn:hasNumberOfTreesInUnits a owl:ObjectProperty , rdf:Property ;
  rdfs:subpropertyOf smo:hasMeasureInUnits ;
  rdfs:label "has number of trees"@en ;
  rdfs:range ifn:VolumeWithBark ;
  rdfs:isDefinedBy ifn: .

ifn:hasBasalAreaInM2byHA a owl:ObjectProperty , rdf:Property ;
  rdfs:subpropertyOf smo:hasMeasureInM2ByHA ;
  rdfs:label "has basal area"@en ;
  rdfs:range ifn:BasalArea ;
  rdfs:isDefinedBy ifn: .

ifn:hasVolumeInM3byHA a owl:ObjectProperty , rdf:Property ;
  rdfs:subpropertyOf smo:hasMeasureInM3ByHA ;
  rdfs:label "has volume in cubic meters per hectare"@en , "tiene volumen en metros cúbicos por hectárea"@es ;
  rdfs:range ifn:Volume ;
  rdfs:isDefinedBy ifn: .

ifn:hasVolumeWithBarkInM3byHA a owl:ObjectProperty , rdf:Property ;
  rdfs:subpropertyOf ifn:hasVolumeInM3byHA ;
  rdfs:label "has volume with bark in cubic meters per hectare"@en , "tiene volumen con corteza en metros cúbicos por hectárea"@es ;
  rdfs:range ifn:Volume ;
  rdfs:isDefinedBy ifn: .
```



```
ifn:hasVolumeWithoutBarkInM3byHA a owl:ObjectProperty , rdf:Property ;
  rdfs:subpropertyOf ifn:hasVolumeInM3byHA ;
  rdfs:label "has volume with bark in cubic meters per hectare"@en , "tiene volumen con corteza en metros cúbicos por hectárea"@es ;
  rdfs:range ifn:Volume ;
  rdfs:isDefinedBy ifn: .

ifn:hasNumberOfTreesInUnitsByHA a owl:ObjectProperty , rdf:Property ;
  rdfs:subpropertyOf smo:hasMeasureInUnitsByHA ;
  rdfs:label "has number of trees"@en ;
  rdfs:range ifn:VolumeWithBark ;
  rdfs:isDefinedBy ifn: .

#################################################################
#    Annotation Properties
#################################################################

ifn:vulgarName a owl:AnnotationProperty , rdf:Property ;
  rdfs:subpropertyOf rdfs:label ;
  rdfs:label "vulgar name"@en ;
  rdfs:domain ifn:Plant ;
  rdfs:range rdf:langString ;
  rdfs:isDefinedBy ifn: .

ifn:scientificName a owl:AnnotationProperty , rdf:Property ;
  rdfs:subpropertyOf rdfs:label ;
  rdfs:label "scientific name"@en ;
  rdfs:domain ifn:Plant ;
  rdfs:range rdf:langString ;
  rdfs:isDefinedBy ifn: .

ifn:acceptedName a owl:AnnotationProperty , rdf:Property ;
  rdfs:subpropertyOf rdfs:label ;
  rdfs:label "scientific name"@en ;
  rdfs:domain ifn:Plant ;
  rdfs:range rdf:langString ;
  rdfs:isDefinedBy ifn: .

ifn:scientificSynonym a owl:AnnotationProperty , rdf:Property ;
```



```
  rdfs:subpropertyOf rdfs:label ;
  rdfs:label "scientific name"@en ;
  rdfs:domain ifn:Plant ;
  rdfs:range rdf:langString ;
  rdfs:isDefinedBy ifn: .

ifn:name a owl:AnnotationProperty , rdf:Property ;
  rdfs:subpropertyOf rdfs:label ;
  rdfs:label "name"@en ;
  rdfs:domain ifn:ScientificName ;
  rdfs:range rdf:langString ;
  rdfs:isDefinedBy ifn: .

ifn:author a owl:AnnotationProperty , rdf:Property ;
  rdfs:subpropertyOf rdfs:label ;
  rdfs:label "author"@en ;
  rdfs:domain ifn:Plant ;
  rdfs:range rdf:langString ;
  rdfs:isDefinedBy ifn: .
```


Annex F: MFE ontology

```
@prefix mfe: <http://crossforest.eu/mfe/ontology/> .
@prefix fio: <http://crossforest.eu/forinv/ontology/> .
@prefix smo: <http://crossforest.eu/measures/ontology/> .
@prefix spo: <http://crossforest.eu/position/ontology/> .
@prefix ifn: <http://crossforest.eu/ifn/ontology/> .
@prefix xsd: <http://www.w3.org/2001/XMLSchema#> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .
@prefix owl: <http://www.w3.org/2002/07/owl#> .
@prefix dc: <http://purl.org/dc/elements/1.1/> .
@prefix vann: <http://purl.org/vocab/vann/> .


@prefix te: <http://crossforest.eu/mfe/data/vegetationStructure/> .  # cambiado x ACO: tipoEstructural x vegetationStructure
@prefix distribution: <http://crossforest.eu/mfe/data/spatialDistribution/> . # cambiado x ACO: Distribución x spatialDistribution
@prefix fdm: <http://crossforest.eu/mfe/data/patchShape/> .  # cambiado x ACO: formaDeMasa x patchShape
@prefix edd: <http://crossforest.eu/mfe/data/standDevelopment/> . # cambiado x ACO: estadoDeDesarrollo x standDevelopment
@prefix tof: <http://crossforest.eu/mfe/data/typeOfForest/> .
@prefix realm: <http://crossforest.eu/mfe/data/biogeographicRegion/> . # cambiado x ACO: biogeographicRealm x biogeographicRegion
@prefix use: <http://crossforest.eu/mfe/data/use/> .



mfe: a owl:Ontology ;
  rdfs:label "Spanish MFE Ontology"@en , "Ontología del MFE de España"@es ; # yo pondría: "Spanish National Forest Map (MFE) Ontology"@en , "Ontología del Mapa Forestal Nacional de España (MFE)"@es
  rdfs:comment "Ontology to publish data of the Spanish Forestry Map"@en , "Ontología para publicar datos del Mapa Forestal Nacional de España" ;
  owl:versionInfo 0.1 ;
  dc:creator <https://www.crossforest.eu/members/josgim> , <https://www.crossforest.eu/members/guiveg> ;
  dc:date "2019-07-17"^^xsd:date ;
  owl:imports fio: , spo: ;
  vann:preferredNamespacePrefix "mfe" .
```



```
#################################################################
#    Classes
#################################################################

mfe:Patch a owl:Class , rdfs:Class ;
  rdfs:subClassOf spo:SpatialEntity ;
  rdfs:label ""@es , ""@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:isDefinedBy mfe: .

mfe:Area a owl:Class , rdfs:Class ;
  rdfs:subClassOf smo:MeasurableEntityInSquareMeters ;
  rdfs:label ""@es , ""@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:isDefinedBy mfe: .

mfe:CanopyCover a owl:Class , rdfs:Class ;
  rdfs:label "Canopy Cover"@es , "Fracción de Cabida Cubierta"@es ;
  rdfs:comment "Canopy Cover of the Vegetation Structure"@en , "Representa la
proporción total de la vegetación."@es ;
  rdfs:isDefinedBy mfe: .

mfe:CanopyCoverTotal a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:CanopyCover ;
  rdfs:label "Total Canopy Cover"@es , "Fracción de Cabida Cubierta Total"@es ;
  rdfs:comment ""@en , "Representa la proporción total de la vegetación arbórea y
de matorral. Proporciona información sobre la proyección sobre el suelo de los
principales pisos de vegetación. En algún caso se incluirán fracciones de cabida
cubierta de pastizales o cultivos. Para su cuantificación se tendrá en cuenta
todas las especies en conjunto, con independencia de que se presenten por razones
de edad o de otro tipo de alturas muy distintas."@es ;
  rdfs:isDefinedBy mfe: .

mfe:CanopyCoverTrees a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:CanopyCover ;
  rdfs:label "Canopy Cover of Trees"@es , "Fracción de Cabida Cubierta Arbórea"@es
;
  rdfs:comment ""@en , "Representa la proporción del conjunto de las especies del
estrato arbóreo como porcentaje de suelo cubierto por la proyección de todas las
copas. No influye en su cálculo el hecho de tratarse de masas monoespecíficas o
```



```
pluriespecíficas, o el de encontrarse en distinto estado de masa las distintas especies."@es ;
  rdfs:isDefinedBy mfe: .

mfe:VegetationStructure a owl:Class , rdfs:Class ; # cambiado x ACO: tipoEstructural x VegetationStructure
  rdfs:label "Tipo Estructural"@es ;
  rdfs:comment "Indica los distintos usos del suelo que pueden aparecer y, dentro del uso forestal, las distintas estructuras de vegetación que lo pueden ocupar, atendiendo más que a la densidad vegetal a la estructura de la vegetación que ocupa." ; # modificado x ACO; eliminado cormótico, palabra inventada y que solo aparece en 6 documentos todos relacionados con el MFE
  rdfs:isDefinedBy mfe: .

mfe:SpatialDistribution a owl:Class , rdfs:Class ; # cambiado x ACO
  rdfs:label "Distribución"@es ;
  rdfs:comment "Indica las distintas formas en las que puede aparecer agrupada la vegetación arbórea. Está más referido a la distribución espacial visual de la mancha vegetal que a su composición específica o la relación entre especies."@es ;
  rdfs:isDefinedBy mfe: .

mfe:PatchShape a owl:Class , rdfs:Class ; # cambiado x ACO: FormaDeMasa x PatchShape
  rdfs:label "Forma de la tesela"@es , "Shape of the patch"@en ;
  rdfs:comment "Indica la forma geométrica que presenta la tesela"@es , "Diferenciates the geometric shape of the patch and vegetation asociated"@en ;
  rdfs:isDefinedBy mfe: .

mfe:PatchInPatch a owl:Class , rdfs:Class ;
  rdfs:label "Patch in the patch"@es ;
  rdfs:comment "Patch contained in the patch"@es ;
  rdfs:isDefinedBy mfe: .

mfe:SpeciesInPatch a owl:Class , rdfs:Class ;
  rdfs:label "Species in the patch"@es ;
  rdfs:comment "Species present in the patch"@es ;
  rdfs:isDefinedBy mfe: .

mfe:UseInPatch a owl:Class , rdfs:Class ;
  rdfs:label "Use in the patch"@es ;
  rdfs:comment "Use present in the patch"@es ;
  rdfs:isDefinedBy mfe: .
```



```
mfe:RateOfPatch a owl:Class , rdfs:Class ;
  rdfs:subClassOf smo:MeasureInPercentage ;
  rdfs:label "Proporción de la tesela"@es ;
  rdfs:comment "Indica la proporción de la tesela dentro de la agrupación."@es ;
  rdfs:isDefinedBy mfe: .

mfe:OccupationOfSpecies a owl:Class , rdfs:Class ;
  rdfs:subClassOf smo:MeasureInPercentage ;
  rdfs:label "Ocupación de especie"@es ;
  rdfs:comment "Indica la ocupación para cada una de las especies descritas. Los
valores que adopta informan del grado de presencia en porcentaje de las especies
arbóreas existentes, siendo tanto mayor, cuanto mayor representatividad posee la
especie en cuestión, en comparación con las otras especies arbóreas presentes en
la tesela."@es ;
  rdfs:isDefinedBy mfe: .

mfe:RateofUse a owl:Class , rdfs:Class ;
  rdfs:subClassOf smo:MeasureInPercentage ;
  rdfs:label "Propoción del uso"@es ;
  rdfs:comment "Indica la proporción para cada una de las usos dentro de la
agrupación de teselas."@es ;
  rdfs:isDefinedBy mfe: .

mfe:StandDevelopment a owl:Class , rdfs:Class ; # cambiado x ACO:
estadoDeDesarrollo x standDevelopment
  rdfs:label "Estado de Desarrollo"@es ;
  rdfs:comment "Indica la fase de desarrollo en que se encuentran las poblaciones
de especies arbóreas presentes en la tesela"@es ;
  rdfs:isDefinedBy mfe: .

mfe:Classification a owl:Class , rdfs:Class ;
  rdfs:label "Clasificación MFE-IFN"@es ;
  rdfs:comment "Pasarela entre el Tipo Estructural y la clasificación por niveles
del IFN3"@es ;
  rdfs:isDefinedBy mfe: .

mfe:TypeOfForest a owl:Class , rdfs:Class ;
  rdfs:label "Tipo de Bosque"@es ;
  rdfs:comment "Tipo de bosque (coníferas, frondosas o mixtas)"@es ;
  rdfs:isDefinedBy mfe: .
```



```
mfe:BiogeographicRegion a owl:Class , rdfs:Class ;
  rdfs:label "Biogeographic Region"@en , "Región biogeográfica"@es ;
  rdfs:comment ""@es ;
  rdfs:isDefinedBy mfe: .

mfe:Use a owl:Class , rdfs:Class ; # Debería in en una ontología de ordenación de territorio (land use planning)
  rdfs:label "Soil use"@en , "Uso del suelo"@es ;
  rdfs:comment ""@es ;
  rdfs:isDefinedBy mfe: .

mfe:SetOfSpecies a owl:Class , rdfs:Class ;
  rdfs:label "Set of Species"@en , "Agrupación de Especies"@es ;
  rdfs:comment ""@es ;
  rdfs:isDefinedBy mfe: .

mfe:BiogeographicRegion-ATL a owl:Class , rdfs:Class ; # cambiado x ACO: Realm x BiogeographicRegion
  rdfs:subClassOf mfe:BiogeographicRegion ; #"atlantic region" "macharonesian region" "alpine region" "mediterranean region"
  rdfs:label "Atlántica"@es ;
  rdfs:comment ""@es ;
  rdfs:isDefinedBy mfe: .

mfe:BiogeographicRegion-MAC a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:BiogeographicRegion ;
  rdfs:label "Macaronésica"@es ;
  rdfs:comment ""@es ;
  rdfs:isDefinedBy mfe: .

mfe:BiogeographicRegion-ALP a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:BiogeographicRegion ;
  rdfs:label "Alpina"@es ;
  rdfs:comment ""@es ;
  rdfs:isDefinedBy mfe: .

mfe:BiogeographicRegion-MED a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:BiogeographicRegion ;
  rdfs:label "Mediterránea"@es ;
  rdfs:comment ""@es ;
```



```
  rdfs:isDefinedBy mfe: .


mfe:SetOfSpecies-71  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Haya"@es ;
        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species71> .


mfe:SetOfSpecies-43  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Quercus pyrenaica"@es ;
        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species43> .


mfe:SetOfSpecies-56  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Olmos"@es ;
        mfe:hasSpecies        <http://crossforest.eu/ifn/ontology/Species356>    ,
<http://crossforest.eu/ifn/ontology/Species256>                                  ,
<http://crossforest.eu/ifn/ontology/Species56> .


mfe:SetOfSpecies-28  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Pinus radiata"@es ;
        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species28> .


mfe:SetOfSpecies-50  a  rdfs:Class , mfe:SetOfSpecies , owl:Class ;
        rdfs:label      "Especies de ribera"@es ;
        mfe:hasSpecies        <http://crossforest.eu/ifn/ontology/Species557>    ,
<http://crossforest.eu/ifn/ontology/Species50>                                   ,
<http://crossforest.eu/ifn/ontology/Species757>                                  ,
<http://crossforest.eu/ifn/ontology/Species53>                                   ,
<http://crossforest.eu/ifn/ontology/Species59>                                   ,
<http://crossforest.eu/ifn/ontology/Species357>                                  ,
<http://crossforest.eu/ifn/ontology/Species51>                                   ,
<http://crossforest.eu/ifn/ontology/Species57>                                   ,
<http://crossforest.eu/ifn/ontology/Species657>                                  ,
<http://crossforest.eu/ifn/ontology/Species857>                                  ,
<http://crossforest.eu/ifn/ontology/Species54>                                   ,
<http://crossforest.eu/ifn/ontology/Species257>                                  ,
<http://crossforest.eu/ifn/ontology/Species457>                                  ,
<http://crossforest.eu/ifn/ontology/Species957> .


mfe:SetOfSpecies-22  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Pinus uncinata"@es ;
        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species22> .


mfe:SetOfSpecies-7  a   mfe:SetOfSpecies , rdfs:Class , owl:Class ;
        rdfs:label      "Especies alóctonas invasoras"@es ;
```



```
        mfe:hasSpecies         <http://crossforest.eu/ifn/ontology/Species11>     ,
<http://crossforest.eu/ifn/ontology/Species292>                                   ,
<http://crossforest.eu/ifn/ontology/Species92>                                    ,
<http://crossforest.eu/ifn/ontology/Species307>                                   ,
<http://crossforest.eu/ifn/ontology/Species7>                                     ,
<http://crossforest.eu/ifn/ontology/Species392>                                   ,
<http://crossforest.eu/ifn/ontology/Species207> .


mfe:SetOfSpecies-48  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;

        rdfs:label      "Quercus rubra"@es ;

        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species48> .


mfe:SetOfSpecies-70  a  rdfs:Class , owl:Class , mfe:SetOfSpecies ;

        rdfs:label      "Tilares y frondosas de gran porte"@es ;

        mfe:hasSpecies        <http://crossforest.eu/ifn/ontology/Species377>     ,
<http://crossforest.eu/ifn/ontology/Species77>                                    ,
<http://crossforest.eu/ifn/ontology/Species75>                                    ,
<http://crossforest.eu/ifn/ontology/Species70>                                    ,
<http://crossforest.eu/ifn/ontology/Species277>                                   ,
<http://crossforest.eu/ifn/ontology/Species275> .


mfe:SetOfSpecies-14  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;

        rdfs:label      "Tejo"@es ;

        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species14> .


mfe:SetOfSpecies-83  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;

        rdfs:label      "Fayal-Brezal"@es ;

        mfe:hasSpecies        <http://crossforest.eu/ifn/ontology/Species283>     ,
<http://crossforest.eu/ifn/ontology/Species83>                                    ,
<http://crossforest.eu/ifn/ontology/Species81> .


mfe:SetOfSpecies-55  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;

        rdfs:label      "Fresnedas y  temblares"@es ;

        mfe:hasSpecies        <http://crossforest.eu/ifn/ontology/Species255>     ,
<http://crossforest.eu/ifn/ontology/Species55> .


mfe:SetOfSpecies-27  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;

        rdfs:label      "Pinus canariensis"@es ;

        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species27> .


mfe:SetOfSpecies-68  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;

        rdfs:label      "Arbutus unedo "@es ;

        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species68> .
```



```
mfe:SetOfSpecies-21  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Pinus sylvestris"@es ;
        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species21> .

mfe:SetOfSpecies-47  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Quercus canariensis"@es ;
        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species47> .

mfe:SetOfSpecies-19  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Otras coníferas"@es ;
        mfe:hasSpecies        <http://crossforest.eu/ifn/ontology/Species217>    ,
<http://crossforest.eu/ifn/ontology/Species436>                                  ,
<http://crossforest.eu/ifn/ontology/Species17>                                   ,
<http://crossforest.eu/ifn/ontology/Species19>                                   ,
<http://crossforest.eu/ifn/ontology/Species336>                                  ,
<http://crossforest.eu/ifn/ontology/Species236>                                  ,
<http://crossforest.eu/ifn/ontology/Species36>                                   ,
<http://crossforest.eu/ifn/ontology/Species317>                                  ,
<http://crossforest.eu/ifn/ontology/Species29> .

mfe:SetOfSpecies-243  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Quercus pubescens (Q. humilis)"@es ;
        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species243> .

mfe:SetOfSpecies-369  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Palmeras"@es ;
        mfe:hasSpecies        <http://crossforest.eu/ifn/ontology/Species469>    ,
<http://crossforest.eu/ifn/ontology/Species69> .

mfe:SetOfSpecies-13  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Almez"@es ;
        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species13> .

mfe:SetOfSpecies-26  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Pinus pinaster"@es ;
        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species26> .

mfe:SetOfSpecies-67  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Ceratonia siliqua"@es ;
        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species67> .

mfe:SetOfSpecies-39  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
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        rdfs:label      "Juniperus phoenicea"@es ;
        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species39> .

mfe:SetOfSpecies-74  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Avellano"@es ;
        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species74> .

mfe:SetOfSpecies-46  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Quercus suber"@es ;
        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species46> .

mfe:SetOfSpecies-40  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Robledales"@es ;
        mfe:hasSpecies         <http://crossforest.eu/ifn/ontology/Species42>    ,
<http://crossforest.eu/ifn/ontology/Species41> .

mfe:SetOfSpecies-25  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Pinus nigra"@es ;
        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species25> .

mfe:SetOfSpecies-94  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Lauredas"@es ;
        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species94> .

mfe:SetOfSpecies-66  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Olea europaea"@es ;
        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species66> .

mfe:SetOfSpecies-38  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Juniperus thurifera"@es ;
        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species38> .

mfe:SetOfSpecies-219  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Araar"@es ;
        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species219> .

mfe:SetOfSpecies-60  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Eucaliptos"@es ;
        mfe:hasSpecies         <http://crossforest.eu/ifn/ontology/Species63>    ,
<http://crossforest.eu/ifn/ontology/Species364>                                  ,
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<http://crossforest.eu/ifn/ontology/Species61>                                  ,
<http://crossforest.eu/ifn/ontology/Species64>                                  ,
<http://crossforest.eu/ifn/ontology/Species62>                                  ,
<http://crossforest.eu/ifn/ontology/Species60>                                  ,
<http://crossforest.eu/ifn/ontology/Species264> .


mfe:SetOfSpecies-495  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Loreras"@es ;
        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species495> .


mfe:SetOfSpecies-32  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Abies pinsapo"@es ;
        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species32> .


mfe:SetOfSpecies-73  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Abedules"@es ;
        mfe:hasSpecies        <http://crossforest.eu/ifn/ontology/Species373>    ,
<http://crossforest.eu/ifn/ontology/Species273>                                 ,
<http://crossforest.eu/ifn/ontology/Species73> .


mfe:SetOfSpecies-45  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Quercus ilex "@es ;
        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species45> .


mfe:SetOfSpecies-58  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Populus nigra"@es ;
        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species58> .


mfe:SetOfSpecies-99  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Frondosas"@es ;
        mfe:hasSpecies        <http://crossforest.eu/ifn/ontology/Species78>    ,
<http://crossforest.eu/ifn/ontology/Species291>                                 ,
<http://crossforest.eu/ifn/ontology/Species15>                                  ,
<http://crossforest.eu/ifn/ontology/Species299>                                 ,
<http://crossforest.eu/ifn/ontology/Species5>                                   ,
<http://crossforest.eu/ifn/ontology/Species395>                                 ,
<http://crossforest.eu/ifn/ontology/Species499>                                 ,
<http://crossforest.eu/ifn/ontology/Species355>                                 ,
<http://crossforest.eu/ifn/ontology/Species578>                                 ,
<http://crossforest.eu/ifn/ontology/Species215>                                 ,
<http://crossforest.eu/ifn/ontology/Species49>                                  ,
<http://crossforest.eu/ifn/ontology/Species99>                                  ,
<http://crossforest.eu/ifn/ontology/Species97>                                  ,
<http://crossforest.eu/ifn/ontology/Species95>                                  ,
<http://crossforest.eu/ifn/ontology/Species40>                                  ,
<http://crossforest.eu/ifn/ontology/Species278>                                 ,
```



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<http://crossforest.eu/ifn/ontology/Species276>                                  ,
<http://crossforest.eu/ifn/ontology/Species476>                                  ,
<http://crossforest.eu/ifn/ontology/Species16>                                   ,
<http://crossforest.eu/ifn/ontology/Species76>                                   ,
<http://crossforest.eu/ifn/ontology/Species6>                                    ,
<http://crossforest.eu/ifn/ontology/Species297>                                  ,
<http://crossforest.eu/ifn/ontology/Species3>                                    ,
<http://crossforest.eu/ifn/ontology/Species96>                                   ,
<http://crossforest.eu/ifn/ontology/Species376>                                  ,
<http://crossforest.eu/ifn/ontology/Species576>                                  ,
<http://crossforest.eu/ifn/ontology/Species8>                                    ,
<http://crossforest.eu/ifn/ontology/Species12>                                   ,
<http://crossforest.eu/ifn/ontology/Species90>                                   ,
<http://crossforest.eu/ifn/ontology/Species315>                                  ,
<http://crossforest.eu/ifn/ontology/Species676>                                  ,
<http://crossforest.eu/ifn/ontology/Species295>                                  ,
<http://crossforest.eu/ifn/ontology/Species399>                                  ,
<http://crossforest.eu/ifn/ontology/Species415>                                  ,
<http://crossforest.eu/ifn/ontology/Species4>                                    ,
<http://crossforest.eu/ifn/ontology/Species2>                                    ,
<http://crossforest.eu/ifn/ontology/Species9>                                    ,
<http://crossforest.eu/ifn/ontology/Species52>                                   ,
<http://crossforest.eu/ifn/ontology/Species98>                                   ,
<http://crossforest.eu/ifn/ontology/Species378>                                  ,
<http://crossforest.eu/ifn/ontology/Species478> .


mfe:SetOfSpecies-80  a  owl:Class , mfe:SetOfSpecies , rdfs:Class ;
        rdfs:label      "Laurisilva macaronésica"@es ;
        mfe:hasSpecies          <http://crossforest.eu/ifn/ontology/Species80>     ,
<http://crossforest.eu/ifn/ontology/Species293>                                  ,
<http://crossforest.eu/ifn/ontology/Species89>                                   ,
<http://crossforest.eu/ifn/ontology/Species87>                                   ,
<http://crossforest.eu/ifn/ontology/Species294>                                  ,
<http://crossforest.eu/ifn/ontology/Species268>                                  ,
<http://crossforest.eu/ifn/ontology/Species858>                                  ,
<http://crossforest.eu/ifn/ontology/Species1>                                    ,
<http://crossforest.eu/ifn/ontology/Species86>                                   ,
<http://crossforest.eu/ifn/ontology/Species253>                                  ,
<http://crossforest.eu/ifn/ontology/Species84>                                   ,
<http://crossforest.eu/ifn/ontology/Species82> .


mfe:SetOfSpecies-24  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Pinus halepensis"@es ;
        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species24> .


mfe:SetOfSpecies-93  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Pistacia terebinthus"@es ;
        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species93> .


mfe:SetOfSpecies-65  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Acebo"@es ;
```



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        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species65> .


mfe:SetOfSpecies-37  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Juniperus"@es ;
        mfe:hasSpecies        <http://crossforest.eu/ifn/ontology/Species237>    ,
<http://crossforest.eu/ifn/ontology/Species37> .


mfe:SetOfSpecies-31  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Abies alba"@es ;
        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species31> .


mfe:SetOfSpecies-72  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Castaño"@es ;
        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species72> .


mfe:SetOfSpecies-44  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Quejigares"@es ;
        mfe:hasSpecies        <http://crossforest.eu/ifn/ontology/Species244>    ,
<http://crossforest.eu/ifn/ontology/Species44> .


mfe:SetOfSpecies-238  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Juniperus turbinata"@es ;
        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species238> .


mfe:SetOfSpecies-23  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Pinus pinea"@es ;
        mfe:hasSpecies  <http://crossforest.eu/ifn/ontology/Species23> .


mfe:SetOfSpecies-258  a  owl:Class , rdfs:Class , mfe:SetOfSpecies ;
        rdfs:label      "Chopera y plataneras"@es ;
        mfe:hasSpecies        <http://crossforest.eu/ifn/ontology/Species258>    ,
<http://crossforest.eu/ifn/ontology/Species79> .


mfe:SetOfSpecies-30  a  rdfs:Class , mfe:SetOfSpecies , owl:Class ;
        rdfs:label      "Coníferas de repoblación"@es ;
        mfe:hasSpecies         <http://crossforest.eu/ifn/ontology/Species34>    ,
<http://crossforest.eu/ifn/ontology/Species30>                                   ,
<http://crossforest.eu/ifn/ontology/Species33>                                   ,
<http://crossforest.eu/ifn/ontology/Species18>                                   ,
<http://crossforest.eu/ifn/ontology/Species235>                                  ,
<http://crossforest.eu/ifn/ontology/Species319>                                  ,
<http://crossforest.eu/ifn/ontology/Species35> .
```



```
mfe:VegetationStructure1 a owl:Class , rdfs:Class ; # cambiado x ACO: TipoEstructural x VegetationStructure

  rdfs:subClassOf mfe:VegetationStructure ;

  rdfs:label "Bosque"@es ;

  rdfs:comment "Agrupación de árboles o especies potencialmente arbóreas, en espesura con una fracción de cabida cubierta superior al 5% y uso netamente forestal. El origen del mismo es natural o de repoblación totalmente integrada"@es ;

  rdfs:isDefinedBy mfe: .


mfe:VegetationStructure2 a owl:Class , rdfs:Class ;

  rdfs:subClassOf mfe:VegetationStructure ;

  rdfs:label "Bosque de Plantación"@es ;

  rdfs:comment "Agrupación de árboles en espesura con una fracción de cabida cubierta superior al 5% y uso netamente forestal, cuyo origen es el de plantación. Para decidir que una plantación ha dejado de serlo, adquiriendo una naturalidad fruto del paso del tiempo y de la propia dinámica de la vegetación, deberán aparecer diluidos los marcos de plantación u otros elementos que delaten su origen artificial. Esta idea se verá reforzada si, además: los árboles tienen al menos un diámetro normal de 25 cm, o hay regeneración natural de la masa, así como árboles de diferentes dimensiones y tallas, o existe una invasión más que incipiente de matorral bajo las copas, o de otros árboles naturales de la zona"@es ;

  rdfs:isDefinedBy mfe: .


mfe:VegetationStructure3 a owl:Class , rdfs:Class ;

  rdfs:subClassOf mfe:VegetationStructure ;

  rdfs:label "Bosque Adehesado"@es ;

  rdfs:comment "Dehesa es aquella formación arbolada (fcc > 5%), poblada habitualmente de árboles con aptitudes ganaderas de sus frutos o ramones, y en la que aunque el uso principal sea el ganadero aparece un doble uso agrícola y forestal"@es ;

  rdfs:isDefinedBy mfe: .


mfe:VegetationStructure4 a owl:Class , rdfs:Class ;

  rdfs:subClassOf mfe:VegetationStructure ;

  rdfs:label "Complementos del Bosque"@es ;

  rdfs:comment "Corresponde a teselas dentro del bosque que, sin ser arboladas, están íntimamente unidas al aprovechamiento forestal del mismo. (Ej.: parques de madera, cortafuegos, …). Se pondrá como TFCCARB la del bosque que las rodea."@es ;

  rdfs:isDefinedBy mfe: .


mfe:VegetationStructure5 a owl:Class , rdfs:Class ;

  rdfs:subClassOf mfe:VegetationStructure ;
```



```
  rdfs:label "Temporalmente Desarbolado (talas)"@es ;

  rdfs:comment "Teselas en terreno forestal que normalmente deberían estar arboladas pero se encuentran temporalmente desarboladas por la realización de talas recientes. Se identifica por tratarse de claros en el bosque con formas geométricas."@es ;

  rdfs:isDefinedBy mfe: .


mfe:VegetationStructure6 a owl:Class , rdfs:Class ;

  rdfs:subClassOf mfe:VegetationStructure ;

  rdfs:label "Temporalmente Desarbolado (incendios)"@es ;

  rdfs:comment "Teselas en terreno forestal que normalmente deberían estar arboladas pero se encuentran temporalmente desarboladas por un reciente incendio."@es ;

  rdfs:isDefinedBy mfe: .


mfe:VegetationStructure7 a owl:Class , rdfs:Class ;

  rdfs:subClassOf mfe:VegetationStructure ;

  rdfs:label "Temporalmente Desarbolado (f. naturales)"@es ;

  rdfs:comment "Teselas en terreno forestal que normalmente deberían estar arboladas pero se encuentran temporalmente desarboladas por causa de algún fenómeno natural (vientos, aludes.."@es ;

  rdfs:isDefinedBy mfe: .


mfe:VegetationStructure8 a owl:Class , rdfs:Class ;

  rdfs:subClassOf mfe:VegetationStructure ;

  rdfs:label "Matorral"@es ;

  rdfs:comment "Agrupación vegetal definida por su estructura o por su aspecto, conferidos por el hecho de que su estrato superior o el más alto con espesura están caracterizados por el predominio de matas (especies leñosas relativamente bajas y ramificadas desde su base)."@es ;

  rdfs:isDefinedBy mfe: .


mfe:VegetationStructure9 a owl:Class , rdfs:Class ;

  rdfs:subClassOf mfe:VegetationStructure ;

  rdfs:label "Herbazal"@es ;

  rdfs:comment "Teselas cubiertas por hierbas de origen natural. Se definen como agrupaciones o cubiertas caracterizadas por la abundancia, densidad y predominio de herbáceas"@es ;

  rdfs:isDefinedBy mfe: .


mfe:VegetationStructure10 a owl:Class , rdfs:Class ;

  rdfs:subClassOf mfe:VegetationStructure ;

  rdfs:label "Monte sin Vegetación Superior"@es ;
```



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  rdfs:comment "Teselas que por circunstancias de composición edáfica, de pendiente, o cualquiera otra, presentan la mayor parte de su superficie desnuda de vegetación incluso herbácea. Serán los desiertos y semidesiertos de los diversos tipos."@es ;
  rdfs:isDefinedBy mfe: .


mfe:VegetationStructure11 a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:VegetationStructure ;
  rdfs:label "A.F.M. (riberas)"@es ;
  rdfs:comment "Teselas forestales arboladas que se encuentran junto a los cauces de los ríos, pobladas de especies ripícolas"@es ;
  rdfs:isDefinedBy mfe: .


mfe:VegetationStructure12 a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:VegetationStructure ;
  rdfs:label "A.F.M. (bosquetes)"@es ;
  rdfs:comment "Teselas que presentan arbolado fuera del monte, es decir, rodeado de otras teselas no forestales, distribuido en bosquetes individualizables y/o suficientemente próximos como para ser agrupados dentro de una misma tesela. Su superficie no excederá de 20 ha."@es ;
  rdfs:isDefinedBy mfe: .


mfe:VegetationStructure13 a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:VegetationStructure ;
  rdfs:label "A.F.M. (alineaciones)"@es ;
  rdfs:comment "Teselas que presentan arbolado fuera del monte, cuya distribución espacial corresponde a una alineación de varios árboles de anchura."@es ;
  rdfs:isDefinedBy mfe: .


mfe:VegetationStructure14 a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:VegetationStructure ;
  rdfs:label "A.F.M. (a. sueltos)"@es ;
  rdfs:comment "Teselas que, teniendo un uso fundamentalmente no forestal, incluyen árboles sueltos dispersos por ellas."@es ;
  rdfs:isDefinedBy mfe: .


mfe:VegetationStructure15 a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:VegetationStructure ;
  rdfs:label "Agrícola"@es ;
  rdfs:comment "Teselas de uso agrícola."@es ;
  rdfs:isDefinedBy mfe: .
```



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mfe:VegetationStructure16 a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:VegetationStructure ;
  rdfs:label "Artificial"@es ;
  rdfs:comment "Contendrá las teselas en las que la influencia antrópica ha determinado que su uso no sea ya más ni agrícola ni forestal. Se exceptúan los casos 21 a 23"@es ;
  rdfs:isDefinedBy mfe: .

mfe:VegetationStructure17 a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:VegetationStructure ;
  rdfs:label "Humedal"@es ;
  rdfs:comment "Teselas que sufren una inundación temporal pero repetitiva año tras año con carácter frecuentemente estacional, lo que condiciona la vegetación presente en ella. "@es ;
  rdfs:isDefinedBy mfe: .

mfe:VegetationStructure18 a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:VegetationStructure ;
  rdfs:label "Agua"@es ;
  rdfs:comment "Incluye las teselas ocupadas por el agua permanentemente,  o sólo temporalmente en el caso de cursos de agua."@es ;
  rdfs:isDefinedBy mfe: .

mfe:VegetationStructure19 a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:VegetationStructure ;
  rdfs:label "Mar"@es ;
  rdfs:isDefinedBy mfe: .

mfe:VegetationStructure20 a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:VegetationStructure ;
  rdfs:label "Fuera de Límites"@es ;
  rdfs:isDefinedBy mfe: .

mfe:VegetationStructure21 a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:VegetationStructure ;
  rdfs:label "Autopistas y Autovías"@es ;
  rdfs:isDefinedBy mfe: .

mfe:VegetationStructure22 a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:VegetationStructure ;
  rdfs:label "Infraestructuras de Conducción"@es ;
```



```
  rdfs:isDefinedBy mfe: .

mfe:VegetationStructure23 a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:VegetationStructure ;
  rdfs:label "Minería, Escombreras y Vertederos"@es ;
  rdfs:isDefinedBy mfe: .

mfe:VegetationStructure24 a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:VegetationStructure ;
  rdfs:label "Prado con Setos"@es ;
  rdfs:isDefinedBy mfe: .

mfe:VegetationStructure25 a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:VegetationStructure ;
  rdfs:label "Mosaico Arbolado sobre Cultivo y/o Prado"@es ;
  rdfs:comment "Comprende aquellos mosaicos en que los bosquetes arbolados no
tienen una continuidad que haga que por su superficie se pueda clasificar como
forestal arbolado. Los bosquetes arbolados están en mosaico con los cultivos y/o
los prados. Cuando una tesela se clasifique con esta distribucción específica, en
el campo especie aparecerá, dentro de las dos primeras, las dos especies
forestales más importantes presentes (si sólo hubiese una, aparecerá sólamente
una), quedando la tercera (o la segunda), para consignar el código del cultivo o
del prado (1500 y 3400  respectivamente). En el campo ocupación se consignará la
proporción relativa en que aparece el cultivo o prado respecto a las otras
especies forestales y por último el campo estado, quedará vacío cuando se trate de
cultivos o prados."@es ;
  rdfs:isDefinedBy mfe: .

mfe:VegetationStructure26 a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:VegetationStructure ;
  rdfs:label "Mosaico Arbolado sobre Forestal Desarbolado"@es ;
  rdfs:comment "Comprende aquellos mosaicos en que los bosquetes arbolados no
tienen una continuidad que haga que por su superficie se pueda clasificar como
forestal arbolado. Los bosquetes arbolados están en mosaico con coberturas
forestales no arboladas, que podrán ser de matorral, herbazal o pastizal-matorral
. Cuando una tesela se clasifique con esta distribucción específica, en el campo
especie aparecerá, dentro de las dos primeras, las dos especies forestales más
importantes presentes (si sólo hubiese una, aparecerá sólamente una), quedando la
tercera (o la segunda), para consignar el código del matorral, herbazal o
pastizal-matorral (8000, 9000 o 3500 respectivamente). En el campo ocupación se
consignará la proporción relativa en que aparece el forestal no arbolado respecto
a las otras especies forestales y por último, el campo estado quedará vacío cuando
se trate de forestal no arbolado."@es ;
  rdfs:isDefinedBy mfe: .

mfe:VegetationStructure27 a owl:Class , rdfs:Class ;
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  rdfs:subClassOf mfe:VegetationStructure ;

  rdfs:label "Mosaico Desarbolado sobre Cultivo y/o Prado"@es ;

  rdfs:comment "Comprende aquellos mosaicos formados por cultivos y/o prados en
mezcla con coberturas forestales no arboladas (matorral, pastizal-matorral o
herbazal). Cuando una tesela se clasifique con esta distribucción específica, en
el campo especie se consignará en primer lugar la cobertura de mayor extensión
superficial con su ocupación  hasta tres posibles valores. En todos los casos el
campo estado quedará vacío. Los posibles valores para el campo especie serán:
1500,3400,3500,8000 y 9000 correspondiendo a agrícola, prados, pastizal-matorral,
matorral y herbazal respectivamente."@es ;

  rdfs:isDefinedBy mfe: .


mfe:VegetationStructure28 a owl:Class , rdfs:Class ;

  rdfs:subClassOf mfe:VegetationStructure ;

  rdfs:label "Cultivo con Arbolado Disperso"@es ;

  rdfs:comment "Espacios dedicados exclusivamente a cultivos de secano, con un
arbolado disperso, que puede superar el 5% de fcc, derivado de antiguos usos de
dehesa o de bosque. Para clasificarlo como tal, el arbolado tiene que ser
representativo de uso forestal (no los frutales) e intuir antiguos usos forestales
(especialmente dehesas)."@es ;

  rdfs:isDefinedBy mfe: .


mfe:VegetationStructure29 a owl:Class , rdfs:Class ;

  rdfs:subClassOf mfe:VegetationStructure ;

  rdfs:label "Parque Periurbano"@es ;

  rdfs:comment "Espacio de gran extensión con características y uso de Parque, en
las proximidades de los grandes núcleos urbanos. En él se separarán las
infraestructuras de uso público y de características de uso artificial como
Parques de Atracciones, Auditorios, etc.. de superficie superior a las 2,5 ha."@es
;

  rdfs:isDefinedBy mfe: .


mfe:VegetationStructure30 a owl:Class , rdfs:Class ;

  rdfs:subClassOf mfe:VegetationStructure ;

  rdfs:label "Área Recreativa"@es ;

  rdfs:comment "Superficie forestal de fuerte actividad recreativa, incluso pistas
de sky."@es ;

  rdfs:isDefinedBy mfe: .


mfe:VegetationStructure31 a owl:Class , rdfs:Class ;

  rdfs:subClassOf mfe:VegetationStructure ;

  rdfs:label "Laguna de Alta Montaña"@es ;

  rdfs:comment "Lago natural de alta montaña."@es ;

  rdfs:isDefinedBy mfe: .
```



```
mfe:VegetationStructure32 a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:VegetationStructure ;
  rdfs:label "Monte Bajo"@es ;
  rdfs:comment "Teselas pobladas por especies potencialmente arbóreas, pero que en la actualidad presentan tallas arbustivas probablemente como consecuencia del tipo de aprovechamiento."@es ;
  rdfs:isDefinedBy mfe: .

mfe:VegetationStructure33 a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:VegetationStructure ;
  rdfs:label "Mancha"@es ;
  rdfs:comment "Formaciones de porte arbustivo en un solo estrato, correspondientes a mezclas de especies arbóreas y de matorral que en la actualidad presentan tallas arbustivas, especialmente esclerófilas y laurifolias. Se presentan casi exclusivamente sobre suelos silíceos (mitad oeste peninsular). Normalmente son manchas de mezclas de encina con madroño, durillo, etc.."@es ;
  rdfs:isDefinedBy mfe: .

mfe:VegetationStructure34 a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:VegetationStructure ;
  rdfs:label "Prado"@es ;
  rdfs:comment "Incluye aquella superficie poblada por pastos, con aprovechamiento ganadero patente que por sus características puede considerarse no forestal y en la que puede aparecer arbolado disperso incluso con fracción de cabida cubierta algo superior al 5%."@es ;
  rdfs:isDefinedBy mfe: .

mfe:VegetationStructure35 a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:VegetationStructure ;
  rdfs:label "Pastizal-Matorral"@es ;
  rdfs:comment "Superficie poblada con matorral bajo (tomillos o similares) en mezcla con herbáceas y aprovechamiento extensivo de ganado. Las zonas de erial quedarán aquí asignadas."@es ;
  rdfs:isDefinedBy mfe: .

mfe:TypeOfForest-C a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:TypeOfForest ;
  rdfs:label "Coníferas"@es ;
  rdfs:comment ""@es ;
  rdfs:isDefinedBy mfe: .

mfe:TypeOfForest-F a owl:Class , rdfs:Class ;
```



```
  rdfs:subClassOf mfe:TypeOfForest ;
  rdfs:label "Frondosas"@es ;
  rdfs:comment ""@es ;
  rdfs:isDefinedBy mfe: .

mfe:TypeOfForest-M a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:TypeOfForest ;
  rdfs:label "Mixtas"@es ;
  rdfs:comment ""@es ;
  rdfs:isDefinedBy mfe: .

mfe:SpatialDistribution1 a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:SpatialDistribution ;
  rdfs:label "Uniforme"@es , "Uniform"@en ;
  rdfs:comment "Para teselas en las que el arbolado está distribuido de forma
homogénea en toda su superficie"@es ;
  rdfs:isDefinedBy mfe: .

mfe:SpatialDistribution3 a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:SpatialDistribution ;
  rdfs:label "Discontinua en bosquetes"@es ;
  rdfs:comment "Para teselas en las que en la distribución visual del arbolado se
aprecian manchas formadas por conjuntos de árboles más o menos separadas unas de
otras, más o menos grandes y más o menos globosas en cuanto a la forma de cada
mancha aislada. Estas manchas están separadas entre sí por zonas más ralas o
desarboladas"@es ;
  rdfs:isDefinedBy mfe: .

mfe:SpatialDistribution4 a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:SpatialDistribution ;
  rdfs:label "Discontinua en fajas"@es ;
  rdfs:comment "Para teselas arboladas en las que en la distribución visual del
arbolado se aprecian manchas formadas por conjuntos de árboles, más o menos
separadas unas de otras, más o menos grandes y más o menos geométricas con
tendencia a la forma rectangular en cuanto a la forma de cada mancha aislada.
Estas manchas están separadas entre sí por zonas más ralas o desarboladas."@es ;
  rdfs:isDefinedBy mfe: .

mfe:SpatialDistribution5 a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:SpatialDistribution ;
  rdfs:label "Discontinua en mosaico"@es ;
```

```
  rdfs:comment "Para teselas arboladas en las que la distribución visual del paisaje vegetal está determinada por la yuxtaposición de piezas de dos o más tipos de agrupación que se reparten el terreno de forma irregular, pero repitiendo o integrando unas ciertas pautas de distribución. El mosaico es el resultado de la influencia de factores o combinaciones de factores que se distribuyen sobre la superficie del terreno con variaciones aleatorias y generalmente discontínuas de sus valores. No se especifica el tipo de mosaico (dendriforme, dinámico, intrazonal, de orientación, ...)"@es ;

  rdfs:isDefinedBy mfe: .


mfe:SpatialDistribution6 a owl:Class , rdfs:Class ;

  rdfs:subClassOf mfe:SpatialDistribution ;

  rdfs:label "Discontinua irregular"@es ;

  rdfs:comment "Para teselas con arbolado agrupado en las que la distribución es irregular, sin seguir pauta alguna de las anteriormente mencionadas o conjugando varias de ellas de forma que no se pueda incluir la tesela en los grupos anteriores"@es ;

  rdfs:isDefinedBy mfe: .


mfe:SpatialDistribution7 a owl:Class , rdfs:Class ;

  rdfs:subClassOf mfe:SpatialDistribution ;

  rdfs:label "Piés aislados"@es ;

  rdfs:comment "Para teselas con poca densidad arbórea y distribuida regular o irregularmente, pero sin formar agrupaciones de árboles que pudieran hacer pensar en manchas arbóreas dentro de la tesela"@es ;

  rdfs:isDefinedBy mfe: .


mfe:SpatialDistribution8 a owl:Class , rdfs:Class ;

  rdfs:subClassOf mfe:SpatialDistribution ;

  rdfs:label "Otras"@es ;

  rdfs:comment "Para teselas arboladas que por cualquier circunstancia no pueden ser incluidas en los apartados anteriores"@es ;

  rdfs:isDefinedBy mfe: .


mfe:SpatialDistribution9 a owl:Class , rdfs:Class ;

  rdfs:subClassOf mfe:SpatialDistribution ;

  rdfs:label "Adehesada"@es ;

  rdfs:comment "Distribución adehesada: teselas con superficie forestal ocupada por un estrato arbolado, con una fracción de cabida cubierta (superficie de suelo cubierta por la proyección de la copa de los árboles) comprendida entre el 5% y el 75%, compuesto principalmente por encinas, alcornoques, quejigos, rebollos, acebuches o fresnos, y ocasionalmente por otro arbolado, que permita el desarrollo de un estrato esencialmente herbáceo (pasto), para aprovechamiento del ganado o de las especies cinegéticas."@es ;

  rdfs:isDefinedBy mfe: .
```

```
mfe:StandDevelopment1 a mfe:StandDevelopment , owl:Class , rdfs:Class ; # cambiado
x ACO: estadoDeDesarrollo x standDevelopment
  rdfs:subClassOf mfe:StandDevelopment ;
  rdfs:label "Repoblado"@es ;
  rdfs:comment "Estado de una población desde su nacimiento (de semilla) o brote
(de cepa o raíz) hasta que se tocan las partes aéreas de los pies contiguos"@es ;
  rdfs:isDefinedBy mfe: .


mfe:StandDevelopment2 a mfe:StandDevelopment , owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:StandDevelopment ;
  rdfs:label "Monte bravo"@es ;
  rdfs:comment "Estado de la masa en su primera juventud, esto es, desde que
empiezan a tocarse las copas nuevas de las plantas hasta alcanzar el estado de
latizal"@es ;
  rdfs:isDefinedBy mfe: .


mfe:StandDevelopment3 a mfe:StandDevelopment , owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:StandDevelopment ;
  rdfs:label "Latizal"@es ;
  rdfs:comment "Estado de masa arbórea a partir de los 8 - 10 metros de talla y
hasta llegar al estado de fustal"@es ;
  rdfs:isDefinedBy mfe: .


mfe:StandDevelopment4 a mfe:StandDevelopment , owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:StandDevelopment ;
  rdfs:label "Fustal"@es ;
  rdfs:comment "Estado de superior desarrollo de los montes arbolados"@es ;
  rdfs:isDefinedBy mfe: .


mfe:ForestType-ST # modificado x ACO; FormacionArbolada x ForestType
        a           owl:Class , rdfs:Class ;
        rdfs:label   "Masas mixtas o puras caracterizadas por su estructura (Tipo
estructural)"@es .


mfe:ForestType-DO
        a           owl:Class , rdfs:Class ;
        rdfs:label  "Masas con una especie dominante"@es .


mfe:ForestType-MX
```

```
        a           owl:Class , rdfs:Class ;
        rdfs:label  "Masas mixtas"@es .

mfe:ForestType-RI # modificado x ACO; FormacionArbolada x ForestType
        a           owl:Class , rdfs:Class ;
        rdfs:label  "Riberas"@es .

mfe:ForestType-DI
        a           owl:Class , rdfs:Class ;
        rdfs:label  "Arbolado disperso"@es .

mfe:ForestType-AA
        a           owl:Class , rdfs:Class ;
        rdfs:label  "Mezcla autóctonas y alóctonas"@es .

mfe:ForestType-AU
        a           owl:Class , rdfs:Class ;
        rdfs:label  "Autóctonas"@es .

mfe:ForestType-RE
        a           owl:Class , rdfs:Class ;
        rdfs:label  "Repoblaciones"@es .

mfe:ForestType-DE
        a           owl:Class , rdfs:Class ;
        rdfs:label  "Dehesas"@es .

mfe:ForestType-AL
        a           owl:Class , rdfs:Class ;
        rdfs:label  "Alóctonas"@es .

mfe:ForestType-M # modificado x ACO; FormacionArbolada x ForestType
        a           owl:Class , rdfs:Class ;
        rdfs:label  "Mezcla de coníferas y frondosas"@es .

mfe:ForestType-C
        a           owl:Class , rdfs:Class ;
        rdfs:label  "Conifer Stand"@en , "Bosque de coníferas"@es .
```

```
mfe:ForestType-F
        a           owl:Class , rdfs:Class ;
        rdfs:label  "Frondosas"@es , "Bosques de frondosas"@es .


mfe:ForestType-DOALC190 # modificado x ACO; FormacionArbolada x ForestType
        a                   owl:Class , rdfs:Class ;
        rdfs:label          "Coníferas alóctonas de gestión (Cupressus sp, Cedrus
spp. otros pinos, etc.)"@es ;
        rdfs:subClassOf               mfe:ForestType-C   ,   mfe:ForestType-AL   ,
mfe:ForestType-DO ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies19 .


mfe:ForestType-MXAAM883
        a               owl:Class , rdfs:Class ;
        rdfs:label       "Coníferas con frondosas (alóctonas con  autóctonas)"@es
;
        rdfs:subClassOf   mfe:ForestType-M , mfe:ForestType-AA , mfe:ForestType-MX
.


mfe:ForestType-DOAUF710
        a                   owl:Class , rdfs:Class ;
        rdfs:label          "Hayedos (Fagus sylvatica)"@es ;
        rdfs:subClassOf               mfe:ForestType-F   ,   mfe:ForestType-AU   ,
mfe:ForestType-DO ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies71 .


mfe:ForestType-DOAUC320
        a                   owl:Class , rdfs:Class ;
        rdfs:label          "Pinsapares (Abies pinsapo)"@es ;
        rdfs:subClassOf               mfe:ForestType-C   ,   mfe:ForestType-AU   ,
mfe:ForestType-DO ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies32 .


mfe:ForestType-DOAUC220
        a                   owl:Class , rdfs:Class ;
        rdfs:label          "Pinar de pino negro (Pinus uncinata)"@es ;
        rdfs:subClassOf               mfe:ForestType-C   ,   mfe:ForestType-AU   ,
mfe:ForestType-DO ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies22 .
```

```
mfe:ForestType-STREC280
        a               owl:Class , rdfs:Class ;
        rdfs:label      "Pinar de pino radiata (Pinus radiata)"@es ;
        rdfs:subClassOf  mfe:ForestType-C , mfe:ForestType-RE , mfe:ForestType-ST
.


mfe:ForestType-DOAUC261
        a               owl:Class , rdfs:Class ;
        rdfs:label            "Pinar de pino pinaster en región mediterránea
(P.pinaster spp. mesogeensis)"@es ;
        rdfs:subClassOf  mfe:ForestType-C , mfe:ForestType-AU , mfe:ForestType-DO
.


mfe:ForestType-MXAUC863
        a                   owl:Class , rdfs:Class ;
        rdfs:comment        "Excepto: 28-30, que sería formación 38"@es ;
        rdfs:label               "Mezcla de coníferas autóctonas en la región
biogeográfica Mediterránea"@es ;
        rdfs:subClassOf              mfe:ForestType-C  ,  mfe:ForestType-AU  ,
mfe:ForestType-MX ;
        mfe:hasSetOfSpecies   mfe:SetofSpecies14-19-21-22-23-24-25-26-27-28-30-31-
32-37-38-39-219-238 .


mfe:ForestType-DOAUF730
        a                   owl:Class , rdfs:Class ;
        rdfs:label          "Abedulares (Betula spp.)"@es ;
        rdfs:subClassOf              mfe:ForestType-F  ,  mfe:ForestType-AU  ,
mfe:ForestType-DO ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies73 .


mfe:ForestType-MXAUF820
        a               owl:Class , rdfs:Class ;
        rdfs:comment           "Frondosas autóctonas en Región Biogeográfica
Atlántica"@es ;
        rdfs:label        "Bosque mixto de frondosas en la región biogeográfica
Atlántica"@es ;
        rdfs:subClassOf  mfe:ForestType-F , mfe:ForestType-AU , mfe:ForestType-MX
.


mfe:ForestType-MXAAF881
        a                   owl:Class , rdfs:Class ;
```

```
        rdfs:comment          "Las especies 48 y 60 no se combinan porque irían a
la formación 38"@es ;

        rdfs:label           "Frondosas alóctonas con  autóctonas"@es ;

        rdfs:subClassOf                mfe:ForestType-F   ,   mfe:ForestType-AA   ,
mfe:ForestType-MX ;

        mfe:hasSetOfSpecies   <http://crossforest.eu/mfe/ontology/SetofSpecies7-48-
60%2F13-40-43-44-45-46-47-48%2A-50-55-56-58-60%2A-65-66-67-68-70-71-72-73-74-80-
83-91-93-95-99-243-258-369-495> .


mfe:ForestType-DOAUC240

        a                    owl:Class , rdfs:Class ;

        rdfs:label           "Pinar de pino carrasco (Pinus halepensis)"@es ;

        rdfs:subClassOf                mfe:ForestType-C   ,   mfe:ForestType-AU   ,
mfe:ForestType-DO ;

        mfe:hasSetOfSpecies  mfe:SetofSpecies24 .


mfe:ForestType-MXAUF840

        a                owl:Class , rdfs:Class ;

        rdfs:comment            "Frondosas   autóctonas   en   Región   Biogeográfica
Macaronésica"@es ;

        rdfs:label         "Bosque mixto de frondosas en la región biogeográfica
Macaronésica"@es ;

        rdfs:subClassOf   mfe:ForestType-F , mfe:ForestType-AU , mfe:ForestType-MX
.


mfe:ForestType-DOAUC238

        a                    owl:Class , rdfs:Class ;

        rdfs:label           "Sabinares canarios (Juniperus turbinata)"@es ;

        rdfs:subClassOf                mfe:ForestType-C   ,   mfe:ForestType-AU   ,
mfe:ForestType-DO ;

        mfe:hasSetOfSpecies  mfe:SetofSpecies238 .


mfe:ForestType-DOAUF430

        a                    owl:Class , rdfs:Class ;

        rdfs:label           "Melojares (Quercus pyrenaica)"@es ;

        rdfs:subClassOf                mfe:ForestType-F   ,   mfe:ForestType-AU   ,
mfe:ForestType-DO ;

        mfe:hasSetOfSpecies  mfe:SetofSpecies43 .


mfe:ForestType-STREF600

        a                owl:Class , rdfs:Class ;

        rdfs:label       "Eucaliptal (Eucaliptus spp.)"@es ;
```

```
        rdfs:subClassOf   mfe:ForestType-F , mfe:ForestType-RE , mfe:ForestType-ST
.


mfe:ForestType-DOAUF650
        a                    owl:Class , rdfs:Class ;
        rdfs:label           "Acebedas (Ilex aquifolium)"@es ;
        rdfs:subClassOf                mfe:ForestType-F   ,   mfe:ForestType-AU   ,
mfe:ForestType-DO ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies65 .


mfe:ForestType-DOAUC260
        a                owl:Class , rdfs:Class ;
        rdfs:label       "Pinar de pino negral "@es ;
        rdfs:subClassOf   mfe:ForestType-C , mfe:ForestType-AU , mfe:ForestType-DO
.


mfe:ForestType-DOAUF550
        a                    owl:Class , rdfs:Class ;
        rdfs:label           "Fresnedas (Fraxinus spp.)"@es ;
        rdfs:subClassOf                mfe:ForestType-F   ,   mfe:ForestType-AU   ,
mfe:ForestType-DO ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies55 .


mfe:ForestType-MXAUC862
        a                    owl:Class , rdfs:Class ;
        rdfs:comment         "Excepto: 28-30, que sería formación 38"@es ;
        rdfs:label                "Mezcla de coníferas autóctonas en la región
biogeográfica Atlántica"@es ;
        rdfs:subClassOf                mfe:ForestType-C   ,   mfe:ForestType-AU   ,
mfe:ForestType-MX ;
        mfe:hasSetOfSpecies    mfe:SetofSpecies14-19-21-22-23-24-25-26-27-28-30-31-
32-37-38-39-219-238 .


mfe:ForestType-MXAAC882
        a                owl:Class , rdfs:Class ;
        rdfs:label       "Coníferas alóctonas con  autóctonas"@es ;
        rdfs:subClassOf   mfe:ForestType-C , mfe:ForestType-AA , mfe:ForestType-MX
.


mfe:ForestType-DOAUF243
        a                    owl:Class , rdfs:Class ;
```

```
        rdfs:label          "Robledales de roble pubescente (Q. humilis)"@es ;
        rdfs:subClassOf               mfe:ForestType-F   ,   mfe:ForestType-AU   ,
mfe:ForestType-DO ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies243 .


mfe:ForestType-DOAUF450
        a                   owl:Class , rdfs:Class ;
        rdfs:label          "Encinares (Quercus ilex)"@es ;
        rdfs:subClassOf               mfe:ForestType-F   ,   mfe:ForestType-AU   ,
mfe:ForestType-DO ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies45 .


mfe:ForestType-DOAUC380
        a                   owl:Class , rdfs:Class ;
        rdfs:label          "Sabinares albares (Juniperus thurifera)"@es ;
        rdfs:subClassOf               mfe:ForestType-C   ,   mfe:ForestType-AU   ,
mfe:ForestType-DO ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies38 .


mfe:ForestType-DOAUF670
        a                   owl:Class , rdfs:Class ;
        rdfs:label          "Algarrobales (Ceratonia siliqua)"@es ;
        rdfs:subClassOf               mfe:ForestType-F   ,   mfe:ForestType-AU   ,
mfe:ForestType-DO ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies67 .


mfe:ForestType-STDEF920
        a               owl:Class , rdfs:Class ;
        rdfs:comment    "Tipo Estructural 3"@es ;
        rdfs:label      "Dehesas"@es ;
        rdfs:subClassOf  mfe:ForestType-F , mfe:ForestType-DE , mfe:ForestType-ST
.


mfe:ForestType-MXAUM874
        a               owl:Class , rdfs:Class ;
        rdfs:label       "Mezcla de coníferas y frondosas autóctonas en la región
biogeográfica Macaronésica"@es ;
        rdfs:subClassOf  mfe:ForestType-M , mfe:ForestType-AU , mfe:ForestType-MX
.


mfe:ForestType-DOAUF470
```

```
        a                   owl:Class , rdfs:Class ;
        rdfs:label          "Quejigares de Quercus canariensis"@es ;
        rdfs:subClassOf                mfe:ForestType-F   ,   mfe:ForestType-AU   ,
mfe:ForestType-DO ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies47 .


mfe:ForestType-MXAUC861
        a                   owl:Class , rdfs:Class ;
        rdfs:comment        "Excepto: 28-30, que sería formación 38"@es ;
        rdfs:label               "Mezcla de coníferas autóctonas en la región
biogeográfica Alpina"@es ;
        rdfs:subClassOf                mfe:ForestType-C   ,   mfe:ForestType-AU   ,
mfe:ForestType-MX ;
        mfe:hasSetOfSpecies   mfe:SetofSpecies14-19-21-22-23-24-25-26-27-28-30-31-
32-37-38-39-219-238 .


mfe:ForestType-DOAUC310
        a                   owl:Class , rdfs:Class ;
        rdfs:label          "Abetales (Abies alba)"@es ;
        rdfs:subClassOf                mfe:ForestType-C   ,   mfe:ForestType-AU   ,
mfe:ForestType-DO ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies31 .


mfe:ForestType-DOAUC210
        a                   owl:Class , rdfs:Class ;
        rdfs:label          "Pinar de pino albar (Pinus sylvestris)"@es ;
        rdfs:subClassOf                mfe:ForestType-C   ,   mfe:ForestType-AU   ,
mfe:ForestType-DO ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies21 .


mfe:ForestType-STDIF931
        a               owl:Class , rdfs:Class ;
        rdfs:label      "Arbolado disperso de frondosas"@es ;
        rdfs:subClassOf   mfe:ForestType-F , mfe:ForestType-DI , mfe:ForestType-ST
.


mfe:ForestType-MXAUM873
        a               owl:Class , rdfs:Class ;
        rdfs:label       "Mezcla de coníferas y frondosas autóctonas en la región
biogeográfica Mediterránea"@es ;
```

```
        rdfs:subClassOf   mfe:ForestType-M , mfe:ForestType-AU , mfe:ForestType-MX
.


mfe:ForestType-DOAUF720
        a                    owl:Class , rdfs:Class ;
        rdfs:label           "Castañares (Castanea sativa)"@es ;
        rdfs:subClassOf                mfe:ForestType-F   ,   mfe:ForestType-AU   ,
mfe:ForestType-DO ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies72 .


mfe:ForestType-MXAUF810
        a                owl:Class , rdfs:Class ;
        rdfs:comment      "Frondosas autóctonas en Región Biogeográfica Alpina"@es
;
        rdfs:label         "Bosque mixto de frondosas en la región biogeográfica
Alpina"@es ;
        rdfs:subClassOf   mfe:ForestType-F , mfe:ForestType-AU , mfe:ForestType-MX
.


mfe:ForestType-DOAUF400
        a                    owl:Class , rdfs:Class ;
        rdfs:label           "Robledales de Q. robur y/o Q. petraea"@es ;
        rdfs:subClassOf                mfe:ForestType-F   ,   mfe:ForestType-AU   ,
mfe:ForestType-DO ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies40 .


mfe:ForestType-DOAUF940
        a                    owl:Class , rdfs:Class ;
        rdfs:label           "Avellanedas (Corylus avellana)"@es ;
        rdfs:subClassOf                mfe:ForestType-F   ,   mfe:ForestType-AU   ,
mfe:ForestType-DO ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies74 .


mfe:ForestType-DOALF070
        a                    owl:Class , rdfs:Class ;
        rdfs:label           "Frondosas alóctonas invasoras "@es ;
        rdfs:subClassOf                mfe:ForestType-F   ,   mfe:ForestType-AL   ,
mfe:ForestType-DO ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies7 .


mfe:ForestType-DOAUC230
```

```
        a                   owl:Class , rdfs:Class ;
        rdfs:label          "Pinar de pino piñonero (Pinus pinea)"@es ;
        rdfs:subClassOf                mfe:ForestType-C   ,   mfe:ForestType-AU   ,
mfe:ForestType-DO ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies23 .


mfe:ForestType-STREC262
        a               owl:Class , rdfs:Class ;
        rdfs:label          "Pinares de pino pinaster en región atlántica (Pinus
pinaster spp. atlántica)"@es ;
        rdfs:subClassOf   mfe:ForestType-C , mfe:ForestType-RE , mfe:ForestType-ST
.


mfe:ForestType-MXAUF830
        a               owl:Class , rdfs:Class ;
        rdfs:comment            "Frondosas  autóctonas  en  Región  Biogeográfica
Mediterránea"@es ;
        rdfs:label          "Bosque mixto de frondosas en la región biogeográfica
Mediterránea"@es ;
        rdfs:subClassOf   mfe:ForestType-F , mfe:ForestType-AU , mfe:ForestType-MX
.


mfe:ForestType-STREC300
        a               owl:Class , rdfs:Class ;
        rdfs:label          "Otras coníferas alóctonas de producción (Larix spp.,
Pseudotsuga spp., etc)"@es ;
        rdfs:subClassOf   mfe:ForestType-C , mfe:ForestType-RE , mfe:ForestType-ST
.


mfe:ForestType-STDIM933
        a               owl:Class , rdfs:Class ;
        rdfs:label      "Arbolado disperso coníferas y frondosas"@es ;
        rdfs:subClassOf   mfe:ForestType-M , mfe:ForestType-DI , mfe:ForestType-ST
.


mfe:ForestType-STREF480
        a               owl:Class , rdfs:Class ;
        rdfs:label      "Repoblación de Quercus rubra"@es ;
        rdfs:subClassOf   mfe:ForestType-F , mfe:ForestType-RE , mfe:ForestType-ST
.


mfe:ForestType-STDIC932
```

```
        a                owl:Class , rdfs:Class ;
        rdfs:label       "Arbolado disperso coníferas"@es ;
        rdfs:subClassOf   mfe:ForestType-C , mfe:ForestType-DI , mfe:ForestType-ST
.


mfe:ForestType-STREF258
        a                    owl:Class , rdfs:Class ;
        rdfs:label           "Choperas y plataneras de producción"@es ;
        rdfs:subClassOf                mfe:ForestType-F   ,   mfe:ForestType-RE   ,
mfe:ForestType-ST ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies258 .


mfe:ForestType-DOAUC250
        a                    owl:Class , rdfs:Class ;
        rdfs:label           "Pinar de pino salgareño (Pinus nigra)"@es ;
        rdfs:subClassOf                mfe:ForestType-C   ,   mfe:ForestType-AU   ,
mfe:ForestType-DO ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies25 .


mfe:ForestType-MXAUM872
        a                owl:Class , rdfs:Class ;
        rdfs:label        "Mezcla de coníferas y frondosas autóctonas en la región
biogeográfica Atlántica"@es ;
        rdfs:subClassOf   mfe:ForestType-M , mfe:ForestType-AU , mfe:ForestType-MX
.


mfe:ForestType-STRIF910
        a                    owl:Class , rdfs:Class ;
        rdfs:comment         "Tipo Estructural 11"@es ;
        rdfs:label           "Bosque ribereño"@es ;
        rdfs:subClassOf                mfe:ForestType-F   ,   mfe:ForestType-RI   ,
mfe:ForestType-ST ;
        mfe:hasSetOfSpecies
<http://crossforest.eu/mfe/ontology/SetofSpecies50%3B50%2F55-58%3B13%2F55-50-
58%3B55%2F58-258> .


mfe:ForestType-MXAUF850
        a                    owl:Class , rdfs:Class ;
        rdfs:label                 "Palmerales y mezclas de palmeras con otras
especies"@es ;
        rdfs:subClassOf                mfe:ForestType-F   ,   mfe:ForestType-AU   ,
mfe:ForestType-MX ;
```

```
        mfe:hasSetOfSpecies  mfe:SetofSpecies369 .


mfe:ForestType-DOAUF440
        a                    owl:Class , rdfs:Class ;
        rdfs:label           "Quejigares (Quercus faginea)"@es ;
        rdfs:subClassOf                mfe:ForestType-F   ,   mfe:ForestType-AU   ,
mfe:ForestType-DO ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies44 .


mfe:ForestType-DOAUC370
        a                    owl:Class , rdfs:Class ;
        rdfs:label           "Enebrales (Juniperus spp.)"@es ;
        rdfs:subClassOf                mfe:ForestType-C   ,   mfe:ForestType-AU   ,
mfe:ForestType-DO ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies37 .


mfe:ForestType-DOAUF660
        a                    owl:Class , rdfs:Class ;
        rdfs:label           "Acebuchales (Olea europaea var. sylvestris)"@es ;
        rdfs:subClassOf                mfe:ForestType-F   ,   mfe:ForestType-AU   ,
mfe:ForestType-DO ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies66 .


mfe:ForestType-STREM940
        a                owl:Class , rdfs:Class ;
        rdfs:label       "Otras de especies de producción en mezcla"@es ;
        rdfs:subClassOf   mfe:ForestType-M , mfe:ForestType-RE , mfe:ForestType-ST
.


mfe:ForestType-DOAUC270
        a                    owl:Class , rdfs:Class ;
        rdfs:label           "Pinar de pino canario (Pinus canariensis)"@es ;
        rdfs:subClassOf                mfe:ForestType-C   ,   mfe:ForestType-AU   ,
mfe:ForestType-DO ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies27 .


mfe:ForestType-DOAUF460
        a                    owl:Class , rdfs:Class ;
        rdfs:label           "Alcornocales (Quercus suber)"@es ;
```

```
        rdfs:subClassOf                mfe:ForestType-F   ,   mfe:ForestType-AU   ,
mfe:ForestType-DO ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies46 .


mfe:ForestType-DOAUC390
        a                    owl:Class , rdfs:Class ;
        rdfs:label           "Sabinares de Juniperus phoenicea"@es ;
        rdfs:subClassOf                mfe:ForestType-C   ,   mfe:ForestType-AU   ,
mfe:ForestType-DO ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies39 .


mfe:ForestType-DOAUF680
        a                    owl:Class , rdfs:Class ;
        rdfs:label           "Madroñales (Arbutus unedo)"@es ;
        rdfs:subClassOf                mfe:ForestType-F   ,   mfe:ForestType-AU   ,
mfe:ForestType-DO ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies68 .


mfe:ForestType-MXAUM871
        a                owl:Class , rdfs:Class ;
        rdfs:label        "Mezcla de coníferas y frondosas autóctonas en la región
biogeográfica Alpina"@es ;
        rdfs:subClassOf   mfe:ForestType-M , mfe:ForestType-AU , mfe:ForestType-MX
.


mfe:ForestType-MXAUC864
        a                    owl:Class , rdfs:Class ;
        rdfs:comment         "Excepto: 28-30, que sería formación 38"@es ;
        rdfs:label                "Mezcla de coníferas autóctonas en la región
biogeográfica Macaronésica"@es ;
        rdfs:subClassOf                mfe:ForestType-C   ,   mfe:ForestType-AU   ,
mfe:ForestType-MX ;
        mfe:hasSetOfSpecies    mfe:SetofSpecies14-19-21-22-23-24-25-26-27-28-30-31-
32-37-38-39-219-238 .


mfe:ForestType-MXAUF843 # modificado x ACO; FormacionArbolada x ForestType
        a                owl:Class , rdfs:Class ;
        rdfs:label       "Otras mezclas de frondosas macaronésicas"@es ;
        rdfs:subClassOf       mfe:ForestType-MXAUF843    ,    mfe:ForestType-F    ,
mfe:ForestType-AU , mfe:ForestType-MX .
```

```
mfe:ForestType-MXAUF842
        a                   owl:Class , rdfs:Class ;
        rdfs:label          "Laurisilvas macaronésicas"@es ;
        rdfs:subClassOf           mfe:ForestType-MXAUF842  ,  mfe:ForestType-F  ,
mfe:ForestType-AU , mfe:ForestType-MX ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies80 .


mfe:ForestType-MXAUF841
        a                   owl:Class , rdfs:Class ;
        rdfs:label          "Fayal-brezal"@es ;
        rdfs:subClassOf           mfe:ForestType-MXAUF841  ,  mfe:ForestType-F  ,
mfe:ForestType-AU , mfe:ForestType-MX ;
        mfe:hasSetOfSpecies  mfe:SetofSpecies83 .


mfe:PatchShape1 a owl:Class , rdfs:Class ; # cambiados x ACO FormaDeMasa x
PatchShape
  rdfs:subClassOf mfe:PatchShape ;
  rdfs:label "Irregular"@es ;
  rdfs:comment "El contorno de la tesela no presenta una de sus dimensiones (largo
o ancho) prácticamente despreciable con respecto a la otra ni adopta una forma más
o menos geométrica"@es ;
  rdfs:isDefinedBy mfe: .


mfe:PatchShape2 a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:PatchShape ;
  rdfs:label "Regular"@es ;
  rdfs:comment "El contorno de la tesela adopta una forma más o menos
geométrica"@es ;
  rdfs:isDefinedBy mfe: .


mfe:PatchShape3 a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:PatchShape ;
  rdfs:label "Galeria"@es ;
  rdfs:comment "El contorno de la tesela arbolada o arbustiva presenta una de sus
dimensiones (largo o ancho) prácticamente despreciable con respecto a la otra y
además sigue el curso de una corriente de agua"@es ;
  rdfs:isDefinedBy mfe: .


mfe:PatchShape4 a owl:Class , rdfs:Class ;
  rdfs:subClassOf mfe:PatchShape ;
  rdfs:label "Alineación"@es ;
```

```
  rdfs:comment "El contorno de la tesela arbolada o arbustiva presenta una de sus
dimensiones (largo o ancho) prácticamente despreciable con respecto a la otra y
además no sigue el curso de una corriente de agua"@es ;
  rdfs:isDefinedBy mfe: .


#################################################################
#    Object Properties
#################################################################


mfe:hasVegetationStructure a owl:ObjectProperty , rdf:Property ; # cambiar x ACO:
TipoEstructural x VegetationStructure
  rdfs:label ""@es , ""@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:domain mfe:Patch ;
  rdfs:range mfe:VegetationStructure ;
  rdfs:isDefinedBy mfe: .


mfe:hasSpatialDistribution a owl:ObjectProperty , rdf:Property ; # cambiado x ACO
  rdfs:label ""@es , ""@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:domain mfe:Patch ;
  rdfs:range mfe:SpatialDistribution ;
  rdfs:isDefinedBy mfe: .


mfe:hasPatchShape a owl:ObjectProperty , rdf:Property ; # cambiado x ACO:
FormaDeMasa x PatchShape
  rdfs:label ""@es , ""@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:domain mfe:Patch ;
  rdfs:range mfe:PatchShape ;
  rdfs:isDefinedBy mfe: .


mfe:hasStandDevelopment a owl:ObjectProperty , rdf:Property ; # cambiado x ACO:
estadoDeDesarrollo x standDevelopment
  rdfs:label ""@es , ""@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:domain mfe:SpeciesInPatch ;
  rdfs:range mfe:StandDevelopment ;
  rdfs:isDefinedBy mfe: .
```

```
mfe:hasRateofPatch a owl:ObjectProperty , rdf:Property ;
  rdfs:label ""@es , ""@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:domain mfe:PatchInPatch ;
  rdfs:range mfe:RateOfPatch ;
  rdfs:isDefinedBy mfe: .

mfe:hasOccupationOfSpecies a owl:ObjectProperty , rdf:Property ;
  rdfs:label ""@es , ""@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:domain mfe:SpeciesInPatch ;
  rdfs:range mfe:OccupationOfSpecies ;
  rdfs:isDefinedBy mfe: .

mfe:hasRateOfUse a owl:ObjectProperty , rdf:Property ;
  rdfs:label ""@es , ""@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:domain mfe:UseInPatch ;
  rdfs:range mfe:RateOfUse ;
  rdfs:isDefinedBy mfe: .

mfe:hasClassification a owl:ObjectProperty , rdf:Property ;
  rdfs:label ""@es , ""@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:domain mfe:Patch ;
  rdfs:range mfe:Classification ;
  rdfs:isDefinedBy mfe: .

mfe:hasTypeofForest a owl:ObjectProperty , rdf:Property ;
  rdfs:label ""@en , "Tipo de Bosque"@es ;
  rdfs:comment ""@en , "Indica la tipología de bosque predominante"@es ;
  rdfs:domain mfe:Patch ;
  rdfs:range mfe:TypeOfForest ;
  rdfs:isDefinedBy mfe: .

mfe:containsPatch a owl:ObjectProperty , rdf:Property ;
  rdfs:label "contains patch"@en , "contiene tesela"@es ;
  rdfs:comment "the merged patch contains sub-patch"@en , "la tesela agregada
contiene sub-tesela"@es ;
```

```
  rdfs:domain mfe:Patch ;
  rdfs:range mfe:PatchInPatch ;
  rdfs:isDefinedBy mfe: .

mfe:containsSpecies a owl:ObjectProperty , rdf:Property ;
  rdfs:label "contains species"@en , "contiene especie"@es ;
  rdfs:comment "the patch contains species"@en , "la tesela agregada contiene
especie"@es ;
  rdfs:domain mfe:Patch ;
  rdfs:range mfe:SpeciesInPatch ;
  rdfs:isDefinedBy mfe: .

mfe:containsUse a owl:ObjectProperty , rdf:Property ;
  rdfs:label "contains use"@en , "contiene use"@es ;
  rdfs:comment "the patch contains use"@en , "la tesela contiene uso"@es ;
  rdfs:domain mfe:Patch ;
  rdfs:range mfe:UseInPatch ;
  rdfs:isDefinedBy mfe: .

mfe:hasPatch a owl:ObjectProperty , rdf:Property ;
  rdfs:subPropertyOf smo:hasMeasure ;
  rdfs:label "has patch"@en , "tiene tesela"@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:range mfe:Patch ;
  rdfs:isDefinedBy mfe: .

mfe:hasSpecies a owl:ObjectProperty , rdf:Property ;
  rdfs:subPropertyOf smo:hasMeasure ;
  rdfs:label "has species"@en , "tiene especie"@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:range ifn:Species ;
  rdfs:isDefinedBy mfe: .

mfe:hasUse a owl:ObjectProperty , rdf:Property ;
  rdfs:subPropertyOf smo:hasMeasure ;
  rdfs:label "has use"@en , "tiene uso"@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:range mfe:Use ;
  rdfs:isDefinedBy mfe: .
```

```
mfe:hasCanopyCoverTotal a owl:ObjectProperty , rdf:Property ;
  rdfs:subPropertyOf smo:hasMeasure ;
  rdfs:label ""@es , ""@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:domain mfe:Patch ;
  rdfs:range mfe:CanopyCoverTotal ;
  rdfs:isDefinedBy mfe: .

mfe:hasCanopyCoverTrees a owl:ObjectProperty , rdf:Property ;
  rdfs:subPropertyOf smo:hasMeasure ;
  rdfs:label ""@es , ""@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:domain mfe:Patch ;
  rdfs:range mfe:CanopyCoverTrees ;
  rdfs:isDefinedBy mfe: .

mfe:hasSetOfSpecies a owl:ObjectProperty , rdf:Property ;
  rdfs:subPropertyOf smo:hasMeasure ;
  rdfs:label ""@es , ""@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:range mfe:SetOfSpecies ;
  rdfs:isDefinedBy mfe: .

#################################################################
#    Datatype Properties
#################################################################

mfe:hasPercentageOfSpecies a owl:DatatypeProperty , rdf:Property ;
  rdfs:subPropertyOf smo:hasMeasureinPercentage ;
  rdfs:label ""@es , ""@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:domain mfe:SpeciesInPatch ;
  rdfs:isDefinedBy mfe: .

mfe:hasPercentageOfPatch a owl:DatatypeProperty , rdf:Property ;
  rdfs:subPropertyOf smo:hasMeasureinPercentage ;
  rdfs:label ""@es , ""@es ;
```

```
  rdfs:comment ""@en , ""@es ;
  rdfs:domain mfe:PatchInPatch ;
  rdfs:isDefinedBy mfe: .

mfe:hasPercentageOfUse a owl:DatatypeProperty , rdf:Property ;
  rdfs:subPropertyOf smo:hasMeasureinPercentage ;
  rdfs:label ""@es , ""@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:domain mfe:UseInPatch ;
  rdfs:isDefinedBy mfe: .

mfe:hasCanopyCoverTotalPercent a owl:DatatypeProperty , rdf:Property ;
  rdfs:subPropertyOf smo:hasMeasureinPercentage ;
  rdfs:label ""@es , ""@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:domain mfe:Patch ;
  rdfs:isDefinedBy mfe: .

mfe:hasCanopyCoverTreesPercent a owl:DatatypeProperty , rdf:Property ;
  rdfs:subPropertyOf smo:hasMeasureinPercentage ;
  rdfs:label ""@es , ""@es ;
  rdfs:comment ""@en , ""@es ;
  rdfs:domain mfe:Patch ;
  rdfs:isDefinedBy mfe: .
```