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## Ecuadorian Geospatial Linked Data

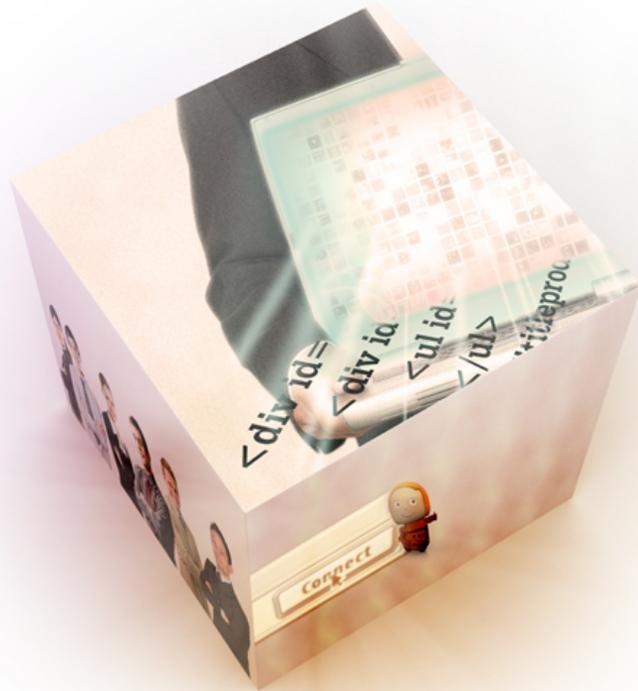
**Victor Saquicela<sup>1</sup>, Mauricio Espinoza<sup>1</sup>,  
Nelson Piedra<sup>2</sup>, and Boris Villazón-Terrazas<sup>3</sup>**

<sup>1</sup> Universidad de Cuenca, Ecuador  
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bvillazon@isoco.com  
@boricles

<http://www.slideshare.net/boricles>



## ToC

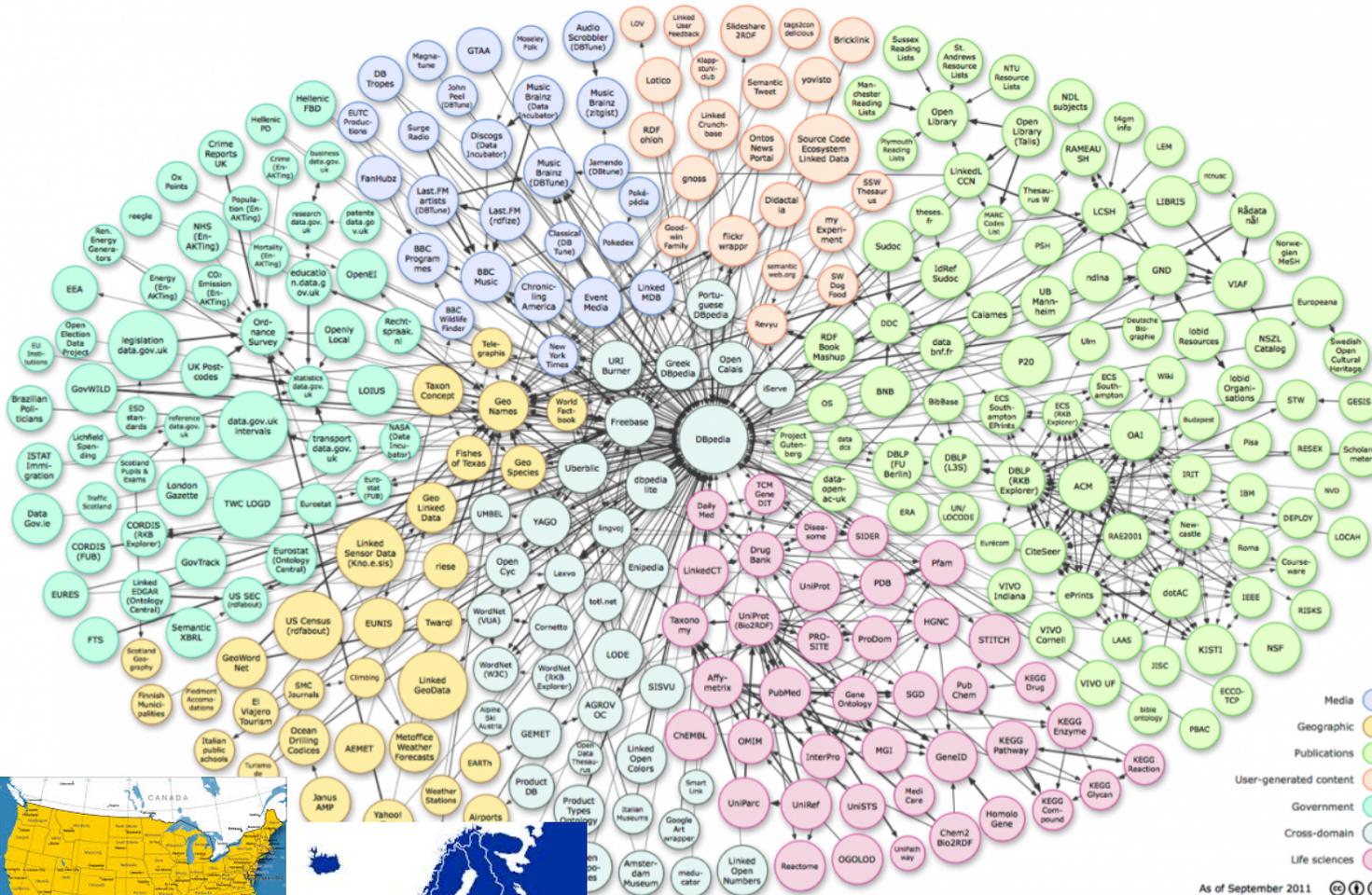
- » Motivation
- » Architecture
- » Geospatial Linked Data Life Cycle

## Latin America Linked Data

<http://datosenlazados.org/cms/>



<http://linkeddata.ec/>

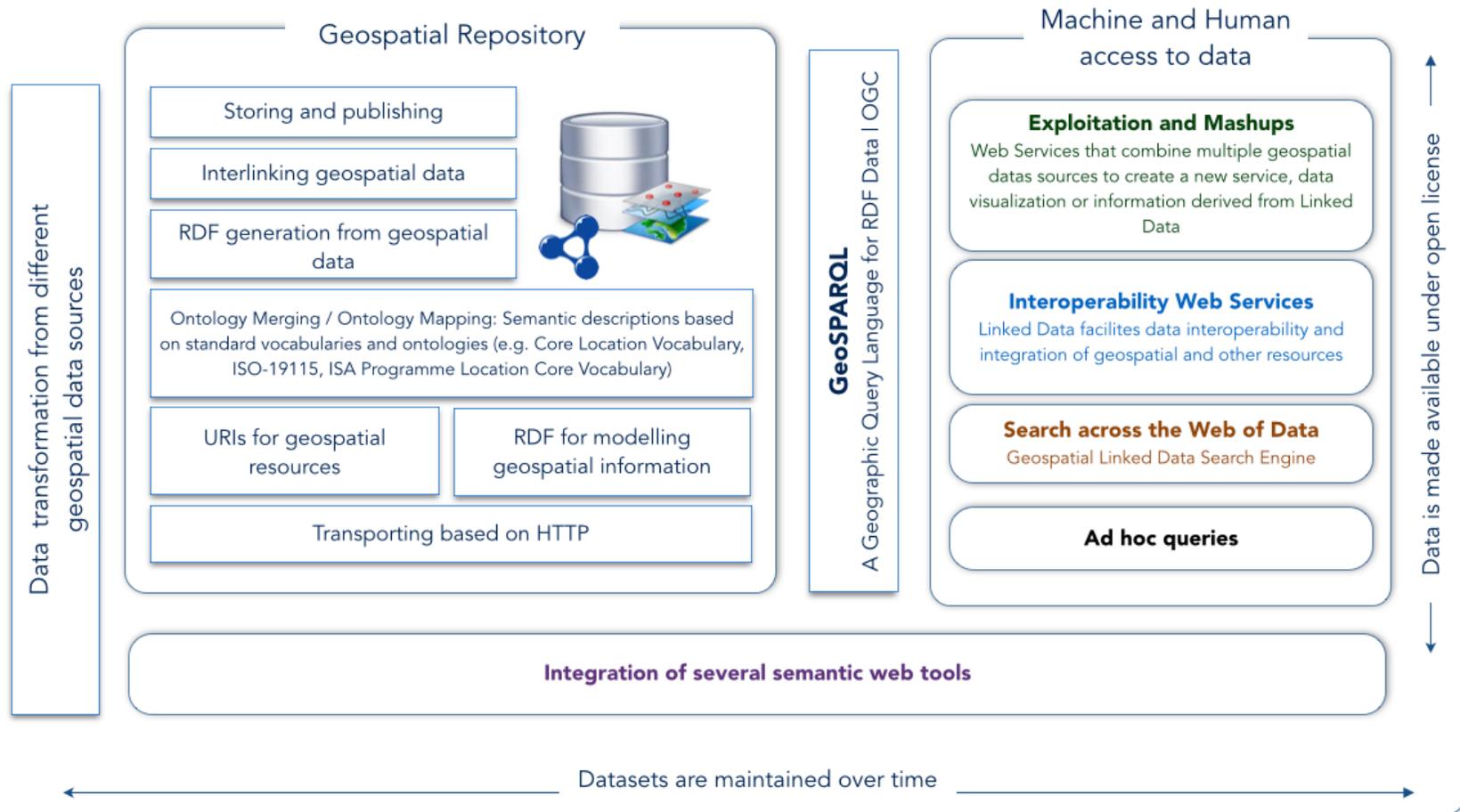


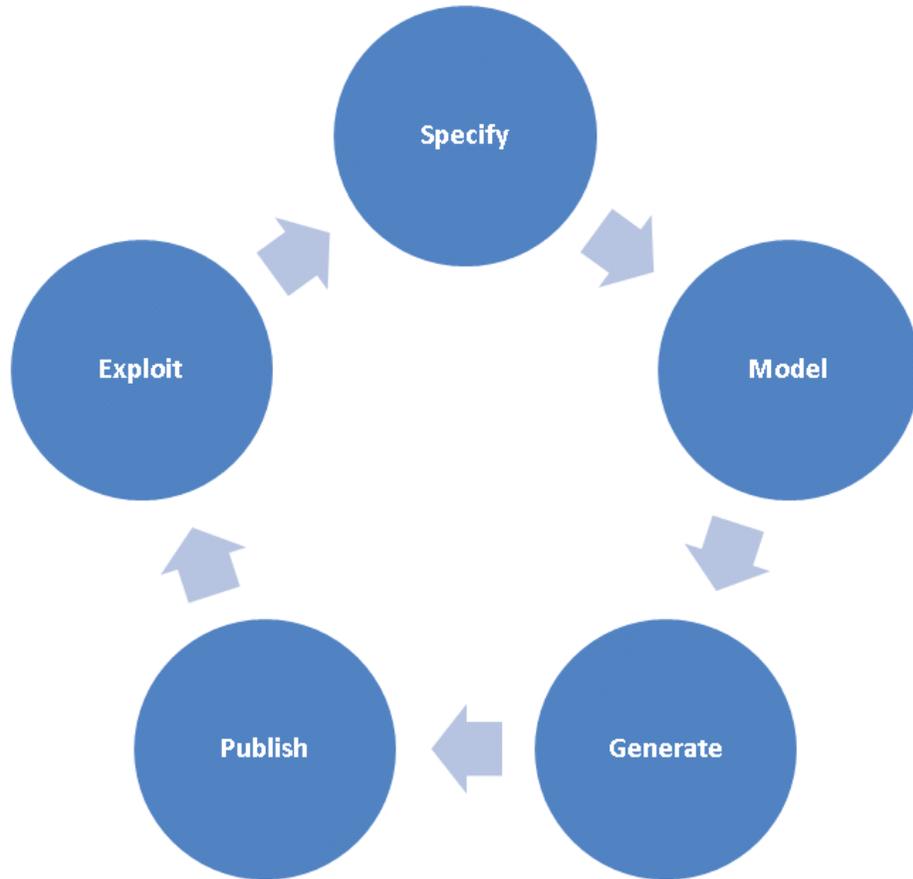
As of September 2011

## Selection of Data Sources



## Ecuadorian Geospatial Linked Data Architecture





**Taking into account geospatial component**

- **Selection of geospatial data sources**
- **URIs for geospatial resources**
- **Geospatial Vocabularies**
- **RDF generation for the geospatial data**
- **Linking of geospatial data**

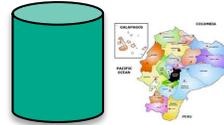


**Boris Villazon-Terrazas, Luis Vilches, Asunción Gómez-Pérez, and Oscar Corcho**

**Methodological Guidelines for Publishing Linked Data. [http://link.springer.com/chapter/10.1007/978-1-4614-1767-5\\_2](http://link.springer.com/chapter/10.1007/978-1-4614-1767-5_2)**

- Identify and select geospatial resources from Ecuadorian Government Agencies.

- Geo-databases



- Shapefiles



- Spreadsheets



- KML



<http://geo.linkeddata.ec/sources/sources.xls>

- **General guidelines**

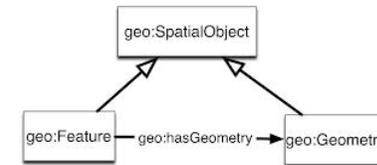
- BP for publishing LD <http://www.w3.org/TR/ld-bp/>
- URIs for UK Public sector  
<https://www.gov.uk/government/publications/designing-uri-sets-for-the-uk-public-sector>
- Study of persistent URIs <http://philarcher.org/diary/2013/uripersistence/>
- Guidelines for Naming and Labeling Ontologies  
<http://dcevents.dublincore.org/IntConf/dc-2011/paper/download/47/15>
- ....

- **Geospatial specific guidelines**

- RFC5870 URI for geospatial locations <http://tools.ietf.org/search/rfc5870>
- INSPIRE [http://inspire.jrc.ec.europa.eu/events/conferences/inspire\\_2012/presentations/ds1/Clements%20Portele.pdf](http://inspire.jrc.ec.europa.eu/events/conferences/inspire_2012/presentations/ds1/Clements%20Portele.pdf)
- <https://www.deri.ie/content/applying-design-patterns-uri-strategies-naming-linked-geospatial-data-infrastructure>
- <http://inspire-forum.jrc.ec.europa.eu/pg/forum/topic/29922/cool-uris-for-linked-geospatial-data/>
- ...

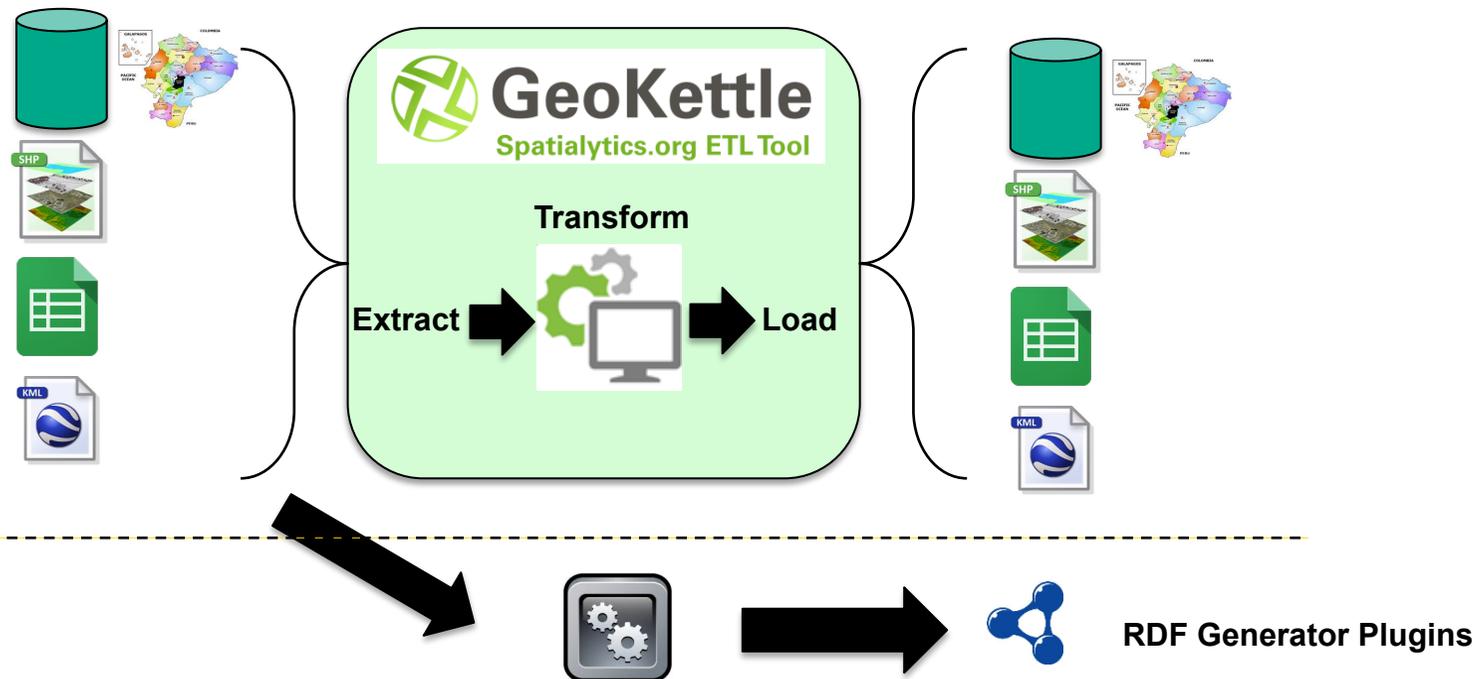
- NeoGeo <http://geovocab.org/doc/neogeo/>
- GeoSPARQL <http://www.opengeospatial.org/standards/geosparql> ←
- ISA Programme Location Core Vocabulary <http://www.w3.org/ns/locn>
- schema.org <http://schema.org/>
  - Place <http://schema.org/Place>
  - GeoShape <http://schema.org/GeoShape>
  - GeoCoordinates <http://schema.org/GeoCoordinates>
- ISO-19115 Ontology <https://www.seegrid.csiro.au/subversion/xmml/metadata/ISO19115/iso-19115.owl> ←
- ...

- Some discussions
  - Geometry separated from the feature
  - Represent geometry as RDF Literal
  - Represent CRS as a property.
  - URIs for the CRSs, e.g., <http://geovocab.org/crs/EPSG4979>
  - Multilinguality



- **GeoKettle**

- Spatially-enabled version of the generic ETL tool, Kettle (Pentaho Data Integration)
- Powerful, metadata-driven spatial ETL tool dedicates to the integration of different geospatial data resources



Examine preview data

Standard view | Geographic view

Rows of step: Entrada Archivo SHP (211 rows)

#	the_geom	CODIGO	COUNT	FIRST_CANT	FIRST_PROV	RECNO	AREA	PERIMETER
1	MULTIPOLYGON (((69261...		3	ND	ND	1	777071032.1	332496.3
2	MULTIPOLYGON (((73414...	0101	1	CUENCA	AZUAY	2	2884811627.2	299109.1
3	MULTIPOLYGON (((69910...	0102	1	GIRON	AZUAY	3	381960592.9	136798.2
4	MULTIPOLYGON (((74105...	0103	1	GUALACEO	AZUAY	4	309920067	108900.6
5	MULTIPOLYGON (((69999...	0104	1	NABON	AZUAY	5	682412606.6	155977.6
6	MULTIPOLYGON (((75559...	0105	1	PAUTE	AZUAY	6	236357098.7	99082.7
7	MULTIPOLYGON (((66574...	0106	1	PUCARA	AZUAY	7	849350970.1	162304.2
8	MULTIPOLYGON (((69289...	0107	1	SAN FERNA...	AZUAY	8	137167393.8	59695.6
9	MULTIPOLYGON (((65635...	0108	1	SANTA ISAB...	AZUAY	9	748811051	193548.1
10	MULTIPOLYGON (((75718...	0109	1	SIGSIG	AZUAY	10	645234310.6	129174.2
11	MULTIPOLYGON (((69999...	0110	1	OÑA	AZUAY	11	291910894.2	106311.3
12	MULTIPOLYGON (((75320...	0111	1	CHORDELEG	AZUAY	12	104715611	54161.2

Close

## Reading shape files



Spatial Reference System Transformation

Step name: SRS Transformation

Apply transformation on: the\_geom (only geometry fields are shown)

Auto-detect spatial reference system from source.

Source Spatial Reference System: Existing (selected) | WKT

Target Spatial Reference System: Existing | WKT (selected)

WGS 84

GEOGCS["WGS 84", DATUM["World Geodetic System 1984", SPHEROID["WGS 84", 6378137.0, 298.257223563, AUTHORITY["EPSG", "7030"]], AUTHORITY["EPSG", "6326"]], PRIMEM["Greenwich", 0.0, AUTHORITY["EPSG", "8901"]], UNIT["degree", 0.017453292519943295], AXIS["Geodetic longitude", EAST], AXIS["Geodetic latitude", NORTH], AUTHORITY["EPSG", "4326"]]

Check WKT

OK Cancel

## SRS Transformation



```

1 <rdf:RDF
2   xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
3   xmlns:georesource="http://geo.linkeddata.ec/r/resource/"
4   xmlns:owl="http://www.w3.org/2002/07/owl#"
5   xmlns:sf="http://www.opengis.net/ont/sf#"
6   xmlns:xsd="http://www.w3.org/2001/XMLSchema#"
7   xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
8   xmlns:geo="http://www.opengis.net/ont/geosparql#"
9   xmlns:geontology="http://geo.linkeddata.ec/ontology/"
10  <rdf:Class rdf:about="http://geo.linkeddata.ec/ontology/centroEducativo">
11    <rdfs:subClassOf rdf:resource="http://www.opengis.net/ont/geosparql#Feature"/>
12  </rdfs:Class>
13  <rdf:Property rdf:about="http://www.opengis.net/ont/geosparql#askWKT"/>
14  <rdf:Property rdf:about="http://geo.linkeddata.ec/ontology/hasExactGeometry">
15    <rdfs:subPropertyOf rdf:resource="http://www.opengis.net/ont/geosparql#hasDefaultGeometry"/>
16    <rdfs:subPropertyOf rdf:resource="http://www.opengis.net/ont/geosparql#hasGeometry"/>
17  </rdf:Property>
18  <rdf:Property rdf:about="http://www.opengis.net/ont/sf#MultiPolygon"/>
19  <geontology:centroEducativo rdf:about=
20    "http://geo.linkeddata.ec/r/resource/centroEducativo/JARAMIJD9f3f0507b110ccabf44bdfb58e582464f676a9">
21    <geontology:hasExactGeometry>
22      <sf:MultiPolygon rdf:about=
23        "http://geo.linkeddata.ec/r/resource/centroEducativo/d9f3f0507b110ccabf44bdfb58e582464f676a9">
24        <geo:asWKT rdf:datatype="http://www.opengis.net/ont/sf#wktLiteral1"
25          ><lit: http://www.opengis.net/def/crs/OGC/1.3/CRS84>MULTIPOLYGON ((((-0.56294842817529
26            -0.9039030740733421, -80.56163588435075 -0.904905025712237, -80.56120862143811 -0.905464041501807,
27            80.56120862143811 -0.904905025712237, 80.56163588435075 -0.905464041501807,
28            80.56120862143811 -0.904905025712237, 80.56163588435075 -0.905464041501807,
29            -0.56294842817529 -0.9039030740733421)))
30        </geo:asWKT>
31      </sf:MultiPolygon>
32    </geontology:hasExactGeometry>
33    </geontology:centroEducativo>
34  </rdf:Property>
35  </rdf:Class>
36  </rdf:RDF>

```

1:1.918 Col1 Sel0 6,39 MB ANSI CR-LF INS XML Document

## RDF Generation

**Silk Workbench** Workspace: VOLCANES Editor: LINKVOLCANES Generate Links Learn Reference Links Population About

Stop Generate Links Task finished in 262ms (100,0%) Help

Expand All Collapse All Prev 1 Next Filter:

Source: VocanesPROMSA	Target: volcanesGENP-STGR	Score	Correct?
source/VOLCAN/COTOPAXI90ee2d7a80120c8c01f5e254f6707f56384934f	source/VOLCAN/Cotopaxifc75efe7ec1a1f5ad2ca20362115d46d8bf02e84	100,0%	✓ ? ✕
Aggregation: max (unnamed_6) 100,0% Comparison: levenshteinDistance (unnamed_5) 100,0% Transform: lowerCase (unnamed_8) cotopaxi Input: ?b/<http://www.w3.org/2000/01/rdf-schema#label> (unnamed_10) Cotopaxi Transform: lowerCase (unnamed_7) cotopaxi Input: ?a/<http://www.w3.org/2000/01/rdf-schema#label> (unnamed_9) COTOPAXI			
e/VOLCAN/CHIMBORAZO640e36ecd376af11fed15595824f3f25578b7efb	ce/VOLCAN/Chimborazo86b8d5bca6fc8c4dab3f6a92dcd4d7ed4713052a	100,0%	✓ ? ✕
VOLCAN/TUNGURAHUA9dde89f7fe7a5e1708e92b734b493bfdb0133a95	rce/VOLCAN/Tungurahua0554ea8798855d84f92a526d18f4c0f5e7a59c02	100,0%	✓ ? ✕
e/VOLCAN/PULULAHUAad685fc13040e5dbe08aba9a68c888c3f4d370f9a	source/VOLCAN/Pululahuaa9cf30e5a5fe9b3c8419d7ba2df2dcf8f98dbe9e	100,0%	✓ ? ✕
rce/VOLCAN/ANTISANA35479f51fe9e3cd378813070a677971ac2fc892a	source/VOLCAN/Antisana0121b648d4f1048729c43a7f71b28aa4bf117fe0	100,0%	✓ ? ✕

**Silk Workbench** Workspace: VOLCANES-DBPEDIA Editor: linkVolcanes Generate Links Learn Reference Links Population About

Start Generate Links Task finished in 251s (100,0%) Help

Expand All Collapse All Prev 1 Next Filter:

Source: volcanes-Ecuador	Target: DBPEDIA	Score	Correct?
igenp-stgr/Guagua%20Pichinchad67f8d73b8e950628165ef90d5bb38dd4b4f5ec2	dbr:Pichincha_Volcano	100,0%	✓ ? ✕
ce/Volcanes_igenp-stgr/Antisana0121b648d4f1048729c43a7f71b28aa4bf117fe0	dbr:Antisana	100,0%	✓ ? ✕
lcanes_igenp-stgr/Reventador2bc412ae99ac7b3b74dc23cdf63abb27e11b28ba	dbr:Reventador	100,0%	✓ ? ✕
lcanes_igenp-stgr/Tungurahua0554ea8798855d84f92a526d18f4c0f5e7a59c02	dbr:Tungurahua	100,0%	✓ ? ✕
ce/Volcanes_igenp-stgr/Cotopaxifc75efe7ec1a1f5ad2ca20362115d46d8bf02e84	dbr:Cotopaxi	100,0%	✓ ? ✕
lcanes_igenp-stgr/Chimborazo86b8d5bca6fc8c4dab3f6a92dcd4d7ed4713052a	dbr:Chimborazo_(volcano)	100,0%	✓ ? ✕

## Rivers of the province of Guayas

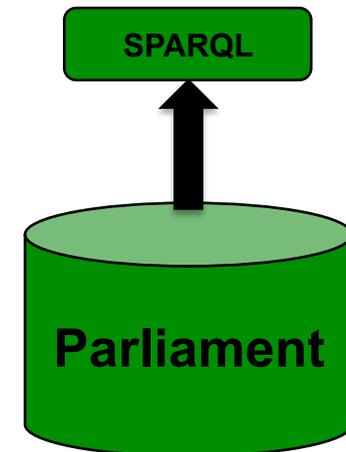
PREFIX geo: <<http://www.opengis.net/ont/geosparql#>>  
 PREFIX rdf: <<http://www.w3.org/1999/02/22-rdf-syntax-ns#>>  
 PREFIX geof: <<http://www.opengis.net/def/function/geosparql/>>  
 PREFIX sf: <<http://www.opengis.net/ont/sf#>>  
 PREFIX units: <<http://www.opengis.net/def/uom/OGC/1.0/>>

```
SELECT distinct ?r ?label ?Figure ?r2 ?Figure2
WHERE {
  ?r rdf:type <http://geo.linkeddata.ec/ontology/riosdobles\_promsa>.
  ?r rdfs:label ?label.
  ?r geo:hasGeometry ?geo.
  ?geo rdf:type ?geoType .
  ?geo geo:asWKT ?Figure.

  ?r2 rdf:type <http://geo.linkeddata.ec/ontology/provincias\_promsa>.
  ?r2 rdfs:label "GUAYAS"@es.
  ?r2 geo:hasGeometry ?geo2.
  ?geo2 rdf:type ?geoType2 .
  ?geo2 geo:asWKT ?Figure2.

  FILTER (geof:sfIntersects(?Figure2, ?Figure)).
}
```

<http://purl.org/Ecuador/geo/sparql>



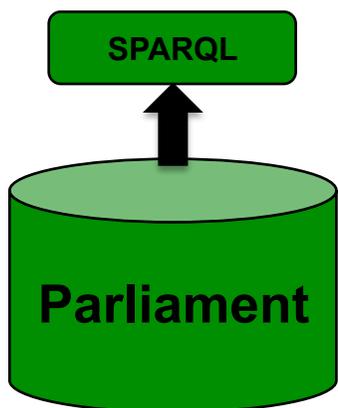
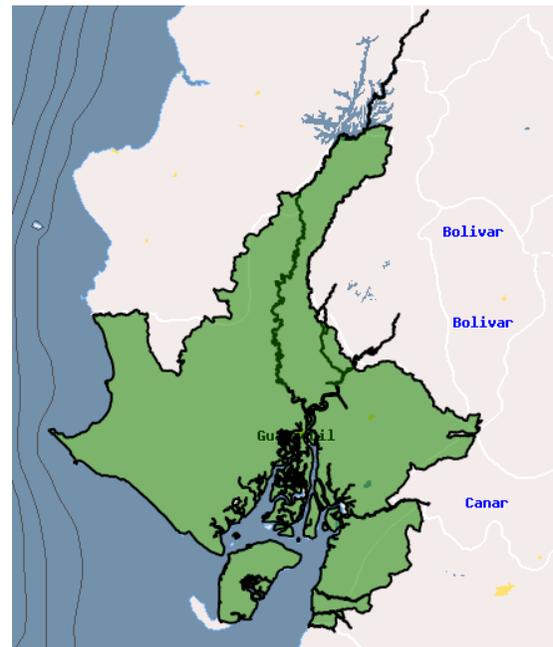
## Rivers of the province of Guayas

```
PREFIX geo: <http://www.opengis.net/ont/geosparql#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX geof: <http://www.opengis.net/def/function/geosparql/>
PREFIX sf: <http://www.opengis.net/ont/sf#>
PREFIX units: <http://www.opengis.net/def/uom/OGC/1.0/>
```

```
SELECT distinct ?r ?label ?Figure ?r2 ?Figure2
WHERE {
  ?r a <http://geo.linkeddata.ec/ontology/riosdobles_promsa>.
  ?r rdfs:label ?label.
  ?r geo:hasGeometry ?geo.
  ?geo rdf:type ?geoType .
  ?geo geo:asWKT ?Figure.
```

```
?r2 a <http://geo.linkeddata.ec/ontology/provincias_promsa>.
?r2 rdfs:label "GUAYAS"@es.
?r2 geo:hasGeometry ?geo2.
?geo2 rdf:type ?geoType2 .
?geo2 geo:asWKT ?Figure2.
```

```
FILTER (geof:sfIntersects(?Figure2, ?Figure)).
}
```



<http://200.0.31.28:8081/map4rdf-0.0.4-OL-SNAPSHOT/#dashboard>





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