



Making the web an
exploratory place
for geospatial data

ESTA-LD: Exploring Spatio-Temporal Linked Statistical Data

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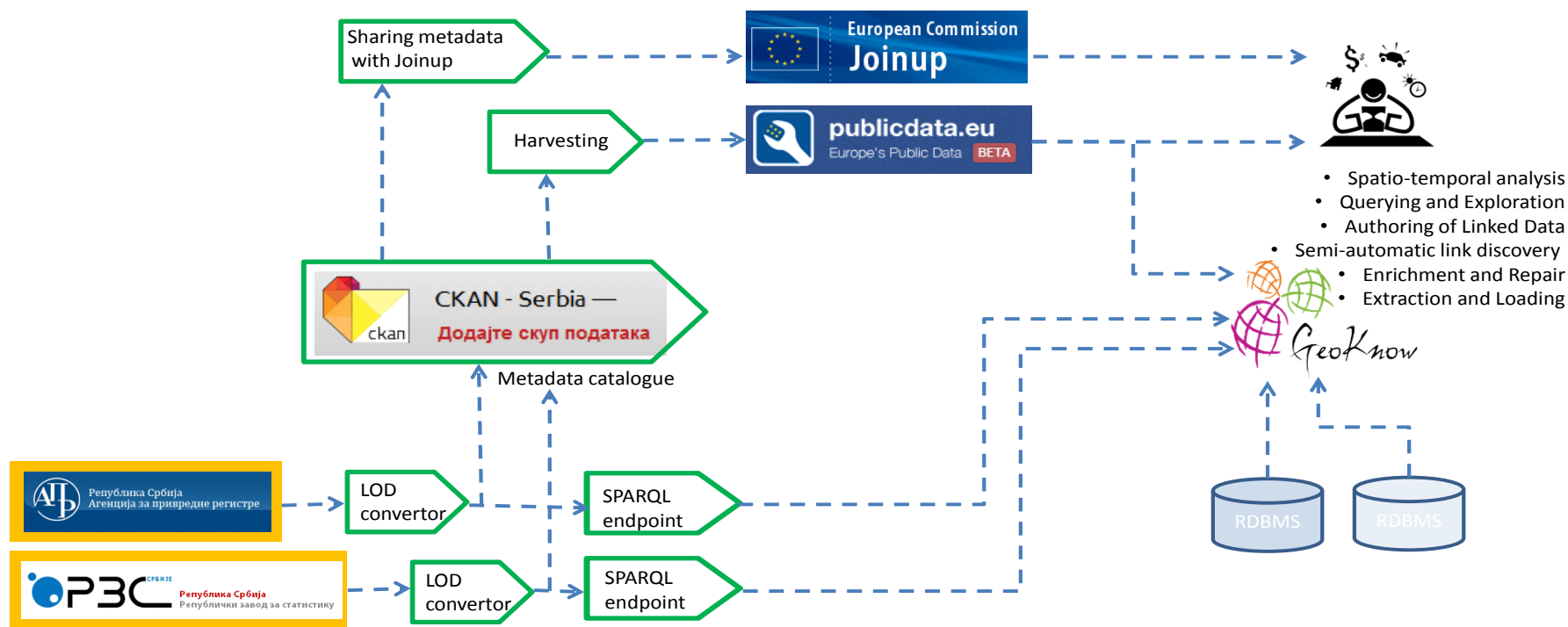
- Introduction
- Modelling
- ESTA-LD
- Future Work



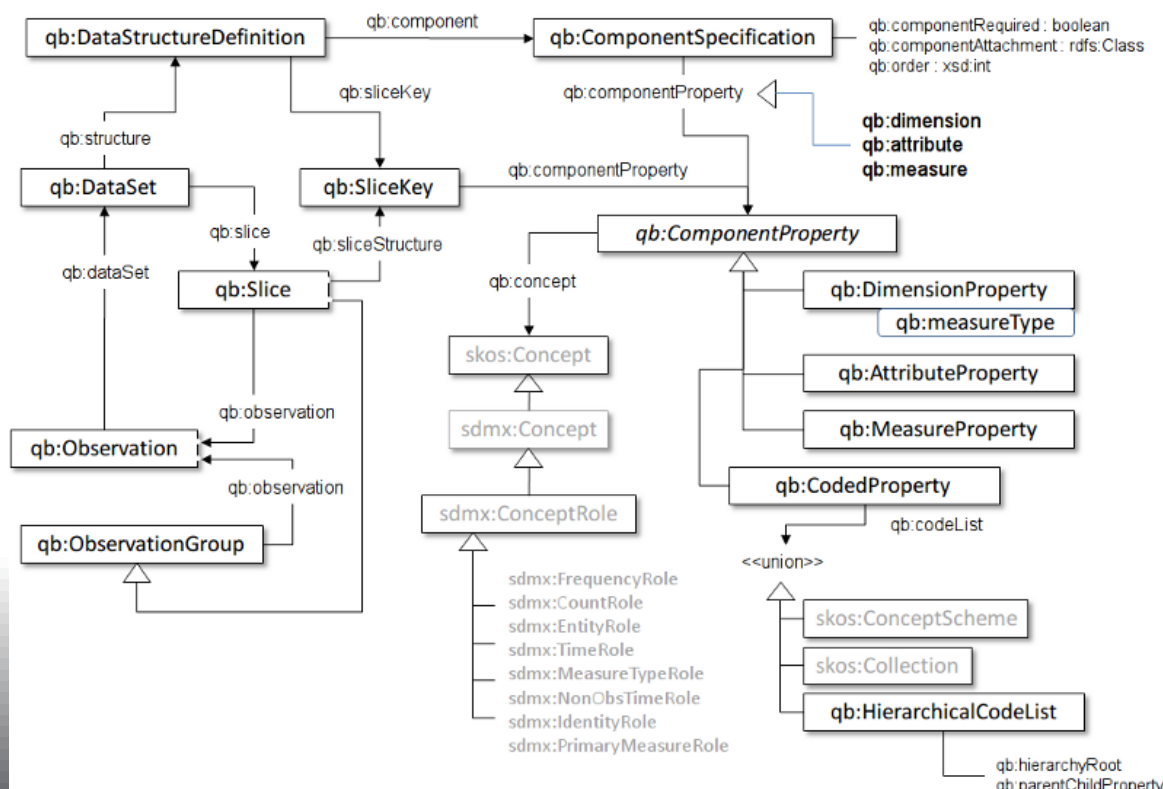
Agents – Data providers



Services



- Publishing multi-dimensional (statistical) data in a way that it can be linked to related data sets and concepts
- Compatible with SDMX
- W3C Recommendation
- Kinds of data:
 - Observations
 - Organizational struct.
 - Structural metadata
 - Reference metadata
- The cube model:
 - Dimensions
 - Attributes
 - Measures



```
@prefix rs: <http://elpo.stat.gov.rs/RS-DIC/rs/>
@prefix qb: <http://purl.org/linked-data/cube#>
@prefix rs-data: <http://elpo.stat.gov.rs/RS-DATA/>
@prefix incentive: <http://stat.apr.gov.rs/RS-DIC/IncentivePurpose/>
@prefix geo: <http://elpo.stat.gov.rs/RS-DIC/geo/>
@prefix sdmx-measure: <http://purl.org/linked-data/sdmx/2009/measure#>
@prefix dct: <http://purl.org/dc/terms/>
```

```
rs-data:ds-regdev a qb:DataSet ;
  rdfs:label "Regional Development"^^xsd:string ;
  qb:structure rs-data:dsd-regdev ;
  dct:subject <http://purl.org/linked-data/sdmx/2009/subject/2.2> ;
  dct:publisher <http://elpo.stat.gov.rs/stat-office> .
```

```
rs-data:obs1 a qb:Observation ;
  qb:dataset rs-data:ds-regdev ;
  rs:geo geo:RS21 ;
  rs:time "2009"^^xsd:gYear ;
  rs:incentiveAim incentive:PT01 ;
  sdmx-measure:obsValue "7653469" .
```

- Use **SDMX COG** (Content Oriented Guidelines) available in RDF:
 - Temporal dimension: sdmx-dimension:refPeriod
 - Spatial dimension: sdmx-dimension:refArea
- **Temporal Dimension**
 - Concept: sdmx-concept:refPeriod
 - Time role: sdmx:TimeRole
 - Range: xsd:gYear, xsd:gYearMonth, xsd:date...
- **Spatial Dimension**
 - Concept: sdmx-concept:refArea
 - There is no spatial role
 - Define geometries for concepts using geo:hasDefaultGeometry and geo:asWKT
 - Hierarhies:
 - Define a code list
 - Define hierarchy levels using the SKOS vocabulary (skos:brader and skos:narrower)


```
eg:refPeriod a rdf:Property, qb:DimensionProperty;
  rdfs:label "reference period"@en;
  rdfs:subPropertyOf sdmx-dimension:refPeriod ;
  rdfs:range xsd:gYearMonth ;
  qb:concept sdmx-concept:refPeriod .
```

```
sdmx-concept:refPeriod a sdmx:TimeRole.
```

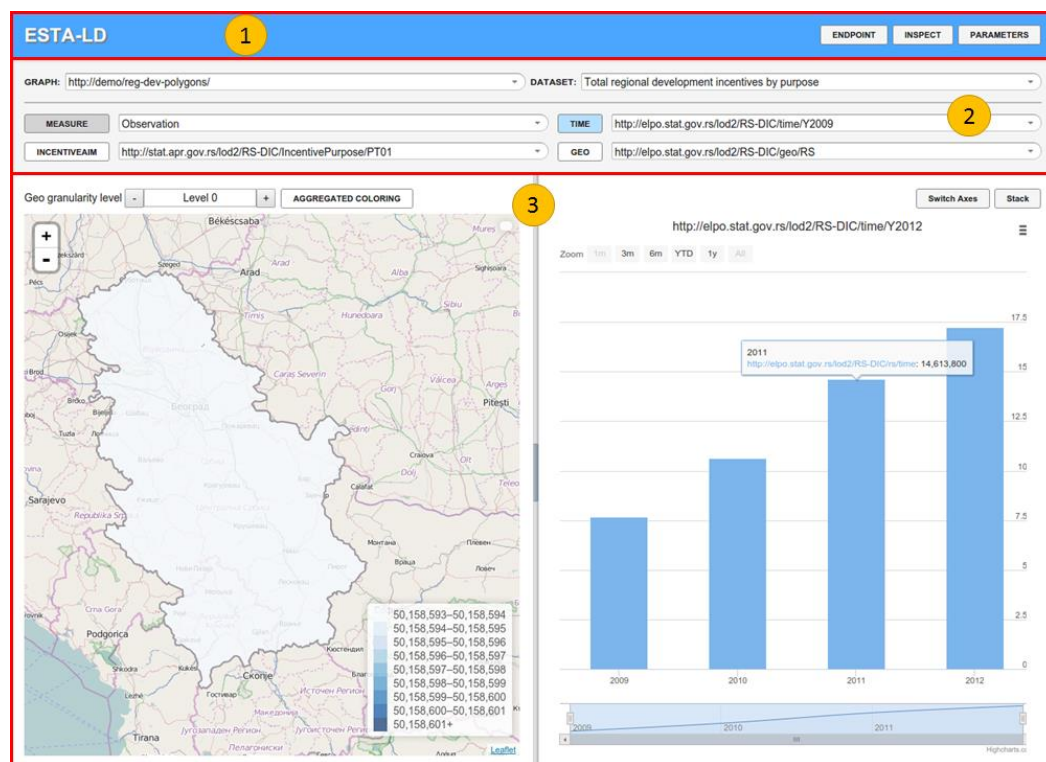
```
eg:obs1 a qb:Observation ;
  qb:dataset eg:ds1 ;
  eg:refArea eg:areal ;
  eg:refPeriod "2014-12"^^xsd:gYearMonth ;
  sdmx-measure:obsValue "123623" .
```

```
eg:refArea a rdf:Property, qb:DimensionProperty;
  rdfs:label "reference area"@en;
  rdfs:subPropertyOf sdmx-dimension:refArea ;
  rdfs:range eg:Area, geo:Feature ;
  qb:concept sdmx-concept:refArea .
```

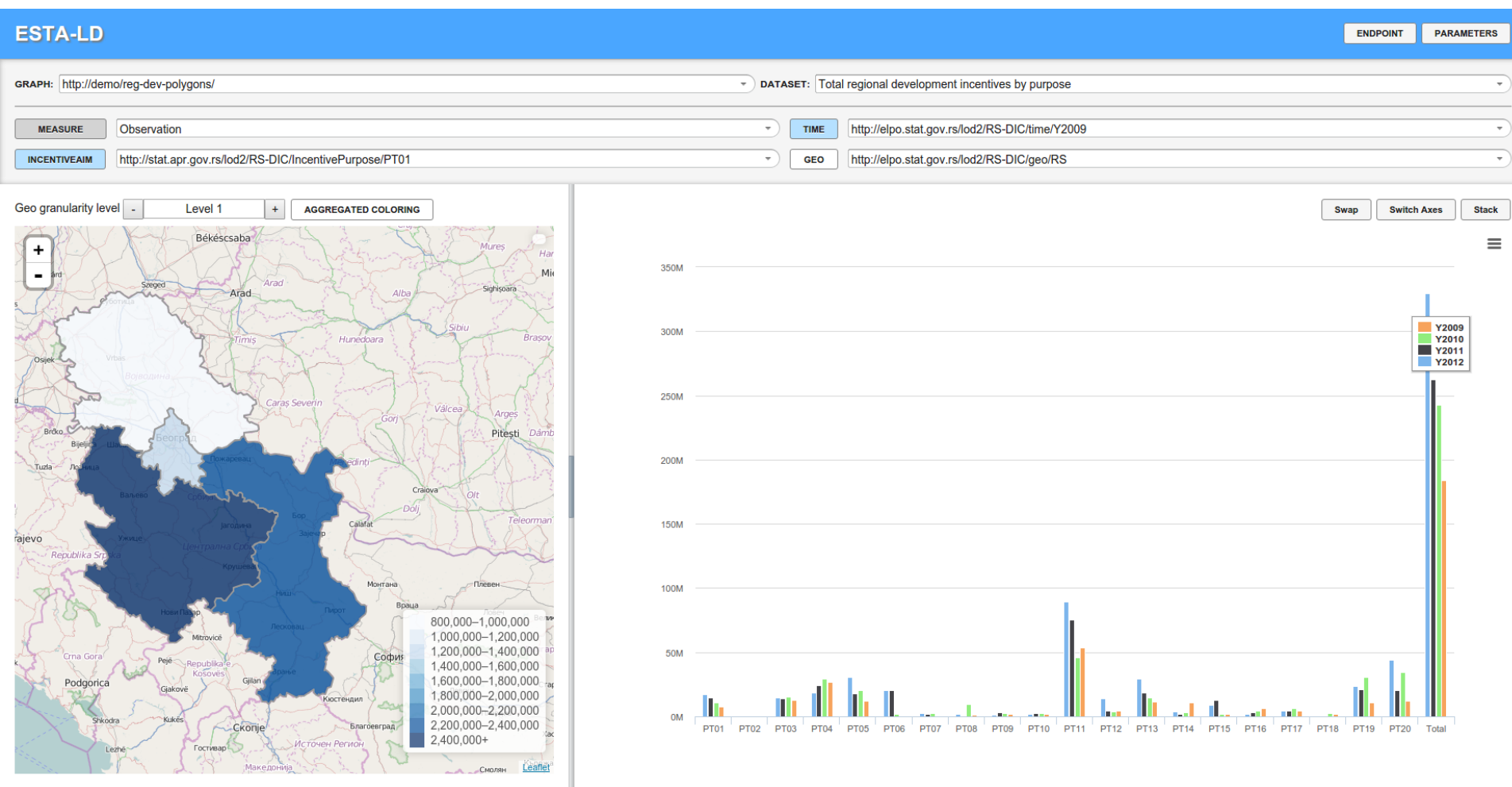
```
eg:obs1 a qb:Observation ;
  qb:dataset eg:ds1 ;
  eg:refArea eg:areal ;
  eg:refPeriod "2014-12"^^xsd:gYearMonth ;
  sdmx-measure:obsValue "123623" .
```

```
eg:areal geo:hasDefaultGeometry eg:geom1 .
eg:geom1 geo:asWKT "MULTIPOLYGON(...)"^^geo:wktLiteral .
```


- Enables exploration and analysis of spatio-temporal linked statistical data
- Based on the RDF Data Cube vocabulary
- Works with any SPARQL Endpoint
- Part of the Linked Data Stack developed within EU FP7 project GeoKnow



- Choose graph and dataset
- Choose measure, set dimension values and select dimensions to visualize



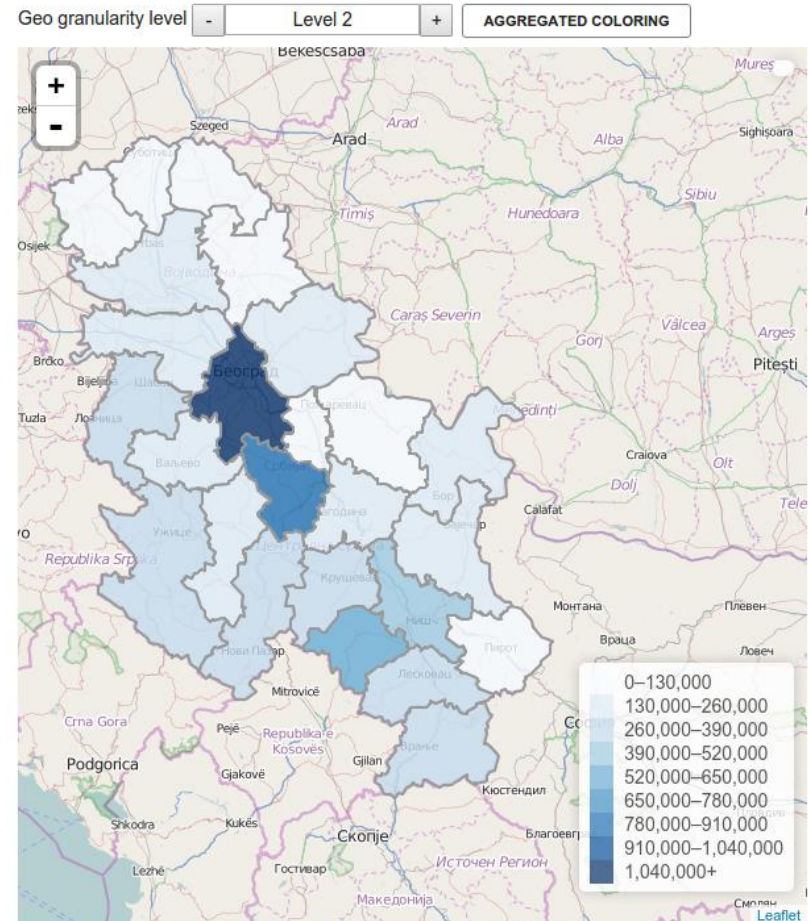
- Visualization of up to two dimensions
- Switching Axes
- Stacking
- Swapping series and categories

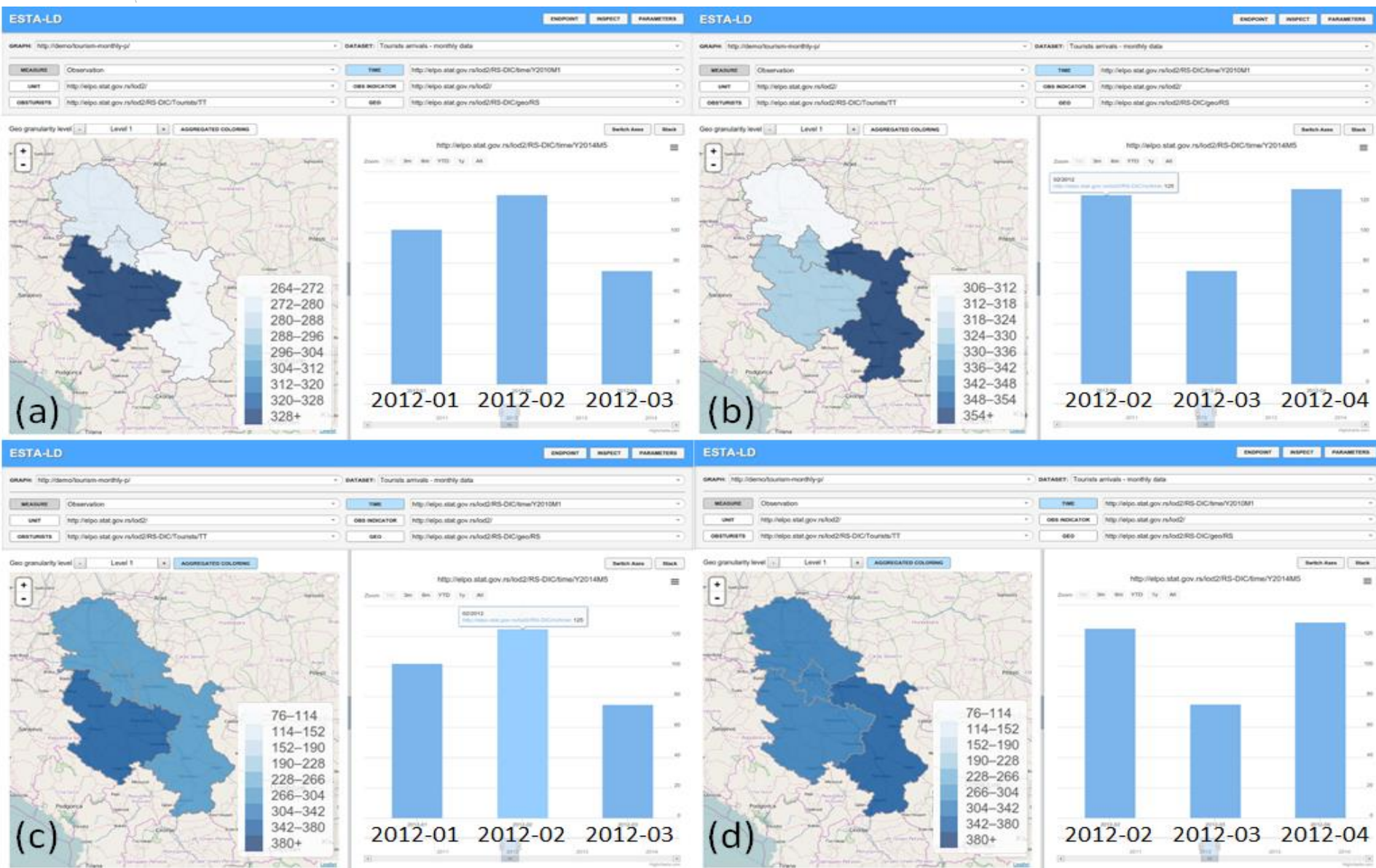


- Time Chart:
 - Dedicated chart for the time dimension
 - Select a period
 - Slide through time
 - Works with SBRA/SORS code list and XSD types
 - Selection of the time window updates the map



- Choropleth Map:
 - Visualizes data on a map
 - Supports hierarchies
 - Regions, municipalities ...
 - Selecting a region updates chart
 - Regions need to point to polygons supplied as WKT strings
 - In combination with the time chart, regions are coloured:
 - Based on the selected time window,
 - Based on every possible time window of the same duration as the one selected.





- Temporal Dimension:
 - In most cases where time is represented with URIs, those URIs contain year/month/date.
 - Provides transformation of URIs to xsd types based on the provided pattern
- Spatial Dimension:
 - In most cases country name or code is embedded in the URI
 - Search for polygons in the LinkedGeoData dataset and add them to the Cube

ESTA-LD: *Inspect and Prepare*

ENDPOINT

GRAPH:

DATASET:

Dataset

- ▼ DSD for dataset 08
 - ▼ Dimensions (3)
 - geo
 - ▼ time
 - ▼ Codes (5)
 - http://elpo.stat.gov.rs/lod2/RS-DIC/time/Y2000
 - http://elpo.stat.gov.rs/lod2/RS-DIC/time/Y2009
 - http://elpo.stat.gov.rs/lod2/RS-DIC/time/Y2010
 - http://elpo.stat.gov.rs/lod2/RS-DIC/time/Y2011
 - http://elpo.stat.gov.rs/lod2/RS-DIC/time/Y2012
 - incentiveAim
 - Measures (1)
 - Attributes (0)

Manage Temporal Dimension

Dimension: <http://elpo.stat.gov.rs/lod2/RS-DIC/rs/time>

Properties

PROPERTY	VALUE
http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.w3.org/2002/07/owl#ObjectProperty
http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://purl.org/linked-data/cube#ComponentProperty
http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://purl.org/linked-data/cube#DimensionProperty
http://www.w3.org/2000/01/rdf-schema#label	time
http://www.w3.org/2000/01/rdf-schema#domain	http://purl.org/linked-data/cube#Observation
http://www.w3.org/2000/01/rdf-schema#range	http://elpo.stat.gov.rs/lod2/RS-DIC/time/P1Y
http://www.w3.org/2004/02/skos/core#prefLabel	time
http://purl.org/linked-data/cube#codeList	http://elpo.stat.gov.rs/lod2/RS-DIC/time
http://www.w3.org/2004/02/skos/core#notation	rs:time

Choose type:

Transformation Pattern:

Transform

- Try ESTA-LD:
 - GitHub: <https://github.com/GeoKnow/ESTA-LD>
 - Demo: <http://geoknow.imp.bg.ac.rs/ESTA-LD>
- Future Work:
 - Add more chart types
 - Enable comparisons, merging, slicing, etc.
 - Reducing the need for replication (DSDs, polygons...)
 - Advanced search and filtering capabilities



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Thank you for your attention!

Questions?

