

KGE - project presentation

Tourism & Waste Management

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Scenarios, Personas and Competency questions



Maximilians

CQ2:

Where can I find the nearest recycling bin?



Diego

CQ1:

what is the total amount of plastic generated in ski locations?



Luciana

CQ6:

What special waste disposal facilities are available in Trentino?

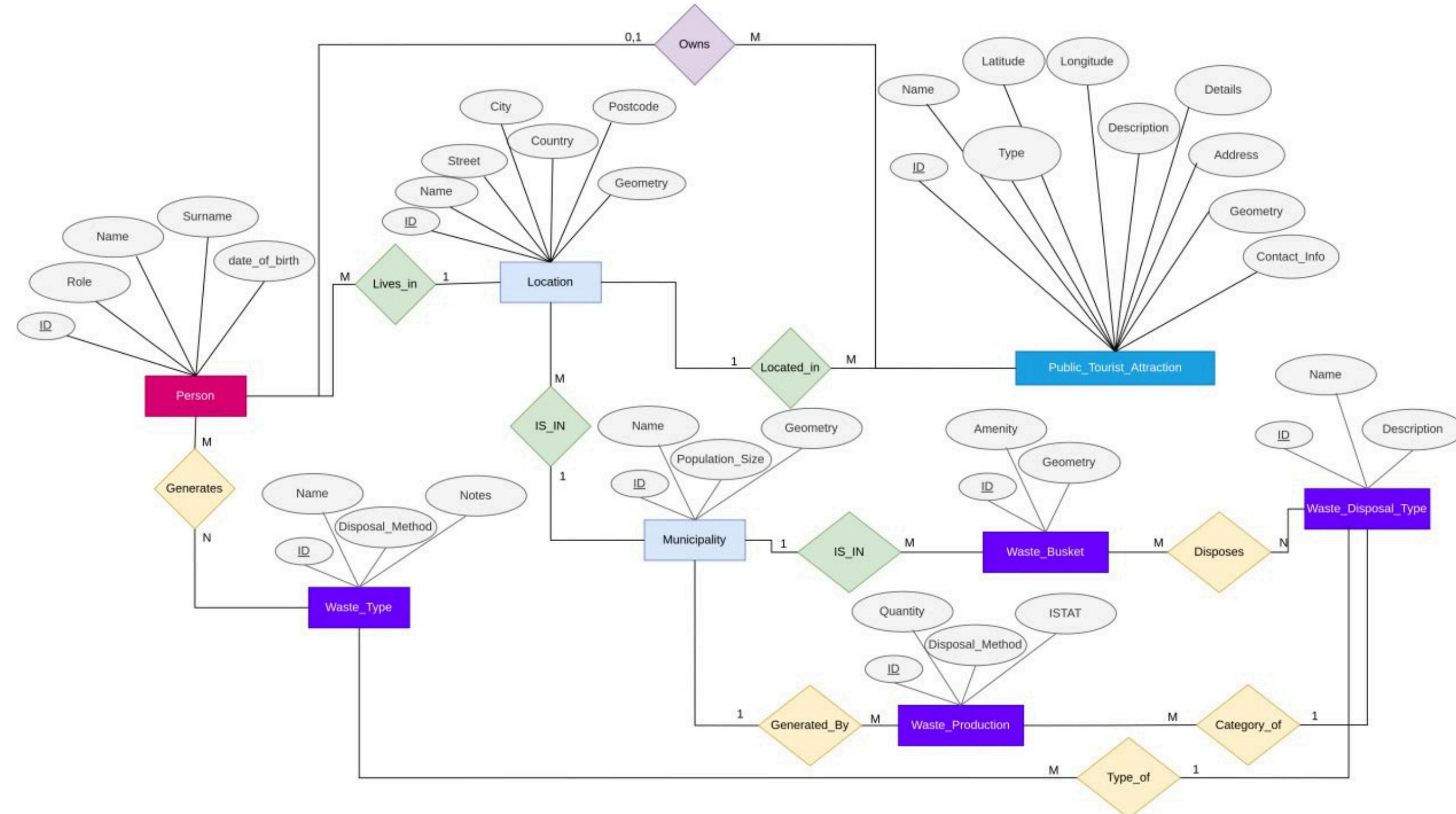


Chiara

CQ8:

During the pandemic, how did visitor fluctuations impact waste production?

The ER Model



First iTelos phase - Purpose Formalization

Data Gathering and Cleaning



OpenStreetMap



Waste_Production.csv



Municipality.csv
tourist_attraction.csv
waste_basket.csv



Waste.csv
waste_disposal_type.csv



Second iTelos phase - Information Gathering

Language resource

ConceptID Word-en

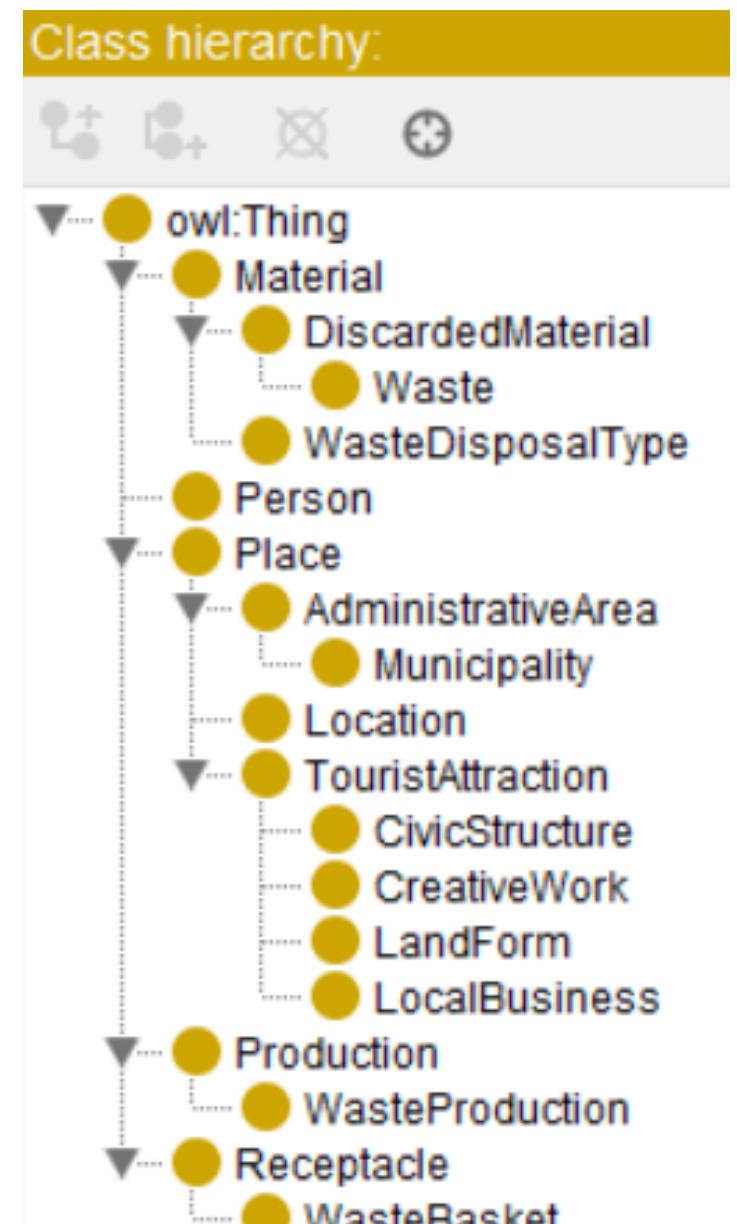
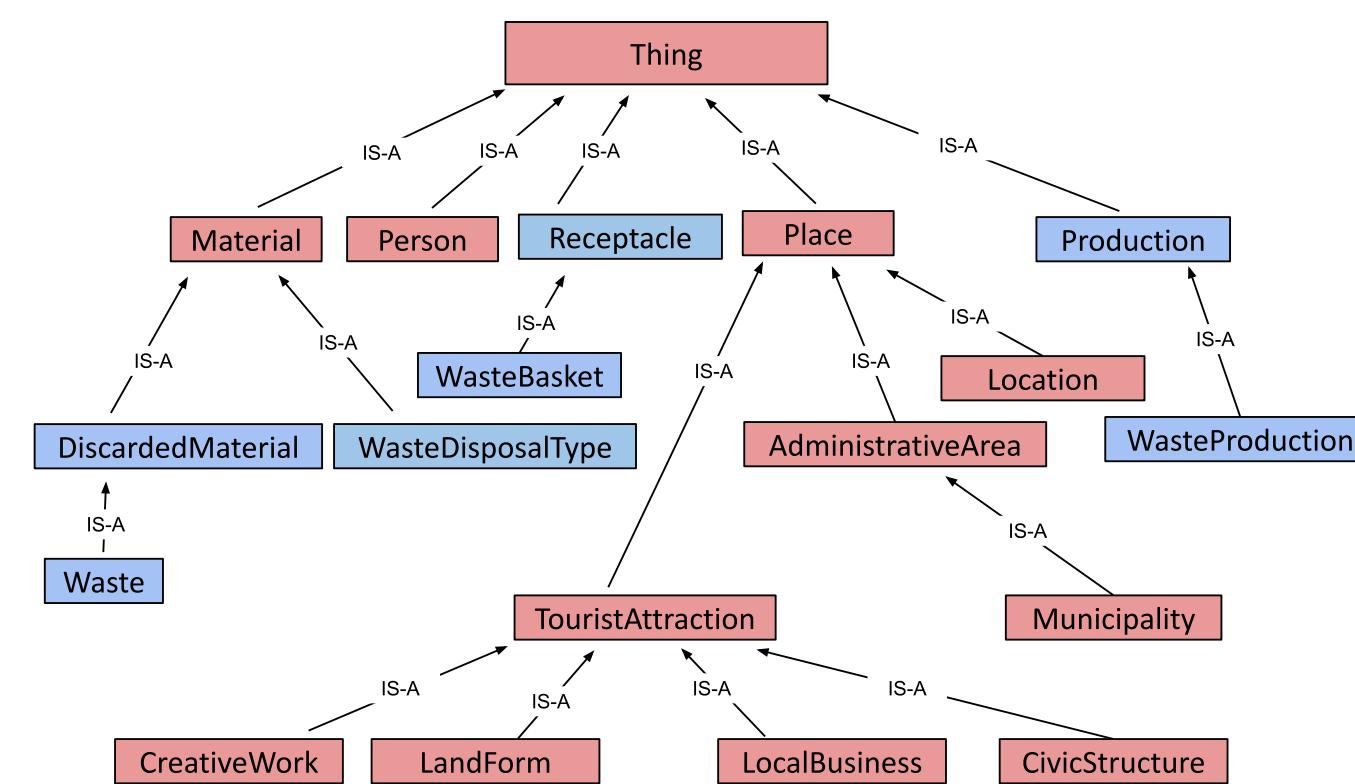
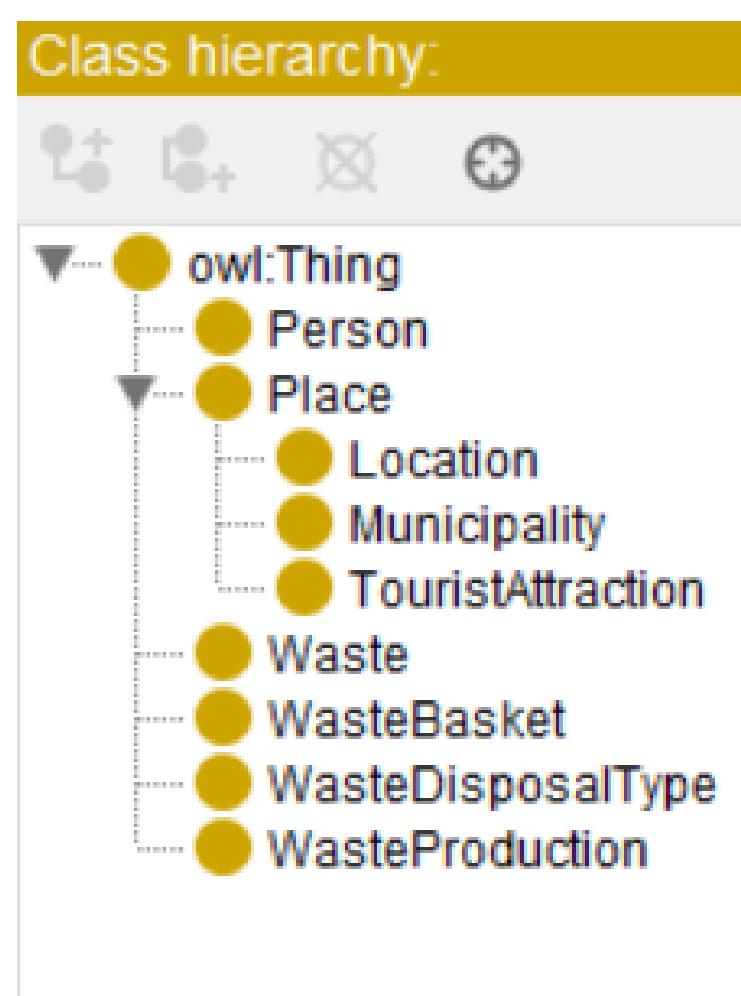
| ConceptID | Word-en | Gloss-en |
|---|------------------------------|--|
| KGE24-09-0002 | geometry | In GIS terminology, geometry refers to the spatial representation of geographic features, defining their shape, location, and size using points, lines, and polygons within a coordinate system. |
| UKC-45537 | municipality | An urban district having corporate status and powers of self-government. |
| UKC-103612 | dispose(s) | Throw or cast away. |
| UKC-71307 | waste | Any materials unused and rejected as worthless or unwanted. |
| UKC-2 | name | A language unit by which a person or thing is known. |
| KGE24-09-0001 | id | A unique identifier assigned to each record in a table, ensuring that each entry can be distinctly referenced and retrieved. |
| KGE24-09-0003 | disposal_method | The specific procedure or category used for waste management, indicating how waste is disposed of. Each method corresponds to a distinct waste type or disposal channel. |
| UKC-34248 | note | A brief written record. |
| UKC-31356 | category | A general concept that marks divisions or coordinations in a conceptual scheme. |
| KGE24-09-0004 | category_of | A relationship that associates an entity with a specific category or classification. |
| KGE24-09-0005 | waste_disposal_type | A classification that defines the specific category of waste based on its composition and characteristics. |
| KGE24-09-0001 | id | A unique identifier assigned to each record in a table, ensuring that each entry can be distinctly referenced and retrieved. |
| UKC-31356 | category | A general concept that marks divisions or coordinations in a conceptual scheme. |
| KGE24-09-0006 | organic | Waste derived from living organisms, including food scraps, garden clippings, and other biodegradable materials. |
| KGE24-09-0007 | paper | Discarded materials made of cellulose pulp, such as newspapers, office paper, and cardboard, that are often recyclable. |
| KGE24-09-0008 | glass | Broken or discarded items made of brittle, transparent material, such as bottles, jars, and windows. |
| KGE24-09-0009 | metal | Discarded metallic items, including cans, tools, and construction materials, typically recyclable due to their conductive and malleable properties. |
| KGE24-09-0010 | plastic | Non-biodegradable synthetic materials discarded as waste, including packaging, containers, and single-use items. |
| KGE24-09-0011 | textile | Waste composed of fabric materials, both natural and synthetic, from clothing, upholstery, or manufacturing processes. |
| KGE24-09-0012 | electronic_waste | Discarded electronic devices and components, such as phones, computers, and batteries, often containing hazardous materials. |
| KGE24-09-0013 | wood | Discarded wooden materials from furniture, construction, or pruning, often recyclable or compostable. |
| KGE24-09-0014 | construction_waste | Waste generated from building, renovation, or demolition activities, including concrete, bricks, metals, and wood. |
| KGE24-09-0015 | miscellaneous | A mixed category of waste that does not fit into standard classifications, often requiring special handling or sorting. |
| UKC-3 | description | A statement that represents something in words. |
| KGE24-09-0016 | waste_baskets_disposal_types | A classification that associates each physical waste basket with the specific types of waste it is designed to accept. |
| KGE24-09-0001 | id | A unique identifier assigned to each record in a table, ensuring that each entry can be distinctly referenced and retrieved. |
| https://wiki.openstreetmap.org/wiki/Tag:tourism%3Dviewpoint | viewpoint | A place, often high, with a good view of surrounding countryside or notable buildings, where tourists, visitors, hikers might like to visit and take photographs. |
| https://wiki.openstreetmap.org/wiki/Tag:water%3Dlake | lake | a natural or semi-natural body of relatively still fresh or salt water, localized in a basin that is surrounded by land. |
| https://wiki.openstreetmap.org/wiki/Rivers | river | A natural flowing watercourse, usually freshwater, flowing towards an ocean, sea, lake or another river. |
| https://wiki.openstreetmap.org/wiki/Tag:natural%3Dpeak | peak | The top (summit) of a hill or mountain - is immaterial and maps the highest point of a natural or renaturalised physical feature. |
| https://en.wikipedia.org/wiki/Protected_area | protected area | locations which receive protection because of their recognized natural or cultural values. |
| https://wiki.openstreetmap.org/wiki/Tag:natural%3Dbeach | beach | A loose geological landform along the coast or along another body of water consisting of sand, gravel, shingle, pebbles, cobblestones or sometimes shell fragments etc |
| https://wiki.openstreetmap.org/wiki/Tag:natural%3Dcave_entrance | cave entrance | the entrance to a cave (natural underground space large enough for a human to enter) |
| https://wiki.openstreetmap.org/wiki/Tag:tourism%3Dhotel | hotel | An establishment that provides paid lodging, usually on a short-term basis. |
| https://wiki.openstreetmap.org/wiki/Tag:tourism%3Dcamp_site | camp site | An area, usually divided into a number of pitches, where people can camp overnight using tents, camper vans, caravans (aka RVs or motorhomes). |
| https://wiki.openstreetmap.org/wiki/Tag:tourism%3Dcaravan_site | caravan site | a place where people with caravans / motorhomes / recreational vehicles can stay overnight, or longer, in allotted spaces known as "pitches" or "sites". |



Legend:

- █ Entity Types (ETypes)
- █ Data Properties
- █ Data values
- █ Object Properties

Teleology, EER model & Teleontology



Fourth iTelos phase - Knowledge Definition

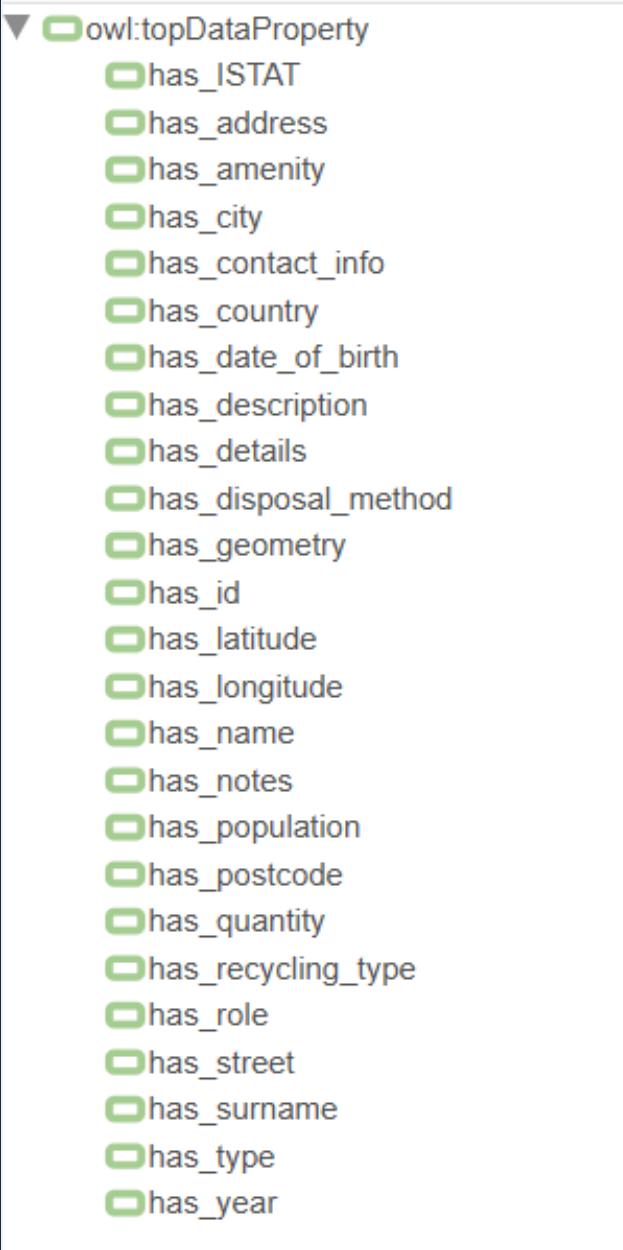
Final Teleontology



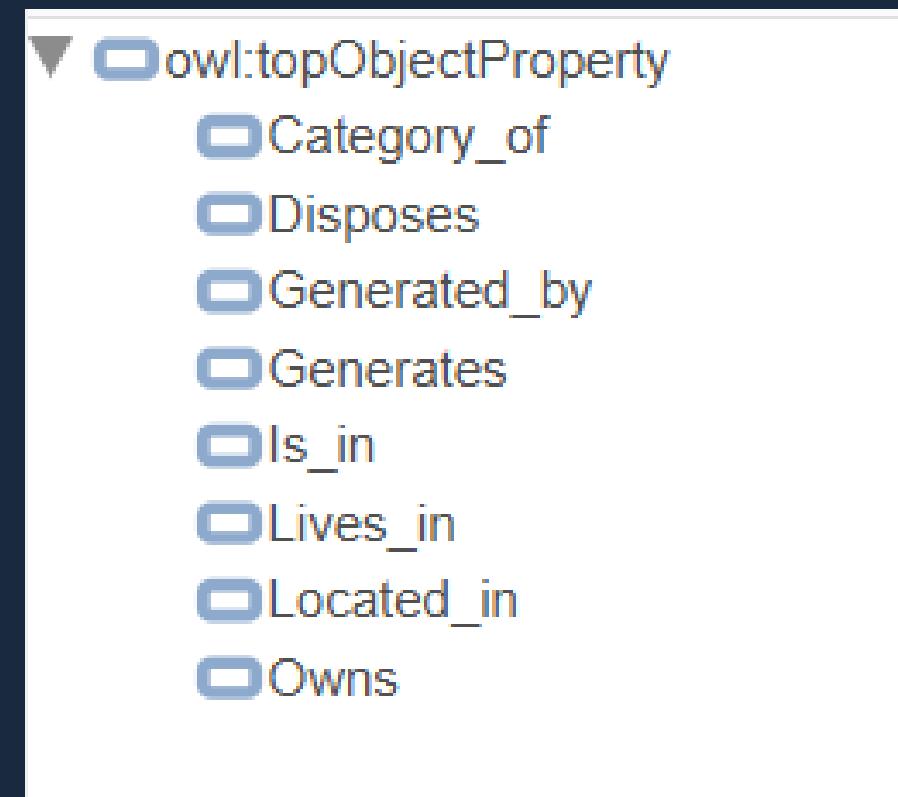
Aligned Teleontology



Data properties

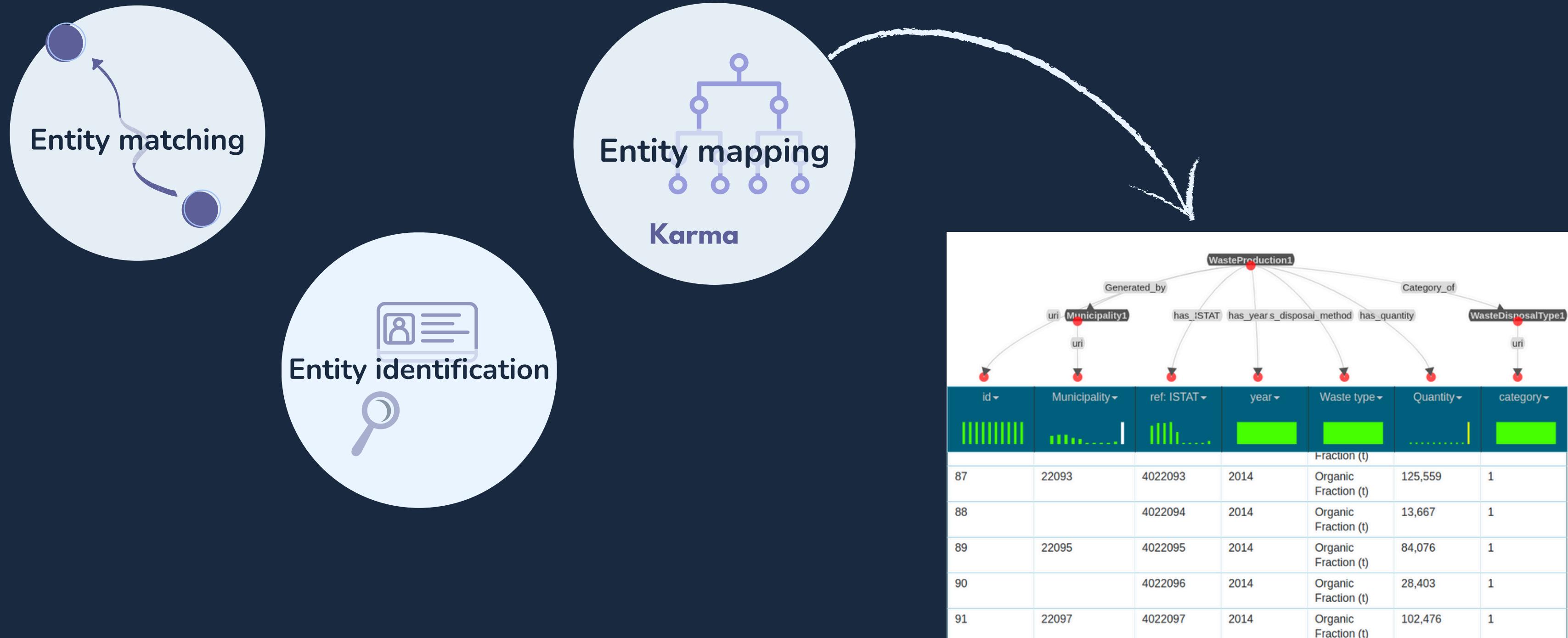


Object properties



Fourth iTelos phase - Knowledge Definition

Entity Definition



Fifth iTelos phase - Entity Definition

Knowledge Layer & Data Layer Evaluation

Knowledge Layer

| | Purpose Satisfaction | Reusability |
|----------------|--|--|
| Etype Level | $Cov_E(CQ_E) = \frac{CQ_E \cap T_E}{CQ_E} = \frac{6}{9} \approx 0.7$ | $Cov_E(RO_E) = \frac{RO_E \cap T_E}{RO_E} = \frac{6}{6} = 1$ |
| Property Level | $Cov_p(CQ_p) = \frac{CQ_p \cap T_p}{CQ_p} = \frac{30}{42} \approx 0.7$ | $Cov_p(RO_p) = \frac{RO_p \cap T_p}{RO_p} = \frac{17}{17} = 1$ |

Data Layer

Entity Connectivity:

$$EC(KG) = \sum_{X=1}^N EC(X) = 9.5$$

$\frac{\sum_{Y=1}^N (X, Y)}{OP(X)}$

Property Connectivity:

$$PC(KG) = \sum_X PC(X) = 7$$

$\frac{(X, X)}{DP(X)}$

Sixth iTelos phase - Evaluation

Query Execution



Query - CQ2:
given my coordinates retrieve the closest waste baskets - ex: from Monte Bondone, one of the most popular skiing destinations near Trento, 45.9881°N, 11.0308°E.



Query - CQ1:
retrieve data on the total quantity of plastic waste generated in municipalities that host tourist attractions related to skiing during 2022.



Query - CQ6:
retrieve all recycling facilities located in the province of Trento along with the waste basket identifier, its geospatial location and Municipality name, and the associated waste disposal type.



Query - CQ8:
retrieve the difference in waste production between 2020-2018 and 2022-2020 for each waste type for the municipalities with the highest number of tourist attractions.

Metadata

We created different metadata tables for the following project aspects:

- Project
- Data Resources
- Knowledge Resources
- Language Resources

Open Issues

- **Knowledge Layer:** Need for broader ontology integration beyond schema.org regarding waste management.
- **Data Layer:** Missing/incomplete regulations & OpenStreetMap data gaps.
- **Future Enhancements:** Potential inclusion of personal data for real-time, dynamic queries.

