LANDSLIDE HAZARD AND RISK MAP PROJECT

AUTHORS
Giovanni Montefoschi
Zhanbin Wu
Xiao Tan

INSTRUCTOR
Giovanni Quattrocchi

TA:Vasil Yordanov

Group name:Hazard_Maps_Project-SE4GEO

LANDSLIDE HAZARD AND RISK MAP

An interactive application to support disaster management activities

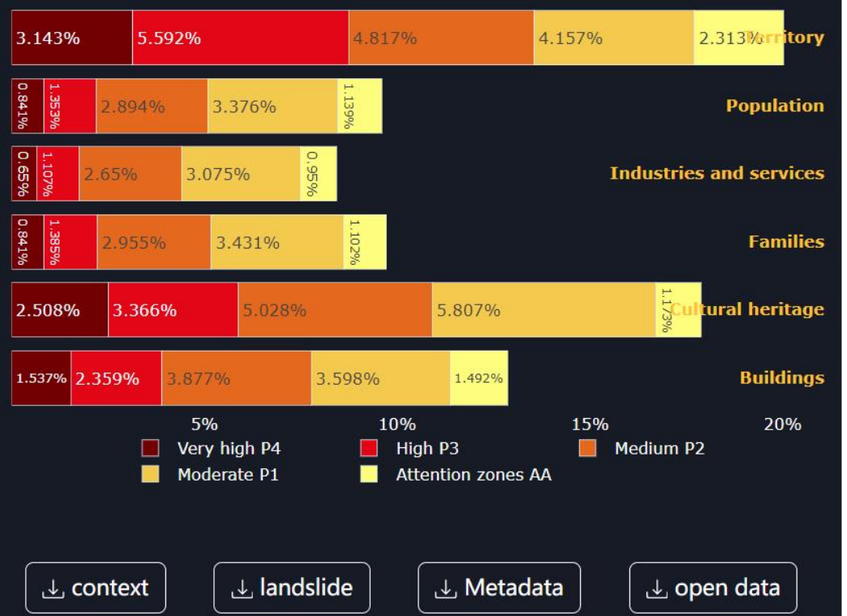
Select a region

Italy

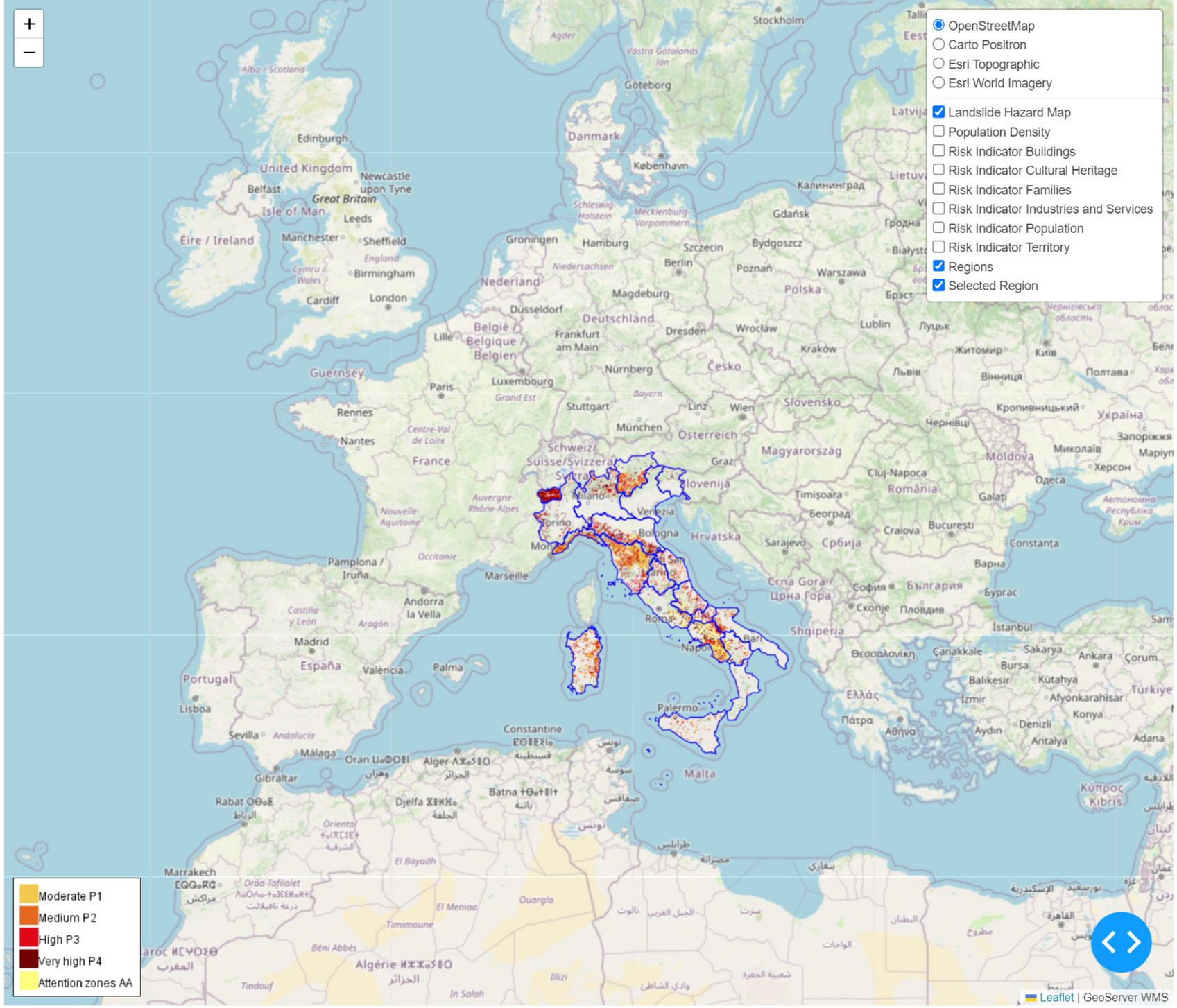
Context Data

302,068 km² Territory	**4,806,014** Industries and services	**14,515,795** Buildings	**213,360** Cultural heritage
	59,433,744 Population	**24,611,766** Families	
	14% Children (0-14)	**65%** Adults (15-64)	**20%** Elderly (65+)

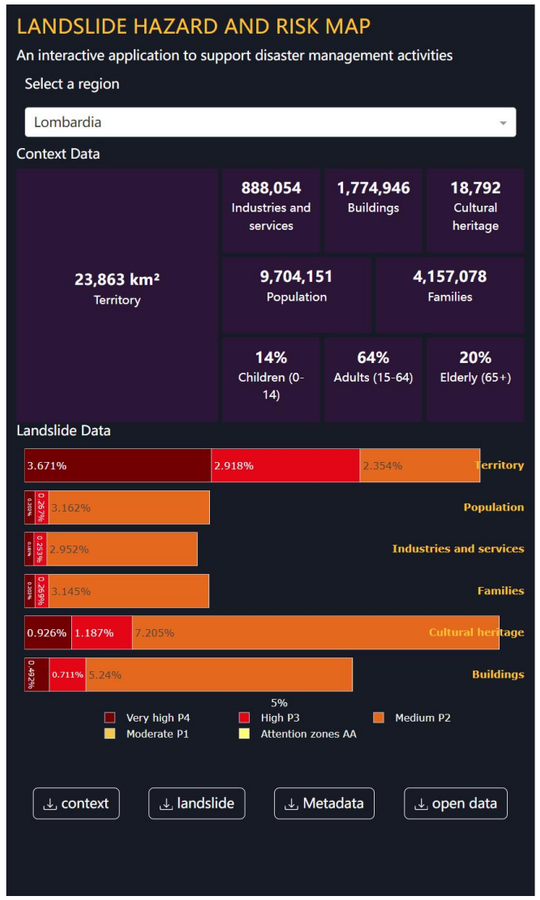
Landslide Data

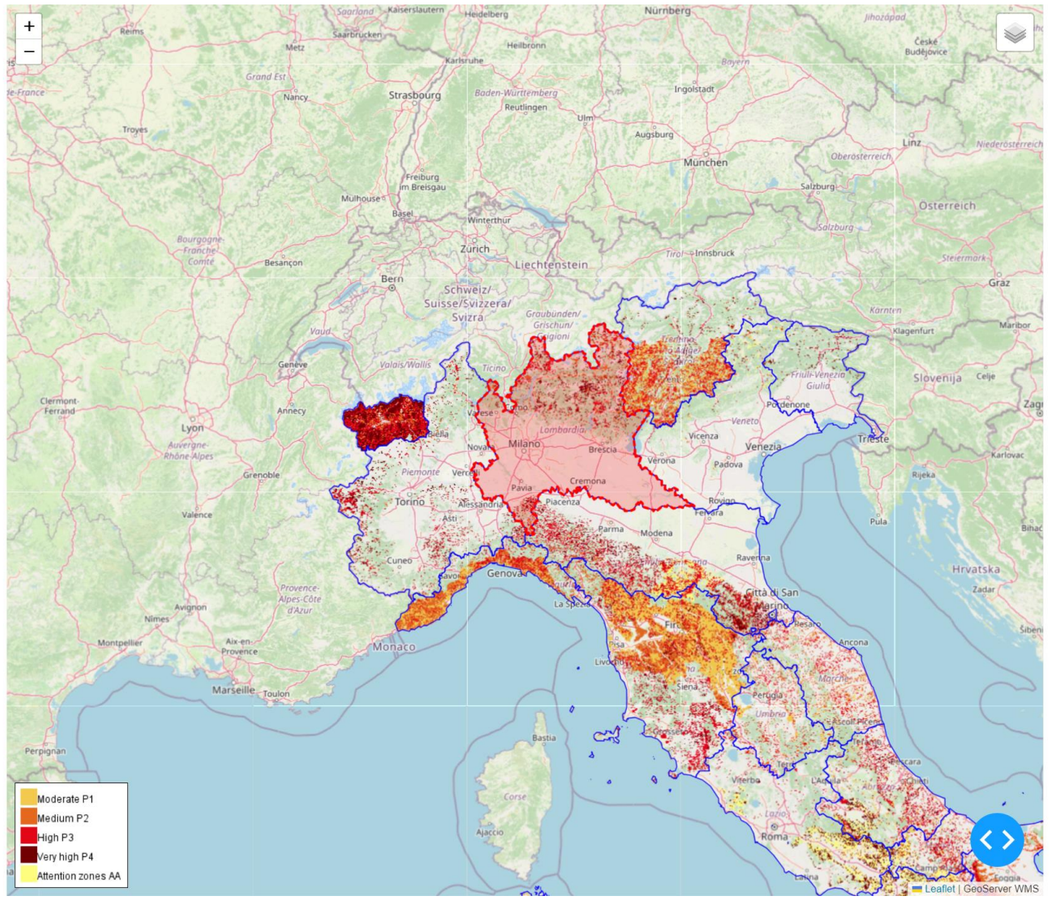


context | landslide | Metadata | open data

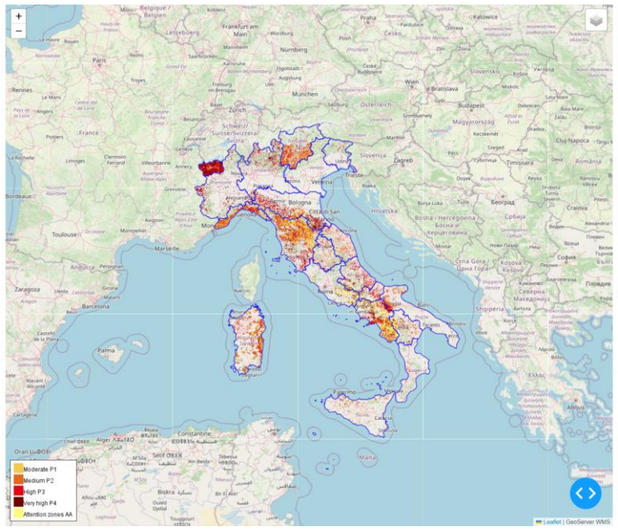


dashboard

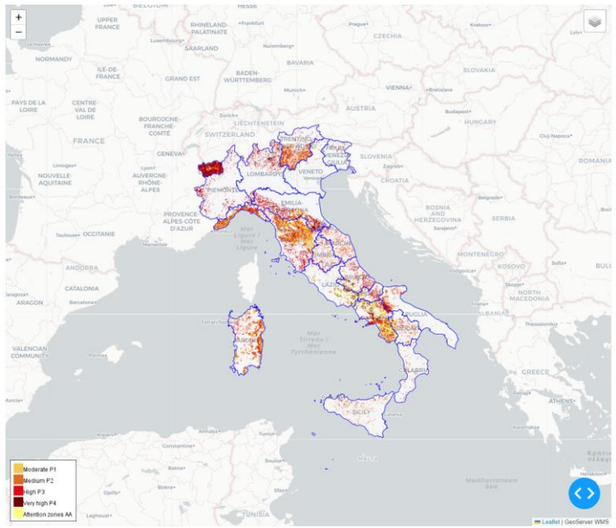




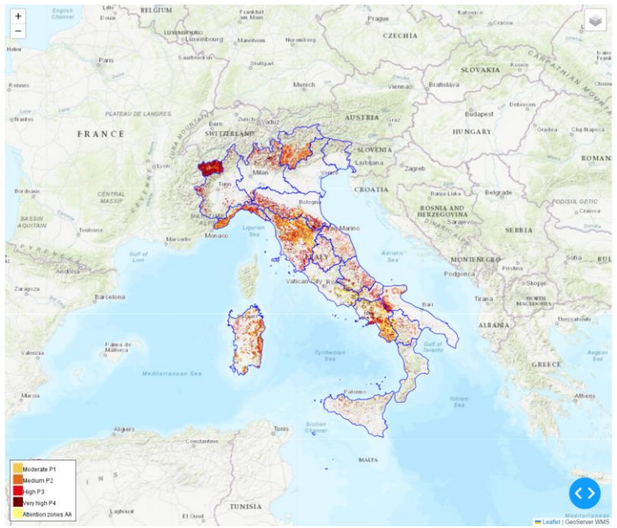
regional level



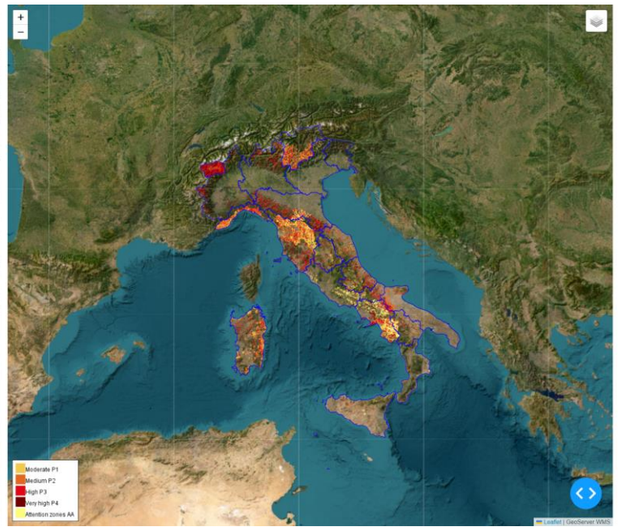
Open street map



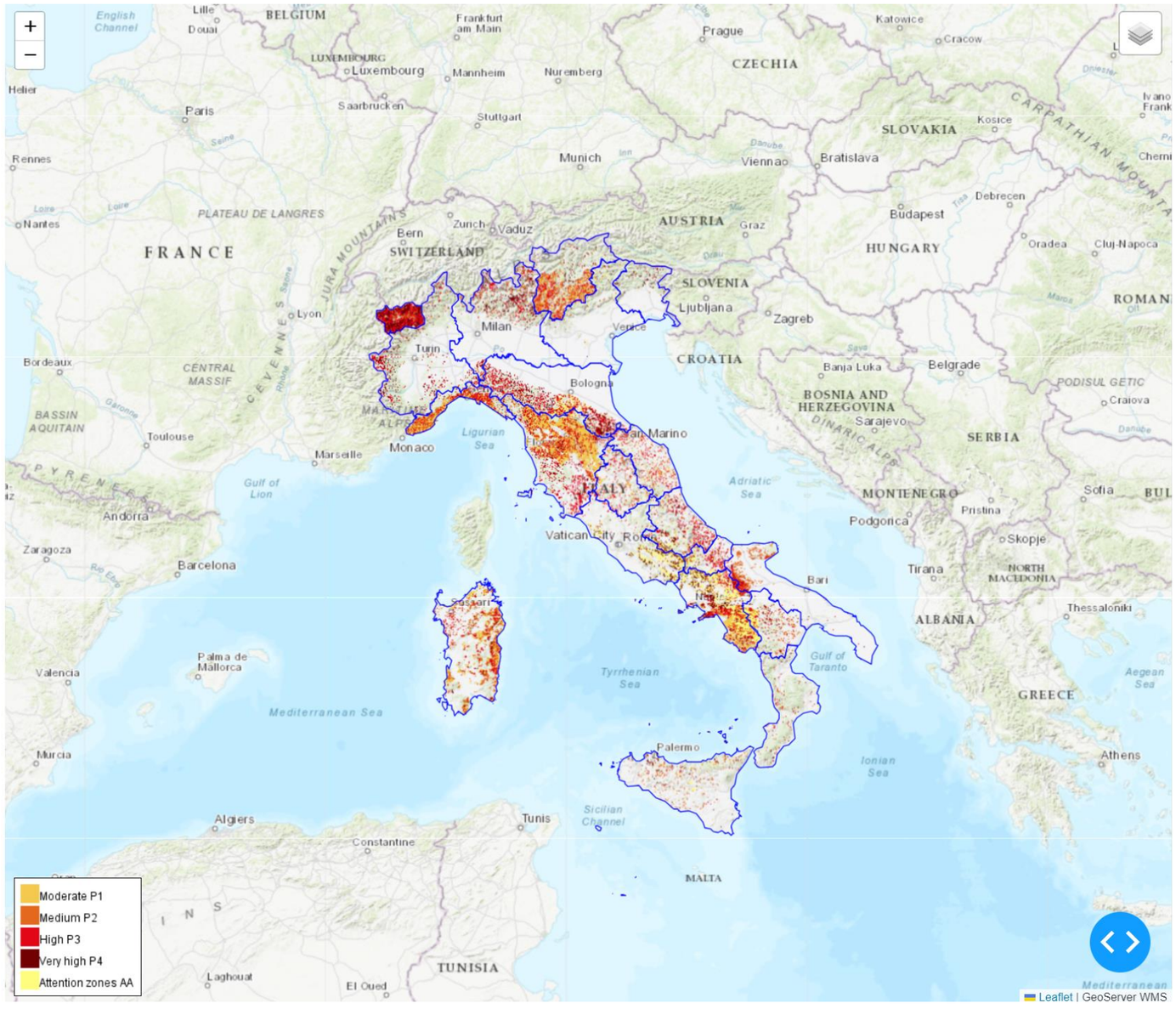
Carto Positron



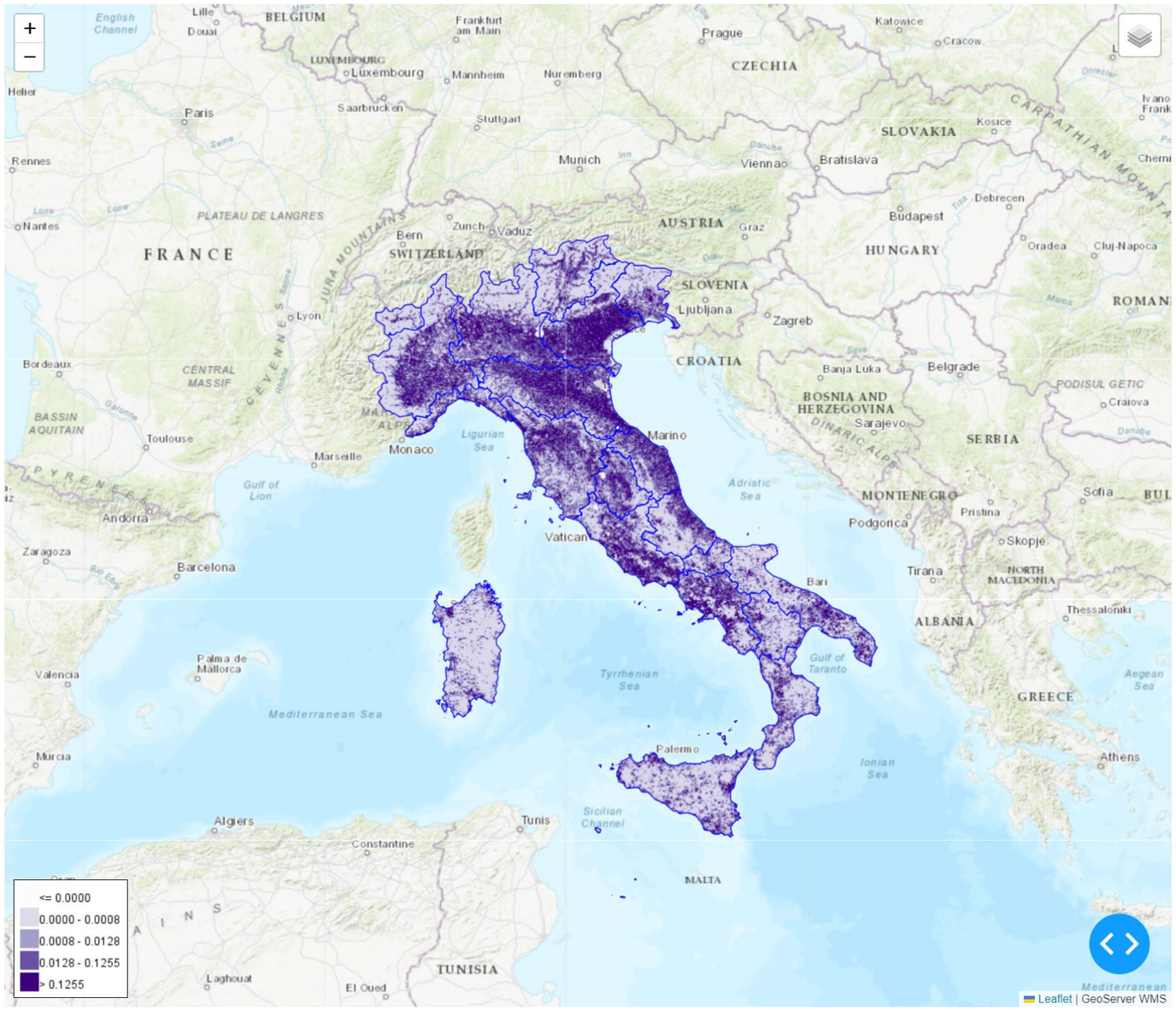
Esri Topographic



Esri World Imagery



Landslide Hazard Map

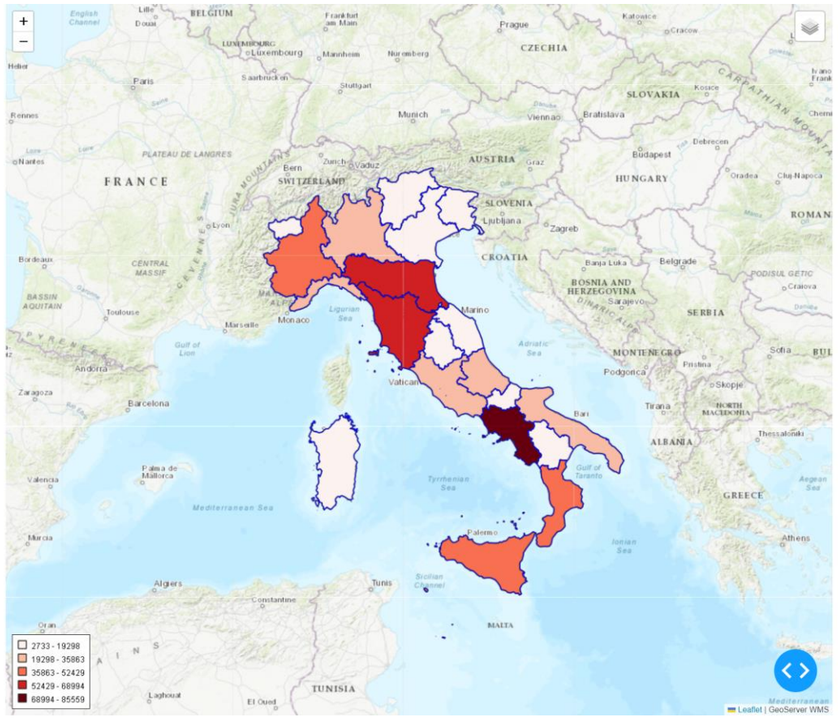


Population Density

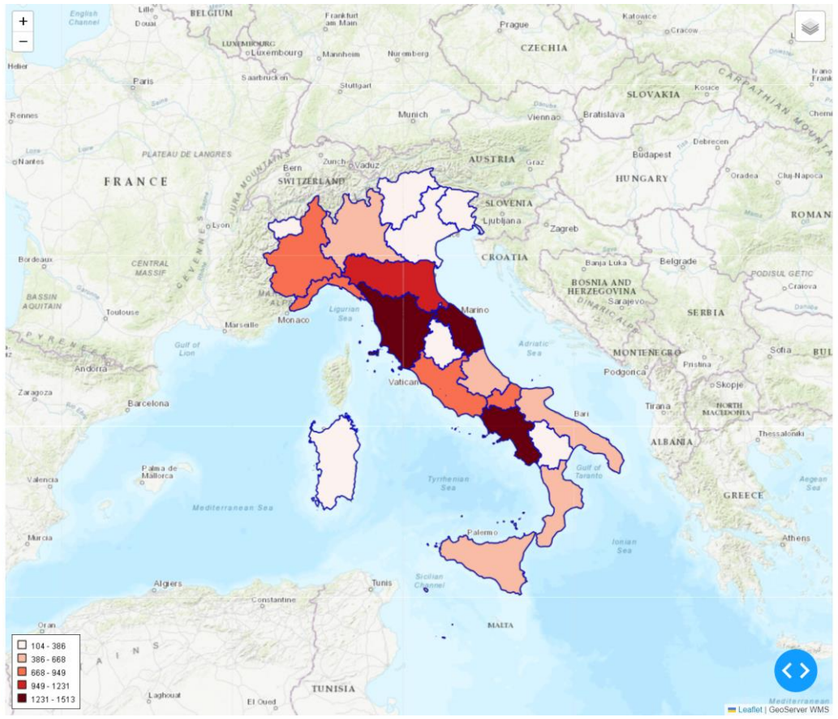
GeoServer

Regions

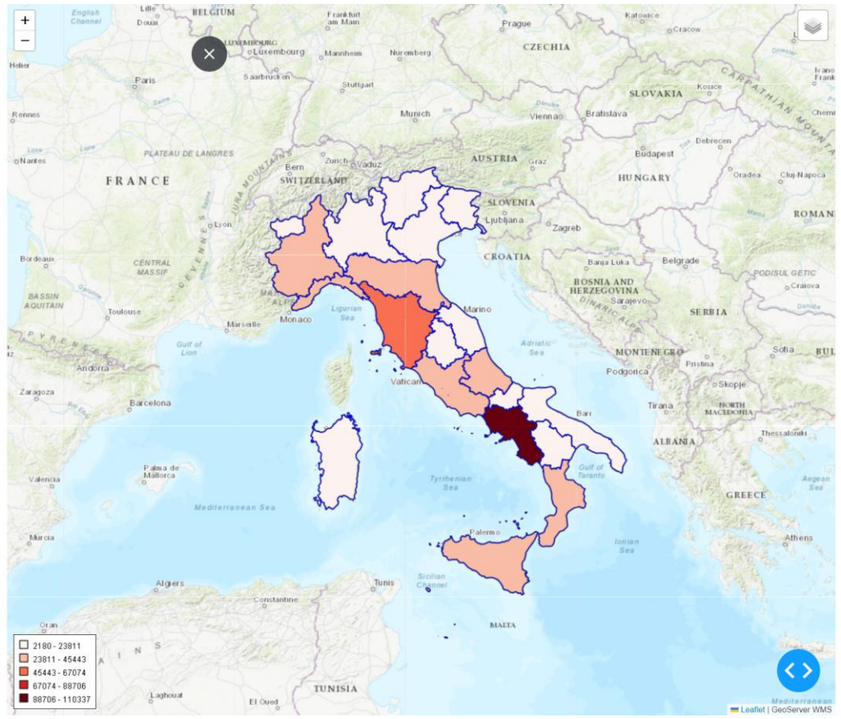
Selected Region



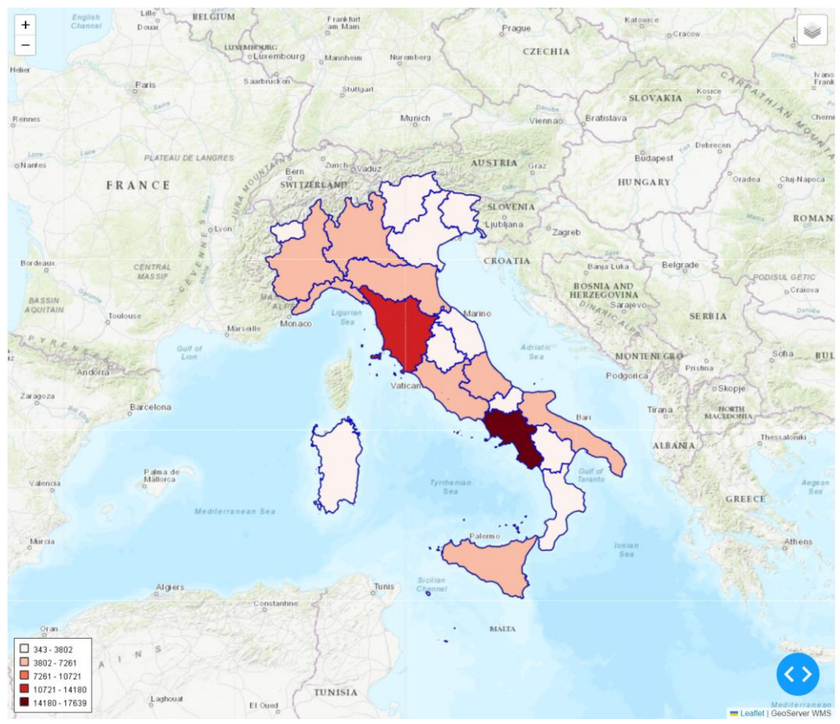
Risk Indicator Buildings



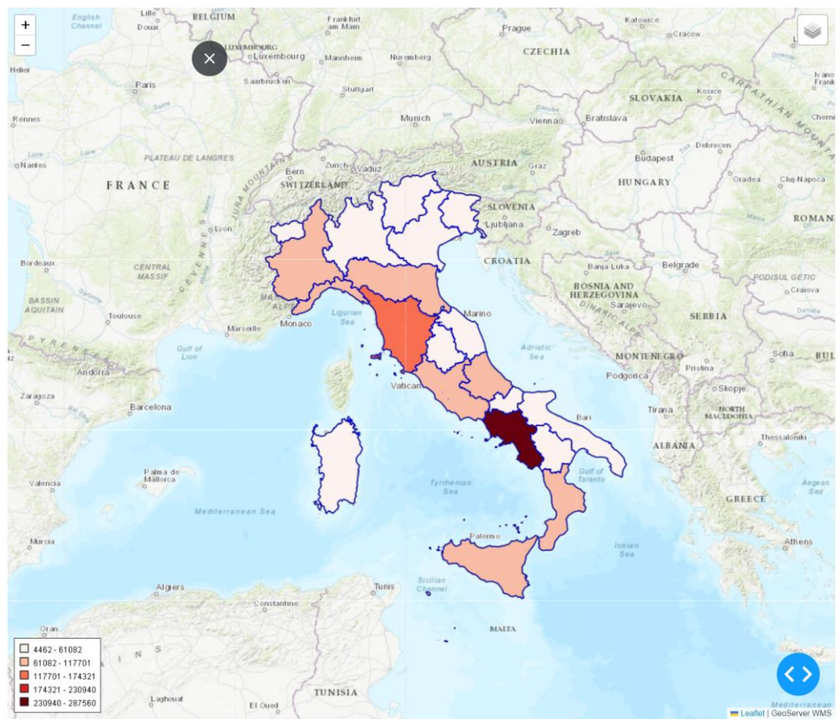
Risk Indicator Cultural Heritage



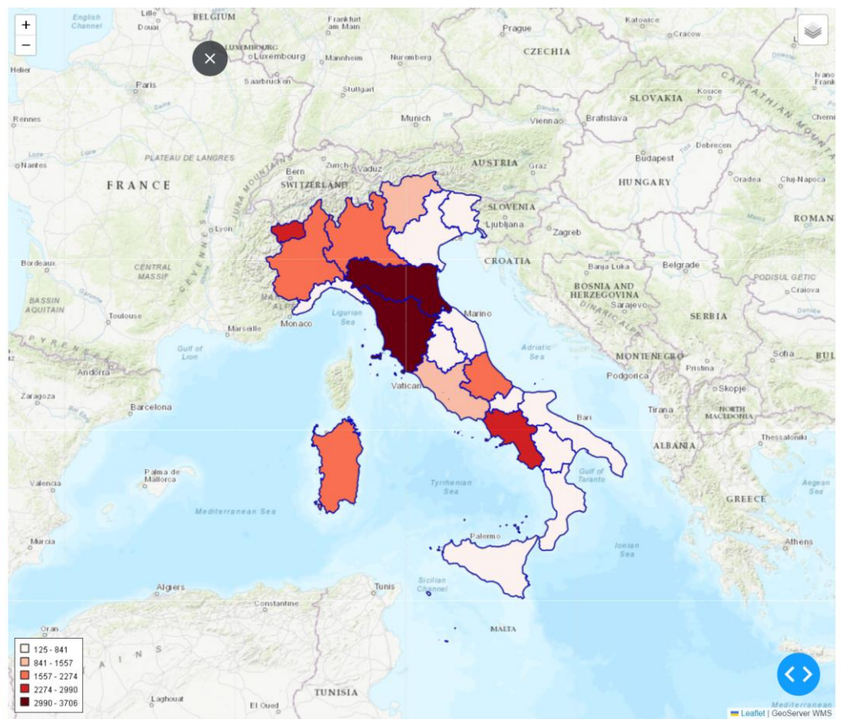
Risk Indicator Families



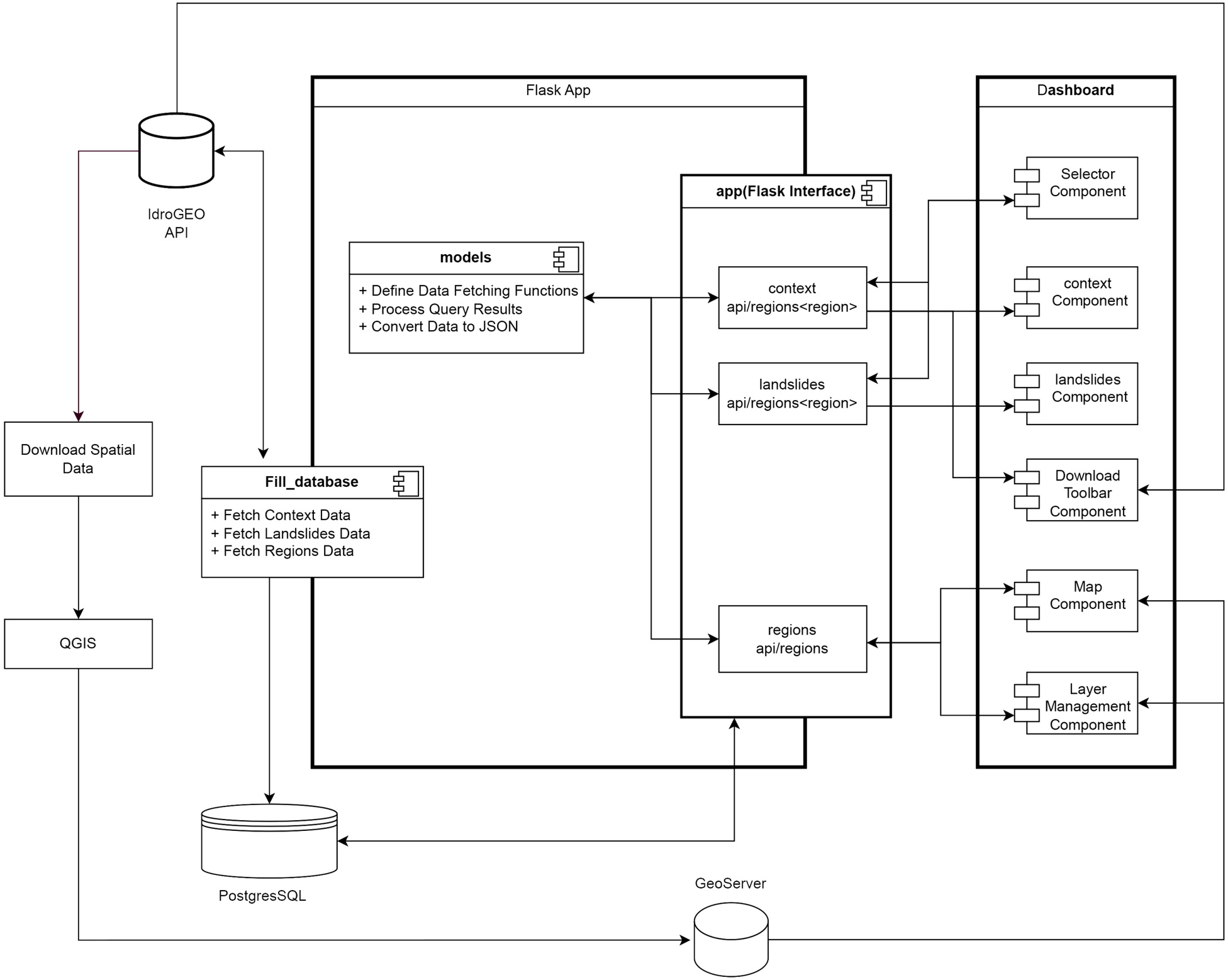
Risk Indicator Industries and Services



Risk Indicator Industries and Services



Risk Indicator Industries and Services



Component Diagrams

	regions
Primary Key	id
	cod_rip
	cod_reg
	den_reg
	shape_leng
	shape_area
	geom

Foreign Key

	context_data_{id}
	territory_km2
	industries...
	buildings
	cultural...
	population
	families
	children...
	adults...
	elderly...

Foreign Key

	landslides_data_{id}
	category
	territory
	population
	families
	buildings
	industries_and...
	cultural_heritage

Database ER diagram

	id bigint	cod_rip bigint	cod_reg bigint	den_reg text	shape_leng double precision	shape_area double precision	geom geometry
1	1	1	1	Piemonte	1234644.01493	25391636805.5	0106000020787F0000010000000103000000030000000EA13000060F5B9DA55F01B41645DDC72E7
2	2	1	2	Valle d'Aosta	311187.149916	3258608423.93	0106000020787F0000010000000103000000001000000AE0400002073D792F2D71741D478E98A6D
3	3	1	3	Lombardia	1411360.47581	23862867853.3	0106000020787F0000040000000103000000010000000400000D0915CFE81A21D417E6ABC2899
4	4	2	4	Trentino-Alto Adige	800731.661919	13605964490.5	0106000020787F0000010000000103000000010000000720E0000E80434D1D3AE2641984C15BC6C
5	5	2	5	Veneto	1056503.58204	18351494741.1	0106000020787F0000010000000103000000080000008A110000107A366B0E7127415E4BC85F0F
6	6	2	6	Friuli-Venezia Giulia	659341.083253	7936833767.7	0106000020787F0000020000000103000000010000003B000000A83E575BF9942A41C898BB3604
7	7	1	7	Liguria	821916.468558	5417714496.69	0106000020787F0000090000000103000000010000001100000028A913B0475721412EB29DB78E
8	8	2	8	Emilia-Romagna	1176991.66838	22501817675.9	0106000020787F0000040000000103000000010000001200000E0C798DBCFDE2241EE5A426A48
9	9	3	9	Toscana	1304649.60395	22985007078.5	0106000020787F0000240000000103000000010000004C000000D066D5475F952441782D2137F6
10	10	3	10	Umbria	619404.571083	8463968722.17	0106000020787F0000020000000103000000010000002800000038EF38452CB6274184C0CA75F4
11	11	3	11	Marche	618848.328436	9344542629.09	0106000020787F0000010000000103000000020000000E3090000F80FE9777D7C28410EBE305DBB
12	12	3	12	Lazio	1056599.44	17236487921.2	0106000020787F0000010000000103000000010000001A000000B88D06D0EBBB2A412063EE92A2
13	13	4	13	Abruzzo	613572.801521	10828888286.1	0106000020787F0000010000000103000000010000000EB090000381AC09B7D852B4198BB964026
14	14	4	14	Molise	433630.82851	4459797834.28	0106000020787F0000010000000103000000010000000BB08000008A3921A1A052E41FEB27B3A61
15	15	4	15	Campania	890506.464536	13667847424.5	0106000020787F00000F0000000103000000010000000900000078832FEC24A82F41FA5C6D9520
16	16	4	16	Puglia	1182953.11178	19541033601.1	0106000020787F00001F0000000103000000010000000D000000EC9E3C1C7C8A3341A245B6EF0E
17	17	4	17	Basilicata	613038.362707	10071594221.5	0106000020787F0000030000000103000000010000001600000007424970F2B6230417EAEB60681I
18	18	4	18	Calabria	847415.624343	15212651631.1	0106000020787F0000050000000103000000010000001C0000004C5986D8DE873041AEB6622FD7
19	19	5	19	Sicilia	1344687.69115	25824319687.6	0106000020787F0000340000000103000000010000001200000907EFBBAEA1C29411C38675C25
20	20	5	20	Sardegna	1449230.54457	24106296672	0106000020787F0000AA0000000103000000010000001700000E03D7998B6641B414AEA04B0F0

Regions(geopandas dataframe)

	Territory (km²) double precision	Industries and services bigint	Buildings bigint	Cultural heritage bigint	Population bigint	Families bigint	Children (0-14) % double precision	Adults (15-64) % double precision	Elderly (65+) % double precision	Population at risk of Landslides bigint	Population at risk of Floods bigint
1	25386.697	369062	1135209	14617	4363916	1953360	12.926	63.514	23.559	699621	213655

context_data_{id}

	Category text	Territory text	Population text	Families text	Buildings text	Industries and services text	Cultural heritage text
1	Very high P4	697 (2.748%)	36843 (0.844%)	17128 (0.877%)	22292 (1.964%)	2498 (0.677%)	370 (2.531%)
2	High P3	885 (3.487%)	45771 (1.049%)	21047 (1.077%)	24263 (2.137%)	3360 (0.91%)	394 (2.695%)
3	Medium P2	133 (0.526%)	64891 (1.487%)	29729 (1.522%)	23878 (2.103%)	5442 (1.475%)	482 (3.298%)
4	Moderate P1	0 (0.001%)	0 (0%)	0 (0%)	1 (0%)	0 (0%)	0 (0%)
5	Attention zones AA	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
6	P4 + P3	1582 (6.235%)	0 (0%)	0 (0%)	46555 (4.101%)	0 (0%)	0 (0%)
7	None zones	23647 (93.238%)	4216548 (96.620%)	1885606 (96.524%)	1064866 (93.796%)	357740 (96.938%)	13372 (91.476%)

landslides_data_{id}

GET /regions

- **Description:** Retrieve data for all regions.
- **Request Parameters:** None.
- **Response:** Returns basic information and geometric data for all regions.
- **Code:**

```
@app.route("/regions", methods=["GET"])
def get_regions_endpoint():
    return get_regions(conn=conn)
```

```
# models.py function
def get_regions(conn):
    df = pd.read_sql_table(table_name='regions', con=conn)
    df_json = df.to_json(orient="records")
    return df_json
```

GET /context/ string:id

- **Description**: Retrieve statistical data for a specific region.
- **Request Parameters**:

  id: Unique identifier of the region (string format).

- **Response**: Returns statistical data for the specified region, including information on population, households, buildings, industries and services, cultural heritage, and territories.
- **Code:**

```
@app.route("/context/string:id", methods=["GET"])
def get_context_endpoint(id):
    table_name = f'context_data_{id}'
    return get_context(conn=conn, table_name=table_name)

# models.py function
def get_context(conn, table_name):
    df = pd.read_sql_table(table_name=table_name, con=conn)
    df_json = df.to_json(orient="records")
    return df_json
```

GET /landslides/ string:id

- **Description:** Retrieve landslide risk data for a specific region.
- **Request Parameters:**

  id: Unique identifier of the region (string format).

- **Response:** Returns landslide risk data for the specified region, including data for different risk categories such as very high risk (P4), high risk (P3), moderate risk (P2), low risk (P1), and attention area (AA).
- **Code:**

```
@app.route("/context/string:id", methods=["GET"])
def get_context_endpoint(id):
    table_name = f'context_data_{id}'
    return get_context(conn=conn, table_name=table_name)

# models.py function
def get_context(conn, table_name):
    df = pd.read_sql_table(table_name=table_name, con=conn)
    df_json = df.to_json(orient="records")
    return df_json
```

REST APIs