

Assessment of the length of roads and railways inside END agglomerations in 2022



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Summary

This report is part of the ETC/HE 2024 Action Plan Task “3.2.4.1 Analysis of Noise Dataflows,” specifically addressing Subtask 2, “Analysis of Changes in Reported Data Between Reporting Cycles (DF1_5 and DF4_8) 2017 and 2022.” The aim of this task is to provide a country-level summary of changes between 2017 and 2022, offering valuable insights into the status of environmental noise across Europe. The results of the changes on noise exposure are analysed under ETC/HE 2025 Action Plan Task “3.2.4.1 Analysis of noise data – Subtask 1: Update new re-harvested data from end 2024”, results that has been included in the Noise in Europe report (<https://www.eea.europa.eu/en/analysis/publications/environmental-noise-in-europe-2025>). This methodological document compiles the methodology followed for this calculation, and the results contained the data processed in 2024 and in 2025 (cut off date 18/11/2025).

The analysis focuses on assessing the length of roads and railways within Environmental Noise Directive (END) agglomerations covered by noise contour maps reported in DF4_8 Strategic Noise Maps for agglomerations⁽¹⁾ in 2022 by member states. Key activities include overlaying noise contour maps with OpenStreetMap data to estimate the coverage of roads and railways inside END agglomerations.

The outputs of this methodology consist of tables (in Excel format) that detail the coverage levels by each END agglomeration where data for noise contour maps inside agglomeration for road traffic noise and for rail traffic noise respectively have been provided.

⁽¹⁾ In the case of Austria, the data submitted under DF4_8 Strategic Noise Maps for Major Roads and for Major Railways have been considered for the analysis.

1 Methodology

1.1 Input data

The analysis of the coverage of the Open Street Map (OSM) network by the Environmental Noise Directive (END) noise contour bands requires the following data sets:

1. **Noise contour maps** for railway and road traffic noise corresponding to the 2022 round of noise mapping inside END agglomerations and delivered up to 18/11/2024. The noise contour maps are reported voluntarily by the Member States.
2. **END agglomerations**. Consists of urban areas with more than 100,000 inhabitants. For each agglomeration, data must include the location, size, and number of inhabitants.
3. **Open Street Map (OSM)**. This is a collaborative project that creates and provides free geographic data and mapping. Cartographic components are systematized by a consistent hierarchical system of tags.

1.2 Workflow

The methodology is summarised in Figure 1 and can be described as follows:

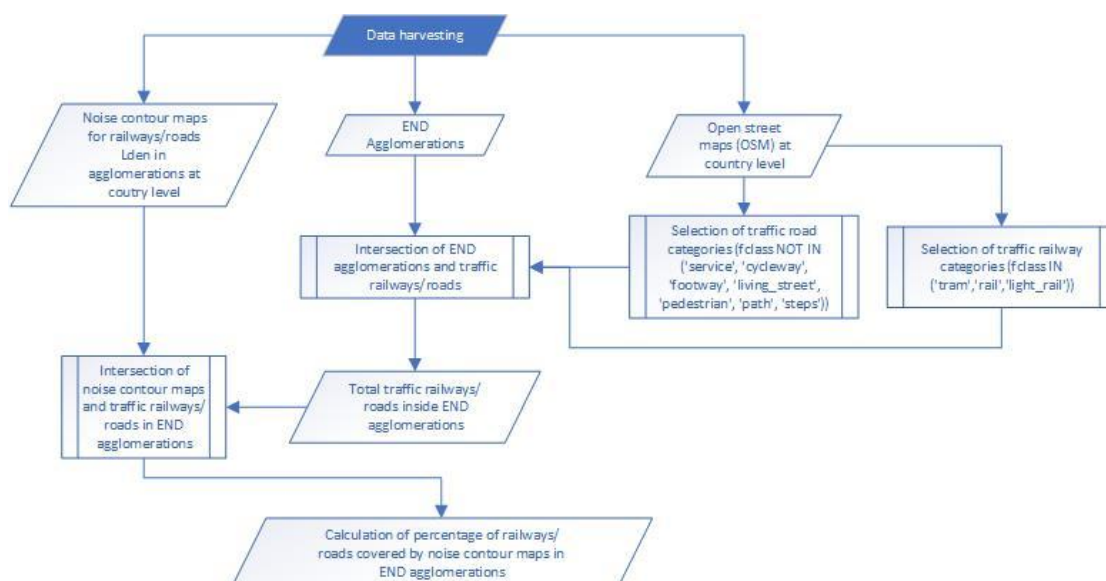
- Data harvesting of the different components required for the analysis:
 - Delineation of END agglomerations
 - Noise contour maps for the selected agglomerations where data is available
 - Open Street Map for selected agglomerations
- Selection of relevant elements:
 - Noise contour bands for road noise inside agglomerations and for rail noise inside agglomerations. The input information are the noise contour maps reported in DF4_8 Strategic Noise Maps for agglomerations⁽²⁾ in 2022 by member states.
 - Selection of streets with road traffic from OSM: Road segments with the following tags are selected:
 - highway=motorway,"Motorway","High-capacity roads designed for fast traffic, with limited access and no intersections.", "Major highways connecting cities or countries (e.g., Autobahns, Autoroutes)."
 - highway=trunk,"Trunk Road","Major roads connecting regions or cities, second only to motorways in importance.", "National or regional roads of strategic importance."
 - highway=primary,"Primary Road","Key regional roads linking smaller towns or important destinations.", "Main roads within regions or connecting large towns."
 - highway=secondary,"Secondary Road","Roads of medium importance, often connecting smaller towns or rural areas.", "Intermediate routes between villages and towns."
 - highway=tertiary,"Tertiary Road","Local roads providing access within towns or between villages.", "Roads serving local traffic or smaller settlements."

⁽²⁾ In the case of Austria, the data submitted under DF4_8 Strategic Noise Maps for Major Roads and for Major Railways have been considered for the analysis.

- highway=unclassified,"Unclassified Road","Minor roads that do not fit into higher categories, often rural or less important.","Small rural roads or minor connectors."
 - highway=residential,"Residential Road","Roads primarily serving residential areas.","Streets within neighborhoods and housing estates."
 - highway=service,"Service Road","Roads providing access to specific services or facilities (e.g., parking lots, industrial areas).","Access roads for businesses, parking areas, or industrial zones."
 - highway=track,"Track","Roads primarily used for agricultural or forestry purposes.","Farm tracks, logging roads, or paths in rural areas."
 - highway=path,"Path","Non-motorized routes for walking, cycling, or hiking.","Footpaths, cycleways, and hiking trails."
 - highway=cycleway,"Cycleway","Dedicated routes for bicycles.","Bike lanes, bike paths, and cycling infrastructure."
 - highway=footway,"Footway","Paths primarily for pedestrians.","Sidewalks, pedestrian-only streets, and urban walkways."
- Streets with the following tags are excluded since they are associated with pedestrian areas: 'service', 'cycleway', 'footway', 'living_street', 'pedestrian', 'path', and 'steps'
 - Selection of railways from OSM: Rail segments with the following tags are selected: 'tram', 'rail' and 'light_rail'
- Intersection of selected noise contour bands and OSM railways/roads with traffic.
 - Calculation of final statistics:
 - Length (unit: kilometre) of OSM railways/roads with traffic.
 - Length (unit: kilometre) of OSM railways/roads covered by noise contour bands.
 - Percentage of OSM railways/roads covered by noise contour maps.

The final statistics obtained refer to the lengths of OSM segments and percentage of OSM railways/roads coverage by noise contour maps in the corresponding END agglomeration.

Figure 1. Workflow to calculate the percentage of railways/roads covered by noise contour maps



1.3 Data harvesting

1.3.1 Open Street Map (OSM)

The primary reference for roads and railways data is the Geofabrik portal (<https://download.geofabrik.de/>), which provides OpenStreetMap (OSM) Data Extracts. These extracts are available in both “.osm.pbf” and shapefile formats. OpenStreetMap is a collaborative project, maintained by a global community of mappers, that offers free, editable maps of the world, including details on roads, trails, railways, and other infrastructure. Geofabrik’s data extracts, based on OSM, are updated daily, ensuring the most current information is accessible.

To download the data for each country, a specific FME process have been developed ("2_download_OSM"). This FME process automatically retrieves shapefiles for the following EEA member states and stores them locally on the EEA CWS: BE, CH, CY, CZ, DK, EE, FI, HR, IE, LT, LU, LV, MT, NO, PT, SE.

For larger countries where complete national extracts are unavailable, the data is divided into regional downloads. These downloads must be performed manually and later merged using ArcGIS Pro. This process applies to the following countries: DE, ES, FR, IT, NL, PL.

Finally, any data unrelated to roads and railways is manually removed from the download folder to ensure only relevant information is retained for further analysis.

1.3.2 END DF1_5 Agglomerations

The delineation of the END agglomerations is as follows: “ part of a territory delimited by the Member State having a population in excess of 100.000 persons and a population density such that the Member State considers it to be an urbanised area ”.

The polygons corresponding to the END agglomerations are reported in the dataflow Noise sources (DF1_5): Reference year 2020, under the data schema Agglomeration Source. The spatial information containing the END agglomerations’ polygons are extracted from the table AgglomerationSource table.

1.3.3 END DF4_8 Contour maps

The noise contour maps are part of the DF4_8: Strategic noise mapping reported as required by the Environmental Noise Directive (END). These maps are designed to provide detailed information about noise levels in specific areas. Noise contour maps are obligatory in the case of major airports, major roads and major railways submissions outside agglomerations, while noise contour maps can be provided on voluntary basis in the case of noise sources mapped inside agglomerations (i.e. roads, rails, airports and industrial areas inside agglomerations).

1.4 Data Processing

1.4.1 Querying Data for Road and Railway Segments

For the shapefiles downloaded directly via url using the FME project, the field used to filter the relevant road segments is “fclass”, using the following SQL query to exclude the irrelevant classes:

```
“fclass NOT IN ('service', 'cycleway', 'footway', 'living_street', 'pedestrian', 'path', 'steps’)”
```

This query is used on the fly in the main python scripts where the calculations are performed.

For the bigger countries the querying could be done two ways, download the data via ogr2ogr using the field “highway” to select relevant roads and “railway” field for railways or even download manually the regions and append afterwards within arcgispro.

If first option is used, for roads the query includes the following classes in the ogr2ogr sentence:

```
-WHERE "highway='trunk' OR highway='motorway' OR highway='primary' OR highway='secondary' OR highway='tertiary' OR highway='unclassified' OR highway='secondary' OR highway='residential' OR highway='motorway_link' OR highway='trunk_link' OR highway='primary_link' OR highway='secondary_link' OR highway='tertiary_link' OR highway='road'"
```

For railways the query includes the following classes in the ogr2ogr sentence:

```
-WHERE "railway='tram' OR railway='rail' OR railway='light_rail'"
```

Both ways are reliable and leads to the same results.

1.4.2 Calculate length

The script “CalcStatsRoads_v1.py” is designed to process and analyse OpenStreetMap (OSM) data to calculate the length of OSM roads covered in a specific agglomeration by END noise contour maps. Here's a brief overview of what it does:

1. **Setup and Initialization:**
 - Imports necessary libraries such as arcpy, pandas, and numpy.
 - Defines the main function clip_and_calculate_length which takes several parameters including country selection, OSM shapefile, contour shapefile, area shapefile, output CSV path, and a flag for repairing contours.
2. **Data Preparation:**
 - Checks out the ArcGIS Spatial Analyst extension.
 - Deletes any existing temporary data in the "in_memory" workspace.
 - Reprojects the OSM and contour shapefiles to EPSG:3035 coordinate system (projected coordinate system for Europe) if the data is not already projected.
3. **Processing Agglomerations:**
 - Iterates through each of the agglomerations in the area shapefile.
 - Clips the OSM roads and contour maps to the extent of each agglomeration.
 - The Clip function from ArcGis extract specific portions of spatial data from one layer based on the boundaries defined by another layer.
 - Filters the OSM roads to exclude certain types (e.g., service roads, cycleways).
4. **Length Calculation:**
 - Calculates the length of the clipped OSM roads and contour maps within each agglomeration.
 - Stores the lengths in lists for further processing.
5. **Data Aggregation and Export:**
 - Aggregates the results obtained in the previous step for each agglomeration.
 - Calculates the percentage of road length covered by contours for each agglomeration.
 - Exports the results to a CSV file and a DBF file.
6. **Cleanup:**
 - Deletes temporary data to free up memory.

The script is designed to be run as a standalone tool, with parameters provided through the ArcGIS interface.

Figure 2 – Standalone tool with both scripts used to calculate railway and road lengths

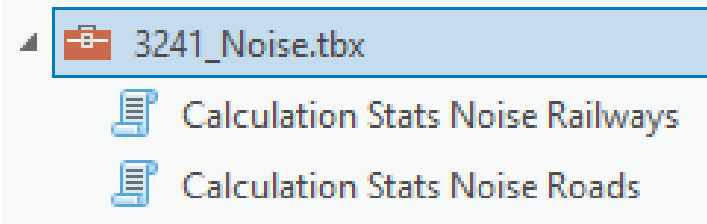
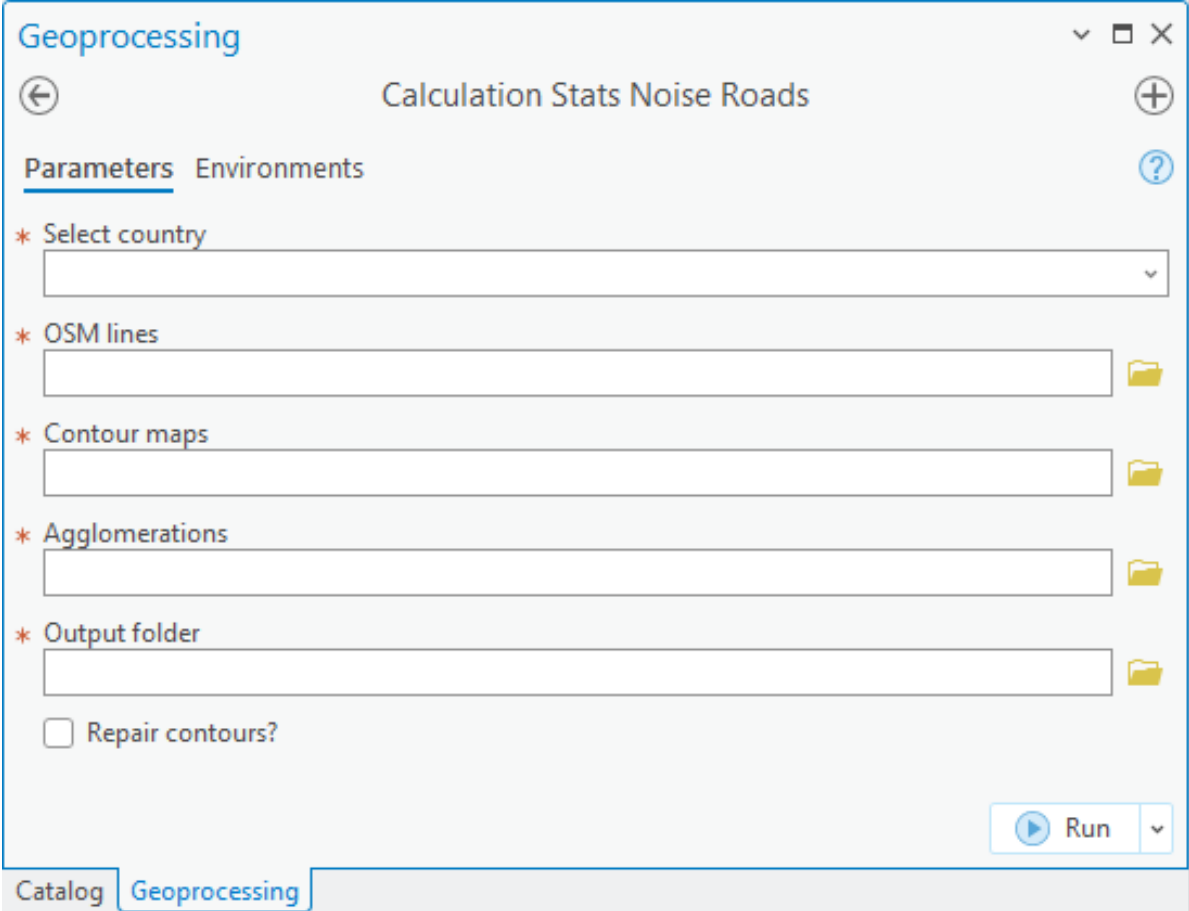


Figure 3 - Parameters to select prior to run the tool



To calculate railway coverage within END urban agglomerations, the same process is applied. Input data consists of railways selected from OSM tagged as 'tram', 'rail', or 'light_rail', processed using the script "CalcStatsRails_v1.py". The result obtained is the railway length covered by END noise contour maps for railway noise for each END agglomeration, following the same approach used for roads within agglomerations.

1.4.3 Quality check

A data quality procedure has also been run to ensure that the results obtained accurately follow the established methodology. This process includes reviewing intermediate data. The review of the results obtained in GIS analysis is crucial to ensure the accuracy, completeness, and validity of the overall analysis. By systematically reviewing the results obtained in GIS analysis, it is possible to identify and address any errors, inconsistencies, or limitations early in the process, thereby improving the overall reliability and credibility of the analysis results.

The quality check assessment was carried out through a structured approach as detailed below:

- **Data Quality Assessment.** Verify the quality of the input data. This includes checking for accuracy, completeness, consistency, and resolution. Use metadata provided with the data sources to understand their limitations and characteristics.
- **Data Pre-processing.** Check for any errors or inconsistencies in the pre-processing steps, such as data cleaning, projection transformations, and attribute normalization.
- **Spatial Analysis.** Evaluate the intermediate spatial analysis results, such as spatial overlays and attribute selection accuracy.
- Verify that spatial operations have been performed correctly and that the results align with the expected outcomes based on the analysis objectives.
- **Spatial quality check.** Visualize the results using maps, charts, and graphs: ensure that the visual representation accurately reflects the results obtained from the analysis. Also visualize the intermediate results using maps, charts and graphs to identify anomalies and outliers

2 Results

The following results have been included in the Noise in Europe Report 2025 (<https://www.eea.europa.eu/en/analysis/publications/environmental-noise-in-europe-2025>).

Table 1 – Coverage of roads table (length units km)

countryCode	Agglo_id	Agglo_name	Length_osm	Length_con	percen
AT	AG_AT_00_1	Wien	4152404	2999879	72.24
AT	AG_AT_00_2	Graz	1204939	765991.3	63.57
AT	AG_AT_00_3	Linz	1251854	683909.7	54.63
AT	AG_AT_00_4	Salzburg	591926.40	374275.10	63.23
AT	AG_AT_00_5	Innsbruck	480187.80	372607.60	77.60
BE	AG_BE_BR_1	Brussels-Capital	1958789.73	1719561.35	87.79
BE	AG_BE_FL_1	Antwerp	1514776.76	1430683.77	94.45
BE	AG_BE_FL_2	Ghent	1358256.1	1035487.98	76.24
BE	AG_BE_FL_3	Brugges	894955.06	602773.95	67.35
BE	AG_BE_FL_4	Leuven	509142.28	393261.06	77.24
BE	AG_BE_WA_1	Charleroi	959497.3	930910.9	97.02
BE	AG_BE_WA_2	Liege	718788	686979.1	95.57
CH	AG_CH_00_1	Winterthur	1699441.71	766344.33	45.09
CH	AG_CH_00_10	Geneva	3671235.89	1780968.13	48.51
CH	AG_CH_00_11	Fribourg	1318699.2	549813.84	41.69
CH	AG_CH_00_12	Zug	1536977.1	644842.55	41.96
CH	AG_CH_00_13	Biel/Bienne	1346769.8	463653.77	34.43
CH	AG_CH_00_2	Zurich	13190513.48	5663928.39	42.94
CH	AG_CH_00_3	Bern	6079462.44	2530039.86	41.62
CH	AG_CH_00_4	Lucerne	1893297.62	831659.72	43.93
CH	AG_CH_00_5	Basel	6596274.69	2188695.89	33.18
CH	AG_CH_00_6	St.Gallen	2224276.23	876362.18	39.40
CH	AG_CH_00_7	Baden – Brugg	1036117.16	400679.11	38.67
CH	AG_CH_00_8	Lugano	1513016.13	767607.62	50.73
CH	AG_CH_00_9	Lausanne	4712311.9	2174938.37	46.15

countryCode	Agglo_id	Agglo_name	Length_osm	Length_con	percen
CY	AG_CY_00_1	Nicosia	1618902.01	1555651.89	96.09
CY	AG_CY_00_4	Larnaca	969897.42	966963.87	99.70
CY	AG_CY_00_5	Limassol	1238475.76	1143699.63	92.35
CY	AG_CY_00_6	Pafos	504377.09	500842.76	99.30
CZ	AG_CZ_00_001	Prague	5726028.18	4646683.8	81.15
CZ	AG_CZ_00_002	Brno	2252080.09	1434764.23	63.71
CZ	AG_CZ_00_003	Ostrava	1765741.99	1533028.89	86.82
CZ	AG_CZ_00_004	Usti nad Labem – Teplice	1110518.37	599965.22	54.03
CZ	AG_CZ_00_005	Pilsen	1275733.49	814088.19	63.81
CZ	AG_CZ_00_006	Liberec	1307133.04	834282.12	63.83
CZ	AG_CZ_00_007	Olomouc	662545.22	508325.79	76.72
DE	AG_DE_NW_13	Aachen	772383.1	579312.6	75.00
DE	AG_DE_BY_3	Augsburg	756539.01	444922.28	58.81
DE	AG_DE_NW_24	Bergisch Gladbach	427835.76	244758.16	57.21
DE	AG_DE_BE_1	Berlin	5980784.23	3184853.99	53.25
DE	AG_DE_NW_8	Bielefeld	1460125.09	1040626.27	71.27
DE	AG_DE_NW_6	Bochum	1150917.56	926562.75	80.51
DE	AG_DE_NW_9	Bonn	931158.71	661815.05	71.07
DE	AG_DE_NW_22	Bottrop	517327.76	453725.96	87.71
DE	AG_DE_HB_1	Bremen	1757995.89	198693.36	11.30
DE	AG_DE_HB_2	Bremerhaven	459003.8	293421.23	63.93
DE	AG_DE_NI_2	Brunswick	898063.01	655726.46	73.02
DE	AG_DE_SN_3	Chemnitz	446423.61	301429.59	67.52
DE	AG_DE_NW_1	Cologne	2644424.22	1983798.14	75.02
DE	AG_DE_HE_4	Darmstadt	476853.39	317492.16	66.58
DE	AG_DE_NW_3	Dortmund	1914810.12	1436403.7	75.02
DE	AG_DE_SN_1	Dresden	1317983.18	704014.19	53.42
DE	AG_DE_NW_2	Duesseldorf	1451572.89	1268189.15	87.37
DE	AG_DE_NW_5	Duisburg	1500288.1	967567.1	64.49
DE	AG_DE_BY_8	Erlangen	466925.18	377907.96	80.94
DE	AG_DE_NW_4	Essen	1662379.1	971386.81	58.43
DE	AG_DE_HE_1	Frankfurt on the Main	1713933.35	1227553.66	71.62
DE	AG_DE_BW_4	Freiburg	664648.08	363009.25	54.62

countryCode	Agglo_id	Agglo_name	Length_osm	Length_con	percen
DE	AG_DE_BY_7	Fuerth	383689	247234.89	64.44
DE	AG_DE_NW_11	Gelsenkirchen	766343.7	563106.17	73.48
DE	AG_DE_NI_5	Goettingen	401681.94	264708.86	65.90
DE	AG_DE_NW_16	Hagen	722773.3	538562.2	74.51
DE	AG_DE_ST_1	Halle (Saale)	741160.19	560904.15	75.68
DE	AG_DE_HH_1	Hamburg	4279199.57	2385631.7	55.75
DE	AG_DE_HE_6	Hanau	388940.59	282115.68	72.53
DE	AG_DE_NI_1	Hanover	1412714.58	858623.78	60.78
DE	AG_DE_BW_5	Heidelberg	495067	341640.86	69.01
DE	AG_DE_BW_6	Heilbronn	459607.64	254077.3	55.28
DE	AG_DE_NW_20	Herne	427005.18	332834.57	77.95
DE	AG_DE_NI_6	Hildesheim	436688.71	314532.59	72.03
DE	AG_DE_BY_6	Ingolstadt	622820.13	466423.16	74.89
DE	AG_DE_BW_3	Karlsruhe	983536.58	629339.09	63.99
DE	AG_DE_HE_3	Kassel	697206.73	453361.21	65.03
DE	AG_DE_SH_1	Kiel	710520.33	440056.69	61.93
DE	AG_DE_RP_3	Koblenz	532585.2	323970.15	60.83
DE	AG_DE_NW_14	Krefeld	831474.08	591082.68	71.09
DE	AG_DE_SN_2	Leipzig	1656017.09	1019227.95	61.55
DE	AG_DE_NW_18	Leverkusen	549923.08	467635.02	85.04
DE	AG_DE_RP_1	Ludwigshafen	629366.72	393574.17	62.53
DE	AG_DE_SH_2	Luebeck	802101.49	366337.92	45.67
DE	AG_DE_ST_2	Magdeburg	916048.41	664989.08	72.59
DE	AG_DE_RP_2	Mainz	595919.92	466709.22	78.32
DE	AG_DE_BW_2	Mannheim	987461.59	658804.75	66.72
DE	AG_DE_NW_12	Moenchengladbach	975227.46	606579.63	62.20
DE	AG_DE_NW_26	Moers	484296.45	279417.02	57.70
DE	AG_DE_NW_17	Muelheim on the Ruhr	570632.7	246248	43.15
DE	AG_DE_NW_10	Muenster	1394919.27	777295.34	55.72
DE	AG_DE_BY_1	Munich	2747190.71	1527900.06	55.62
DE	AG_DE_NW_21	Neuss	558925.65	490054.02	87.68
DE	AG_DE_BY_2	Nuremberg	1320902.1	794006.21	60.11
DE	AG_DE_NW_15	Oberhausen	599563.06	467615.9	77.99

countryCode	Agglo_id	Agglo_name	Length_osm	Length_con	percen
DE	AG_DE_HE_5	Offenbach on the Main	276272.64	194308.89	70.33
DE	AG_DE_NI_4	Oldenburg	659128.87	496103.32	75.27
DE	AG_DE_NI_3	Osnabrueck	738748.01	443926.27	60.09
DE	AG_DE_BW_8	Pforzheim	504971.63	314242.85	62.23
DE	AG_DE_BB_1	Potsdam	581214.19	372030.65	64.01
DE	AG_DE_NW_23	Recklinghausen	470055.94	336816.04	71.65
DE	AG_DE_BY_4	Regensburg	495207.6	325412.89	65.71
DE	AG_DE_NW_25	Remscheid	403530.72	134841.27	33.42
DE	AG_DE_BW_9	Reutlingen	448820.49	216237.49	48.18
DE	AG_DE_MV_1	Rostock	666521.77	331467.42	49.73
DE	AG_DE_SL_1	Saarbruecken	774010.21	458971.75	59.30
DE	AG_DE_NW_19	Solingen	510629.93	206614.34	40.46
DE	AG_DE_BW_1	Stuttgart	1548509.95	900203.47	58.13
DE	AG_DE_BW_7	Ulm	503381.07	312013.3	61.98
DE	AG_DE_HE_2	Wiesbaden	925698.43	669852.65	72.36
DE	AG_DE_BY_5	Wuerzburg	505039.25	331350.31	65.61
DE	AG_DE_NW_7	Wuppertal	1079147.06	615023.68	56.99
DK	AG_DK_00_1	Copenhagen	3776117.48	2531161.32	67.03
DK	AG_DK_00_2	Aarhus	974419.83	565145.48	58.00
DK	AG_DK_00_3	Odense	1072467.45	466525.23	43.50
DK	AG_DK_00_4	Aalborg	746232.19	422072.46	56.56
EE	AG_EE_00_1	Tallinn	1089894.73	775666.62	71.17
EE	AG_EE_00_2	Tartu city	567916.52	388965.55	68.49
ES	AG_ES_11_36057	Vigo	1289897.78	747113.32	57.92
ES	AG_ES_12_33024	Gijón	878221.07	878174.07	99.99
ES	AG_ES_12_33044	Oviedo	783462.25	482279.55	61.56
ES	AG_ES_21_01059	Vitoria-Gasteiz	249668.1	248017	99.34
ES	AG_ES_21_20069	Donostia/San Sebastián	273026.66	256594.97	93.98
ES	AG_ES_21_48020	Bilbao	273468.6	258931.38	94.68
ES	AG_ES_22_00008	Comarca de Pamplona	822917.03	820290.67	99.68
ES	AG_ES_23_26089	Logrono	616134	546436.28	88.69
ES	AG_ES_30_28006	Alcobendas	289541.51	265630.6	91.74
ES	AG_ES_30_28058	Fuenlabrada	448192.13	448192.13	100.00

countryCode	Agglo_id	Agglo_name	Length_osm	Length_con	percen
ES	AG_ES_30_28065	Getafe	656640.49	635794.81	96.83
ES	AG_ES_30_28074	Leganes	514478.26	514084.84	99.92
ES	AG_ES_30_28079	Madrid	5810219.5	5330176.31	91.74
ES	AG_ES_30_28148	Torrejón de Ardoz	273792.28	273792.28	100.00
ES	AG_ES_41_24089	León	408373.19	367094.86	89.89
ES	AG_ES_41_47186	Valladolid	1227736.09	1121080.44	91.31
ES	AG_ES_52_12040	Castellón de la Plana	1145552.05	255208.62	22.28
ES	AG_ES_52_46250	València	1349300.39	1349238.08	100.00
ES	AG_ES_61_41038	Dos Hermanas	886113.75	838836.36	94.66
FI	AG_FI_00_1	Helsinki	1712535.9	1183606.01	69.11
FI	AG_FI_00_10	Kuopio	6846471.59	832448.35	12.16
FI	AG_FI_00_2	Espoo	1675432.84	847802.87	50.60
FI	AG_FI_00_3	Tampere	1923075.95	713199.85	37.09
FI	AG_FI_00_4	Vantaa	1428132.23	910018.53	63.72
FI	AG_FI_00_5	Turku	1259338.28	517550.11	41.10
FI	AG_FI_00_6	Oulu	5251137.51	671984.5	12.80
FI	AG_FI_00_7	Lahti	1908871.4	614618.32	32.20
FI	AG_FI_00_8	Kauniainen	42636.63	22631.84	53.08
FI	AG_FI_00_9	Jyvaskyla	3464650.31	660185.08	19.05
FR	AG_FR_00_1	Angers	5052000.01	2920233.98	57.80
FR	AG_FR_00_10	Cergy	817686.08	662450.37	81.02
FR	AG_FR_00_11	Clermont-Ferrand	3249081.24	1592725.7	49.02
FR	AG_FR_00_12	Courcouronnes	1786827.05	1494403.14	83.63
FR	AG_FR_00_14	Dunkerque	2943319.79	1859999.12	63.19
FR	AG_FR_00_15	Grenoble	1492816.48	1400409.09	93.81
FR	AG_FR_00_19	Le Pecq	1465961.41	1083328.77	73.90
FR	AG_FR_00_2	Arras	686762.2	589829.79	85.89
FR	AG_FR_00_20	Lens	1831483.36	1652583.89	90.23
FR	AG_FR_00_22	Lyon	3126509.3	2514491.28	80.42
FR	AG_FR_00_23	Marseille	7556092.65	7155649.91	94.70
FR	AG_FR_00_24	Montmorency	666050.07	549002.77	82.43
FR	AG_FR_00_27	Nantes	4122025.73	3665085.49	88.91

countryCode	Agglo_id	Agglo_name	Length_osm	Length_con	percen
FR	AG_FR_00_28	Nice	1607183.58	736187.22	45.81
FR	AG_FR_00_3	Aubergenville	3499271.05	2095757.41	59.89
FR	AG_FR_00_30	Orsay	1642155.56	1416314.11	86.25
FR	AG_FR_00_31	Paris	10686145.39	9915784.99	92.79
FR	AG_FR_00_33	Reims	8499987.41	3614456.19	42.52
FR	AG_FR_00_34	Rennes	4113896.69	1837463.3	44.66
FR	AG_FR_00_35	Roissy-en-France	2199862.69	1727953.69	78.55
FR	AG_FR_00_36	Rouen	3959701.54	2846254.33	71.88
FR	AG_FR_00_37	Sainte-Geneviève-des-Bois	1052792	845627.84	80.32
FR	AG_FR_00_38	Saint-Étienne	4483867.08	3147001.46	70.18
FR	AG_FR_00_4	Beauchamp	928682.19	840803.29	90.54
FR	AG_FR_00_40	Torcy	857197.33	748840.21	87.36
FR	AG_FR_00_43	Tours	2782557.1	2193401.2	78.83
FR	AG_FR_00_44	Trappes	1100137.57	932076.45	84.72
FR	AG_FR_00_45	Versailles	1182895.24	922097.57	77.95
FR	AG_FR_00_48	Besançon	2752992.78	1878250.98	68.23
FR	AG_FR_00_49	Limoges	3967512.93	2130256.23	53.69
FR	AG_FR_00_5	Bordeaux	6604933.69	4217417.41	63.85
FR	AG_FR_00_6	Brest	1198460.08	1013604.51	84.58
FR	AG_FR_00_7	Brunoy	625728.97	547685.33	87.53
FR	AG_FR_00_8	Caen	3303578.46	2429249.29	73.53
HR	AG_HR_00_1	City of Zagreb	3770242.5	1884303.4	49.98
HR	AG_HR_00_2	City of Split	426624.12	227523.19	53.33
HR	AG_HR_00_3	City of Rijeka	421782.03	216534.29	51.34
IE	AG_IE_00_1	Dublin	6038464.18	3630161.58	60.12
IE	AG_IE_00_2	Cork	1478870.95	973123.44	65.80
IE	AG_IE_00_3	Limerick	652554.36	450675.75	69.06
LU	AG_LU_00_1	AggloLux	1748796.03	1208059.76	69.08
LU	AG_LU_00_2	AggloSud	1377010.68	825341.61	59.94
LV	AG_LV_00_1	Riga	1568398.88	1229264.77	78.38
MT	AG_MT_00_1	Malta Noise Agglomeration	1010233.88	515011.44	50.98
NL	AG_NL_00_01	Alkmaar	3424109.83	1760370.93	51.41

countryCode	Agglo_id	Agglo_name	Length_osm	Length_con	percen
NL	AG_NL_00_02	Almere	5852995.34	2777127.37	47.45
NL	AG_NL_00_03	Amersfoort	1488733.78	909212.48	61.07
NL	AG_NL_00_04	Amsterdam-Haarlem	16820480.87	7015860	41.71
NL	AG_NL_00_05	Apeldoorn	3876699.99	1431348.39	36.92
NL	AG_NL_00_06	Arnhem	2168635.99	1246104.58	57.46
NL	AG_NL_00_07	Breda	2086361.05	1256699.4	60.23
NL	AG_NL_00_08	"s-Hertogenbosch'	2005433.59	1280220.86	63.84
NL	AG_NL_00_09	Den Haag-Leiden	11626682.59	5656110.97	48.65
NL	AG_NL_00_10	Eindhoven	5744573.26	3103396.33	54.02
NL	AG_NL_00_11	Enschede	4373185.12	2007072.87	45.89
NL	AG_NL_00_12	Gouda	2539013.51	1420228.11	55.94
NL	AG_NL_00_13	Groningen	2513399.53	1222622.64	48.64
NL	AG_NL_00_14	Heerlen-Kerkrade	3422298.85	1458439.77	42.62
NL	AG_NL_00_15	Hilversum	2782109.35	1503499.05	54.04
NL	AG_NL_00_17	Nijmegen	1479926.94	826614.77	55.86
NL	AG_NL_00_18	Rotterdam-Dordrecht	12622025.71	6300496.64	49.92
NL	AG_NL_00_20	Utrecht	5645917.09	2746967.35	48.65
NL	AG_NL_00_21	Zwolle	1725407.48	665057.61	38.54
NO	AG_NO_00_1	Oslo	6496306.25	3589103.97	55.25
NO	AG_NO_00_2	Bergen	1981806.27	982656.17	49.58
NO	AG_NO_00_3	Trondheim	1820151.16	835391.62	45.90
NO	AG_NO_00_4	Stavanger/Sandnes	3003771.49	1254602.26	41.77
NO	AG_NO_00_5	Fredrikstad/Sarpsborg	2486411.38	982923.87	39.53
NO	AG_NO_00_6	Drammen	1091945.67	430891.16	39.46
PL	AG_PL_02_64	Wroclaw	9435790.16	5198183.95	55.09
PL	AG_PL_02_65	Wałbrzych	1084240.31	385631.18	35.57
PL	AG_PL_04_61	Bydgoszcz	3593791.22	2062841.26	57.40
PL	AG_PL_04_63	Torun	4008399.47	1448572.07	36.14
PL	AG_PL_04_64	Włocławek	1202844.42	484129.42	40.25
PL	AG_PL_06_63	Lublin	3558111.51	3272188.56	91.96
PL	AG_PL_08_61	Gorzow Wielkopolski	1310188.83	1033376.13	78.87
PL	AG_PL_08_62	Zielona Gora	2914555.88	1023848.35	35.13
PL	AG_PL_10_61	Lodz	8241567.14	4527151.73	54.93

countryCode	Agglo_id	Agglo_name	Length_osm	Length_con	percen
PL	AG_PL_12_61	Cracow	8934350.26	4460904.45	49.93
PL	AG_PL_12_63	Tarnow	1375242.64	623743.1	45.36
PL	AG_PL_14_62	Plock	1202243.19	440691.67	36.66
PL	AG_PL_14_63	Radom	4649010.19	2353049.41	50.61
PL	AG_PL_14_65	Warsaw	19349251.17	12478176.78	64.49
PL	AG_PL_16_61	Opole	2621092.16	1321374.2	50.41
PL	AG_PL_18_63	Rzeszow	2699154.36	1089392.72	40.36
PL	AG_PL_20_61	Bialystok	1992957.18	1769880.72	88.81
PL	AG_PL_22_61	GDAŃSK	6994419.14	3632498.91	51.93
PL	AG_PL_22_62	Gdynia	2656553.98	1120771.05	42.19
PL	AG_PL_24_61	Bielsko-Biała	2009756.92	985809.4	49.05
PL	AG_PL_24_62	BYTOM	1714599.56	671082.21	39.14
PL	AG_PL_24_63	Chorzow	1037739.45	554348.94	53.42
PL	AG_PL_24_64	Czestochowa	2224450.02	1138493.28	51.18
PL	AG_PL_24_65	Dabrowa Gornicza	3738662.87	2772240.45	74.15
PL	AG_PL_24_66	Gliwice	2219812.68	1404314.44	63.26
PL	AG_PL_24_69	Katowice	3746922.53	1920149	51.25
PL	AG_PL_24_72	Ruda Slaska	2134344.57	903200.01	42.32
PL	AG_PL_24_73	bd	2329687.64	677837	29.10
PL	AG_PL_24_75	Sosnowiec	2117066.26	994211.21	46.96
PL	AG_PL_24_77	Tychy	1253471.59	543721.03	43.38
PL	AG_PL_24_78	ZABRZE	2055513.58	1038210.23	50.51
PL	AG_PL_26_61	Kielce	3204636.97	1449411.28	45.23
PL	AG_PL_28_61	Elblag	1786557.47	835792.15	46.78
PL	AG_PL_28_62	Olsztyn	1479001.45	1190503.36	80.49
PL	AG_PL_30_64	Poznan	7650232.02	3972727.37	51.93
PL	AG_PL_32_62	Szczecin	6000153.45	2942838.92	49.05
PT	AG_PT_00_1	AMADORA	435608.12	435608.12	100.00
PT	AG_PT_00_3	MATOSINHOS	733540.77	729209.35	99.41
PT	AG_PT_00_4	ODIVELAS	466257.26	466257.25	100.00
PT	AG_PT_00_5	OEIRAS	668017.21	667869.38	99.98
PT	AG_PT_00_6	PORTO	585810.52	585806.96	100.00
LT	LT_a_ag0001	Vilnius	2418352.11	1159159.84	47.93

countryCode	Agglo_id	Agglo_name	Length_osm	Length_con	percen
LT	LT_a_ag0002	Kaunas	994572.05	986268.03	99.17
LT	LT_a_ag0004	Siauliai	436961.94	280560.9	64.21
SE	SE_a_ag0126	Huddinge	689758.37	423443.28	61.39
SE	SE_a_ag0180	Stockholm	2109629.41	2090902.07	99.11
SE	SE_a_ag0182	Nacka	622891.54	584116.49	93.77
SE	SE_a_ag0380	Uppsala	4449516.49	3691471.44	82.96
SE	SE_a_ag0484	Eskilstuna	2811065.12	2805880.18	99.82
SE	SE_a_ag0580	Linkoping	3815808.36	3460135.37	90.68
SE	SE_a_ag0581	Norrkoping	3882553.67	1233110.09	31.76
SE	SE_a_ag0680	Jonkoping	3451164.15	1330149.43	38.54
SE	SE_a_ag1280	Malmo	1276606.92	1185888.17	92.89
SE	SE_a_ag1281	Lund	1513546.23	676089.59	44.67
SE	SE_a_ag1283	Helsingborg	1368042.32	1314656.59	96.10
SE	SE_a_ag1380	Halmstad	2729488.9	1648700.75	60.40
SE	SE_a_ag1480	Gothenburg	2597971.89	2150125.62	82.76
SE	SE_a_ag1490	Boras	2329316.93	1313193.96	56.38
SE	SE_a_ag1880	Orebro	3354296.22	1491651.45	44.47
SE	SE_a_ag1980	Vasteras	2355080.2	1174501.98	49.87
SE	SE_a_ag2180	Gavle	2975074.14	2547798.57	85.64
SE	SE_a_ag2480	Umea	4450191.38	1437256.32	32.30
IT	AG_IT_00_00009	Rome	8804687.6	8800855.55	99.96
IT	AG_IT_00_00045	Milan-Monza	5046900.4	5046900.39	100.00
IT	AG_IT_00_00001	Bari	1132228	1131857	99.97
IT	AG_IT_00_00003	Catania	1106056	863770.6	78.09
IT	AG_IT_00_00004	Florence	1020867	1020590	99.97
IT	AG_IT_00_00005	Genoa	1579982	325672.9	20.61
IT	AG_IT_00_00007	Naples	1306876	1305945	99.93
IT	AG_IT_00_00008	Palermo	1119934	255545.9	22.82
IT	AG_IT_00_00010	Turin	3305195	2375875	71.88
IT	AG_IT_00_00011	Venice	1049243	1048856	99.96
IT	AG_IT_00_00012	Verona	1413491	840495.7	59.46
IT	AG_IT_00_00013	Cagliari	2105873	1816405	86.25
IT	AG_IT_00_00016	Brescia	913153.1	402345.8	44.06

countryCode	Agglo_id	Agglo_name	Length_osm	Length_con	percen
IT	AG_IT_00_00017	Ferrara	1523065	1052521	69.11
IT	AG_IT_00_00018	Foggia	1220530	1220183	99.97
IT	AG_IT_00_00019	Forlì	969218.8	777016.9	80.17
IT	AG_IT_00_00020	Latina	1095197	571996.4	52.23
IT	AG_IT_00_00021	Livorno	605090	604796.9	99.95
IT	AG_IT_00_00022	Messina	1261199	484726.9	38.43
IT	AG_IT_00_00023	Modena	1040595	1010275	97.09
IT	AG_IT_00_00025	Bolzano	355975.7	194065.5	54.52
IT	AG_IT_00_00026	Padua	1017190	1014568	99.74
IT	AG_IT_00_00027	Parma	1533464	1209955	78.90
IT	AG_IT_00_00028	Perugia	2069901	2069235	99.97
IT	AG_IT_00_00029	Pescara	418742.3	230205.6	54.98
IT	AG_IT_00_00030	Piacenza	704088.5	498223.3	70.76
IT	AG_IT_00_00031	Prato	752503.5	655543.9	87.12
IT	AG_IT_00_00032	Ravenna	2108809	1186653	56.27
IT	AG_IT_00_00034	'Reggio nell"Emilia'	1497099	684244.2	45.70
IT	AG_IT_00_00035	Rimini	941166.7	940993.7	99.98
IT	AG_IT_00_00037	Sassari	627217.1	533269.2	85.02
IT	AG_IT_00_00039	Taranto	1204200	1203946	99.98
IT	AG_IT_00_00040	Terni	959845.1	738520.7	76.94
IT	AG_IT_00_00041	Trieste	893087.6	892858.7	99.97
RO	AG_RO_00_1	Bucharest	2565265.41	2372920.67	92.50
RO	AG_RO_00_14	Bacău	270544.56	139460.13	51.55
RO	AG_RO_00_20	Satu Mare	478486.24	349975.66	73.14
RO	AG_RO_00_3	Iași	610781.85	329968.98	54.02
RO	AG_RO_00_5	Timișoara	735369.67	554390.09	75.39
RO	AG_RO_00_7	Craiova	596788.98	291143.2	48.78

Table 2 – Coverage of Railways table (length units km)

countryCode	Agglo_id	Agglo_name	Length_osm	Length_con	percen
BE	AG_BE_WA_1	Charleroi	256980.5	215012.2	83.67
BE	AG_BE_WA_2	Liege	229817.2	208689.5	90.81
BE	AG_BE_FL_1	Antwerp	1125266.62	651401.8	57.89
BE	AG_BE_FL_3	Brugges	277230.99	170694.11	61.57
BE	AG_BE_FL_2	Ghent	437367.95	306739.21	70.13
BE	AG_BE_BR_1	Brussels-Capital	816818.63	581678.5	71.21
DE	AG_DE_NW_13	Aachen	121177.61	103966.1	85.80
CH	AG_CH_00_10	Geneva	391073.94	188499.16	48.20
CH	AG_CH_00_5	Basel	880700.49	496410.74	56.37
CH	AG_CH_00_8	Lugano	137527.28	80934.35	58.85
CH	AG_CH_00_4	Lucerne	176590.37	113805.89	64.45
CH	AG_CH_00_2	Zurich	1496864.92	1036461.68	69.24
CH	AG_CH_00_6	St.Gallen	177542.41	123572.45	69.60
CH	AG_CH_00_3	Bern	557654.84	396146.57	71.04
CH	AG_CH_00_13	Biel/Bienne	162160.44	117405.56	72.40
CH	AG_CH_00_9	Lausanne	505973.43	369983.29	73.12
CH	AG_CH_00_7	Baden - Brugg	104816.17	85472.49	81.55
CH	AG_CH_00_11	Fribourg	82479.23	72935.26	88.43
CH	AG_CH_00_12	Zug	107547.43	98497.8	91.59
CH	AG_CH_00_1	Winterthur	158772.42	147792.76	93.08
CZ	AG_CZ_00_001	Prague	1103495.3	743521.8	67.38
CZ	AG_CZ_00_002	Brno	536854.67	357512.92	66.59
CZ	AG_CZ_00_003	Ostrava	710217.1	365270.3	51.43
CZ	AG_CZ_00_004	Usti nad Labem - Teplice	299241.86	274620.84	91.77
CZ	AG_CZ_00_005	Pilsen	287249.59	187275.9	65.20
CZ	AG_CZ_00_006	Liberec	136143.59	95544.99	70.18
CZ	AG_CZ_00_007	Olomouc	182499.37	134820.97	73.87
DE	AG_DE_BY_3	Augsburg	23667.13	17765.86	75.07
BE	AG_BE_FL_4	Leuven	101238.92	100387.05	99.16

countryCode	Agglo_id	Agglo_name	Length_osm	Length_con	percen
DE	AG_DE_NW_24	Bergisch Gladbach	3072.74	2026.65	65.96
DE	AG_DE_BE_1	Berlin	667331.4	632346.6	94.76
DE	AG_DE_NW_8	Bielefeld	12916.71	11906.33	92.18
DE	AG_DE_NW_6	Bochum	35980.1	33772.59	93.86
DE	AG_DE_NW_9	Bonn	19063.08	18367.14	96.35
DE	AG_DE_NW_22	Bottrop	10021.35	9416.44	93.96
DE	AG_DE_HB_1	Bremen	126252.4	87203.72	69.07
DE	AG_DE_HB_2	Bremerhaven	10741.77	9306.82	86.64
DE	AG_DE_NI_2	Brunswick	43016.56	32060.02	74.53
DE	AG_DE_SN_3	Chemnitz	22377.96	20296.42	90.70
DE	AG_DE_NW_1	Cologne	117517.41	90789.67	77.26
DE	AG_DE_HE_4	Darmstadt	23608.23	21434.64	90.79
DE	AG_DE_NW_3	Dortmund	119045.34	106951.49	89.84
DE	AG_DE_SN_1	Dresden	100297.77	85577.74	85.32
DE	AG_DE_NW_2	Duesseldorf	63388.47	56462.6	89.07
DE	AG_DE_NW_5	Duisburg	977416.44	543349.66	55.59
DE	AG_DE_BY_8	Erlangen	13279.77	8494.67	63.97
DE	AG_DE_NW_4	Essen	419444.46	354011.1	84.40
DE	AG_DE_HE_1	Frankfurt on the Main	116701.7	105234.05	90.17
DE	AG_DE_BW_4	Freiburg	28866.52	27327.56	94.67
DE	AG_DE_BY_7	Fuerth	6631.04	6616.33	99.78
DE	AG_DE_NW_11	Gelsenkirchen	33447.52	21644.53	64.71
DE	AG_DE_NI_5	Goettingen	13473.69	11777.55	87.41
DE	AG_DE_NW_16	Hagen	344493.6	313824.19	91.10
DE	AG_DE_ST_1	Halle (Saale)	50927.7	42548.29	83.55
DE	AG_DE_HH_1	Hamburg	246481.96	223195.67	90.55
DE	AG_DE_HE_6	Hanau	13268.39	13253.59	99.89
DE	AG_DE_NI_1	Hanover	67116.38	63696.77	94.90
DE	AG_DE_BW_5	Heidelberg	9938.03	7050.19	70.94
DE	AG_DE_BW_6	Heilbronn	9244.57	4919.69	53.22
DE	AG_DE_NW_20	Herne	24270.39	23919.47	98.55

countryCode	Agglo_id	Agglo_name	Length_osm	Length_con	percen
DE	AG_DE_NI_6	Hildesheim	22434.23	16487.27	73.49
DE	AG_DE_BY_6	Ingolstadt	13745.78	11733.87	85.36
DE	AG_DE_BW_3	Karlsruhe	20402.73	13952.93	68.39
DE	AG_DE_HE_3	Kassel	22449.17	20538.14	91.49
DE	AG_DE_SH_1	Kiel	48321.06	40687.76	84.20
DE	AG_DE_RP_3	Koblenz	16210.14	16013.4	98.79
DE	AG_DE_NW_14	Krefeld	25487.14	21946.8	86.11
DE	AG_DE_SN_2	Leipzig	37554.33	33681.23	89.69
DE	AG_DE_NW_18	Leverkusen	11013.9	9914.98	90.02
DE	AG_DE_RP_1	Ludwigshafen	14975.19	13076.28	87.32
DE	AG_DE_SH_2	Luebeck	36308.7	23591.79	64.98
DE	AG_DE_ST_2	Magdeburg	71658.77	60297.21	84.14
DE	AG_DE_RP_2	Mainz	15488.81	14746.98	95.21
DE	AG_DE_BW_2	Mannheim	16247.33	15054	92.66
DE	AG_DE_NW_12	Moenchengladbach	23088.8	19471.64	84.33
DE	AG_DE_NW_26	Moers	95704.13	73451.72	76.75
DE	AG_DE_NW_17	Muelheim on the Ruhr	187623.17	128344.48	68.41
DE	AG_DE_NW_10	Muenster	42488.64	37075.85	87.26
DE	AG_DE_BY_1	Munich	104081	101117.31	97.15
DE	AG_DE_NW_21	Neuss	224393.95	209570.71	93.39
DE	AG_DE_BY_2	Nuremberg	107432.49	90015.8	83.79
DE	AG_DE_NW_15	Oberhausen	72240.55	71321.97	98.73
DE	AG_DE_HE_5	Offenbach on the Main	4916	4899.14	99.66
DE	AG_DE_NI_4	Oldenburg	15835.23	12766.3	80.62
DE	AG_DE_NI_3	Osnabrueck	4155.11	3628.81	87.33
DE	AG_DE_BW_8	Pforzheim	9275.56	8360.24	90.13
DE	AG_DE_BB_1	Potsdam	68596.15	67654.53	98.63
DE	AG_DE_NW_23	Recklinghausen	14027	14027	100.00
DE	AG_DE_BY_4	Regensburg	23648.9	18765.83	79.35
DE	AG_DE_NW_25	Remscheid	41227.73	37796.32	91.68
DE	AG_DE_BW_9	Reutlingen	7582.71	7576.86	99.92

countryCode	Agglo_id	Agglo_name	Length_osm	Length_con	percen
DE	AG DE MV 1	Rostock	50434	37906.1	75.16
DE	AG DE SL 1	Saarbruecken	13571.66	11575.29	85.29
DE	AG DE NW 19	Solingen	51394.86	49998.05	97.28
DE	AG DE BW 1	Stuttgart	170475.33	148180.62	86.92
DE	AG DE BW 7	Ulm	13090.95	13058.08	99.75
DE	AG DE HE 2	Wiesbaden	30855.57	26360.41	85.43
DE	AG DE BY 5	Wuerzburg	29372.33	28393.78	96.67
DE	AG DE NW 7	Wuppertal	16619.62	10814.08	65.07
DK	AG DK 00 1	Copenhagen	466995.77	389149.82	83.33
DK	AG DK 00 2	Aarhus	98370.25	80685.84	82.02
DK	AG DK 00 3	Odense	70727.11	33006.97	46.67
DK	AG DK 00 4	Aalborg	42966.48	20913.03	48.67
EE	AG EE 00 1	Tallinn	211596.18	137316.65	64.90
EE	AG EE 00 2	Tartu city	41964.45	41365.19	98.57
ES	AG ES 11 36057	Vigo	5185.71	1923.82	37.10
ES	AG ES 12 33024	Gijón	31609.65	31609.65	100.00
ES	AG ES 12 33044	Oviedo	37963.02	27834.62	73.32
ES	AG ES 21 01059	Vitoria-Gasteiz	10306.12	8153.28	79.11
ES	AG ES 21 20069	Donostia/San Sebastián	5104.28	4530.88	88.77
ES	AG ES 21 48020	Bilbao	15104.02	8844.5	58.56
ES	AG ES 22 00008	Comarca de Pamplona	22640.66	21733.6	95.99
ES	AG ES 23 26089	Logrono	15774.61	15596.08	98.87
ES	AG ES 30 28006	Alcobendas	4277.78	1023.71	23.93
ES	AG ES 30 28058	Fuenlabrada	9241.41	9241.41	100.00
ES	AG ES 30 28065	Getafe	68360.07	62551.58	91.50
ES	AG ES 30 28074	Leganes	13395.1	13055.19	97.46
ES	AG ES 30 28148	Torrejón de Ardoz	22701	18162.6	80.01
ES	AG ES 41 24089	León	28059.21	26204.38	93.39
ES	AG ES 52 12040	Castellón de la Plana	23874.49	2567.07	10.75
ES	AG ES 52 46250	València	71024.03	71024.03	100.00
ES	AG ES 61 41038	Dos Hermanas	19769.16	17977.77	90.94

countryCode	Agglo_id	Agglo_name	Length_osm	Length_con	percen
FI	AG FI 00 1	Helsinki	408805.22	264722.56	64.76
FI	AG FI 00 10	Kuopio	119537.61	76410.32	63.92
FI	AG FI 00 2	Espoo	55766.97	39227.18	70.34
FI	AG FI 00 3	Tampere	175030.98	151612.4	86.62
FI	AG FI 00 4	Vantaa	105292.2	67373.53	63.99
FI	AG FI 00 5	Turku	69325.89	49319.71	71.14
FI	AG FI 00 6	Oulu	140952.51	109072.91	77.38
FI	AG FI 00 7	Lahti	131879.1	98208.1	74.47
FI	AG FI 00 8	Kauniainen	5844.23	5844.23	100.00
FI	AG FI 00 9	Jyvaskyla	101305.47	65516.45	64.67
FR	AG FR 00 1	Angers	65395.02	44137.45	67.49
FR	AG FR 00 10	Cergy	90953.12	73413.03	80.72
FR	AG FR 00 11	Clermont-Ferrand	44569.36	25041.38	56.19
FR	AG FR 00 12	Courcouronnes	205940.08	181181.31	87.98
FR	AG FR 00 14	Dunkerque	113254.31	23972.25	21.17
FR	AG FR 00 15	Grenoble	95392.98	74385.04	77.98
FR	AG FR 00 19	Le Pecq	222538.68	208033.39	93.48
FR	AG FR 00 2	Arras	65780.84	49238.77	74.85
FR	AG FR 00 20	Lens	167506.21	139865.84	83.50
FR	AG FR 00 22	Lyon	205359.78	170312.71	82.93
FR	AG FR 00 23	Marseille	624924.82	358635.27	57.39
FR	AG FR 00 24	Montmorency	41324.28	40383.76	97.72
FR	AG FR 00 27	Nantes	330094.5	299040.68	90.59
FR	AG FR 00 28	Nice	52588.41	15013.44	28.55
FR	AG FR 00 3	Aubergenville	389192.34	375555.48	96.50
FR	AG FR 00 30	Orsay	150002.9	129568.67	86.38
FR	AG FR 00 31	Paris	3061686.59	2565648.98	83.80
FR	AG FR 00 33	Reims	173766.55	104469.56	60.12
FR	AG FR 00 34	Rennes	273756.25	245370.78	89.63
FR	AG FR 00 35	Roissy-en-France	332804.17	314425.22	94.48
FR	AG FR 00 36	Rouen	624486.81	421153.19	67.44

countryCode	Agglo_id	Agglo_name	Length_osm	Length_con	percen
FR	AG FR 00 37	Sainte-Geneviève-des-Bois	157927.18	153510.15	97.20
FR	AG FR 00 38	Saint-Étienne	216402.97	184383.07	85.20
FR	AG FR 00 4	Beauchamp	78739.46	78697.72	99.95
FR	AG FR 00 40	Torcy	197325.25	192405.77	97.51
FR	AG FR 00 43	Tours	372218.51	356621	95.81
FR	AG FR 00 44	Trappes	172661.79	171009.86	99.04
FR	AG FR 00 45	Versailles	176101.88	151773.4	86.18
FR	AG FR 00 48	Besançon	246795.64	189355.68	76.73
FR	AG FR 00 49	Limoges	66708.51	32223.9	48.31
FR	AG FR 00 5	Bordeaux	82528.83	59611.78	72.23
FR	AG FR 00 6	Brest	9498.7	3170.55	33.38
FR	AG FR 00 7	Brunoy	67691.65	67214.14	99.29
FR	AG FR 00 8	Caen	20935.01	10053.79	48.02
HR	AG HR 00 1	City of Zagreb	454761.88	241895.08	53.19
HR	AG HR 00 2	City of Split	36079.5	24690.25	68.43
HR	AG HR 00 3	City of Rijeka	66573.18	22426.99	33.69
IE	AG IE 00 1	Dublin	412511.23	397906.86	96.46
IE	AG IE 00 2	Cork	31887.94	27703.98	86.88
IE	AG IE 00 3	Limerick	27915.8	26658.86	95.50
LU	AG LU 00 1	AggloLux	186935.1	158532.4	84.81
LU	AG LU 00 2	AggloSud	358784.4	243546.4	67.88
LV	AG LV 00 1	Riga	731110.28	580546.37	79.41
NL	AG NL 00 01	Agglomeration Alkmaar	51368.79	51362.78	99.99
NL	AG NL 00 02	Agglomeration Almere	38412.21	37493.2	97.61
NL	AG NL 00 03	Agglomeration Amersfoort	112503.5	106252.92	94.44
NL	AG NL 00 04	Agglomeration Amsterdam-Haarlem	993834.97	511312.38	51.45
NL	AG NL 00 05	Agglomeration Apeldoorn	67181.86	50776.45	75.58
NL	AG NL 00 06	Agglomeration Arnhem	60180.53	49647.7	82.50
NL	AG NL 00 07	Agglomeration Breda	87380.44	82769.31	94.72
NL	AG NL 00 08	'Agglomeration 's-Hertogenbosch'	54095.87	54095.77	100.00

countryCode	Agglo_id	Agglo_name	Length_osm	Length_con	percen
NL	AG_NL_00_09	Agglomeration Den Haag-Leiden	561003.01	257264.36	45.86
NL	AG_NL_00_10	Agglomeration Eindhoven	137453.1	133158.51	96.88
NL	AG_NL_00_11	Agglomeration Enschede	96628.93	87984.61	91.05
NL	AG_NL_00_12	Agglomeration Gouda	83490.31	71246.47	85.34
NL	AG_NL_00_13	Agglomeration Groningen	111781.37	105902.74	94.74
NL	AG_NL_00_14	Agglomeration Heerlen-Kerkrade	75243.41	59826.01	79.51
NL	AG_NL_00_15	Agglomeration Hilversum	60194.1	59845.66	99.42
NL	AG_NL_00_17	Agglomeration Nijmegen	48466.34	45012.75	92.87
NL	AG_NL_00_18	Agglomeration Rotterdam-Dordrecht	1196078.64	904525.48	75.62
NL	AG_NL_00_20	Agglomeration Utrecht	318728.23	211336.64	66.31
NL	AG_NL_00_21	Agglomeration Zwolle	96095.92	92913.71	96.69
PL	AG_PL_02_64	Wroclaw	656422.4	591758.6	90.15
PL	AG_PL_02_65	Wałbrzych	114968.3	87776.21	76.35
PL	AG_PL_04_61	Bydgoszcz	293068.3	239148.4	81.60
PL	AG_PL_04_63	Torun	171311.7	143265	83.63
PL	AG_PL_04_64	Włocławek	77894.24	41730.48	53.57
PL	AG_PL_06_63	Lublin	153931.1	144267.9	93.72
PL	AG_PL_08_61	Gorzow Wielkopolski	69128.77	44192.04	63.93
PL	AG_PL_08_62	Zielona Gora	57237.23	50953.78	89.02
PL	AG_PL_10_61	Lodz	487569.6	370638.4	76.02
PL	AG_PL_12_61	Cracow	785719.3	487603.7	62.06
PL	AG_PL_12_63	Tarnow	126918.3	37016.94	29.17
PL	AG_PL_14_62	Płock	75516.31	23073.89	30.55
PL	AG_PL_14_63	Radom	46055.12	39815.63	86.45
PL	AG_PL_14_65	Warsaw	931471.5	713797.9	76.63
PL	AG_PL_16_61	Opole	203560.2	140378.9	68.96
PL	AG_PL_18_63	Rzeszow	75932.38	58360.49	76.86
PL	AG_PL_20_61	Bialystok	117020.4	116138.4	99.25
PL	AG_PL_22_61	GDAŃSK	446862.2	183029.8	40.96
PL	AG_PL_22_62	Gdynia	269928.4	156758.9	58.07

countryCode	Agglo_id	Agglo_name	Length_osm	Length_con	percen
PL	AG_PL_24_61	Bielsko-Biała	58967.63	32617.55	55.31
PL	AG_PL_24_62	BYTOM	78632.51	69849.97	88.83
PL	AG_PL_24_63	Chorzow	88362.43	64688.62	73.21
PL	AG_PL_24_64	Czestochowa	235129	172523.8	73.37
PL	AG_PL_24_65	Dabrowa Gornicza	430990	237149.6	55.02
PL	AG_PL_24_66	Gliwice	201178.7	138224.5	68.71
PL	AG_PL_24_69	Katowice	247246.6	186596.8	75.47
PL	AG_PL_24_72	Ruda Slaska	100568.7	65341.08	64.97
PL	AG_PL_24_73	bd	223312.7	181771.4	81.40
PL	AG_PL_24_75	Sosnowiec	179814.4	118515.2	65.91
PL	AG_PL_24_77	Tychy	79132.99	61733.73	78.01
PL	AG_PL_24_78	ZABRZE	118521.8	104415.4	88.10
PL	AG_PL_26_61	Kielce	110131	101628.7	92.28
PL	AG_PL_28_61	Elblag	62122.61	56280.43	90.60
PL	AG_PL_28_62	Olsztyn	79986.84	59664	74.59
PL	AG_PL_30_64	Poznan	558274.6	502962.6	90.09
PL	AG_PL_32_62	Szczecin	528924.2	273599.6	51.73
PT	AG_PT_00_1	AMADORA	18176.28	18176.28	100.00
PT	AG_PT_00_5	OEIRAS	23588.59	23588.59	100.00
PT	AG_PT_00_6	PORTO	104784.62	104783.18	100.00
LT	LT_a_ag0001	Vilnius	346696.47	265382.35	76.55
LT	LT_a_ag0002	Kaunas	179440.9	137115.6	76.41
LT	LT_a_ag0004	Siauliai	78751.04	62780.4	79.72
SE	SE_a_ag0126	Huddinge	44579.3	44493.93	99.81
SE	SE_a_ag0180	Stockholm	240092.07	183900.6	76.60
SE	SE_a_ag0182	Nacka	6473.1	5859.56	90.52
SE	SE_a_ag0380	Uppsala	134718.61	132256.73	98.17
SE	SE_a_ag0484	Eskilstuna	124945.29	124855.03	99.93
SE	SE_a_ag0580	Linkoping	129492.65	129492.65	100.00
SE	SE_a_ag0581	Norrkoping	281312.34	230492.6	81.93
SE	SE_a_ag0680	Jonkoping	101376.54	81593.82	80.49

countryCode	Agglo_id	Agglo_name	Length_osm	Length_con	percen
SE	SE a ag1280	Malmo	252646.75	211924.83	83.88
SE	SE a ag1281	Lund	58652.96	48482.42	82.66
SE	SE a ag1283	Helsingborg	191764.09	177272.01	92.44
SE	SE a ag1380	Halmstad	137203.18	136733.14	99.66
SE	SE a ag1480	Göteborg	426138.51	365240.82	85.71
SE	SE a ag1490	Boras	83829.14	71820.15	85.67
SE	SE a ag1880	Orebro	151821.19	132494.56	87.27
SE	SE a ag1980	Vasteras	149985.41	138225.74	92.16
SE	SE a ag2180	Gavle	250643.38	205379.34	81.94
SE	SE a ag2480	Umea	134102.43	112831.38	84.14
AT	AG AT 00 4	Salzburg	148929.60	135010.50	90.65
AT	AG AT 00 2	Graz	243188.20	215604.60	88.66
AT	AG AT 00 1	Wien	1396751.00	1209853.00	86.62
AT	AG AT 00 5	Innsbruck	161376.80	121988.70	75.59
AT	AG AT 00 3	Linz	566715.60	409347.70	72.23
RO	AG RO 00 1	Bucharest	659479.20	239772.70	36.36
RO	AG RO 00 3	Iasi	247643.10	69771.43	28.17
RO	AG RO 00 5	Timisoara	238976.70	47818.36	20.01
RO	AG RO 00 7	Craiova	193284.10	27936.84	14.45
IT	AG IT 00 00001	Bari	220291.90	217639.90	98.80
IT	AG IT 00 00003	Catania	85595.85	80541.74	94.10
IT	AG IT 00 00004	Florence	226496.50	182414.70	80.54
IT	AG IT 00 00005	Genoa	307040.10	229234.00	74.66
IT	AG IT 00 00007	Naples	233418.50	233418.50	100.00
IT	AG IT 00 00008	Palermo	129056.40	35633.52	27.61
IT	AG IT 00 00009	Rome	857689.50	857674.10	100.00
IT	AG IT 00 00010	Turin	503363.70	291225.10	57.86
IT	AG IT 00 00011	Venice	351630.20	212631.80	60.47
IT	AG IT 00 00012	Verona	289714.70	268013.10	92.51
IT	AG IT 00 00013	Cagliari	68826.31	46471.13	67.52
IT	AG IT 00 00016	Brescia	87278.81	29003.48	33.23

countryCode	Agglo_id	Agglo_name	Length_osm	Length_con	percen
IT	AG IT 00 00017	Ferrara	95027.31	61046.08	64.24
IT	AG IT 00 00018	Foggia	201817.40	195127.40	96.69
IT	AG IT 00 00019	Forlì	32978.38	32978.38	100.00
IT	AG IT 00 00020	Latina	6213.70	6213.70	100.00
IT	AG IT 00 00021	Livorno	126542.70	126524.80	99.99
IT	AG IT 00 00022	Messina	140925.20	61871.30	43.90
IT	AG IT 00 00023	Modena	138257.70	119195.10	86.21
IT	AG IT 00 00025	Bolzano	44372.90	44372.90	100.00
IT	AG IT 00 00026	Padua	167959.80	167886.40	99.96
IT	AG IT 00 00027	Parma	124138.00	121062.90	97.52
IT	AG IT 00 00028	Perugia	61530.18	61529.24	100.00
IT	AG IT 00 00029	Pescara	39300.44	36828.92	93.71
IT	AG IT 00 00030	Piacenza	112137.30	112137.30	100.00
IT	AG IT 00 00031	Prato	63883.53	63602.35	99.56
IT	AG IT 00 00032	Ravenna	137535.90	79943.49	58.13
IT	AG IT 00 00034	'Reggio nell"Emilia'	135346.30	97800.55	72.26
IT	AG IT 00 00035	Rimini	55519.27	55498.13	99.96
IT	AG IT 00 00037	Sassari	27833.34	14845.47	53.34
IT	AG IT 00 00039	Taranto	246537.30	246383.50	99.94
IT	AG IT 00 00040	Terni	78056.35	65848.90	84.36
IT	AG IT 00 00041	Trieste	204276.30	202541.10	99.15
IT	AG IT 00 00045	Milan-Monza	1198072.00	1198072.00	100.00

List of abbreviations

Abbreviation	Name	Reference
EEA	European Environment Agency	www.eea.europa.eu
ETC	European Topic Centre	Consortium giving support to the EEA
DF1_5	Dataflow 1_5 Sources	Related to Noise sources under the Environmental Noise Directive (END)
DF4_8	Dataflow 4_8 Strategic Noise Maps	Related to strategic noise mapping under the Environmental Noise Directive (END)
END	Environmental Noise Directive	Directive 2002/49/EC
Lden	Day-Evening-Night Noise Level	Measurement threshold for noise contour maps and exposure
OSM	Open Street Map	Used as a source of geospatial data (www.openstreetmap.org)
FME	Feature Manipulation Engine	Software used for downloading OpenStreetMap (OSM) data
EPSG	European Petroleum Survey Group	Refers to a standardized coordinate system, EPSG:3035
GIS	Geographic Information System	Core methodology for spatial data analysis
arcpy	ArcGIS Python Library	Used for scripting and automation in ArcGIS

References

ArcGIS: Esri., 2025, ArcGIS Documentation, Esri, (<https://doc.arcgis.com/en/>) accessed 03/April/2025.

FME: Safe Software., 2025, FME Form Documentation, Safe Software, (<https://docs.safe.com/fme/html/FME-Form-Documentation/FME-Form/Home.htm>) accessed 03/April/2025.

OpenStreetMap contributors., 2025, OpenStreetMap Data Extracts, Geofabrik, (<https://download.geofabrik.de/>) accessed 03/April/2025.

Python: Python Software Foundation., 2025, Python 3.13.2 Documentation, Python Software Foundation, (<https://docs.python.org/>) accessed 03/April/2025.

Pandas: pandas development team., 2024, pandas documentation — pandas 2.2.3 documentation, pandas development team, (<https://pandas.pydata.org/docs/>) accessed 03/April/2025.

Annex 1 Scripts

CalcStatsRoads_v1.py script --- Start ---

```
import arcpy
import pandas as pd
import numpy as np

def clip_and_calculate_length(country_code, osm_file, contour_file, area_file, output_folder,
repair_contours):
    """
    Calculates the lengths of roads and contours within agglomerations based on spatial analysis.

    Parameters:
    - country_code: Country code to filter agglomerations (e.g., "DE", "FR").
    - osm_file: Path to the OSM roads shapefile.
    - contour_file: Path to the noise contour shapefile.
    - area_file: Path to the agglomeration shapefile.
    - output_folder: Folder to save output data.
    - repair_contours: Boolean flag to repair contour geometry (True/False).
    """

    # Initialize Spatial Analyst extension
    arcpy.CheckOutExtension("Spatial")

    # Clear temporary workspace
    arcpy.Delete_management("in_memory")

    # Reproject OSM shapefile if necessary
    if not arcpy.Exists(osm_file + "_LAEA"):
        arcpy.Project_management(osm_file, osm_file + "_LAEA", output_folder +
"/temp/ETRS_1989_LAEA.prj")

    # Repair and reproject contour shapefile if necessary
    if repair_contours:
        arcpy.RepairGeometry_management(contour_file, "KEEP_NULL", "ESRI")

    if not arcpy.Exists(contour_file + "_LAEA"):
        arcpy.Project_management(contour_file, contour_file + "_LAEA", output_folder +
"/temp/ETRS_1989_LAEA.prj")

    # Initialize data storage
    osm_lengths = [] # To store road lengths
    contour_lengths = [] # To store contour lengths

    # Process each agglomeration
    with arcpy.da.SearchCursor(area_file, ["countryCod", "agglomerat", "SHAPE@", "id"]) as cursor:
        for row in cursor:
            if row[0] == country_code:
                agglomeration_name = row[1]
                agglomeration_shape = row[2]
```

```

try:
    # Clip roads to agglomeration area
    arcpy.Clip_analysis(osm_file + "_LAEA", agglomeration_shape,
    "in_memory/clipped_osm_roads")

    # Filter road features
    arcpy.MakeFeatureLayer_management("in_memory/clipped_osm_roads", "osm_layer")
    arcpy.SelectLayerByAttribute_management("osm_layer", "NEW_SELECTION", "fclass NOT
    IN ('service', 'cycleway', 'footway', 'pedestrian', 'path')")

    # Calculate road length
    road_length = sum([row[0] for row in arcpy.da.SearchCursor("osm_layer",
    ["SHAPE@LENGTH"])])
    osm_lengths.append((agglomeration_name, road_length))

    # Clip contours to agglomeration area
    arcpy.Clip_analysis(contour_file + "_LAEA", agglomeration_shape,
    "in_memory/clipped_contours")

    # Calculate contour length
    contour_length = sum([row[0] for row in
    arcpy.da.SearchCursor("in_memory/clipped_contours", ["SHAPE@LENGTH"])])
    contour_lengths.append((agglomeration_name, contour_length))

except Exception as e:
    arcpy.AddError(f"Error processing {agglomeration_name}: {str(e)}")
finally:
    # Clean up in-memory data
    arcpy.Delete_management("in_memory/clipped_osm_roads")
    arcpy.Delete_management("in_memory/clipped_contours")

# Combine and process results into a DataFrame
df_osm = pd.DataFrame(osm_lengths, columns=["Agglomeration", "Road Length"])
df_contours = pd.DataFrame(contour_lengths, columns=["Agglomeration", "Contour Length"])

results = pd.merge(df_osm, df_contours, on="Agglomeration", how="outer")
results["Coverage (%)"] = (results["Contour Length"] / results["Road Length"]) * 100
results.fillna(0, inplace=True)

# Export results to CSV
output_csv = f"{output_folder}/road_lengths_{country_code}.csv"
results.to_csv(output_csv, index=False)
arcpy.AddMessage(f"Results saved to {output_csv}")

# Release Spatial Analyst extension
arcpy.CheckInExtension("Spatial")

# Example usage
if __name__ == "__main__":
    clip_and_calculate_length(

```

```

country_code="ExampleCountry",
osm_file="path/to/osm.shp",
contour_file="path/to/contours.shp",
area_file="path/to/agglomerations.shp",
output_folder="path/to/output",
repair_contours=True
)

```

CalcStatsRoads_v1.py script --- End ---

CalcStatsRails_v1.py script --- Start ---

```

import arcpy
import pandas as pd
import numpy as np
import sys

def clip_and_calculate_length(ctry_sel, osm_shp, contour_shapefile, area_shapefile, output_folder,
repair_cont):
    """
    Processes railways in a selected country, calculating the length of rail lines
    and their coverage by noise contour maps within agglomerations.

    Parameters:
    - ctry_sel: Country code for filtering agglomerations (e.g., "DE", "FR").
    - osm_shp: Path to the OSM railway shapefile.
    - contour_shapefile: Path to the noise contour shapefile.
    - area_shapefile: Path to the agglomerations shapefile.
    - output_folder: Path to save output files.
    - repair_cont: Boolean indicating whether to repair contour geometry.
    """
    # Check out ArcGIS Spatial Analyst extension
    arcpy.CheckOutExtension("Spatial")
    arcpy.AddMessage("Starting processing...")

    # Clear in-memory workspace
    arcpy.AddMessage("Clearing temporary workspace...")
    arcpy.Delete_management("in_memory")

    # Reproject input shapefiles if necessary
    def ensure_laia_projection(input_shp, laea_shp, spatial_ref):
        """Ensures the input shapefile is in the LAEA projection."""
        If arcpy.Describe(input_shp).spatialReference.name != spatial_ref:
            arcpy.AddMessage(f"Reprojecting {input_shp} to LAEA...")
            arcpy.Project_management(input_shp, laea_shp, output_folder + "/ETRS_1989_LAEA.prj")
        else:
            arcpy.AddMessage(f"{input_shp} already in LAEA projection.")

    ensure_laia_projection(osm_shp, osm_shp + "_LAEA", "ETRS 1989 LAEA")
    ensure_laia_projection(contour_shapefile, contour_shapefile + "_LAEA", "ETRS 1989 LAEA")

```

```

if repair_cont:
    arcpy.AddMessage("Repairing contours...")
    arcpy.RepairGeometry_management(contour_shapefile, "KEEP_NULL")

# Initialize result storage
rail_lengths_agglo = []
rail_lengths_contour = []

# Process each agglomeration in the specified country
with arcpy.da.SearchCursor(area_shapefile, ["countryCod", "agglomerat", "SHAPE@", "id"]) as cursor:
    for row in cursor:
        if row[0] == ctry_sel:
            try:
                agglomeration_id = row[1]
                agglomeration_shape = row[2]

                arcpy.AddMessage(f"Processing agglomeration: {agglomeration_id}")

                # Clip OSM railways to agglomeration area
                arcpy.Clip_analysis(osm_shp + "_LAEA", agglomeration_shape,
                "in_memory/clipped_osm_rails")
                arcpy.MakeFeatureLayer_management("in_memory/clipped_osm_rails", "rails_layer")
                arcpy.SelectLayerByAttribute_management("rails_layer", "NEW_SELECTION",
                "railway IN ('tram', 'rail', 'light_rail')")

                # Calculate total rail length within agglomeration
                rail_length = sum(row[0] for row in arcpy.da.SearchCursor("rails_layer",
                ["SHAPE@LENGTH"]))
                rail_lengths_agglo.append((agglomeration_id, rail_length))

                # Clip noise contours to agglomeration area
                arcpy.Clip_analysis(contour_shapefile + "_LAEA", agglomeration_shape,
                "in_memory/clipped_contours")

                # Calculate total rail length within contour maps
                arcpy.Clip_analysis("rails_layer", "in_memory/clipped_contours",
                "in_memory/clipped_rails_contour")
                contour_length = sum(row[0] for row in
                arcpy.da.SearchCursor("in_memory/clipped_rails_contour", ["SHAPE@LENGTH"]))
                rail_lengths_contour.append((agglomeration_id, contour_length))

                # Clean up temporary data
                arcpy.Delete_management("in_memory/clipped_osm_rails")
                arcpy.Delete_management("in_memory/clipped_contours")
                arcpy.Delete_management("in_memory/clipped_rails_contour")

            except Exception as e:
                arcpy.AddError(f"Error processing agglomeration {agglomeration_id}: {str(e)}")
                continue

```

```

# Combine results into a DataFrame
df_agglo = pd.DataFrame(rail_lengths_agglo, columns=["Agglo_ID", "Rail_Length_Agglo"])
df_contour = pd.DataFrame(rail_lengths_contour, columns=["Agglo_ID", "Rail_Length_Contour"])
df_combined = pd.merge(df_agglo, df_contour, on="Agglo_ID", how="outer").fillna(0)

# Calculate percentage coverage
df_combined["Coverage (%)"] = (df_combined["Rail_Length_Contour"] /
df_combined["Rail_Length_Agglo"]) * 100
df_combined["Coverage (%)"].replace([np.inf, -np.inf], 0, inplace=True)

# Export results to CSV
output_csv = f"{output_folder}/rail_length_results_{ctry_sel}.csv"
df_combined.to_csv(output_csv, index=False)
arcpy.AddMessage(f"Results saved to {output_csv}")

# Release Spatial Analyst extension
arcpy.CheckInExtension("Spatial")

# Example usage
if __name__ == "__main__":
    ctry_sel = arcpy.GetParameterAsText(0)
    osm_shp = arcpy.GetParameterAsText(1)
    contour_shapefile = arcpy.GetParameterAsText(2)
    area_shapefile = arcpy.GetParameterAsText(3)
    output_folder = arcpy.GetParameterAsText(4)
    repair_cont = arcpy.GetParameterAsText(5)

    clip_and_calculate_length(ctry_sel, osm_shp, contour_shapefile, area_shapefile, output_folder,
repair_cont)

```

CalcStatsRails_v1.py script --- End ---

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