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European Union

Transboundary Storm Risk and  
Impact Assessment in Alpine Regions



# MODEL OF EXPOSED ASSETS

**Deliverable 4.4**



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## TABLE OF CONTENTS

1	INTRODUCTION .....	4
2	THE DATASET .....	4
2.1	Dataset 1 – Aggregation boundary .....	6
2.2	Dataset 2 – Connectivity graph.....	8
3	CONCLUSIONS.....	11



## 1 INTRODUCTION

The purpose of this document is to describe the dataset related to the companion deliverable D4.3 “IDENTIFICATION AND CHARACTERIZATION OF EXPOSED ASSETS AND THEIR VULNERABILITY TO STORMS”. The dataset is designed and implemented to support quantitative risk assessment related to storms in alpine regions, although its scope can be easily extended to other region and encompass other hazards of relevance for stakeholders.

In section 2 the main characteristics and metadata of the dataset are provided along with the indication for accessing and downloading the data. In the last section a few concluding remarks are provided. Further details on the methodological approach to exposure modelling are provided in deliverable D4.3.

## 2 THE DATASET

The exposure dataset is composed by two main components:

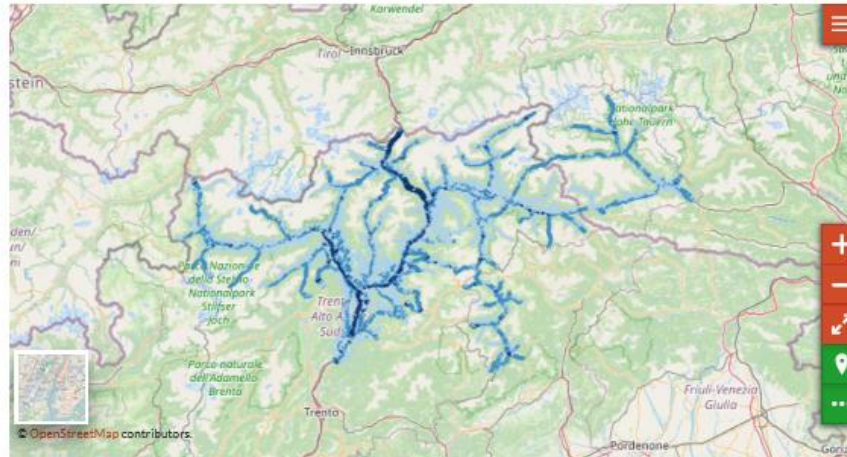
1. **Dataset 1- Aggregation boundary with cell-based exposure information** – A fixed-resolution (250m) planar tessellation based on regular hexagonal planar cells. Each cell is assigned a set of static attributes describing the considered exposed assets aggregated to the cell area. The dataset is composed by a set of polygonal geometries.
2. **Dataset 2 - Road-based cell connectivity graph** - A set of linear segments connecting the centroids of the cells of the planar tessellation. Each segment defining an edge of the graph is a simplified representation of the functional transport connection between neighbouring cells and is modelled after the actual network of drivable roads (drivable primary, secondary and tertiary roads) each edge includes two attributes describing the number of actual roads crossing the boundary between the neighbouring cells and the overall weight / intensity of the connection in terms of the expected aggregated transport capacity of the original roads.

The attribute information and the metadata for the datasets are provided in the following section.

The two datasets can be freely downloaded from the EURAC TRANS-ALP web-gis repository, with the links provided in the tables. A basic user registration / login is needed (see Figure 1).



## TRANSALP Study Area: tessellated OSM drivable roads (~250m)



Info Attributes Share Ratings Comments Favorite

**Title** TRANSALP Study Area: tessellated OSM drivable roads (~250m)  
**License** Public Domain (PD) ⓘ  
**Abstract** Drivable roads from OpenStreetMap over TransAlp project's study area (South Tyrol, East Tyrol, Valle Agordina) onto an hexagonal tessellation of ~250m.  
**Publication Date** March 30, 2022, 8:02 a.m.  
**Type** Vector Data  
**Keywords** drive , features , tessellation , transalp , transalp\_tran\_rds\_in\_s4\_osm\_pp\_drive\_250tess  
**Category** Transportation ⓘ  
**Regions** Austria , Italy  
**Responsible** pcampalani  
**Group** TRANS-ALP Project - Public

More info -

Layer WMS GetCapabilities document

Download Layer

Metadata Detail

Editing Tools

View Layer

Download Metadata

### Legend

Edge Weight  
 1  
 1 - 5  
 5 - 10  
 10 - 81

### Maps using this layer

This layer is not currently used in any maps.

### Create a map using this layer

Click the button below to generate a new map based on this layer.

Create a Map

### Add the layer to an existing map

BURUNDI: Geological Units ▾

Click the button below to add the layer to the selected map.

Add to Map

### Styles

The following styles are associated with this

Figure 1 Dataset 2 (connectivity graph) in the EURAC TRANS-ALP web-gis repository

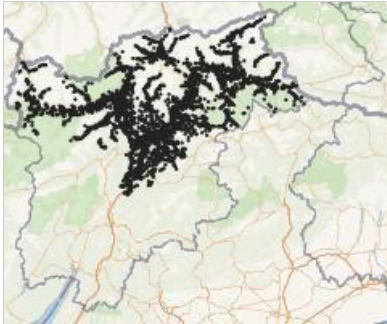
## 2.1 DATASET 1 – AGGREGATION BOUNDARY

### Resource Metadata

**Access / download Link:** [https://maps.eurac.edu/layers/eo\\_cdr\\_transalp:EO\\_CDR:st\\_exposure\\_res\\_empl\\_tou\\_sch\\_eld\\_hosp\\_pa\\_250tess](https://maps.eurac.edu/layers/eo_cdr_transalp:EO_CDR:st_exposure_res_empl_tou_sch_eld_hosp_pa_250tess)

SOUTH TYROL: Tessellated exposed assets (~250m)

Thumbnail



Resource ID b139010f-75cc-4de8-9ea1-c8ae50fac8cb

Title

SOUTH TYROL: Tessellated exposed assets (~250m)

Date

March 30, 2022, 6:05 p.m., Publication

Abstract

Aggregated data from exposed assets over South Tyrol (IT) onto an hexagonal tessellation of ~250m.

Edition

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Responsible pcampalani

Point of Contact Campalani piero.campalani@eurac.edu

Purpose

Covariates for the generation of people flow models over South Tyrol.

Maintenance Frequency asNeeded  
 Type  
 vector  
 Restrictions withheld from general circulation or disclosure  
 License  
 Varied / Derived  
 Language eng  
 Temporal Extent  
 Start  
 --  
 End  
 --  
 Supplemental Information  
 No information provided  
 Data Quality  
 --  
 Extent  
 x0: 605721.9375000000000000 x1: 766096.2500000000000000 y0: 5120540.5000000000000000 y1: 5220476.0000000000000000  
 Spatial Reference System Identifier  
 EPSG:25832  
 Keywords  
 no keywords  
 Category  
 Geoscientific Information  
 Regions  
 Italy

### Attributes

Attribute name	Description
grid_id	Unique identifier of the gid cell
no_residen	Number of resident people (Aggregated number of people in the cell)
cap_touris	Total capacity of tourists accommodations



cap_school	Total capacity of schools (aggregated max number of pupils in the cell)
cap_care_e	Total capacity of elderly care structures (aggregated max number of elderly people in the cell)
hosbedsday	Total number of beds in the daycare structures (aggregated max number of beds in the cell)
hosp_beds	Total number of beds in the hospitals (aggregated max number of beds in the cell)
no_hosp	Number of hospitals in the cell
no_elderly	Number of elderly care structures in the cell
no_tourist	Number of tourists accommodations in the cell
no_schools	Number of schools in the cell
no_empl	Number of employees in the cell
prt_forest	Relative area of protection forest within the cell
lc_artific	Relative area of artificial surface within the cell
rds_main	Length of main roads in the cell (motorway, trunk, primary)
rds_other	Length of other types of drivable roads in the cell
shape_leng	Perimeter of the cell (m)
shape_area	Area of the cell (m <sup>2</sup> )
geom	Geometry 2D (Polygon)

## 2.2 DATASET 2 – CONNECTIVITY GRAPH

### Resource Metadata

**Access / download Link:** [https://maps.eurac.edu/layers/EO\\_CDR:transalp\\_tran\\_rds\\_ln\\_s4\\_osm\\_pp\\_drive\\_250tess](https://maps.eurac.edu/layers/EO_CDR:transalp_tran_rds_ln_s4_osm_pp_drive_250tess)

TRANSALP Study Area: tessellated OSM drivable roads (~250m)  
Thumbnail





Resource ID e0078129-d1ab-49c5-b886-c2ff7e7338fa

Title

TRANSALP Study Area: tessellated OSM drivable roads (~250m)

Date

March 30, 2022, 8:02 a.m., Publication

Abstract

Drivable roads from OpenStreetMap over TransAlp project's study area (South Tyrol, East Tyrol, Valle Agordina) onto an hexagonal tessellation of ~250m.

Edition

--

Responsible pcampalani

Point of Contact Campalani piero.campalani@eurac.edu

Purpose

Simplify the OSM roads network onto a regular tessellation for more flexible use in risk analysis and reduction.

Maintenance Frequency asNeeded

Type

vector

Restrictions otherRestrictions None.

License

Public Domain

Language eng

Temporal Extent

```

Start
--
End
--
Supplemental Information
An edge in the roads network exist when at least 1 road in the original OSM network intersects with the underlying hexagonal tessellation. The
"count" field registers the number of such roads per each edge. The type and number of roads intersecting with the cells borders both
participate in the definition of the "weight". The more important the road, the higher the weight. Python packages used: NetworkX, Shapely,
GeoPandas.
Data Quality
Data derived from original OSM data.
Extent
x0: 609134.1875000000000000 x1: 799442.9375000000000000 y0: 5120673.0000000000000000 y1: 5224369.5000000000000000 Spatial
Reference System Identifier
EPSG:25832
Keywords no keywords
Category
Transportation
Regions
Austria , Italy

```

## Attributes

Attribute name	Description
Index	Unique identifier of the edge
u	ID of the starting node (i.e., origin grid cell)
v	ID of the ending node (i.e., destination grid cell)
count	number of roads bundled together in the edge
weight	total cumulative weight associated to the edge
geom	Geometry 2D (line segment)



### 3 CONCLUSIONS

This document describes the main specification and metadata of a dataset encoding an integrated exposure / vulnerability model designed to support risk assessment activities related to complex multi-hazard events such as storms in alpine environments. The dataset is to be considered a preliminary product which will be further updated and improved during the project. The dataset will be thoroughly tested and validated in a subsequent phase of the project TRANS-ALP where a consistent risk assessment framework is going to be devised.