

## GROUND-MED demo site 3

### University of Oradea, Romania

The demonstration site no. 3 of the GROUND-MED project will be located at the University of Oradea, Romania. Building T on the main university campus has been selected for this purpose. It comprises seminar rooms, laboratories, offices, and a workshop.

The City of Oradea is located in the western part of Romania, close to the border with Hungary, is the capital city of the Bihor County, and has a population of about 220,000. The University of Oradea campus is located in the southern part of Oradea.

The climate in Oradea is basically mild temperate continental and some Mediterranean influence, with cold winters and hot summers.

Multiannual weather data in Oradea

Weather parameter	Month												Annual	
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.		
Sunshine hours	65.2	84.8	145.8	191.8	245.0	261.0	286.0	266.0	209.0	175.0	76.0	51.0	2056.0	
Air Temp. [°C]	Abs. max.	15.2	19.0	26.4	29.6	33.4	34.5	40.4	39.6	32.6	29.3	22.8	19.8	40.4
	Average	-2.1	0.9	5.2	10.9	15.8	19.0	24.0	19.8	16.0	10.5	5.8	0.2	10.4
	Abs. min.	-25.3	-20.4	-14.6	-3.1	-0.6	1.9	7.0	5.0	-6.7	-6.7	-14.2	-21.0	-25.3
No. of freezing days	25.5	19.0	12.3	2.2	0.2	0.0	0.0	0.0	0.2	3.1	8.7	21.8	93.0	
Average precipitations [l/day]	39.0	32.0	33.0	45.0	59.0	85.0	67.0	58.0	40.0	37.0	4.7	53.0	595.0	
Days with precipitations	11.9	10.8	11.0	12.3	13.0	12.3	10.7	9.4	8.4	7.8	11.7	13.6	133.0	
Wind speed [m/s]	13.3	14.1	14.0	13.2	12.0	11.7	13.3	11.1	10.9	12.7	13.0	13.9	12.8	
No. of days with fog	9.0	5.1	2.1	0.5	0.8	0.6	0.7	0.5	0.9	2.5	5.4	9.5	37.6	

#### Building J data:

- Year of construction: 1913;
- Use: labs, classrooms, offices;
- Building type:
  - red brick walls, outside surface area: about 950 m<sup>2</sup>;
  - single glazed windows in wood frames;
  - no thermal insulation.
- Building size:
  - 3 floors, height: 3.59 m ground floor, 2.95 m first floor, 2 m second floor;
  - total surface area: about 700 m<sup>2</sup>;
  - conditioned surface area: about 473 m<sup>2</sup>.

The building was used as university library, but as the University of Oradea developed very much during the last 20 years, it is now too small for this purpose. The new library building will be commissioned in June 2010, but the most of the inventory is already moved to the new location.

Due to its age and very high heat losses (mainly through the windows), the building has been planned for complete renovation starting in 2010. The nominal heat load in the initial design is about 70 kW (for a -18°C nominal outdoor temperature, as required by the Romanian standard for the Oradea area). A new project is currently carried out, aiming at reducing the nominal heat load as much as possible, by replacing the windows with double glazed ones and adding thermal insulation. The building is connected, at present, to the geothermal heating system of the university campus for space heating.

The ground source heat pump to be installed in the GROUND-MED project will be manufactured by the Austrian company OCHSNER, will have a nominal heating capacity of 38 kW, and will provide space heating and cooling. The heating and cooling system will basically be placed on the floors and, if necessary, on the walls (the inner side of the outside walls). The geothermal heating system will be used as back-up and even peak load.

The total cost of the project, including the building renovation, has not been estimated yet.

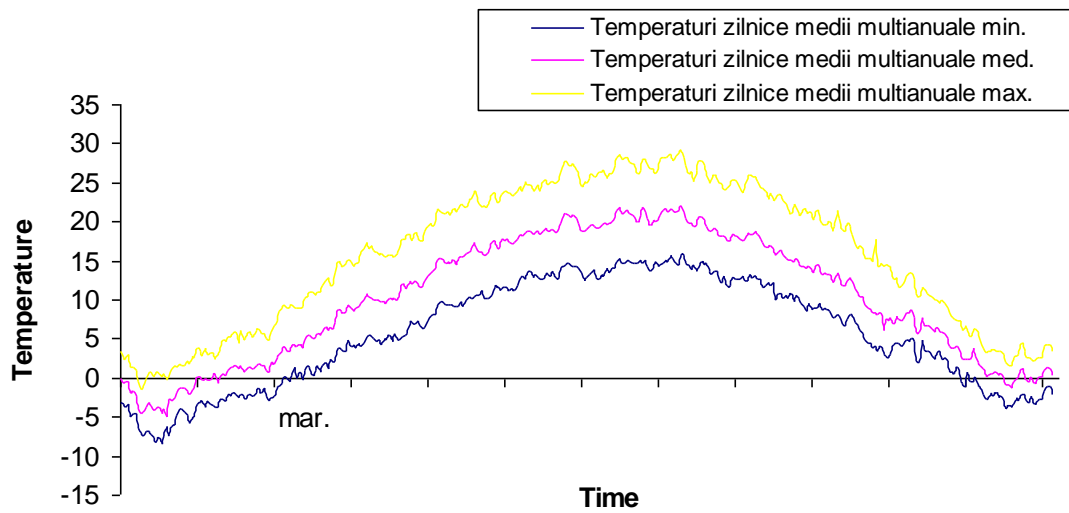


Map of Romania



Map of Bihor County





Multiannual average of the daily mean temperature in Oradea