Potential and limits of implementing open-loop Groundwater Heat Pump Systems (GWHPs) in Italian urban areas: the cases study of Piedmont and Lombardy Regions

Potential and limits of implementing open-loop Groundwater Heat Pump Systems (GWHPs) in Italian urban areas: the cases study of Piedmont and Lombardy Regions

Alessandro Berta[1*], Glenda Taddia[1], Federico vagnon[1], Martina Gizzi[1]

1 Department of Environment, Land and Infrastructure Engineering (DIATI), Politecnico di Torino, C.so Duca degli Abruzzi 24, 10129 Torino, Italy
*Corresponding Author: alessandro.berta@polito.it

Italian urban areas are characterized by centuries-old infrastructure: 35% of the Italian buildings stock is built before 1970 and about 75% is thermally inefficient. Besides, an important portion of buildings' energy consumption, from 60% to 80%, is attributed to space heating. In this context, defining a sustainable path to pursue 33.9% of energy consumption from renewable sources in the heating sector in 2030 is essential. Open-loop groundwater heat pumps (GWHPs) currently represent one of the most suitable technologies to be applied in the heating and cooling of buildings in Italian urbanized areas. However, different environmental aspects must be considered to minimize the impact of GWHP systems on the subsurface and aquifers. As a consequence, for allowing the diffusion of GWHPs urban planning instruments cannot disregard the knowledge about geological and hydrogeological urban and regional settings. A comprehensive analysis of the planning instruments with which two different Italian regions (Piedmont and Lombardy region) are equipped is proposed. The in-force regional and municipal regulatory references to which a new geothermal project must comply (i.e. authorization requests and plant final testing operations) were taken into consideration, highlighting the potential and the limits connected to the diffusion of GWHPs in the mentioned contexts.

Keywords: GWHPs, hydrogeology, modeling, Italy, urban areas

Topic: Geothermal open-loop in urban contest