

Renewable energy application: sustainability techniques in Torino Urban City

Original

Renewable energy application: sustainability techniques in Torino Urban City / Taddia, G.; Gizzi, M.; Berta, A.; Lo Russo, S.. - ELETTRONICO. - Congresso SGI-SIMP abstract book 2024:(2024), pp. 1148-1148. (Intervento presentato al convegno Congresso congiunto SGI-SIMP 2024 - Geology for a sustainable management of our Planet tenutosi a Bari nel 2 - 5 settembre 2024) [10.3301/ABSGI.2024.02].

Availability:

This version is available at: 11583/2992849 since: 2024-09-27T13:50:52Z

Publisher:

Società Geologica Italiana ETS, Roma 2024

Published

DOI:10.3301/ABSGI.2024.02

Terms of use:

This article is made available under terms and conditions as specified in the corresponding bibliographic description in the repository

Publisher copyright

(Article begins on next page)



Bari, 2-5 September 2024

ABSTRACT BOOK

a cura della Società Geologica Italiana



**Geology for a sustainable
management of our Planet**



Politecnico
di Bari



PRESIDENTS OF THE CONGRESS

Luisa Sabato (SGI), Emanuela Schingaro (SIMP).

VICEPRESIDENT OF THE CONGRESS

Marcello Tropeano (SGI).

SCIENTIFIC COMMITTEE COORDINATOR

Sandro Conticelli (Università di Firenze).

SCIENTIFIC COMMITTEE

Lucia Angiolini (Università di Milano), Giuseppina Balassone (Università di Napoli), Domenico Calcaterra (Università di Napoli), Angelo Camerlenghi (OGS), Serafina Carbone (Università di Catania), Chiara Cardaci (Protezione Civile), Domenico Chiarella (Royal Holloway, London), Angelo Cipriani (ISPRA), Paolo Conti (Università di Siena), Giovanni De Giudici (Università di Cagliari), Patrizia Fiannacca (Università di Catania), Diego Gatta (Università di Milano), Guido Giordano (Università di Roma Tre), Lara Maritan (Università di Padova), Annalisa Martucci (Università di Ferrara), Ilaria Mazzini (CNR-IGAG), Stefano Mazzoli (Università di Camerino), Barbara Nisi (CNR-IGG), Stefano Poli (Università di Milano), Giovanna Rizzo (Università della Basilicata), Laura Scognamiglio (INGV), Mauro Soldati (Università di Modena e Reggio Emilia), Mario Tribaudino (Università di Torino), Chiara Varone (CNR-IGAG).

ORGANISING COMMITTEE

Donato Belmonte (SIMP), Bernardo Carmina (Università di Pisa), Fabio Dioguardi (Università di Bari), Giacomo Eramo (Università di Bari), Lorenza Fascio (SIMP), Vincenzo Festa (Università di Bari), Marilena Filippucci (Università di Bari), Fulvio Franchi (Università di Bari), Salvatore Gallicchio (Università di Bari), Giulia Innamorati (SGI), Maria Lacalamita (Università di Bari), Isabella Serena Liso (Università di Bari), Stefania Lisco (Università di Bari), Piernicola Lollino (Università di Bari), Daniela Mele (Università di Bari), Patrizia Maiorano (Università di Bari), Nadia Malaspina (SIMP), Virginia Marchionni (SIMP), Giuseppe Mastronuzzi (Università di Bari), Ernesto Mesto (Università di Bari), Francesca Micheletti (Università di Bari), Mario Parise (Università di Bari), Fabio Massimo Petti (SGI), Angela Rizzo (Università di Bari), Giovanni Scardino (Università di Bari), Giovanni Scicchitano (Università di Bari), Luigi Spalluto (Università di Bari), Simona Tripaldi (Università di Bari), Alessandro Zuccari (SGI).

COMMUNICATION COMMITTEE

Giovanna Agrosì (Università di Bari), Giulia Innamorati (SGI), Christian Leo (Università di Bari), Fabio Massimo Petti (SGI), Virginia Marchionni (SIMP), Nicola Venisti (Museo di Scienze della Terra, Università di Bari), Martina Zucchi (Università di Bari).

ABSTRACT BOOK EDITORS

Bernardo Carmina, Lorenza Fascio, Giulia Innamorati, Virginia Marchionni & Fabio Massimo Petti.

COVER IMAGE

The Pontifical Basilica of Saint Nicholas (Bari).

*Papers, data, figures, maps and any other material published are covered by the copyright own by the **Società Geologica Italiana**.*

DISCLAIMER: The Società Geologica Italiana, the Editors are not responsible for the ideas, opinions, and contents of the papers published; the authors of each paper are responsible for the ideas opinions and contents published.

La Società Geologica Italiana, i curatori scientifici non sono responsabili delle opinioni espresse e delle affermazioni pubblicate negli articoli: l'autore/i è/sono il/i solo/i responsabile/i.

Renewable energy application: sustainability techniques in Torino Urban City

Taddia G.*, Gizzi M., Berta A. & Lo Russo S.

Dipartimento di Ingegneria dell'Ambiente, del Territorio e delle Infrastrutture, Politecnico di Torino.

Corresponding author email: glenda.taddia@polito.it

Keywords: groundwater heat pumps (GWHPs), urban sustainability, aquifer protection.

Italy is one of the top 10 countries for geothermal electricity generation and among the first 15 for heating and cooling applications. In 2021, there were 226 active installations in Italy for the exploitation of direct geothermal energy for the sole heat production purposes. These are, in most cases, individual heating and thermal plants.

For about 2 years, Torino has been among the 100 European cities and the 9 Italian cities that have the objective of achieving an 80% reduction in CO₂ emissions by 2030 compared to 2019 values. The journey started long ago when the European Union's Mission Smart and Climate-Neutral Cities was launched, with the aim of accelerating the transition towards climate neutrality in 100 selected European cities as a reference by 2030 (anticipating 2050 foreseen by the Green Deal) and opening a call aimed at all European cities. Torino was thus one of the selected Italian cities. The priority objective of Torino and the other selected cities was the preparation of the so-called Climate City Contracts (CCC) (Comunicato Stampa Comune di Torino, 2024), i.e. contracts which, although having no legal value, will serve to formalize a clear, transparent and well-defined political commitment towards the Commission and national/regional authorities, including citizens, research organizations and the private sector.

In this context, Groundwater Heat Pumps (GWHPs) are an efficient solution for reducing carbon emissions in heating and cooling systems in urban areas with favourable geological conditions (Taddia et al., 2019). These systems draw water from shallow aquifers, undergo heat exchange processes, and return water at a modified temperature. It is important to preserve the groundwater quality of aquifers, which serve as renewable energy sources, for urban sustainability. In order to promote the adoption of GWHP, urban planning should be carried out while ensuring the long-term protection of groundwater. Torino Urban City has an alluvial shallow aquifer that is a valuable source of low-enthalpy geothermal energy (Berta et al., 2024). However, it is essential to conduct a comprehensive site assessment to evaluate the environmental impacts, taking into account well characteristics, locations, pumping rates, and thermal effects on local groundwater resources. The thermal plumes, which are shaped by water extraction and reinjection rates, have an impact only on downstream neighbouring plants. Accurate hydrogeological characterization is crucial for constructing new facilities, as positive aquifer responses to long-term disturbances demonstrate. The proposed urban-scale model is a valuable tool for experts and authorities, enabling the assessment of thermal disruptions at both localized and urban levels. Using this tool ensures the sustainable use of aquifer resources in complex systems, promoting informed decision-making for urban heating and cooling strategies.

Berta A. et al. (2024) - The role of standards and regulations in the open-loop GWHPs development in Italy: The case study of the Lombardy and Piedmont regions. *Renewable Energy*, <https://doi.org/10.1016/j.renene.2024.120016>.

Comunicato Stampa Comune di Torino: <https://comunicatistampa.comune.torino.it/2024/03/la-citta-di-torino-presenta-il-climate-city-contract-alla-commissione-europea/> (Accessed on April 2024)

Taddia G. et al. (2019) - Groundwater Heat Pump Systems Diffusion and Groundwater Resources Protection. *Geingegneria Ambientale e Mineraria*, 156.