



UNIVERSITÀ DEGLI STUDI DI MILANO

DIPARTIMENTO DI SCIENZE DELLA TERRA

A. DESIO

Urban hydrogeology: challenges and opportunities



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Topics

Emerging
contaminant

Influence of urban underground
structures

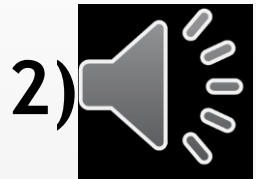
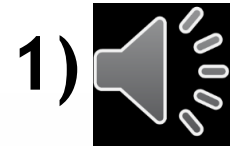
Diffuse
contamination



Scientific background

Background values

.....*con le mani posso finalmente bere*

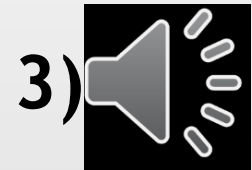


Natural sources of pollution

.....*mi fai bere, con un colpo mi trattiene il bicchiere*

Anthropogenic sources of pollution

senti decidere che per l'estate prossima sarebbe andata di moda.....



GENERAL INFOS

APPEAL AND PUBLIC AWARENESS

RESEARCH AND APPLICATION

WATER AUTHORITIES AND LOCAL GOVERNMENT



THE EUROPEAN KEYWORDS

DIGITAL WATER

MULTIPLE WATER

HYBRID GREY AND GREEN WATER
INFRASTRUCTURE



THE EUROPEAN SLOGANS

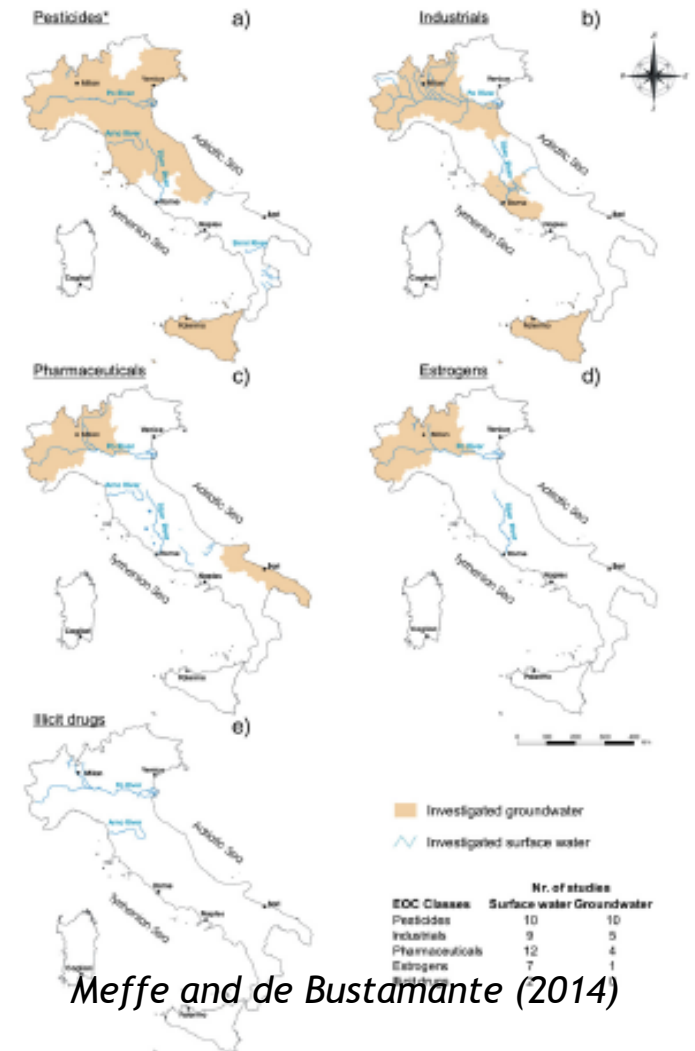
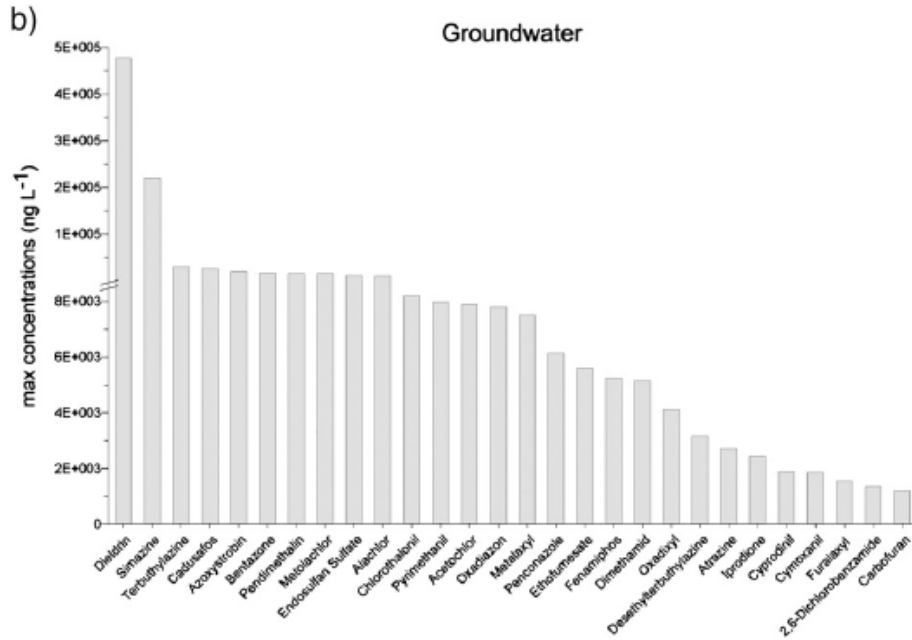
MORE PROTECTION LESS TREATMENT

THE VALUE OF WATER (RESERVE AND RECHARGE AREAS)



Research and/or applications

Emerging contaminant



Pharmaceuticals, personal care products, pesticides, industrial compounds/by-products, food additives, engineered nano-materials.....



Scientific background

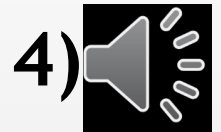
Emerging contaminant

Diazepam

Hypnotic

Estrone
Steroid

Blaenavon



Valsartan

Hypertension



Research and/or applications

Emerging contaminant

Identification is influenced by:

- Who you are
- Where you are

Hydrogeologists...yes but someone else!

MAIN SOURCES

Use of sewer sludge as fertilizers
leakage from sewer systems



Research and/or applications

Emerging contaminant

IMPACT ON HUMAN HEALTH AND ECOSYSTEMS
IMPROVE THE USE AS ENVIRONMENTAL TRACERS

Spatial and temporal variability in groundwater

Fate in groundwater

Monitoring plan

Toxicological impact within the environment

Partitioning to solid matter during wastewater treatment



Scientific background

Influence of urban underground structures

Sewer systems length of the city of Milan

- A) FROM TURIN TO TRIESTE (ABOUT 550 KM)
- B) FROM CAGLIARI TO SASSARI (ABOUT 250 KM)
- C) FROM ROME TO BERLIN (ABOUT 1500 KM)

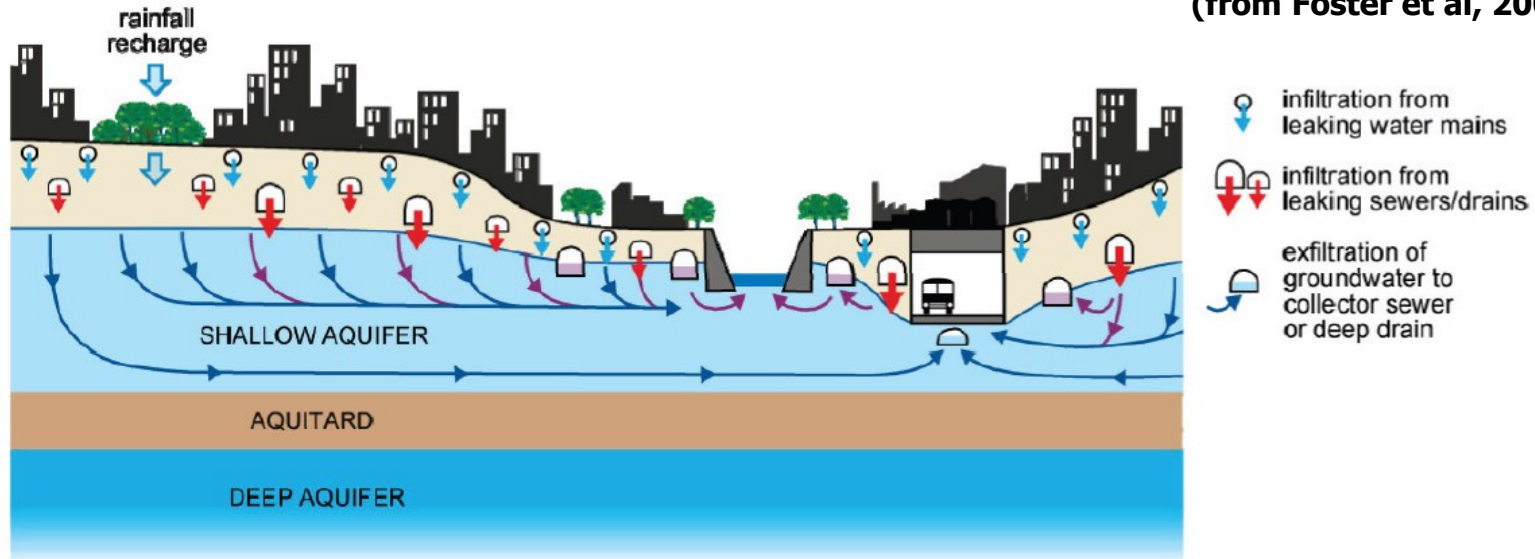
5- 10 km/sqkm



Research and/or applications

Influence of urban underground structures

(from Foster et al, 2003)



- the flooding/recharge paradox

- few studies at the urban scale



Research and/or applications

Influence of urban underground structures

Sewer losses

ls/km	
2.00E-04	2.00E+00
1.40E-05	1.79E-01

Urban area of 100 sqkm with
a 7 km/sqkm ratio

mm/y	
4.20E-02	4.20E+02
2.94E-03	3.76E+01

- Quantitative approaches for recharge and contaminant load estimation
- Adequate methods for measures and monitoring



Research and/or applications

Diffuse contamination

Diffuse sources

Multiple point sources

Multiple linear sources

Anthropogenic Background value



Research and/or applications

Diffuse contamination

Important economic effects on
remediation activities

Some problems in matching it
with groundwater quality
objectives

Statistics and numerical
modeling



An holistic view

Urban Underground Space

- Inclusion of underground in urban planning (beyond the «UUS has less value than surface land» idea)
- Mapping underground resources potential (space, groundwater, geothermal energy, geomaterials)
- Develop quantitative descriptors, and include in a 3D Masterplan (with U-P-CG-E trends)



Final scene and credits

Organized chaos

Lateral
thinking!



Telling
stories!

Involving peoples!

High doses of Blaenavon...it doesn't hurt!

5)



Soundtrack

1) Acqua azzurra acqua chiara - Lucio Battisti
<https://youtu.be/99n0yQG2pcl>

2) Acqua e sale - Mina e Celentano
<https://youtu.be/5WgCtuxGEO>

3) La ballata della moda - Luigi Tenco
<https://youtu.be/GZeXslpb8u0>

4) My bark is your bite - Blaenavon
https://youtu.be/i2MQK9Qnl_Q

5) Lonely side - Blaenavon
<https://youtu.be/FpNHJT8wFfy>

