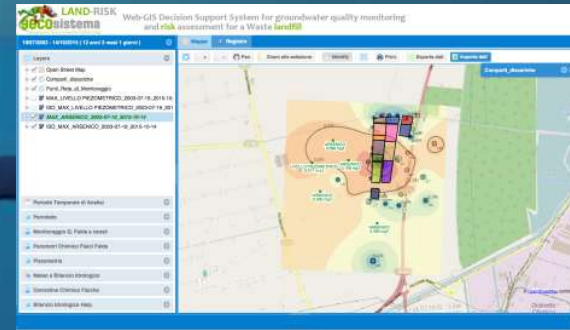


# LAND-RISK: UN SISTEMA WEB-GIS A SUPPORTO DELLE DECISIONI PER IL MONITORAGGIO E LA VALUTAZIONE DEL RISCHIO FALDA PER UNA DISCARICA DI RIFIUTI

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Ing. Davide Broccoli



Torino, 14-15 Ottobre 2015



Italian DHI Conference 2015

# GECOsystema srl



GECOsystema is a specialist company providing advanced consulting/engineering and modeling services in the fields of water, energy, pollution and natural hazard management.

- Through advanced use of GIS and environmental models, we deliver both turnkey services and specialized consulting for:
  - 1) *environmental impact studies and assessments*
  - 2) *water resources and natural hazards*
  - 3) *renewable energy assessment and development*
  - 4) *spatial decision support systems for optimal siting/routing*





# SHPA: a GIS-based Small Hydropower Atlas



**SHPA** provides a user friendly support tool for energy investors who want to:

- Estimate HP productivity on the basis of flow and jump and environmental flows
- Rank sites for development of SHP plants, considering limiting factors such as infrastructures presence
- Screen for costs and optimal sizing of the plant

Do you want to invest and make profit in a small hydropower plants? **SHPA** will assist you in selecting the site that suits your needs and perform a fast and reliable technical and economical assessment.

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## Modeling

the web



Desktops



Finance



Database



Tablets

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with a



Conference 2015





# Why LAND-RISK?



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analysis

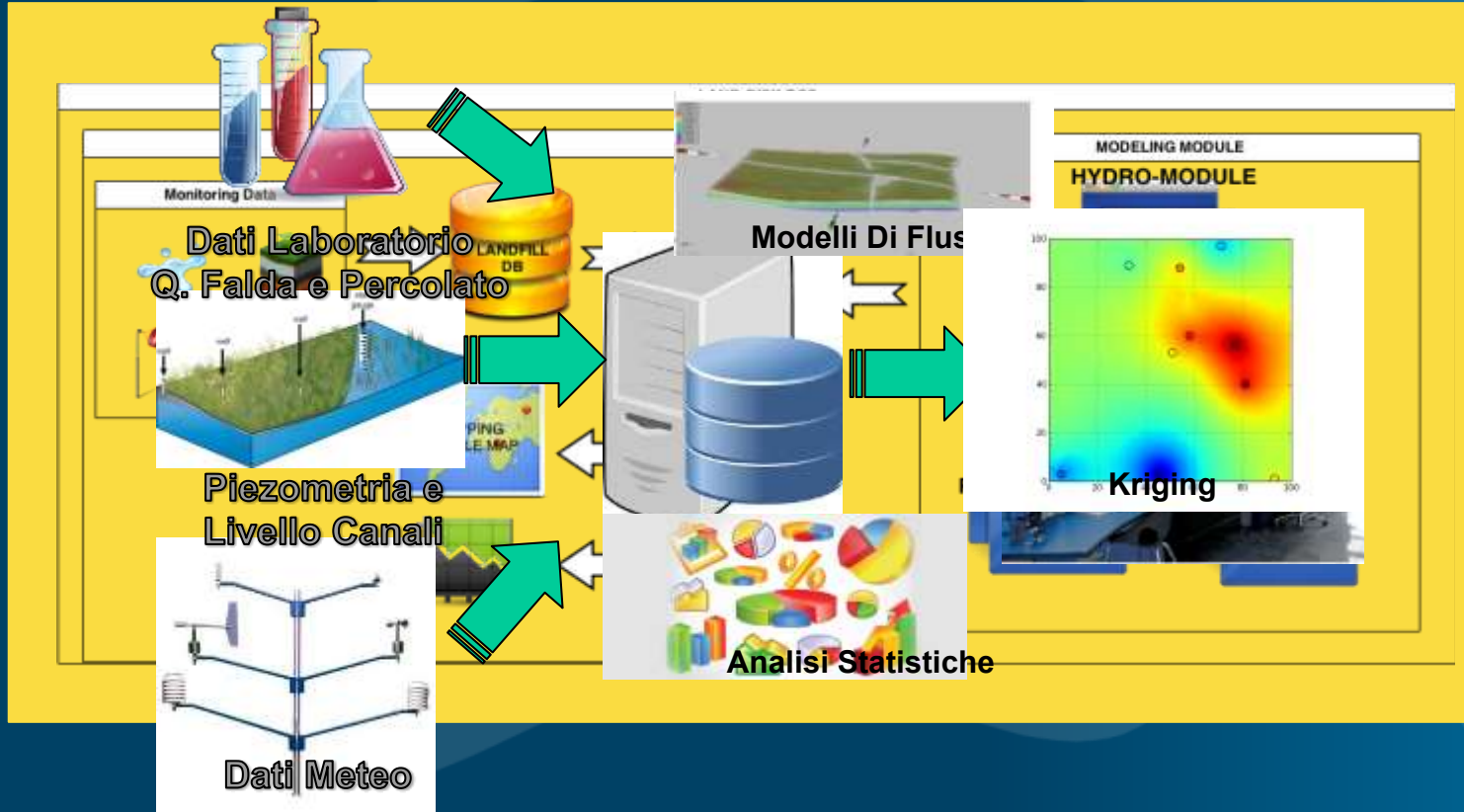
## Identification

- Statistical and geostatistical analysis tools
- Methodology for environmental and human health risk assessment

# LAND-RISK

- LAND-RISK is a web-based Spatial Decision Support System able to manage, analyse, modelling and evaluate in real time (daily) the groundwater quality and risk for human and environment related to a Waste Landfill site.
- LAND-RISK is developed as a web services merging together the following elements:
  - real-time acquisition of data from monitoring sensors for water quality and aquifer hydraulic head
  - numerical hydrogeological model for flow and transport (FEFLOW)
  - hydrological water balance of the study area and for the landfill (HELP)
  - human health and groundwater risk/exposure assessment models
  - routines for spatial interpolation (Ordinary Kriging)
  - Open Source Web-GIS/mapping technology
  - Wizard reporting tool

# LAND-RISK: Framework



## LAND-R

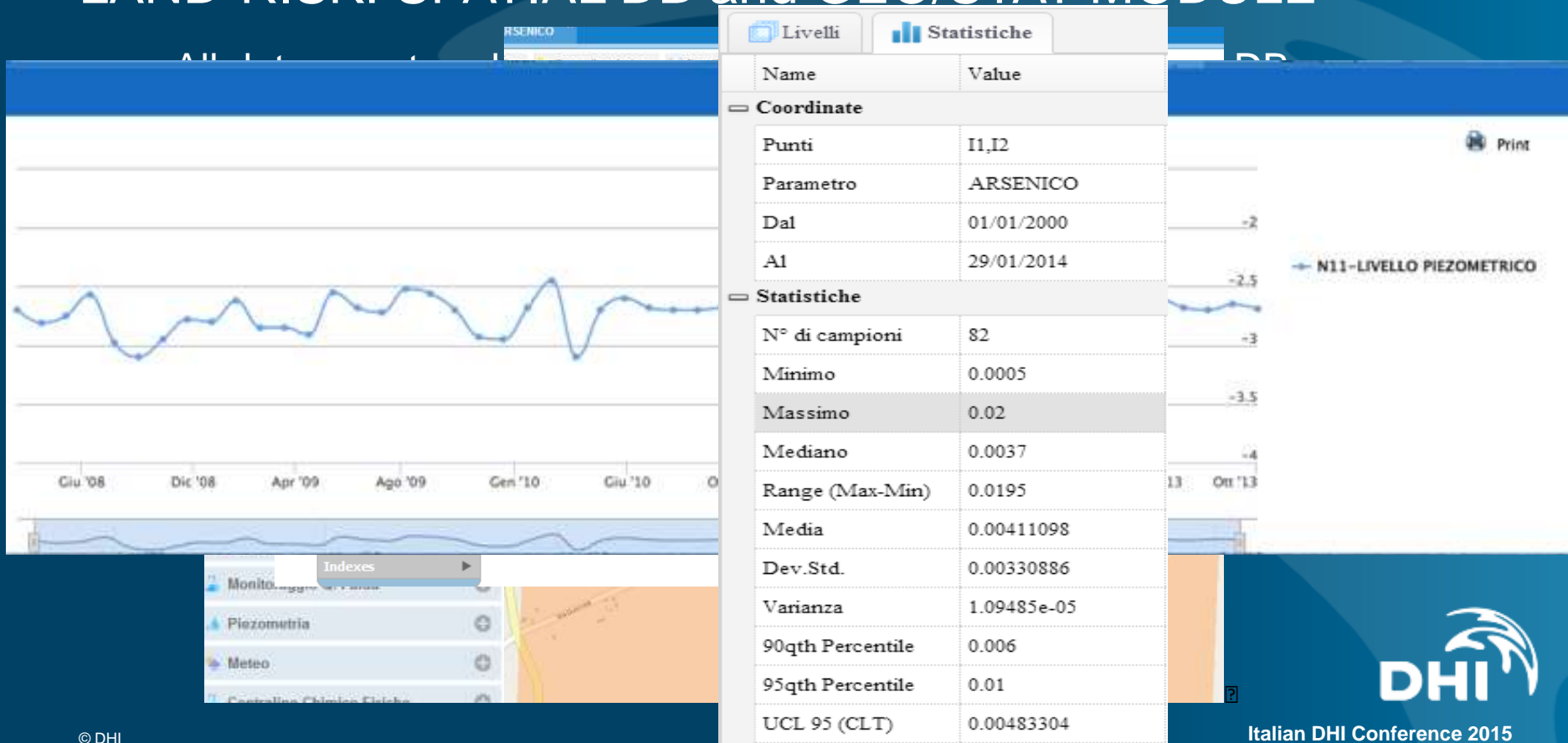
- The DSS obtain real time monitoring and provide possibly the limits
- The DSS (Layer) are able to install and provide real time



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# LAND-RISK: SPATIAL DB and GEO/STAT MODULE

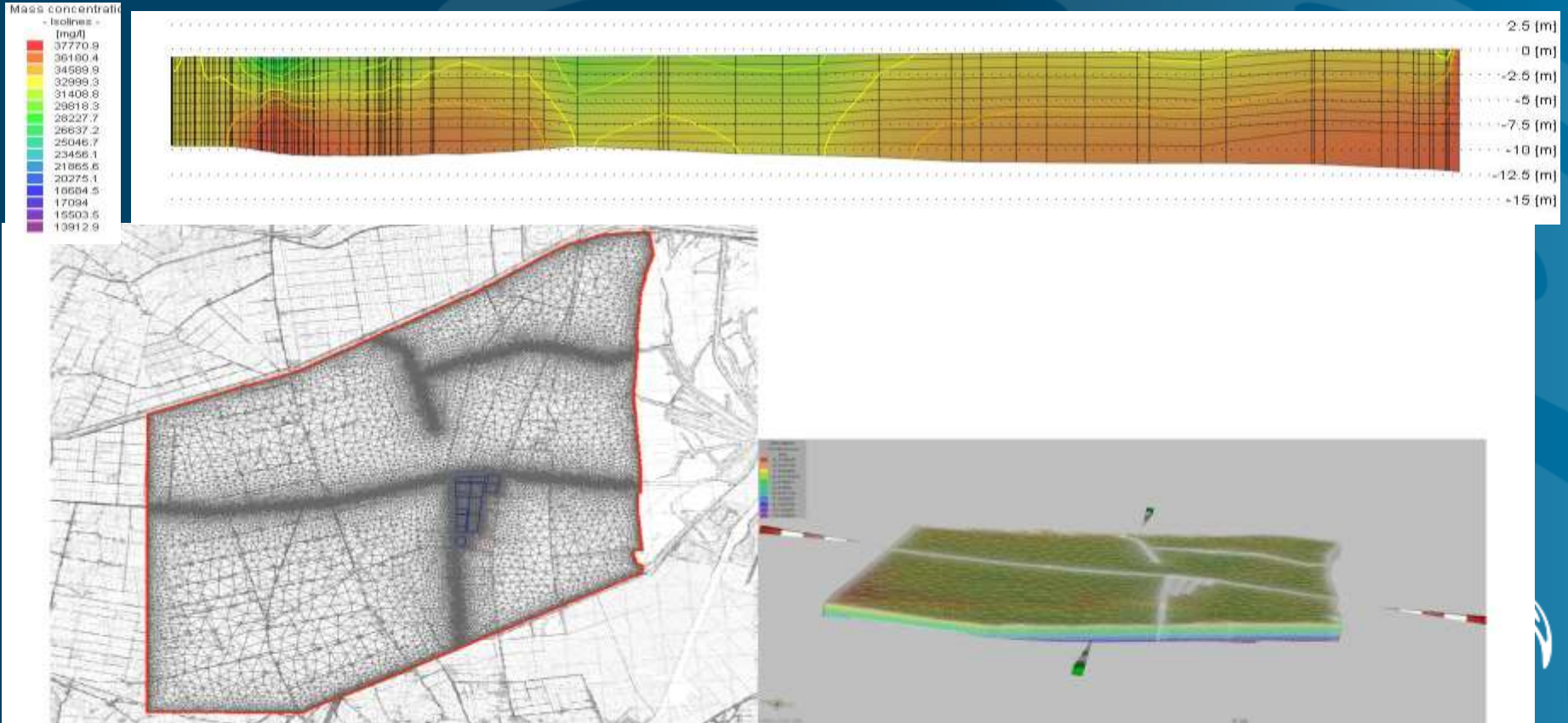




# LAND-RISK: HYDRO MODULE

- Daily Hydrological water balance of landfill (HELP) and for the recharge assessment (Pistocchi et al. 2008)
- Density dependent numerical 3D model (FEFLOW):
  - Daily RUN of flow conditions
- Back Analysis routine for source identification in case of potential contamination based on historical source leachate and flow conditions.

# LAND-RISK: 3D numerical flow model -Feflow

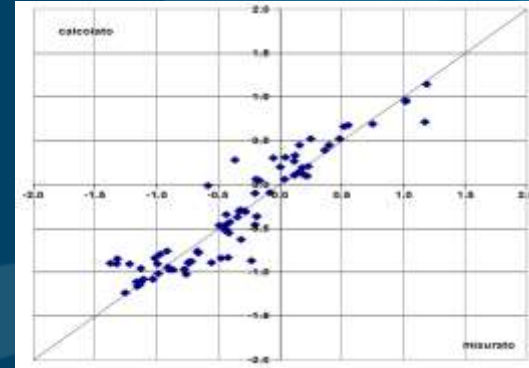
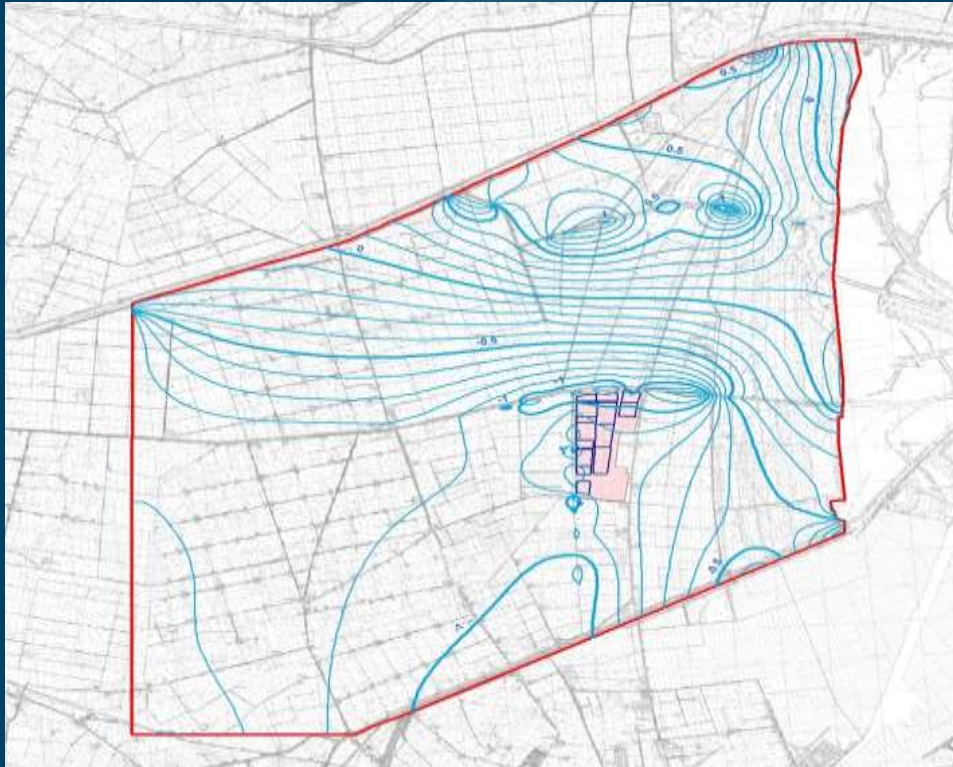


# LAND-RISK: 3D numerical flow model -Feflow

- Fase 1
  - modello stazionario 2D in grado di rappresentare le condizioni medie stagionali del flusso e piezometria presenti nell'area di studio
- Fase 2
  - modello dinamico 3D delle condizioni di flusso in condizioni *density-dependent* (salinità variabile). Il modello 3D dinamico, in grado di rappresentare le condizioni di flusso dell'area di studio al variare delle condizioni al contorno (livelli sui canali) e della ricarica superficiale, costituirà il cuore del DSS e fornirà informazioni utili per l'analisi di eventuali superamenti dei limiti di concentrazione e l'individuazione delle potenziali sorgenti



# LAND-RISK: 3D numerical flow model -Feflow

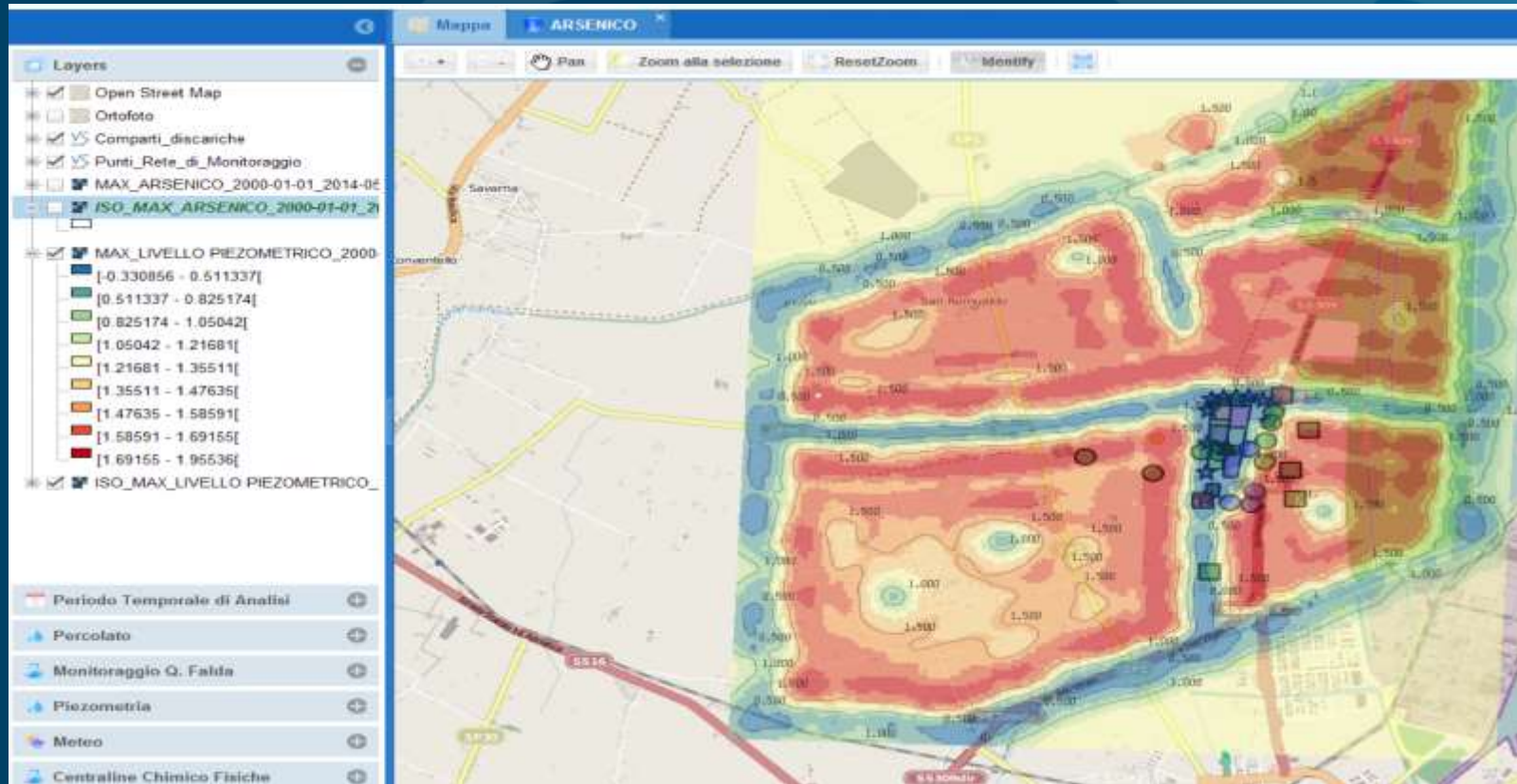


## parametri statistici di scostamento

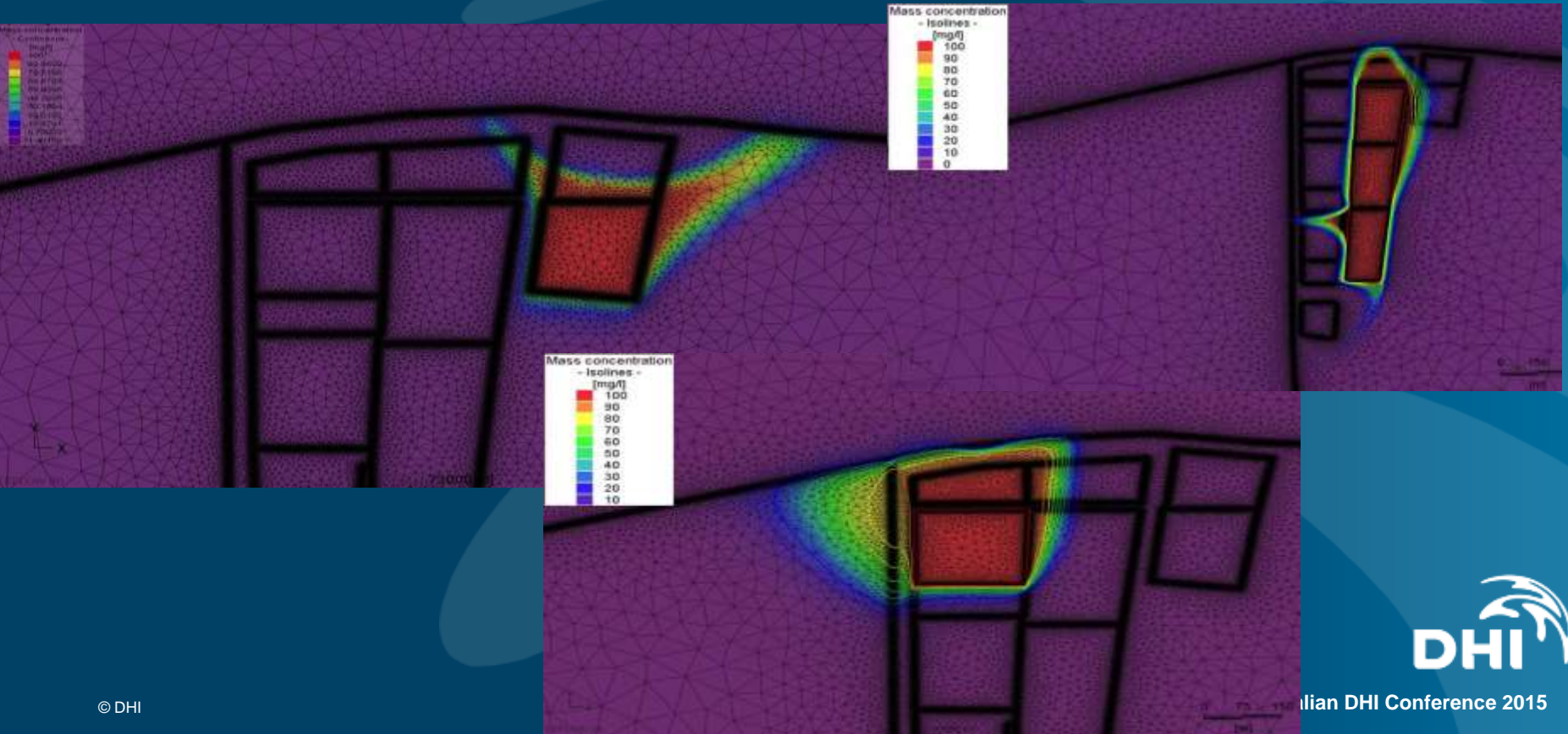
coefficiente	0.66
simbolo	-0.62
media	0.03
mediana	0.00
scarto medio assoluto	0.15
scarto quadratico medio	0.22



# LAND-RISK: 3D numerical flow model -Feflow

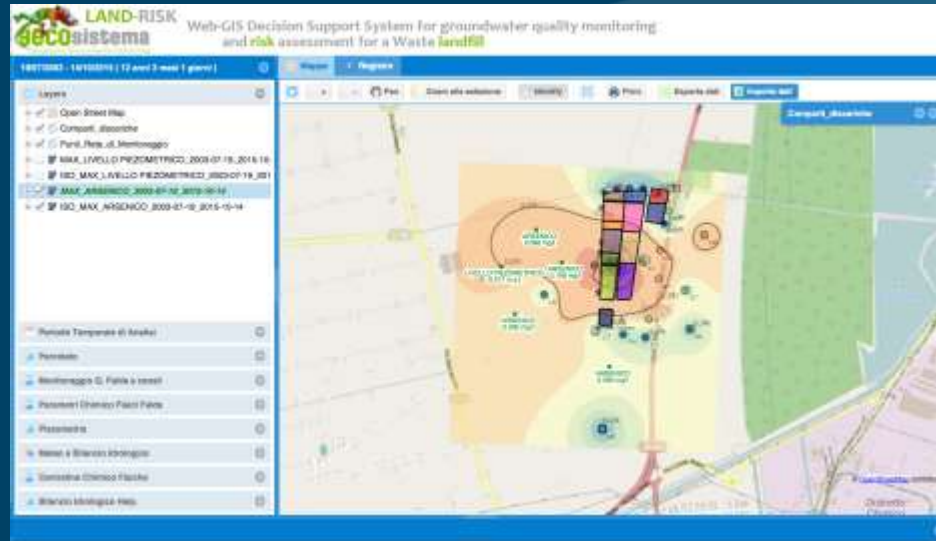


# LAND-RISK: 3D numerical Transport model -Feflow



# LAND-RISK ON-LINE

- LAND-RISK is actually operating in an important landfill site located in the North of Italy
- SICURA first implementation of LAND-RISK for HERA Spa





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- GIS
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- Studi ambientali
- Idrologia ed idraulica
- Energie rinnovabili



# Grazie

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