

Online and in Stockholm, Sweden | 23 August - 1 September 2022

Seeing the Unseen: The Value of Water

SIWI Seminar: Valuing wastewater for new solutions (1/3)

The changing value of wastewater and sludges
2022 August 24th

Effect of the irrigation with reclaimed water on plants, soils and aquifers in the MED area.
The EARSAC project.



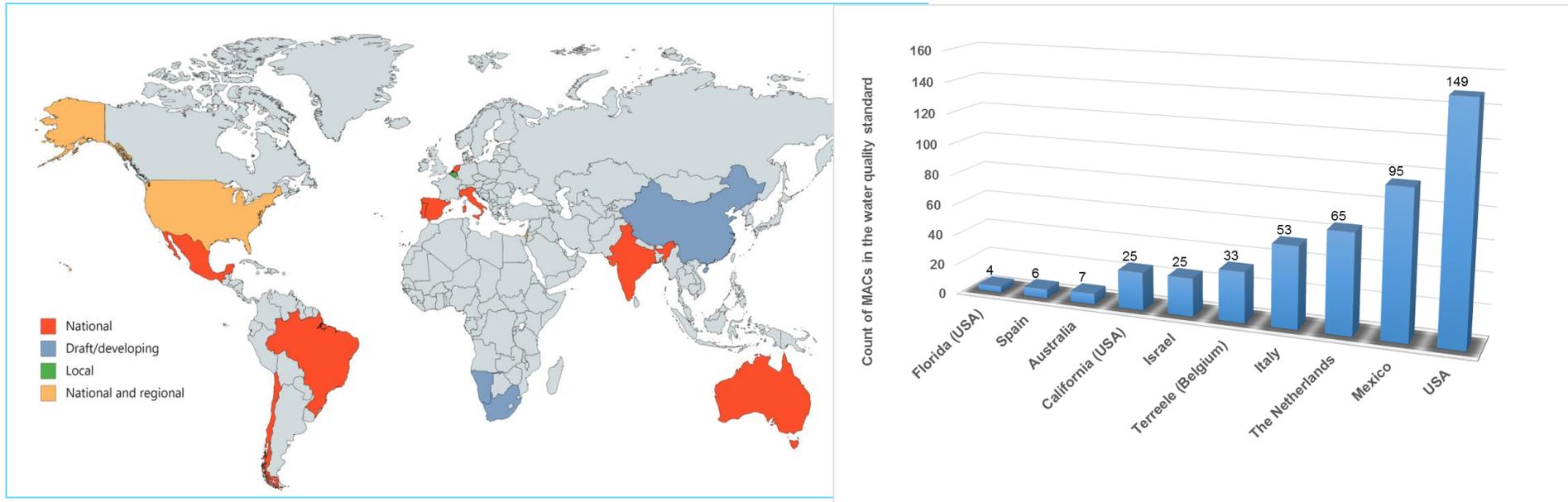
Dr. Enrique Fernández-Escalante, Tragsa Group (Spain) &
IAH MAR Commission

<https://dinamar.tragsa.es>



MAR water quality. International background

MAR regulations. Analyses and comparisons



Maximum allowable Concentrations or MACs

18 countries which have or are developing legislation on MAR water quality, either at regional or national level

Number of parameters per legislation with water quality standards analysed

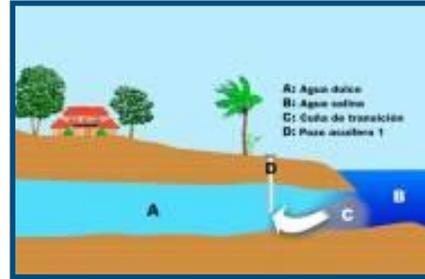
The min/maximum number of parameters in the MAR quality standards is

4-255

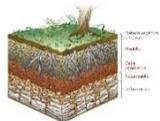
5/18 countries have specific SAT-MAR regulations

EARSAC project's objectives and lines of action

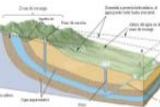
The main target is the setting and study of an **INTEGRATED SYSTEM** combining crops, soils and aquifers irrigated with water from different systems, specially reclaimed water



1. Effects on plants physiology, production and quality (irrigated with reclaimed water)



2. Effect on the soil



3. Groundwater characterization and study of the evolution for the groundwater-reclaimed water system after irrigation and SAT-MAR



4. Evolution of the water stored in irrigation dams Vs in the aquifer



5. Water quality variations during disinfection and filtration actions and evolution, **FIVE YEARS OF MONITORING**

RECLAIMED WATER FOR IRRIGATION



Total: 1,65 MMC storage

14 Sites in the Balearic Islands

5-year monitored sites

CROPS:

Effects of reclaimed water on plant physiology, yield and crop quality.

ANALYSES

1. Water potential
2. Photosynthesis
3. Stomatic conductance
4. Vegetative growth
5. Canopy cover
6. Flowering
7. Fruit set
8. Fruit growth
9. Foliar

Analysis

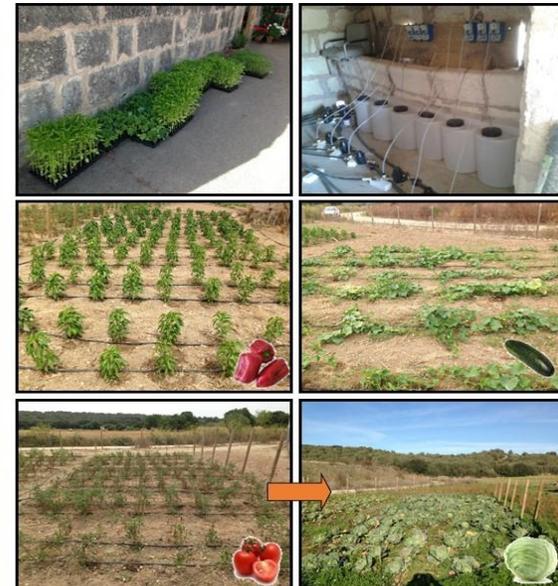
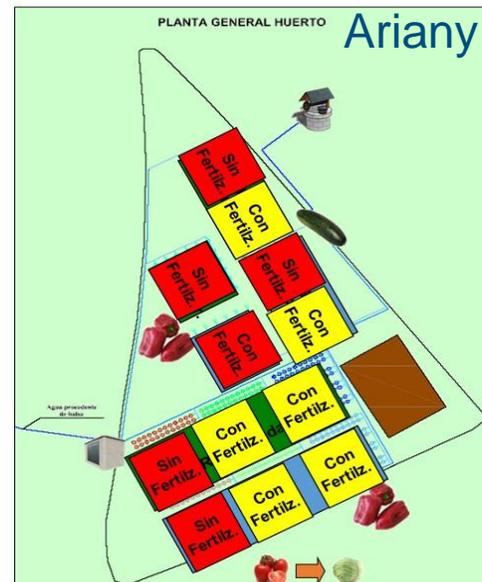
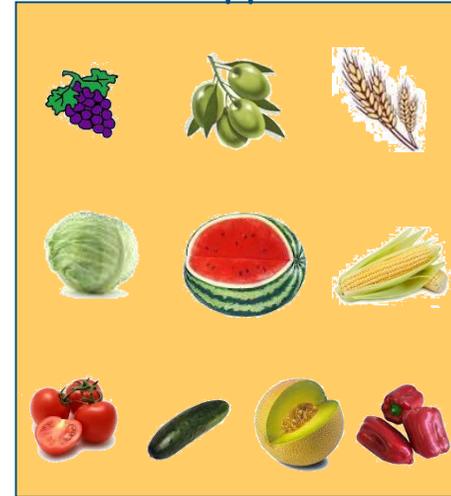
FIVE YEARS MONITORING
11. Fruit Quality

5 Sites



Crops selection:

11



CROPS:

Methodology

- 1. Water sources characterization
- 2. Plant water status measurement
- 3. Gas exchange levels measurement
- 4. Nutritional status of the crop (foliar analysis)
- 5. Evaluation of fruit quality and fruit microbiology.

Positive effect for 10/11 crops



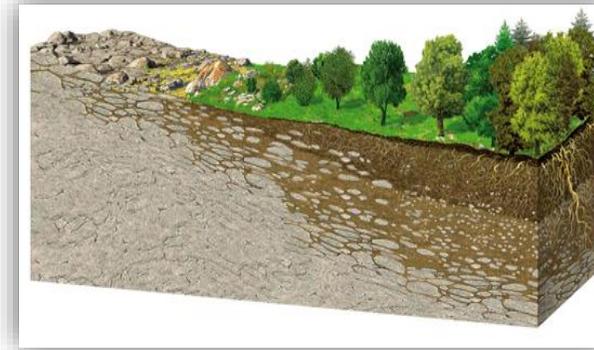
SOILS:

Methodology

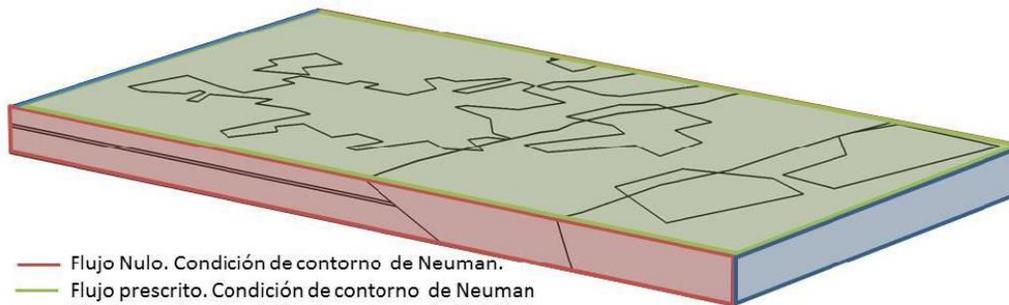
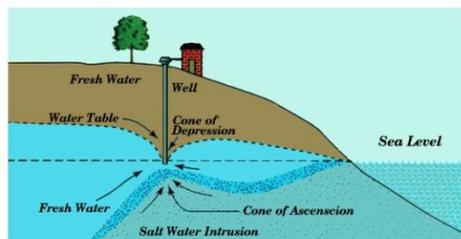


1. Identification of soil units
2. Sampling of plots
3. Analyses of 17 parameters

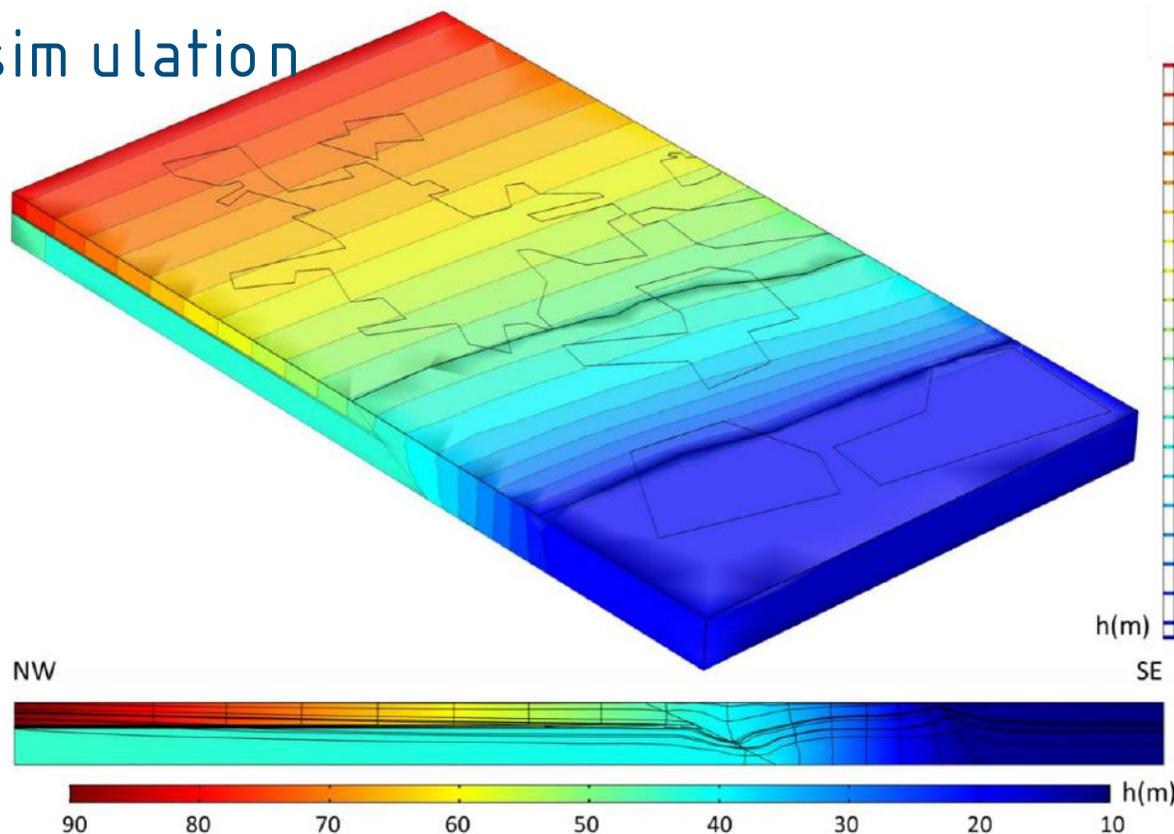
No affection after a sufficient washing dose



AQUIFERS: G W characterization. Quality and quantity



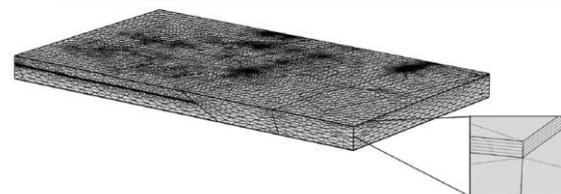
Boundary conditions for G W flow simulation



-3D isolines and 2D profile + results in steady-state regime

-Superficial aquifer (60-100 m interval) and deep aquifer (55-10 m interval)

FIVE YEARS MONITORING



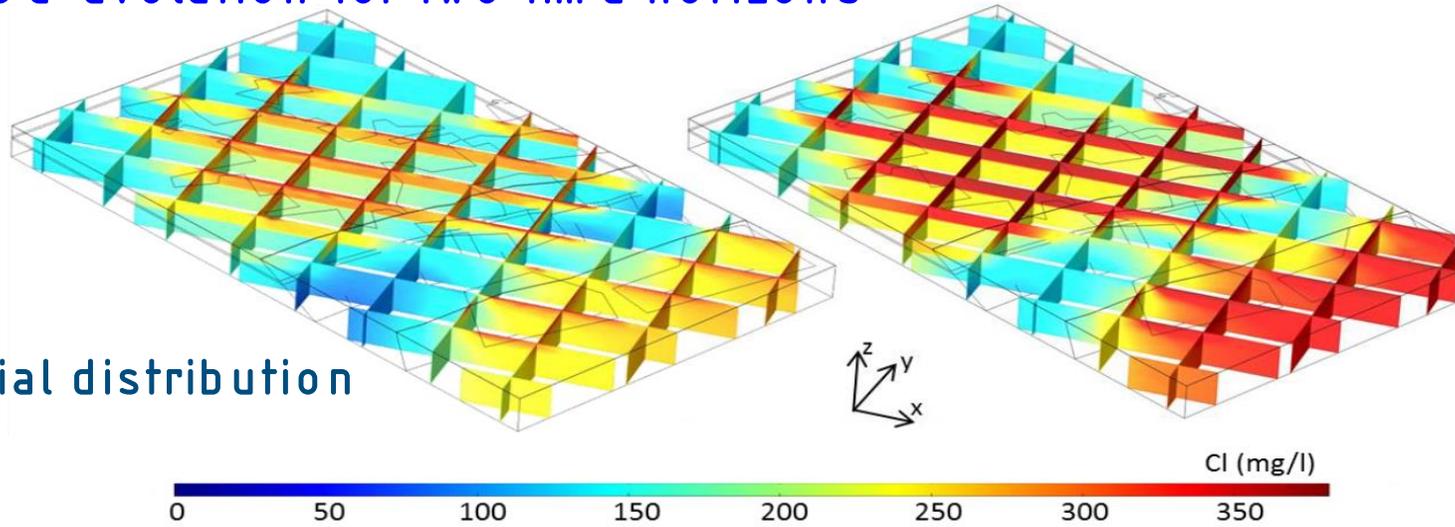
GW quality results

Chlorides and DOC evolution for two time horizons

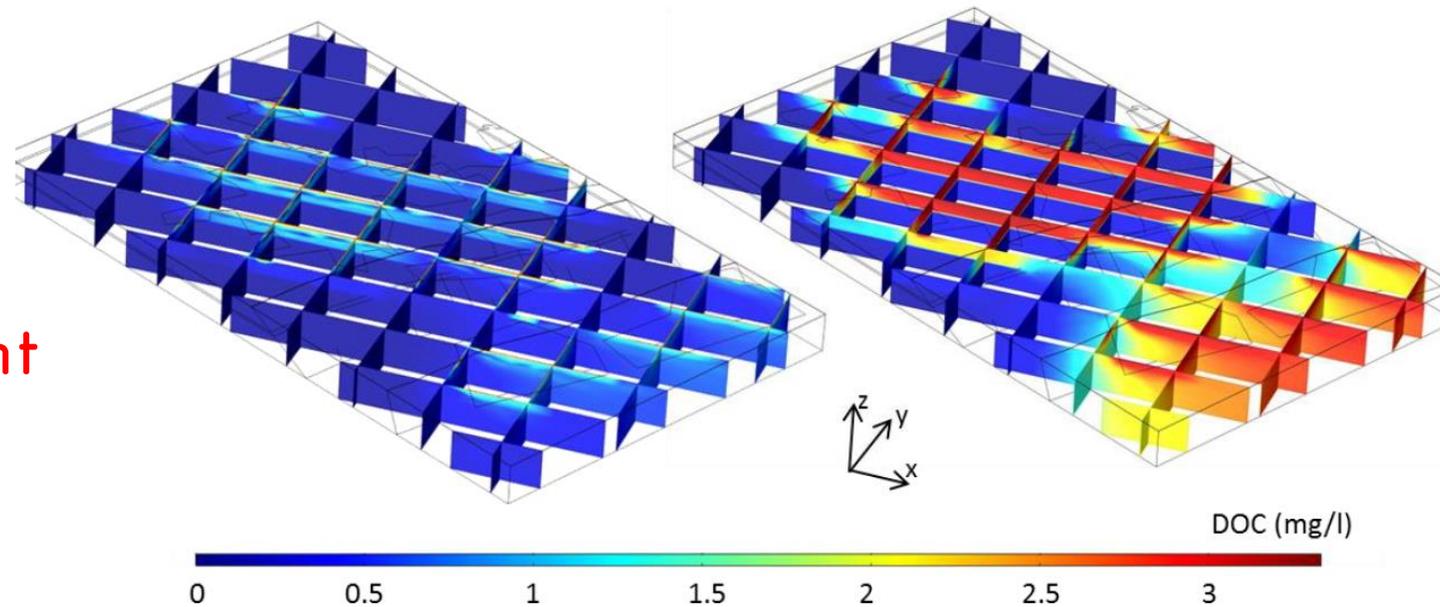
Chlorides spatial distribution

2 years

5 years

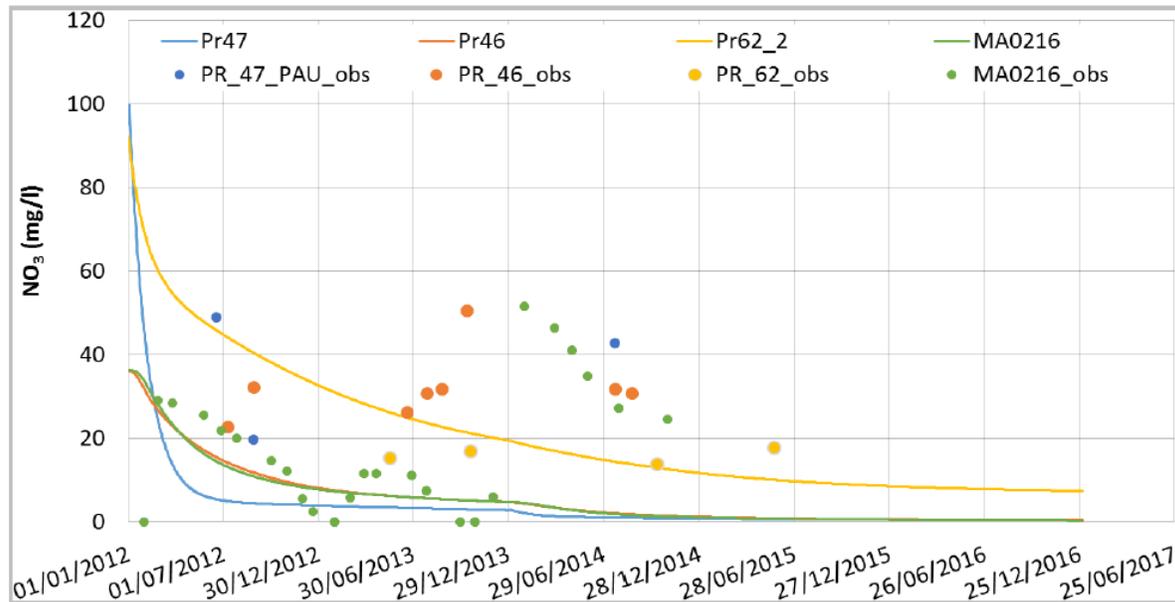
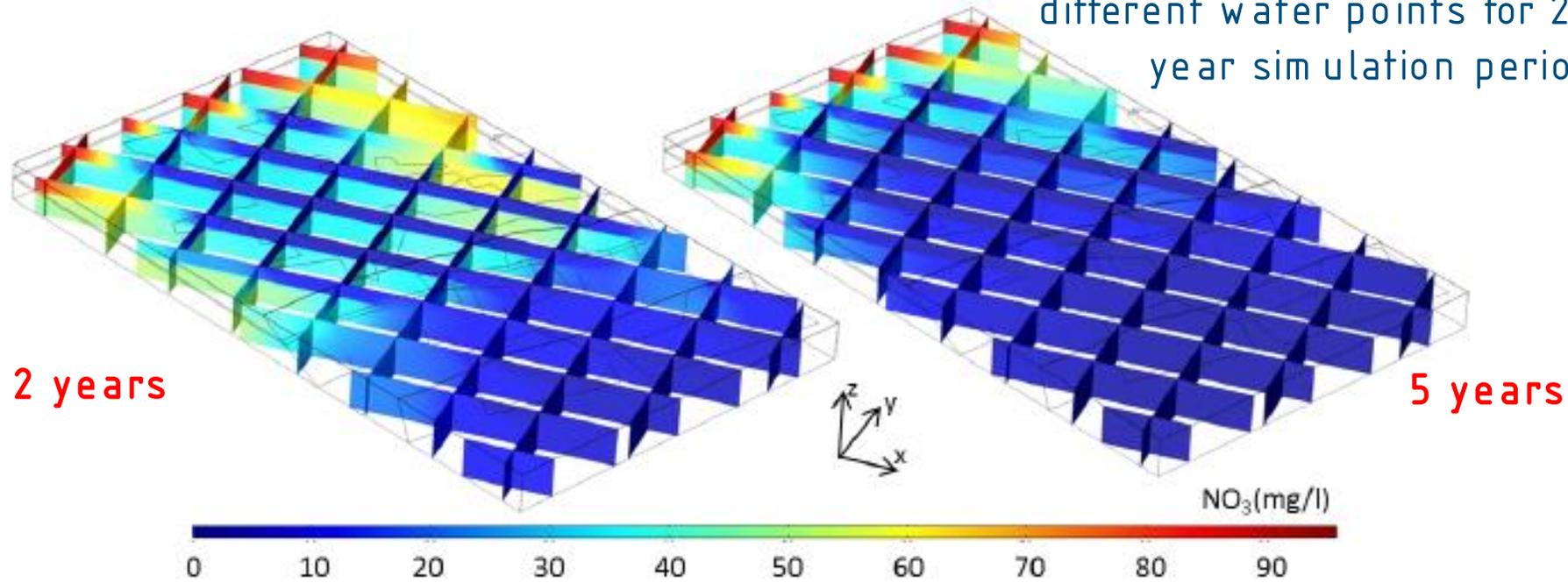


Organic content evolution and distribution



Nitrates evolution

Nitrates evolution in different water points for 2-5 year simulation period.



—Measured data and simulated results converge

STEADY STATE FROM YEAR 5

Conclusions and recommendations

The SAT-MAR developed in EARSAC project concludes:

None important environmental impact has been detected neither in plants nor in soils or

SAT-MAR in MED areas entails safe reuse, a higher water security and circular economy (under the exposed circumstances)

Pros overcome the cons

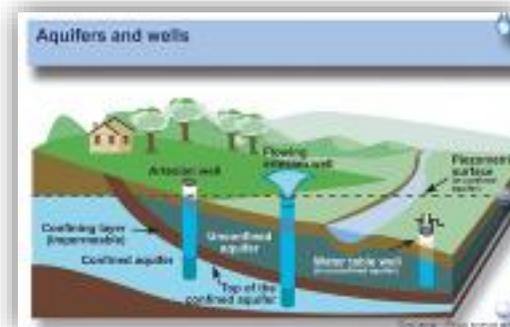
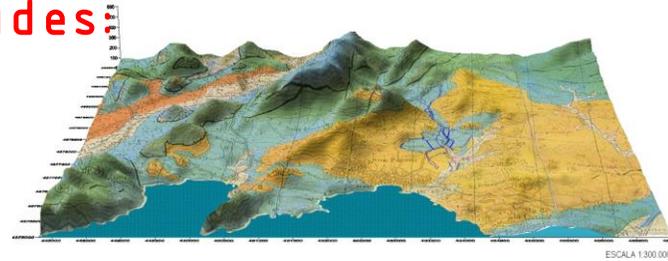
EVERY SAT-MAR should consider:

Hydrogeochemical criteria
water sources (e.g. river, rainwater...)

MAR technologies (basin, flooding, wells, boreholes, combinations...)

The final use (irrigation, drinking water...) and its feasibility

Concrete monitoring guidelines



To broaden this information...

PUBLICATIONS:

- EARSAC Results book
- Guidelines for practitioners and end-users (in Spanish)



EFECTO DEL REGADÍO CON AGUAS REGENERADAS SOBRE LOS SUELOS, ACUÍFEROS Y CULTIVOS

RESULTADOS DEL PROYECTO DE I+D+i EARSAC

HOME / ARCHIVES / VOL. 9 NO. 2 (2020) / Original Papers

Regulations and guidelines on water quality requirements for Managed Aquifer Recharge. International comparison

<https://doi.org/10.7343/as-2020-462>

Enrique Fernandez Escalante | ✉ efernan6@tragsa.es
Departamento de gestión integral del agua, Tragsa, Madrid, Spain.

Jose David Henao Casas
Departamento de gestión integral del agua, Tragsa, Madrid; Universidad Politécnica de Madrid, Escuela Técnica Superior de Ingeniería Agronómica, Alimentaria y de Biosistemas, Madrid, Spain.

Ana María Vidal Medeiros
Water resources management, World Bank consultant, Montevideo, Uruguay.

Jon San Sebastián Sauto
Departamento de construcción e ingeniería, Tragsatec, Madrid, Spain.

PDF

PUBLISHED

2020-06-25

<https://www.acquesotteranee.net/index.php/acque/article/view/462> REGULATIONS

EL REGADÍO CON AGUAS REGENERADAS. EFECTOS SOBRE SUELOS, ACUÍFEROS Y CULTIVOS

GUÍA PARA PROFESIONALES Y USUARIOS FINALES

<https://dinamar.tragsa.es/pdfs/Libro-earsac-end-users.pdf>

<https://dinamar.tragsa.es/pdf/libro-earsac.pdf>

Things to keep in mind

- Review and refine your content, highlighting the key messages. This makes for a clear and impactful presentation.
- Infographics communicate data and relationships effectively.
- Use the 'Theme Colours' as much as possible.
- Text should be in Kievit font.
- Is there enough whitespace between the elements? Are they aligned? And is there good contrast?
- Please don't hesitate to contact coms if there's anything we can help with, even to just review or tidy-up a Powerpoint presentation.





Thank you!

efernan6@Tragsa.es