FUNDACIÓN BOTÍN

Seminario

¿Es el modelo actual de regadío en España viable?

USO DE FUENTES DE AGUA NO CONVENCIONALES

Irene Blanco Gutiérrez

11 Abril 2024

POLITÉCNICA

UNIVERSIDAD POLITÉCNICA DE MADRID

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Centro de Estudios e Investigación para la Gestión de Riesgos Agrarios y Medioambientales

RECLAMO

The contribution of water REuse to a resourCe-efficient and sustainabLe wAter manageMent for irrigatiOn

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ENVIRONMENTAL RESEARCH
LETTERS

LETTER

Using reclaimed water to cope with water scarcity: an alternative for agricultural irrigation in Spain

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Keywords: water reuse, reclaimed water, agriculture, stakeholder perception, fuzzy cognitive map, scenario analysis

Supplementary material for this article is available online

Abstract

In water-stressed agricultural regions, reuse of reclaimed water has emerged as a promising alternative that improves supply reliability, alleviates water scarcity and contributes to circular economy. The European

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A method for the prioritization of water reuse projects in agriculture irrigation

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ABSTRACT

Water reuse is a strategic priority for Water Authorities in Europe to reduce the pressu
although implementation is lagging behind expectations due to financial, administrative
consensus. In this context, there is a special interest to identify in which specific Wastewat
would be interesting to add a Water Regeneration Plant, taking account of potential existin
and the implied costs and benefits. This paper proposes a method to quantify the infrast
costs of project implementation and the benefits of the additional water offer. An algorit
network, allowing for a quick cost analysis. The method is applied in the Upper
to irrigation led to the overexploitation of the local aquifer and the subsequen
g account of the existing Wastewater Treatment Plants, candidate reuse proj
their benefit/cost ratio, showing large differences according to the locations a
d water. The analysis allows for a quick assessment of the costs and benefits ins
of scenarios, providing science-based evidence to support water policy decisio

water

MDPI

Article

Are Non-Conventional Water Resources the Solution for the Structural Water Deficit in Mediterranean Agriculture? The Case of the Segura River Basin in Spain

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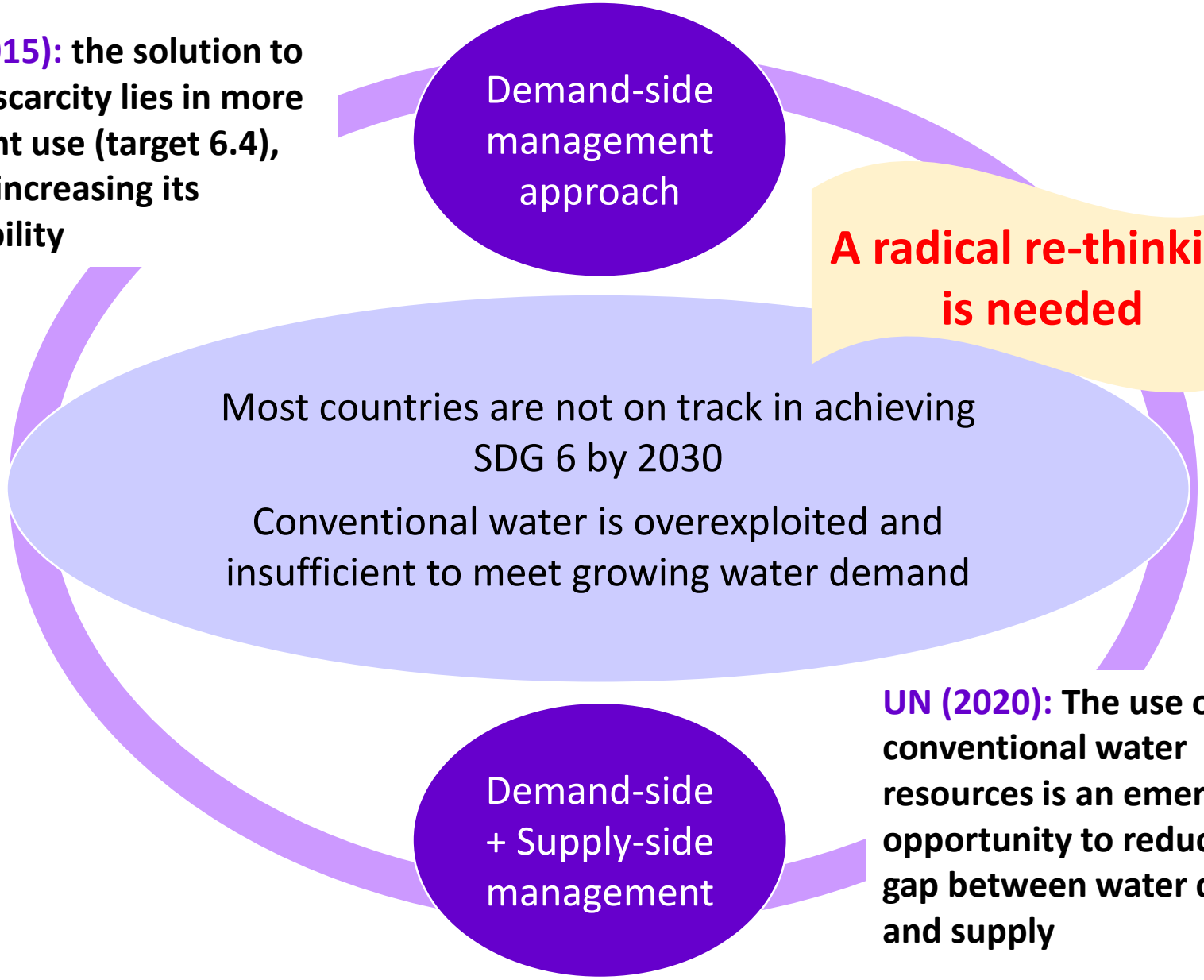
Abstract: The water sustainability of the Segura River Basin (SRB), located in southeastern Spain, is being challenged as conventional available water sources fall short of meeting the authorised demands of the basin. In recent years, non-conventional water (NCW), such as desalinated and reclaimed water, has become part of the resource pool. However, it has not yet become crucial for irrigation water supply due to its relatively high cost and lower quality compared to conventional water. The new political framework in Spain, developed in the context of ecological transition, marks

PARADIGM SHIFT

UN (2015): the solution to water scarcity lies in more efficient use (target 6.4), not in increasing its availability



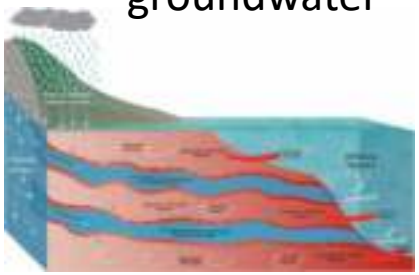
UN (2020): The use of non-conventional water resources is an emerging opportunity to reduce the gap between water demand and supply

NON-CONVENTIONAL WATER SOURCES

Fog water collection

Rain enhancement

Offshore deep groundwater



Ballast water

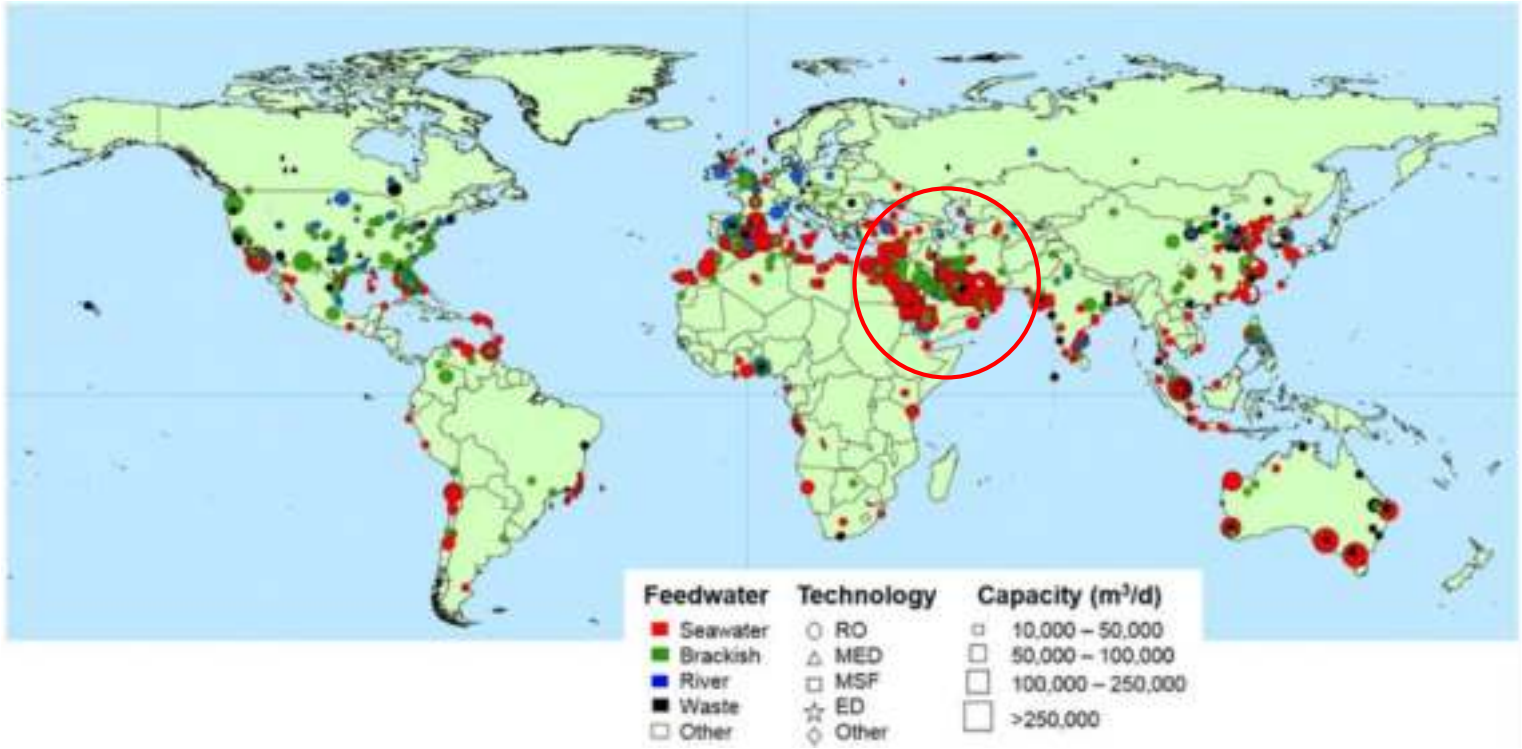
Iceberg transportation

Desalinated water

Reclaimed water

GLOBAL PERSPECTIVE

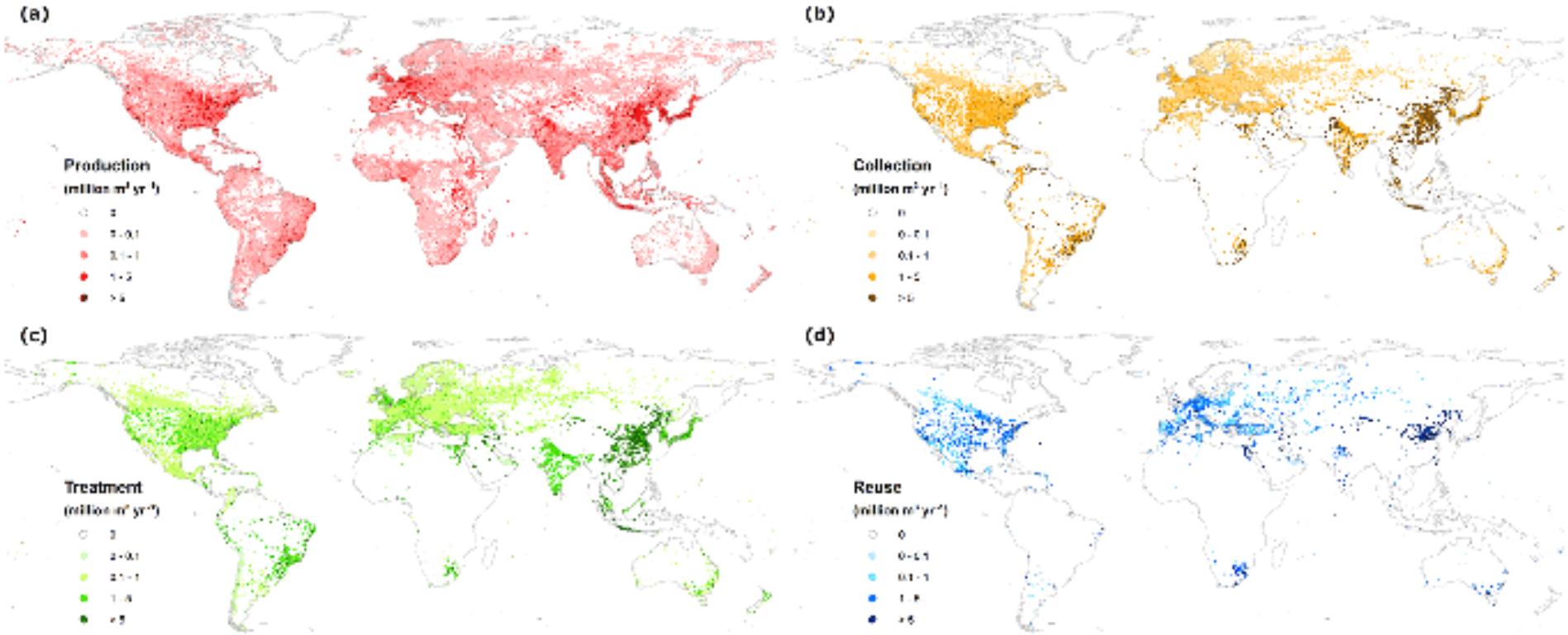
Global distribution of large desalination plants by capacity, feedwater type and desalination technology



Source: Jones et al. (2019)

GLOBAL PERSPECTIVE

Wastewater production (a), collection (b), treatment (c) and reuse (d)



Source: Jones et al. (2021)

POLICY CONTEXT IN THE EU AND IN SPAIN

EU

Dir. 271/91
2000 WFD

2015
Circular
Economy

Regulation
2020/741

Dir. 271/91
(revised)

SPAIN

2001
W. Law

2004
AGUA Program

2007
RD W.Reuse

2021
DSEAR Plan

RDL 6/2022

Order TED/157/2023

RDL 4/2023
(Mod. W.Law)

RECLAIMED WATER

- Basic water quality conditions
- Concessions /author.
- W. reuse priority line of action
- Min. requirements for w.reuse for agriculture
- Priorization of w. reuse projects/Regulatory&tax symplification
- Quality of treated ww.

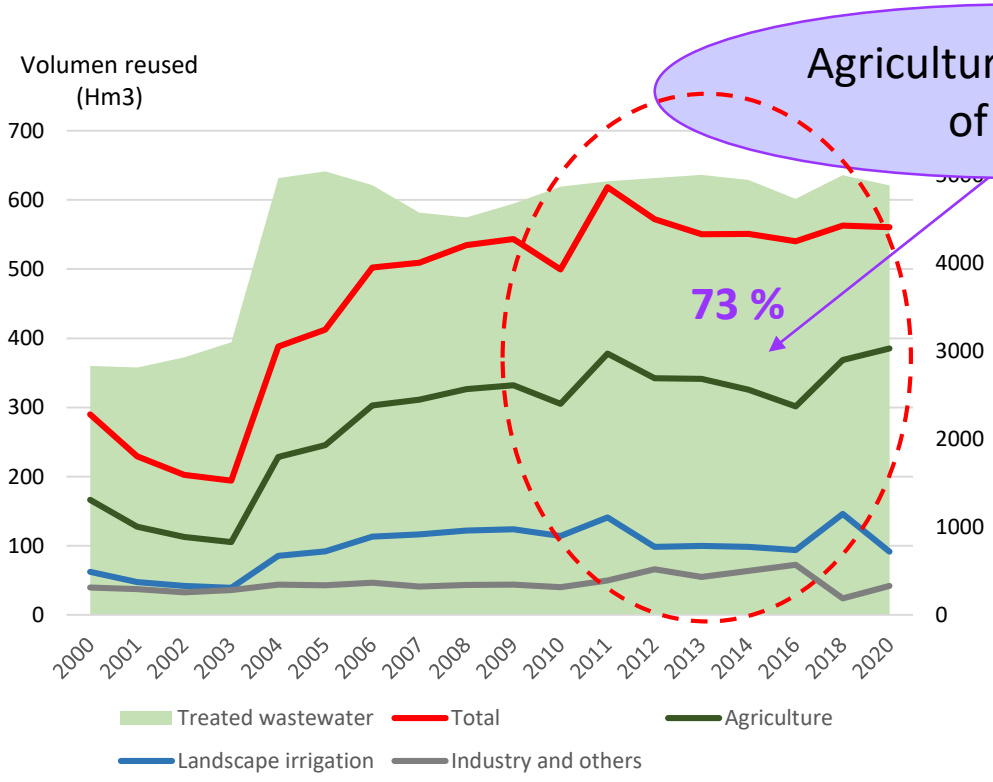
DESALINATED WATER

- Basic water quality conditions
- Concessions /authorizations
- Growth in desalination capacity
- Photovoltaic energy, self-consumption
- Competitive prices

USE OF NON-CONVENTIONAL WATER IN SPAIN

Reclaimed water

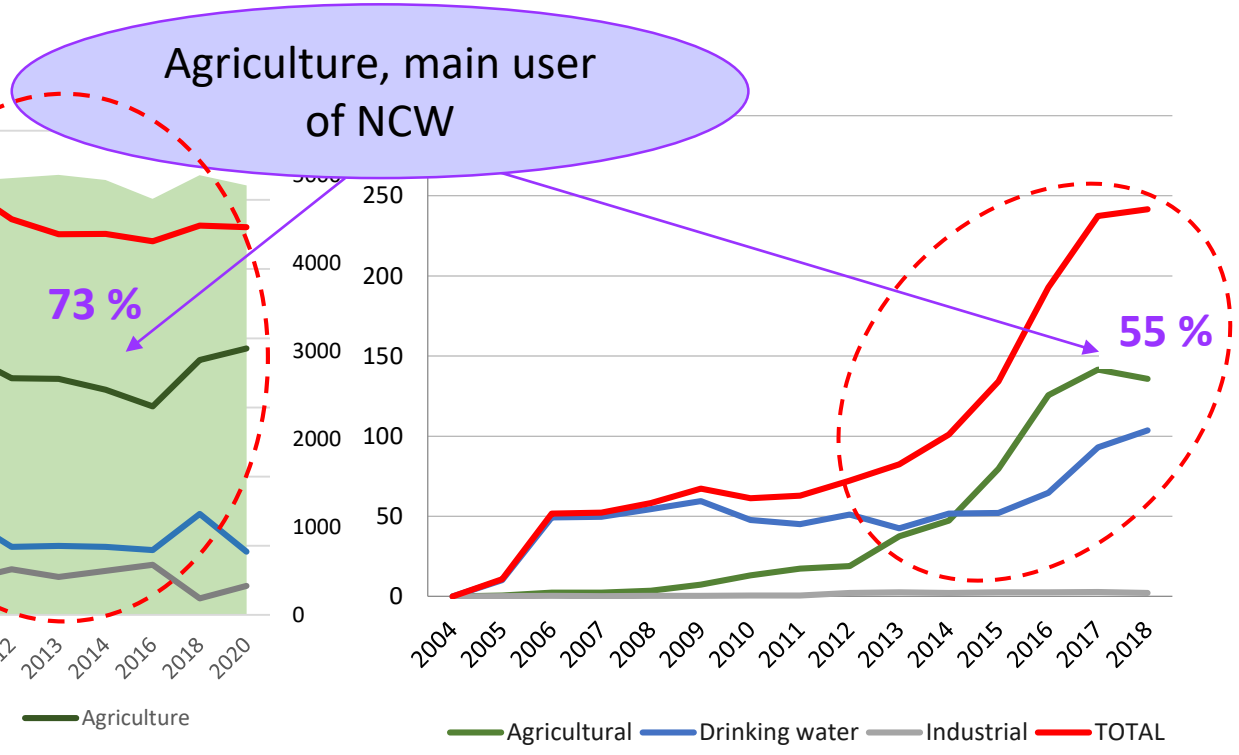
Spain has the highest yearly reuse volume of the EU (10% of treated w. is reused)



Source: Own elaboration based on INE (2022)

Desalinated water

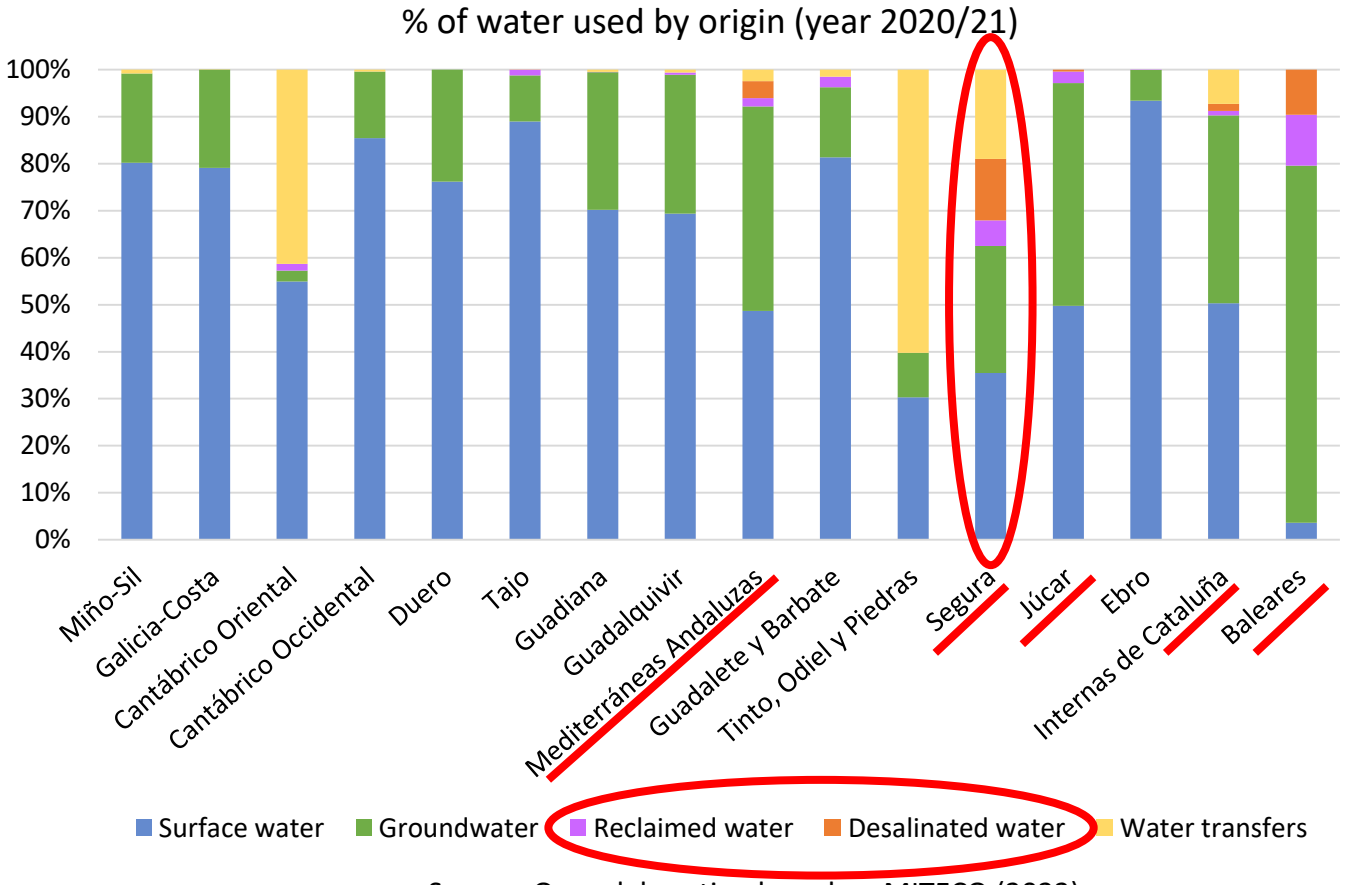
1st in EU and 4th in the world in terms of installed capacity



Source: Own elaboration based on ACUAMED (2021)

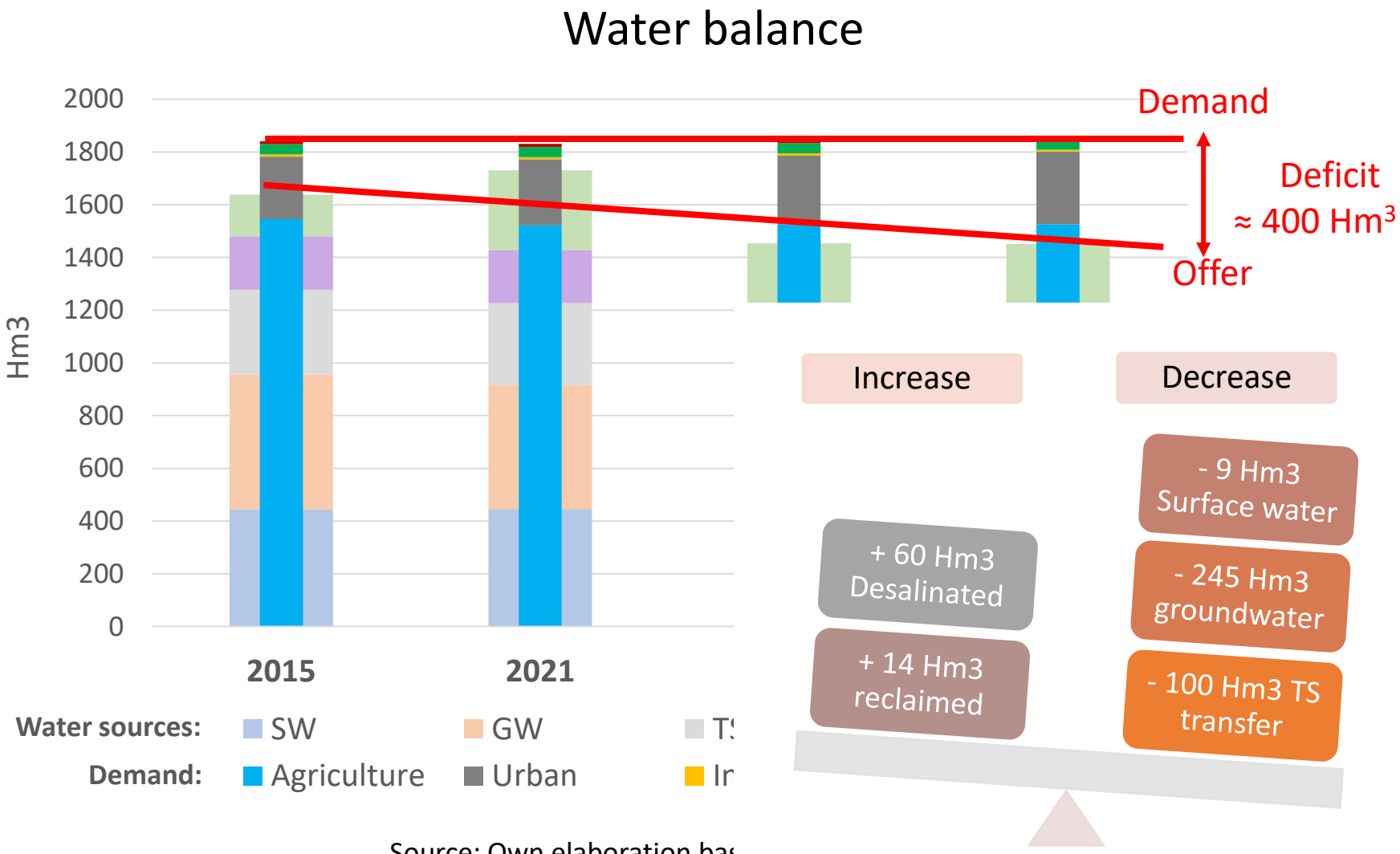
MARKED TERRITORIAL DIFFERENCES

- NCW remain a minority as a source of water supply, with volumes below 5% of the total
- But, it plays a strategic role in water-deficient areas (Mediterranean coastline and the islands)



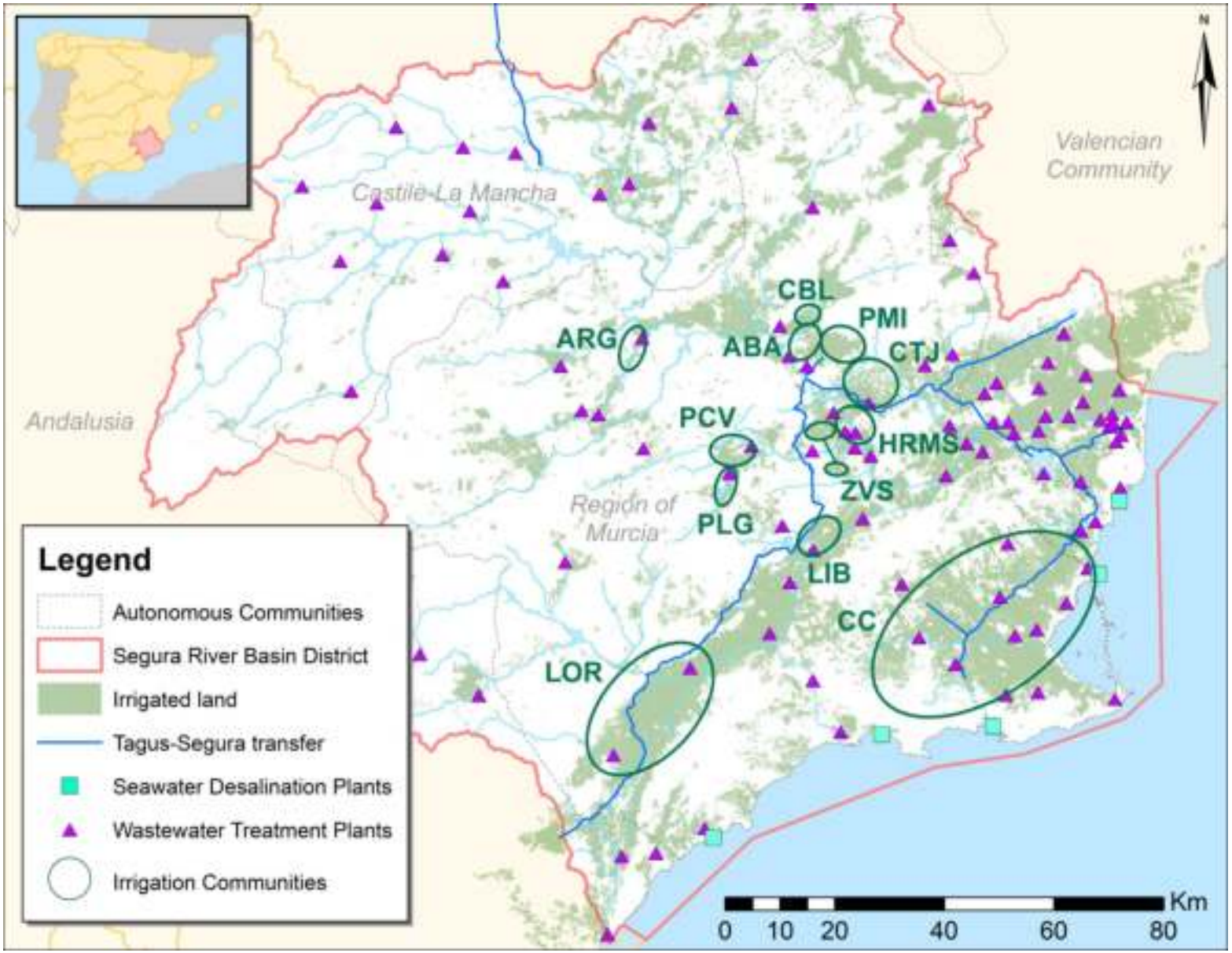
Source: Own elaboration based on MITECO (2022)

SEGURA BASIN

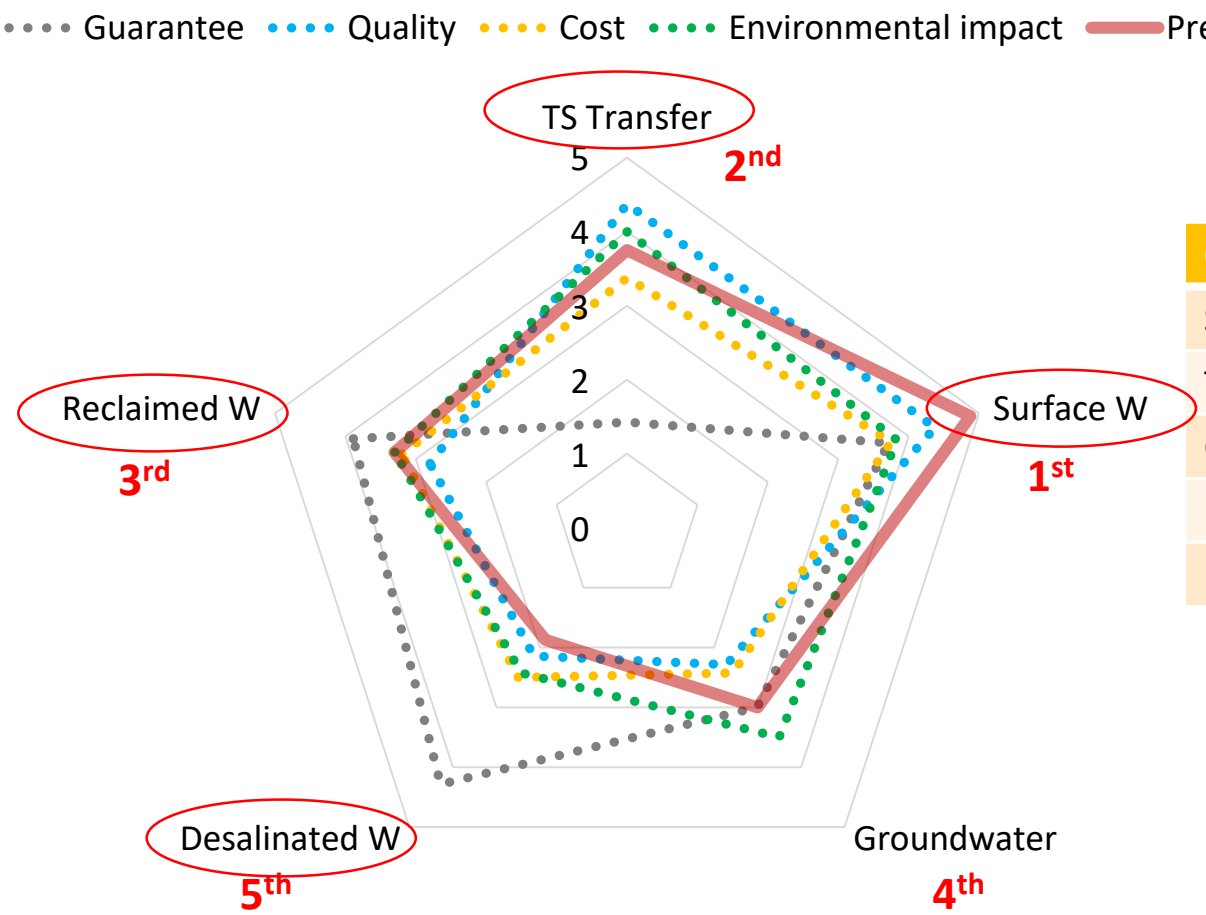


Source: Own elaboration bas

PERCEPTIONS IN THE IRRIGATION SECTOR



FARMERS' PERCEPTIONS OF WATER SOURCES



Cost of water	€/m3
Surface w.	0.09
TS Transfer	0.22
Groundwater	0.24
Reclaimed w.	0.13
Desalinated w.	0.50

Likert scale: 1 (worst)- 5 (best)

Source: Own elaboration based on Gómez-Ramos et al. (2024)

PERCEPTIONS IN THE IRRIGATION SECTOR

Significant differences between the ICs' attributes and the degree of preference regarding desalinated and reclaimed water

One factor ANOVA results

Attributes	Preference DW		Preference RW	
	F	***Sig***	***F***	***Sig***
Nº Irrigators	4,460	0.065*	10,945	0.012*
Total water supply	9,605	0,014*	12,205	0.010*
Use of reclaimed water	4,672	0.082*	5.987	0.058*
Use of desalinated water	5,238	0.049*	6.739	0.033*
Price paid desalinated water	53,944	0.096*	-	-
Storage capacity	45,522	0.001**	.	.

*significative 90%; **significative 95%

SOME REFLECTIONS

- NCW can be key to meet water needs in water-stressed areas, but a basin-wide vision is needed
- Advances in desalination and water purification technology are contributing to the expansion of NCW
- Rate of adoption of NCW may be lower than expected→ NCW must be affordable and cost-competitive for farmers
- Policies and governance structures have to be better coordinated for ensuring the most efficient use of NCW
- Circular economy to be explored→ a promising path to valorize NCW
- Scaling up the use of NCW needs awareness raising and public acceptance

Queensland, Australia (taken from J. Berbel)

Los Ángeles, US

San Francisco, US

THANKS!

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RECLAMO

MINISTERIO DE CIENCIA E INNOVACIÓN

AGENCIA ESTATAL DE INVESTIGACIÓN