



OPTimal strategies to retAIN and re-use water and nutrients in small agricultural catchments across different soil-climatic regions in Europe

Mainstreaming Natural/Small Water Retention Measures in Europe – evaluation of drivers and hindrances with a dedicated SWOT framework

Julia Szulecka, Ingrid Nesheim, **Federica Monaco**

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Introduction

- **Natural/Small Water Retention Measures** (NSWRMs) (*Magnier et al., 2024*) capable to face issues of water quality and quantity, soil erosion, and nutrient loss.
- Generate **multiple co-benefits**: increased biodiversity, climate change adaptation and mitigation, aesthetic and recreational functions of the environment.
- Despite growing attention paid to NSWRMs, **motivations behind** their systematic **implementation** remain quite **underexplored**

The OPTAIN project

- EU Horizon 2020 Research & Innovation project
- Call: H2020-SFS-2018-2020 (Sustainable Food Security)
- Budget: 7 Mio Euro
- Start: September 2020, duration: 5 years
- 21 Partners from 14 countries, 14 case studies
- Coordination: Helmholtz-Center for Environmental Research (DE)





Natural



Small



Water Retention



Measure

- **Headwaters**
- **Farmscale**

Mean: using or mimicking nature

- Multifunctional
- Improve and/or restore soil water retention, capacity, aquatic ecosystems, aquifers
- Localised, cumulative
- Not only natural entities

- **Direct effect:**
increase water retention in river basin (slow down, store, reduce run off)
- **Indirect effect:**
biophysical impacts from retention (reduce pollution, conserve soil, create habitat, alter climate)

Set of techniques with objectives:

- Ecosystems direct modification
- Practice change/adaptation

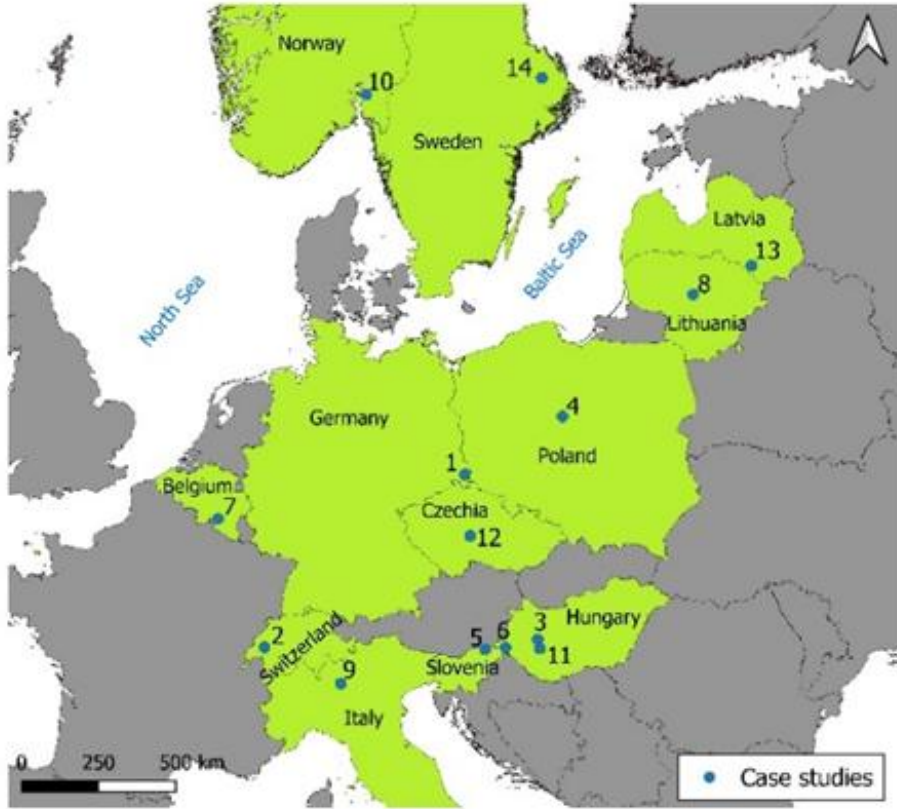


Agricultural land management

Hydro-morphological measures, structures and vegetation



Research design



- Multi-step research process based on the SWOT framework (*Sammut-Bonnici and Galea, 2015*)
- Analytical framework: *SWOT pillars x 6 topics x 3 specific factors*
- Applied in 14 case study locations in Europe
- Evaluated by 26 local experts: quantitative information requested

Assessment framework: topics addressed

1. **Attitudes & perceptions** of practitioners towards NSWORMs
2. Scientific and practical **knowledge** on NSWORMs available
3. **Institutional capacity & framework** for the discussion and promotion of NSWORMs
4. Availability, adequacy and flexibility of **financing schemes**
5. **Technology & infrastructures** available and accessible to practitioners
6. **Communication & dissemination** on NSWORMs

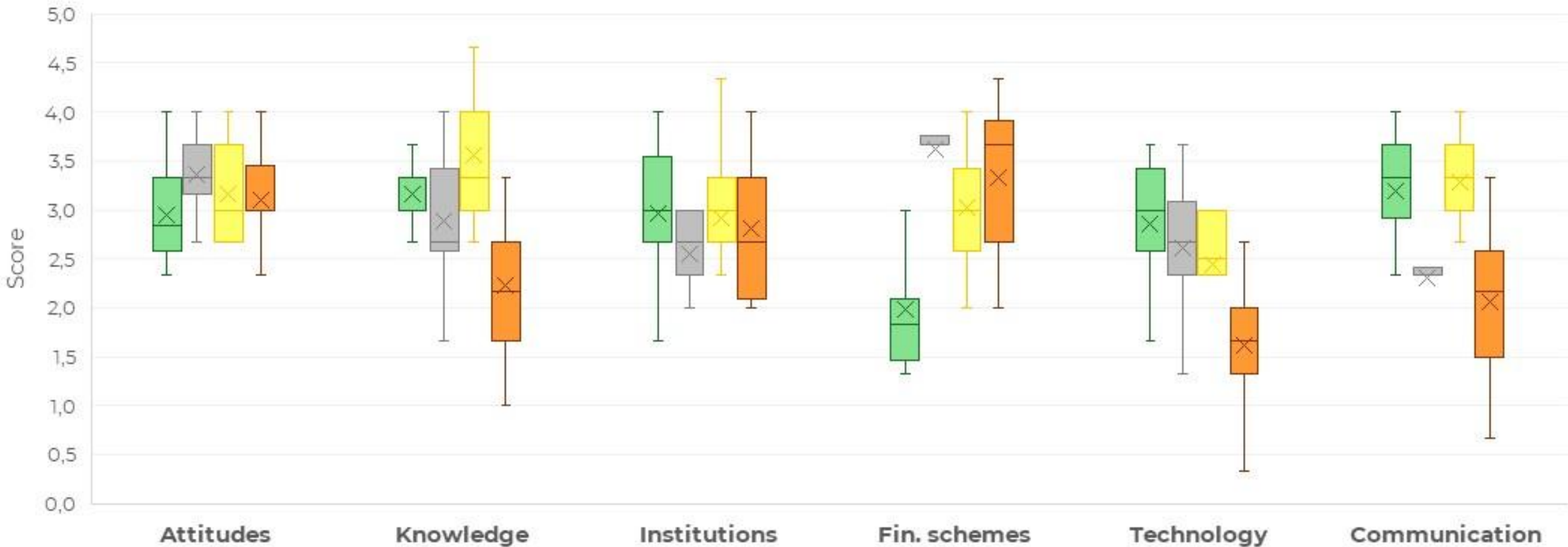
Cross-case synthesis

Topic	Factor	Strengths	Weaknesses	Opportunities	Threats
Attitudes/perceptions	Need for measures is acknowledged	3.50 ± 0.67	3.58 ± 0.90	3.42 ± 0.67	2.64 ± 0.81
	Win-win with other objectives	2.25 ± 0.62	3.25 ± 0.87	2.92 ± 0.67	3.75 ± 0.75
	Interest by practitioners	3.08 ± 0.67	3.25 ± 0.75	3.17 ± 0.72	2.83 ± 1.03
	Mean value and SD for the Topic	2.94 ± 0.55	3.36 ± 0.48	3.17 ± 0.48	3.10 ± 0.54
Knowledge	Scientific research	3.50 ± 0.67	2.92 ± 0.90	3.67 ± 0.98	2.25 ± 1.06
	Knowledge on benefits	2.75 ± 0.97	3.42 ± 1.08	3.50 ± 1.00	2.92 ± 1.08
	Education and practice	3.25 ± 0.62	2.33 ± 0.89	3.50 ± 0.52	1.50 ± 1.24
	Mean value and SD for the Topic	3.17 ± 0.50	2.89 ± 0.74	3.56 ± 0.66	2.22 ± 0.74
Institutions	Integration into regulations	3.00 ± 1.34	2.50 ± 1.17	3.42 ± 0.79	2.42 ± 1.16
	Advisory system	3.58 ± 0.79	2.17 ± 0.72	2.75 ± 1.14	3.00 ± 0.85
	Regulation/legislation framework	2.25 ± 1.14	3.00 ± 1.21	2.58 ± 1.00	2.91 ± 0.54
	Mean value and SD for the Topic	2.96 ± 0.77	2.56 ± 0.52	2.92 ± 0.78	2.81 ± 0.73
Financing schemes	Support for direct costs	2.67 ± 0.78	3.42 ± 0.90	3.42 ± 1.00	3.08 ± 1.08
	Support for indirect costs	1.45 ± 0.82	3.73 ± 0.90	2.75 ± 0.62	3.25 ± 1.36
	Bureaucracy	1.83 ± 1.11	3.75 ± 0.62	2.92 ± 1.00	3.67 ± 0.65
	Mean value and SD for the Topic	1.99 ± 0.72	3.63 ± 0.56	3.03 ± 0.69	3.33 ± 0.74
Technology/infrastructure	Access to machinery	3.42 ± 0.51	3.00 ± 0.85	2.58 ± 1.08	1.17 ± 0.83
	Collective networks	2.92 ± 1.16	2.58 ± 1.08	2.50 ± 1.38	1.67 ± 0.65
	Machinery rental	2.25 ± 1.14	2.25 ± 0.87	2.25 ± 1.06	2.00 ± 0.85
	Mean value and SD for the Topic	2.86 ± 0.77	2.61 ± 0.83	2.44 ± 1.09	1.61 ± 0.58
Communication/dissemination	Guidelines for NSWRMs	2.67 ± 0.65	2.92 ± 0.79	3.33 ± 0.49	2.58 ± 0.90
	Role of the advisory services	3.75 ± 0.75	1.92 ± 0.67	3.42 ± 0.79	1.50 ± 1.00
	Arenas for discussion	3.17 ± 0.72	2.08 ± 0.90	3.08 ± 0.67	2.08 ± 1.00
	Mean value and SD for the Topic	3.19 ± 0.54	2.31 ± 0.36	3.28 ± 0.42	2.06 ± 0.83

Own elaboration

Cross-case synthesis

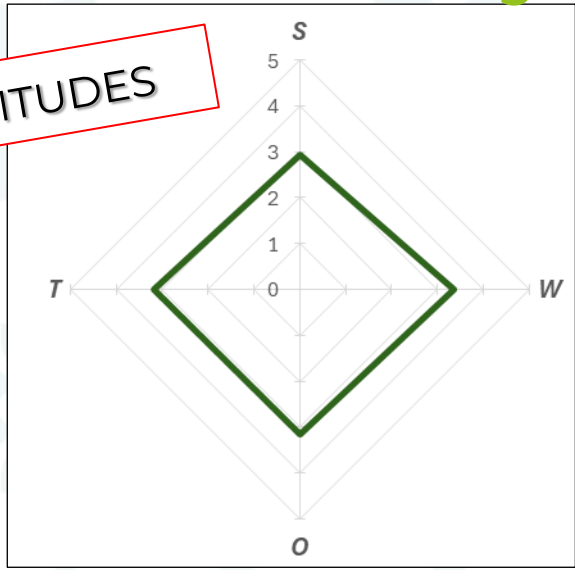
Strengths Weaknesses Opportunities Threats



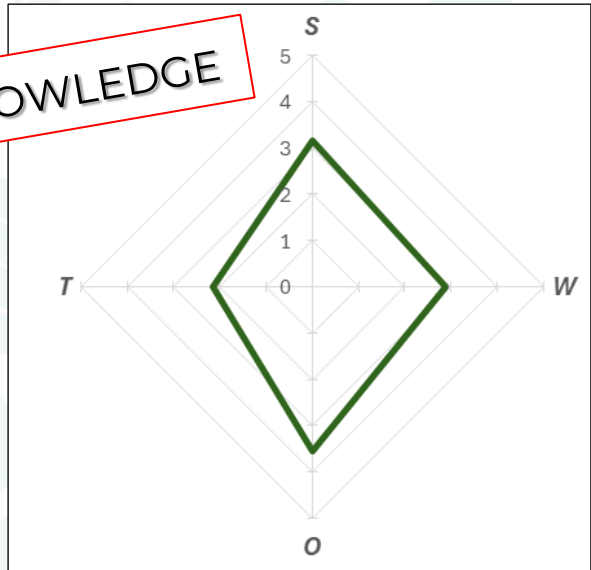
Own elaboration

Cross-case synthesis

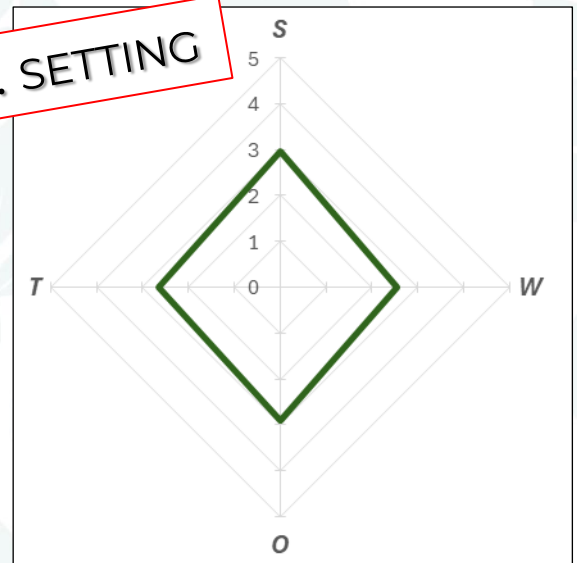
ATTITUDES



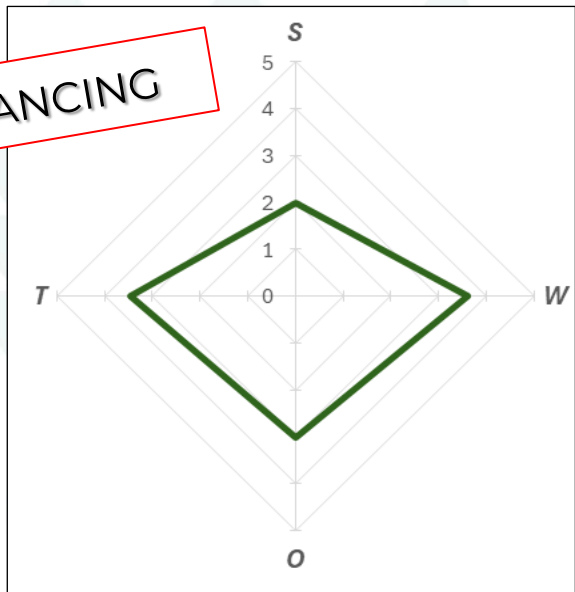
KNOWLEDGE



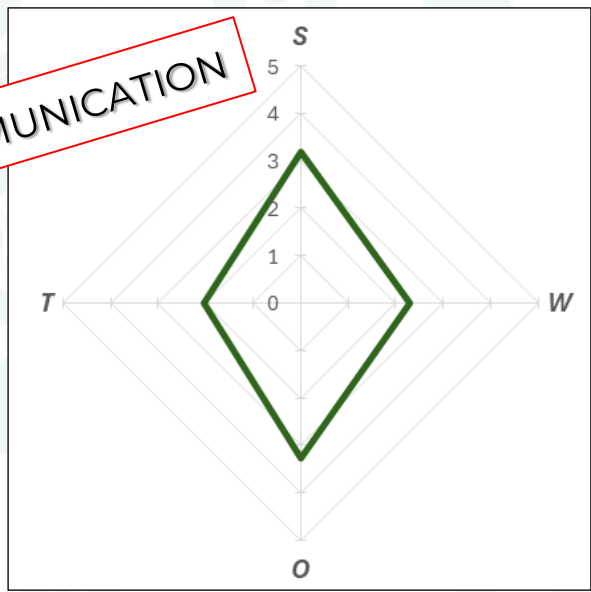
INST. SETTING



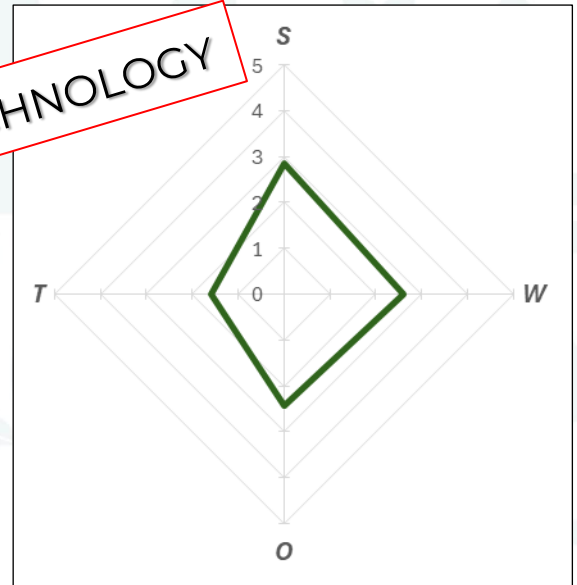
FINANCING



COMMUNICATION



TECHNOLOGY



Similar patterns detected



Dendrogram for clustering graphical stats. Own elaboration, based on Górniewicz et al., 2024

What promotes NSWRRMs implementation?

KNOWLEDGE and **COMMUNICATION** display future opportunities rather than current strengths, **INSTITUTIONS** boast current strengths before future opportunities.

At the factor level, the main **drivers** are:

- the expectation of knowledge availability
- sharing through formal and informal networks
- good work from advisory services

What **hinders** NSWORMs implementation?

ATTITUDES/PERCEPTIONS and **FINANCING SCHEMES** have been ranked as starting with major weaknesses.

A few key factors **discourage** the implementation or the practice of NSWORMs:

- long waiting time sparks scepticism on NSWORMs benefits
- the *theory/practice gap* is a current weakness
- financing schemes rarely consider indirect costs
- bureaucratic procedures for fundings further discourage practitioners

Concluding remarks

- Despite the growing recognition of the benefits of NSWORMs, their implementation remains slow
- Good coordination between local measures implemented across Europe can have significant impacts on European water, soil and biodiversity conditions and significantly contribute to the global SDG agenda
- SWOT analysis can be seen as a relevant diagnosis, and it also helps identifying new research gaps
- Need of natural science studies documenting effects of various NSWORMs, their exact role in soil, water, and biodiversity protection. But also need of various socio-economic and governance components, from evaluating support mechanisms and incentives, to understanding how knowledge and perceptions diffuse among practitioners

**Thank you
for your
attention !**



Julia.Szulecka@niva.no

Ingrid.Nesheim@niva.no

Federica.Monaco@unimi.it



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