Sustainable Adaptive Landscapes through Transdisciplinary Gardening to Advance the Resilience and Dynamics of our Ecological Natural-heritage

SALTGARDEN team

Erik Horstman I *University of Twente*

- Dutch coordinator of SALTGARDEN; lead of SALTlandscape work package
- Developing models, maps and visions for future salt marsh landscapes in the Wadden Sea

Martin Meijer I *University of Twente*

- Modelling of pollutant trapping in salt marsh vegetation
- Modelling the development of biodiverse vs. managed monoculture salt marshes

Bas Borsje I *University of Twente*

- Co-leading SALTimpact work package
- Exploring Nature based Gardening strategies to maintain and strengthen biodiverse, dynamic salt marsh ecosystems

Marte Stoorvogel I *University of Twente*

- Temporal evolution & ecological resilience of biodiverse, dynamic salt marshes
- Exploring Nature based Gardening strategies

Borjana Bogatinoska I *University of Twente*

- Project management and development
- Co-developing Nature based Gardening strategies
- Development of adaptive policy pathways

SALTGARDEN team

Maike Paul I Leibniz *University Hannover*

- German coordinator of SALTGARDEN
- Lead of SALTlab work package
- Improve the understanding how different salt marsh communities respond to changing environmental conditions

Dorothea Bunzel I Leibniz *University Hannover*

- Co-PI SALTGARDEN; administration & project management
- Investigation of stability limits of the hydrodynamic resilience of salt marsh communities

Thaísa F. Bergamo I Leibniz *University Hannover*

- Conducting a laboratory experiment to understand the ecological response of salt marshes to future climate conditions and environmental pollution

Lasse SanderI *AWI*

- Investigation of how past states in the evolution of salt-marsh landscapes reflect on their modern properties and functions
- Focus on surface structure, sediments, and vegetation of salt marshes

Nina Hildebrandt I *AWI*

- Analysing landscape dynamics in salt marshes (interplay between geomorphology, vegetation composition and ecosystem functions)
- Conducting fieldwork & laboratory analyses

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Jantsje van Loon – Steensma I *Van Hall Larenstein*

- Management and maintenance of strategies for Nature-based adaptation and their co-benefits and trade-offs for other functions and values

Marie-Catherine Riekhof I *Kiel University*

- Development of an integrated assessment method for the salt marshes taking into account their natural, social and economic values by combining a mental-modeling approach with economic valuation

Heike Schwermer I *Kiel University*

- Conduction of interview in a participatory approach to model knowledge types and perspectives of stakeholders and the local community
- Socio-economic valuation of salt marsh ecosystem services

Further scientists in SALTGARDEN

Vasileios Kitsikoudis I University of Twente
Daphne van der Wal I NIOZ
Kathelijne Wijnberg I University of Twente

Katrin Rehdanz I Kiel University

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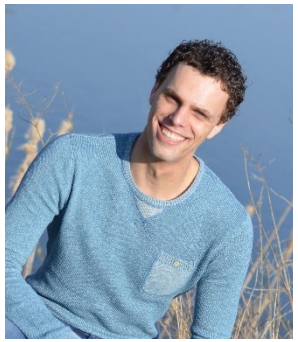


Pim Willemsen I *Deltares*

- Numerical models to assess long-term bio-morphological development of salt marshes & coastal protection
- Support and contribution to research

Jorryt Braaksma I *LAMA landscape architects*

- Using spatial research by design to gain insight into the opportunities of SALTGARDEN strategies
- Conduction of workshops to bridge the gap between science, land managers and other stakeholders

Stefanie Nolte I *Lower Saxon Wadden Sea National Park*

- Conservation manager for salt marshes
- Stakeholder and associated project partner

Further associated partners of SALTGARDEN

Waterschap Noorderzijlvest
Wetterskip Fryslân
Ecoshape

Nature Conservation Union Germany e.V. (NABU)

University of Copenhagen
Technical University of Denmark

CAUSE of the problem

Cultivated landscapes with a strong focus on coastal protection.

Mono-dominant, mature vegetation stage at high risk of permanent loss.

Lacking natural resilience to the impacts of the triple ecological crisis.

Time for Change

How can we future-proof the **ecological and socio-economic values** of the Wadden Sea salt marshes?

01

Building on expertise of area managers, NGOs, researchers, and other stakeholders.

02

Biodiverse and dynamic salt marshes through selective interventions and landscape design.

03

Human interventions and ecological self-regulation to cope with triple ecological crisis stressors.

Nature based Gardening

KNOWLEDGE GAPS

I. How do cultivated, static **salt marshes with low biodiversity respond** to ongoing impacts of the triple ecological crisis?

II. To what extent can **biodiverse, dynamic salt marshes mitigate and adapt** to such future changes and thus provide their ecosystem services now and in the future?

III. What is the **social and political perception of human-cultivated salt marshes** and what **socio-economic benefits** can be obtained with biodiverse dynamic salt marshes?

Westernessmerheller © Dorothea Bunzel

Mesocosm Living Labs to test the resilience of plant communities under triple ecological crisis stressors.

Engineering and socio-economic models to predict and assess future development of coastal landscapes.

Co-creation of **adaptive policy pathways with NbG strategies** to optimize resilience and ecosystem services of WS salt marshes.

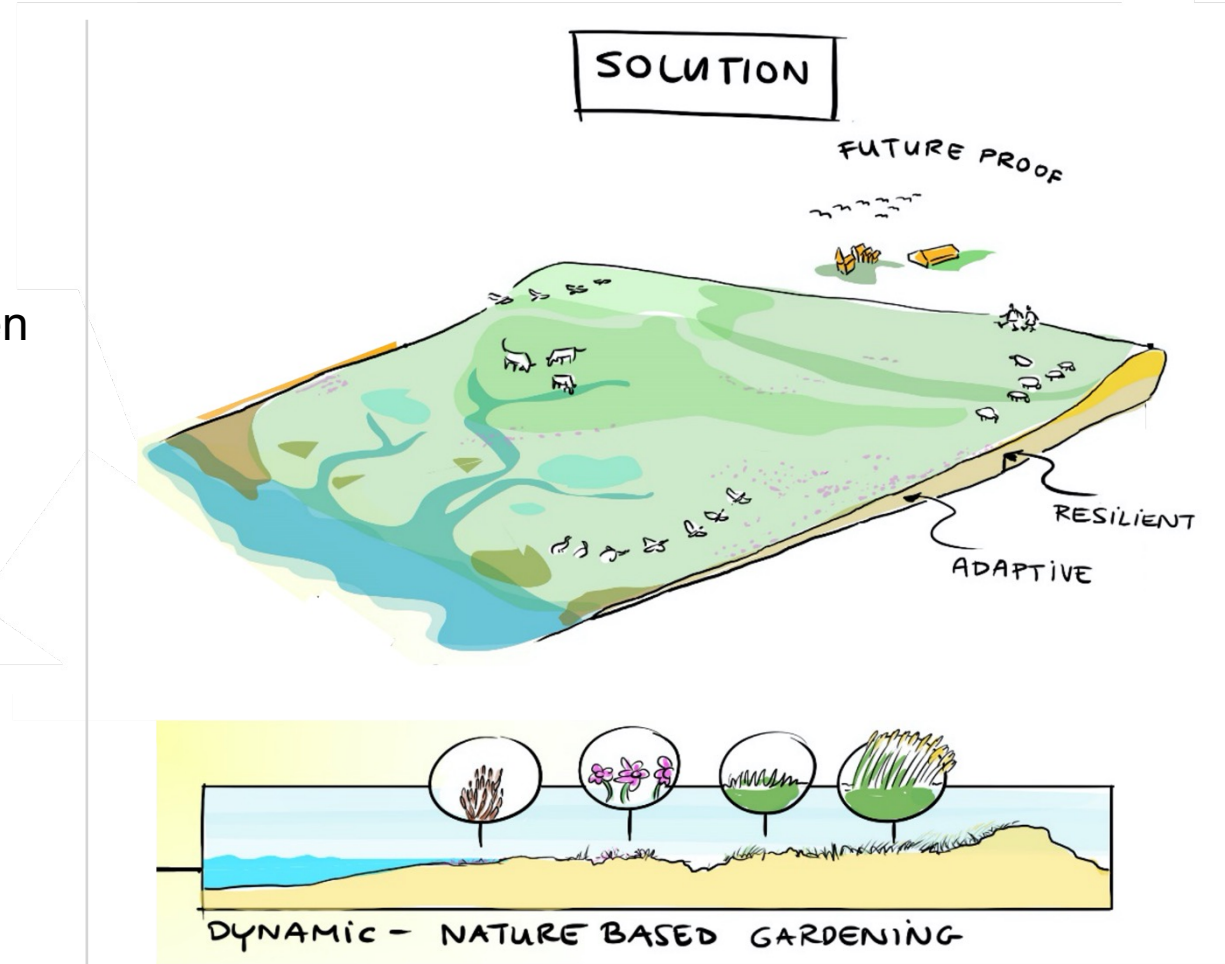
RELEVANCE of project results for stakeholders

- **Transdisciplinary approach**
  - Project proposal was **co-designed** to realize application-oriented science.
- **Co-produced knowledge** for (1) qualified **knowledge transfer** and (2) broad **acceptance** of dynamic Wadden Sea salt marshes in society and politics.
- **Co-creation** of socially and politically accepted strategies on the basic principles of **Nature based Gardening (NbG)** to:

  I. enable and strengthen salt marsh biodiversity and dynamics (ecological and geophysical);

  II. enhance the functionality and persistence of the ecosystem services of salt marshes;

  III. improve the adaptability and resilience of salt marshes, mitigating the effects of the triple ecological crisis.



OUTPUT of SALTGARDEN

A fundamental **understanding of the impacts** of the triple ecological crisis (TEC) on Wadden Sea salt marshes.

A quantitative **understanding of the functioning** of static, cultivated salt marshes versus biodiverse, dynamic salt marshes.

Insights in the impact of the degree of cultivation or biodiversity on the persistence of salt marshes in the face of the TEC.

A qualitative **understanding of the socio-economic value of ecosystem services** of various salt marsh landscapes, now and in the future.

Impact assessment of the ecological and socio-economic impacts of Nature based Gardening strategies.

Policy framework that recognizes and promotes the importance of Nature based Gardening for the management of salt marshes.

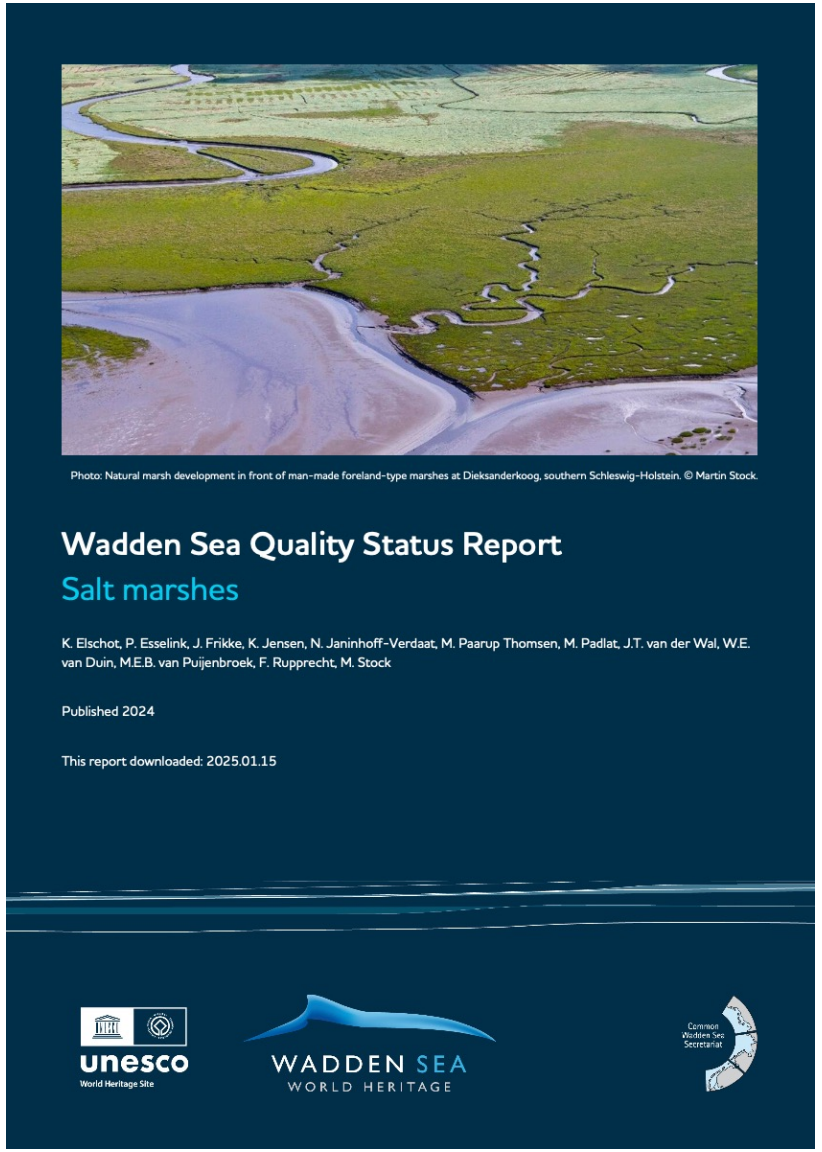
RELEVANCE for TMAP

Possible synergies between SALTGARDEN and salt marsh monitoring within TMAP:

1. Aim of SALTGARDEN –to promote dynamic salt marshes– is discussed in the **Wadden Sea Quality Status Report**; 3. Assessment, 3.4 To achieve an increased natural morphology and dynamics.
2. Contribute to "**4.1. Recommendations for monitoring and research, g. Develop a standardised geodata format"**
3. Lab **experiments** to research the response of salt marshes to climate treatments; application of TMAP data collection protocols to make the data comparable.

Ideas from stakeholders are very welcome!

We hope for close co-operation with the national parks in GER, NL, DK and would like to contribute to TMAP.



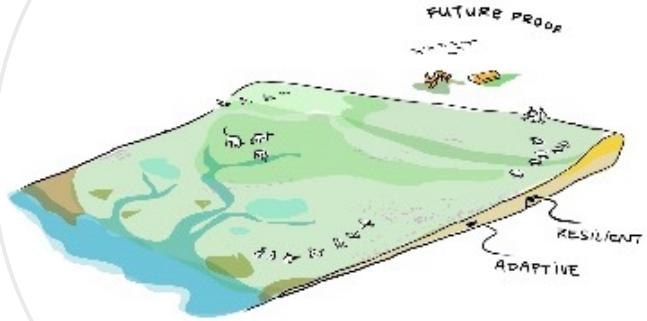
Elschot et al., 2024

APPLICATION of project results

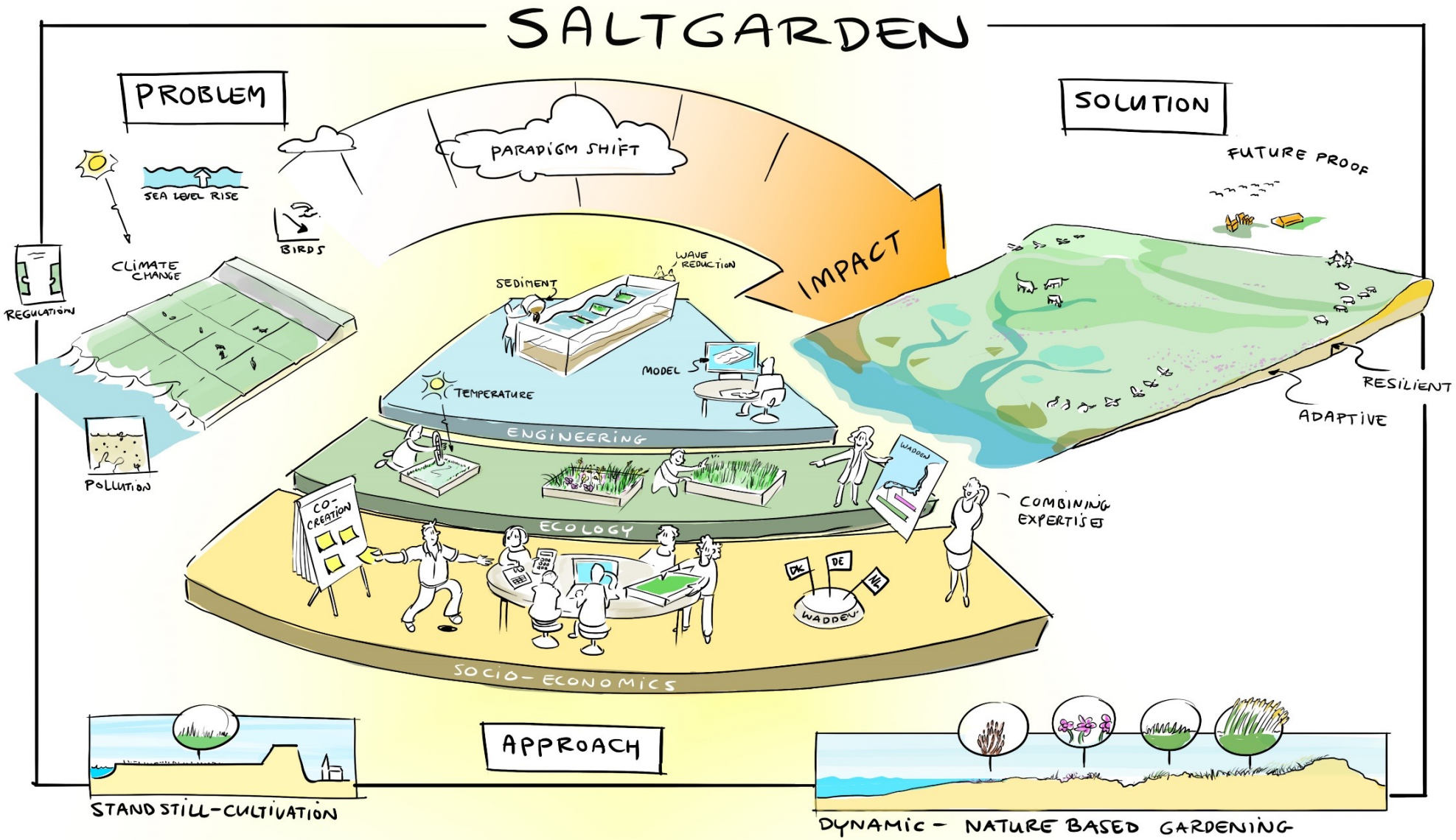
- Current foreshore management concepts
  - overlook the inherent **dynamics of salt marshes**
  - lack the opportunity to exploit their **natural resilience**

- SALTGARDEN we will promote **biodiverse, dynamic salt marshes** to enable **resilient** coastal landscapes in the Wadden Sea
  - Providing society and policy makers with scientifically sound knowledge on the added value of biodiverse and dynamic salt marshes
  - Exploring new restoration concepts: **Nature based Gardening** to be implemented in practice

Paradigm shift in the management of salt marshes towards new, progressive ecological guiding concepts!



Dornumersiel, © Dorothea Bunzel


SALTGARDEN
PROBLEM
SEA LEVEL RISE
BIRDS
CLIMATE CHANGE
REGULATION
POLLUTION
PARADIGM SHIFT
IMPACT
SEDIMENT
WAVE REDUCTION
MODEL
TEMPERATURE
ENGINEERING
ECOLOGY
CO-CREATION
SOCIO-ECONOMICS
WADDEN
DK
DE
NL
WADDEN
SOLUTION
FUTURE PROOF
RESILIENT
ADAPTIVE
COMBINING EXPERTISE
APPROACH
STAND STILL-CULTIVATION
DYNAMIC - NATURE BASED GARDENING