MODULE B3
NATMed decision-making tool for the implementation of FWC-NbS

Training Manual

October, 2025

The training programme has been developed within the framework of the NATMed project **“Nature-based Solutions on existing infrastructures for resilient water management in the Mediterranean”** funded by the PRIMA programme.

This manual is a collection of notes for workshop participants and is intended to complement the presentation delivered by the workshop facilitator.

For more detailed information on each module, please refer to the "Further Information" section provided at the end of each module, as well as the project website: **https://natmed-project.eu**

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FWC-NbS TRAINING PROGRAMME

MODULE A – Lessons learnt from NATMed case studies

A1: Knowledge Sharing from the Implementation of FWC-NbS
A2: IUCN Global standards for NbS (self-assessment tool)
A3: Replicability and Upscaling of FWC-NbS projects

MODULE B – NATMed tools

B1: Implementation Guidelines for FWC-NbS in the Mediterranean
B2: Citizen engagement and co-design procedures
B3: NATMed decision-making tool for the implementation of FWC-NbS

MODULE C – Market-based Mechanisms for NbS implementation

C1: Financial mechanisms, opportunities and business models for NbS

NATMed

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Introduction

NATMed has developed and constantly updates a user-friendly **Decision Support tool (DSS)** to provide a new structured way to implement Full Water Cycle Nature-based Solutions (FWC-NbS) in future ecosystems that need an improvement in their water management. It will be a valuable tool for the trainees in deciding which FWC-NbS will be optimal to improve the use of water and its related Ecosystem Service according to local needs, existing infrastructures, climate variability and future Climate Change scenarios. This tool will be open access, user-friendly, and applicable in the entire Mediterranean Region in order to reduce the skills, data and time required to facilitate its accessibility.

What will you learn?

By completing this module, you will:

- Understand the **objectives and core functions** of the NATMed DSS.
- Discover how the DSS integrates with **policy, planning, and monitoring systems**.
- Recognize the **challenges and risks** linked to DSS use.
- Gain confidence to test the DSS through a **live demonstration exercise.**

Guiding questions

How can the DSS support municipalities and stakeholders in choosing appropriate NbS?

How does the DSS connect with monitoring and governance frameworks?

What are the limits and risks of the DSS, and how can they be addressed?

How can you apply the DSS in your own context?

Who is this for?

Technical staff of local/regional authorities and water authorities,
Researchers and academics,
Policy makers.

Objectives and Functionality of the Tool

The NATMed Decision Support System (DSS) **dss.natmed-project.eu** is a tool designed to help municipalities, water authorities, and stakeholders make informed choices about planning, designing, and replicating FWC-NbS. Its main objective is to provide a structured, evidence-based platform that connects site-specific data, challenges, and indicators with practical NbS solutions tested in NATMed pilots.

Objective of the DSS

To support decision-making for the design, planning, and replication of NbS by integrating technical, environmental, and governance information, thereby reducing uncertainty and providing a structured, transparent approach to a complex decision-making process.

Practical Application

The DSS organizes knowledge from NATMed into an accessible **decision framework**. By linking challenges, ecosystem services, NbS types, and implementation characteristics, it allows users to **narrow down options** that match their context.

Objectives and Functionality of the Tool

Core functions:

- Provide a **catalogue of NbS options** linked to case study evidence.
- Allow users to **compare local conditions** (challenges, ecosystem services, land use, water needs).
- Suggest suitable **NbS types and implementation pathways.**
- Integrate **Key Performance Indicators (KPIs) and monitoring indicators** to evaluate performance.
- Understand applications in **different and similar conditions** (e.g. different NbS options under varying local constraints).

Actions to take

- Use the tool to compare multiple NbS options before selecting interventions.
- Always feed the DSS with accurate local data to improve recommendation quality.
- Combine DSS outputs with stakeholder engagement to ensure solutions are socially acceptable.

Pitfalls to avoid

- DSS is a support tool, not a substitute for expert judgment.
- Don't rely only on technical outputs; the DSS must be embedded in participatory decision-making.

Input Data and Key Performance Indicators

The DSS relies on **structured input data** to generate useful recommendations. By combining local conditions with tested NbS performance data, it guides municipalities and stakeholders to select interventions that are technically sound, environmentally effective, and socially acceptable.

Practical Application

- Users input their local challenges and needs into the DSS.
- The tool then connects these with matching NbS solutions from the NATMed knowledge base.
- KPIs are suggested to guide monitoring and evaluation.

Input Data and Key Performance Indicators

Why inputs matter

WHY ?

Good decision support depends on **reliable data**. Without clear information on local challenges and conditions, NbS recommendations may be irrelevant.

Input categories

- Local **challenges** (e.g. water scarcity, flooding, erosion, pollution).
- Desired **ecosystem services** (e.g., water reuse, groundwater recharge, biodiversity support).
- **NbS type** (wetlands, buffer zones, infiltration areas, conservation agriculture).
- **Implementation characteristics** (scale, costs, integration with grey infrastructure).

KPIs: Key Performance Indicators are currently built in to ensure interventions can be evaluated and compared.

Actions to take

- Collect baseline data before using the tool (climate, soil, water, land use).
- Choose KPIs aligned with local priorities (e.g., agriculture vs. drinking water).
- Use DSS as a dialogue tool with stakeholders, not just a technical assessment.

Pitfalls to avoid

- Don't ignore social and governance data; NbS success depends on local acceptance.
- Avoid using a single indicator; resilience requires multiple KPIs.
- Don't overlook data updates. DSS outputs are only as good as the data entered.

Use Cases from NATMed pilots

The DSS was tested and populated with data from the **five NATMed pilot case studies** (see module A1). These use cases validate the tool, showing how different contexts (water scarcity, soil erosion, pollution, drought) can be addressed by tailored NbS recommendations.

- The DSS integrates real case study data from NATMed to demonstrate how NbS work in practice.
- Each case study serves as a reference model for other regions: by entering similar challenges, municipalities can learn from tested solutions.

Each NATMed case study demonstrates how the DSS can connect local challenges → NbS solutions → measurable KPIs. Together, they form the evidence base that future users can draw from when applying the tool.

Use Cases from NATMed pilots

Carrión de los Céspedes, Spain CS1

Challenges:

Water scarcity, high evaporation, reliance on treated water storage.

NbS implemented:

- Constructed wetlands for wastewater treatment.
- Floating gardens to enhance purification and biodiversity.
- Ultrasound treatment in reservoirs.
- Reuse of treated wastewater for irrigation.

Climate resilience benefits:

Reduced evaporation losses, stabilized irrigation supply, improved water reuse.

KPIs:

Evaporation rate, water reuse volume, water quality parameters, bio-indicator species in water, water temperature, water retention capacity by vegetation and soil, infiltration capacity/rate.

Use Cases from NATMed pilots

Chimaditida, Greece CS2

Challenges:

Nutrient runoff from agriculture, soil erosion, inefficient irrigation, pressures on the lake's grazing capacity.

NbS implemented:

- Grazing management plans aligned with the lake's carrying capacity.
- Riparian buffer zones.
- Irrigation planning and efficiency measures.
- Small-scale wastewater treatment solutions.

Climate resilience benefits:

Reduced erosion and nutrient load, more efficient water use, protection of water bodies, and improved ecological balance between grazing, reed management, and lake habitats.

KPIs:

Soil erosion rates, nutrient concentrations in water, irrigation efficiency indicators, and indicators of grazing pressure relative to the lake's carrying capacity and reed-bed condition.

Use Cases from NATMed pilots

Arborea, Italy CS3

Challenges:

Groundwater nitrate pollution due to intensive agriculture, aquifer vulnerability.

NbS implemented:

Forested infiltration area with Passive Treatment System (PTS) designed to recharge aquifers and reduce nitrate concentration in groundwater.

Climate resilience benefits:

Improved groundwater recharge, nitrate reduction, CO2 immobilization, climate cooling.

KPIs:

Nitrate concentrations in the aquifer, groundwater recharge rate, and Greenhouse gas emissions.

Use Cases from NATMed pilots

Bozcaada, Türkiye CS4

Challenges:

Increasing drought, soil erosion, limited water availability for vineyards.

NbS implemented:

- Conservation agriculture practices.
- Natural infiltration and groundwater storage measures.
- Natural barriers for erosion control.
- Smart irrigation (Water 4.0).

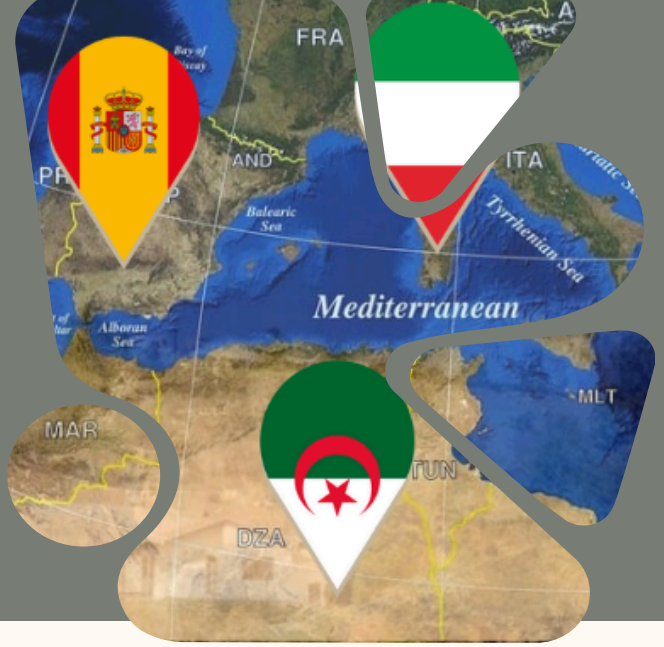
Climate resilience benefits:

Enhanced soil water retention, improved irrigation efficiency, reduced erosion.

KPIs:

Soil organic matter, irrigation efficiency, erosion rates, groundwater storage capacity.

Use Cases from NATMed pilots



Oued Righ, Algeria CS5

Challenges:

Oued Righ canal degradation, groundwater and surface water pollution, water scarcity, high evaporation.

NbS implemented:

- Constructed wetlands for wastewater treatment.
- Canal bank restoration.

Climate resilience benefits:

Improved water purification, pollution load reduction, ecosystem restoration, increased resilience to scarcity.

KPIs:

Wastewater quality parameters, reuse of treated wastewater, water reuse volume.

Use Cases from NATMed pilots

Actions to take

- Use pilot examples to benchmark your own city's challenges against NATMed cases.
- When applying the DSS, compare outputs with similar pilot conditions to gain confidence.
- Document and share your own use case to improve the DSS database.

Pitfalls to avoid

- Don't assume one case study equals a universal solution. Local context always matters.
- Avoid copying solutions without checking feasibility (legal, cultural, financial).
- Don't neglect to measure KPIs - without monitoring, lessons cannot be transferred.

Integration with Policy and Planning Frameworks

The DSS is not only a technical tool but also a **policy support instrument.** Its value lies in helping municipalities and regions integrate NbS into planning, governance, and investment processes, ensuring that solutions are not isolated projects but part of long-term resilience strategies.
The DSS is most valuable when used as a policy-support tool. It helps municipalities and regions align NbS choices with planning frameworks, legal structures, and investment strategies, ensuring solutions are replicable, fundable, and sustainable.

NATMed-based Conclusions

The DSS was designed to facilitate the replication and mainstreaming of NbS into municipal and regional planning.

NbS decisions must align with legal and institutional frameworks to ensure acceptance and funding.

Replication depends on integrating NbS into urban planning documents, water management strategies, and regional climate plans.

Tools like the DSS should support transparent and participatory governance, not just technical evaluation.

The Mediterranean Community of Practice (MedCoP), that was established in the NATMed project, provides a local example/methodology for policy dialogue to scale DSS application across Mediterranean contexts.

Members of MedCoP provided feedback for the DSS during the co-design workshops.

Integration with Policy and Planning Frameworks

NATMed Practices

In **Spain (Carrión de los Céspedes):** DSS recommendations support integration into irrigation planning and national-regional water reuse regulations and plans.

In **Greece (Chimaditida):** DSS outputs align with agricultural water use plans and Natura2000 site management.

In **Italy (Arborea):** DSS support NbS (Forested infiltration Area) integration into the regional water protection policies.

In **Türkiye (Bozcaada)** and **Algeria (Oued Righ):** DSS guidance links NbS options to municipal land-use planning and water scarcity strategies.

MedCoP: Demonstrated how DSS outputs can be discussed at regional governance level, creating shared Mediterranean frameworks.

Integration with Policy and Planning Frameworks

Actions to take

- Position DSS outputs within existing planning documents (water plans, urban development plans, climate strategies).
- Use the DSS as a dialogue tool between technical teams and policymakers.
- Ensure DSS recommendations are linked to funding opportunities (EU Green Deal, LIFE, Horizon Europe).
- Use methodologies, such as MedCoP to share DSS practices regionally.

Pitfalls to avoid

- Avoid treating DSS outputs as standalone. They must fit into broader governance frameworks.
- Don't neglect the legal and regulatory constraints; an NbS recommended by DSS may not be viable unless policy frameworks are supportive.
- Avoid excluding citizens and stakeholders from decision-making; policy integration must remain participatory.

Linking the Tool with Monitoring Systems

Monitoring is essential for ensuring that NbS deliver the expected benefits. The DSS connects directly with monitoring systems and KPIs, allowing municipalities to not only select suitable interventions but also track and evaluate their performance over time.

NATMed-based Conclusions

- The DSS was designed to use KPIs and monitoring protocols developed in NATMed. This ensures decisions are not theoretical but **evidence-based**, validated by data from real pilot monitoring.
- **Adaptive governance:** By linking DSS recommendations to monitoring indicators, municipalities can create **feedback loops,** adjusting actions as data comes in.
- **Policy relevance:** Linking with monitoring systems supports compliance with EU frameworks (e.g. Water Framework Directive, Biodiversity Strategy).

NATMed Practices

- **Spain (Carrión de los Céspedes):** DSS recommends wetlands → monitored through KPIs like evaporation, water quality and reuse.
- **Greece (Chimaditida):** DSS suggests buffer strips → tracked via nutrient loads and erosion indicators.
- **Italy (Arborea):** DSS points to infiltration forests → KPIs include nitrate concentrations and groundwater recharge rates.
- **Türkiye (Bozcaada):** DSS outputs include conservation agriculture → monitored by soil organic matter and irrigation efficiency.
- **Algeria (Oued Righ):** DSS guidance on wetlands and Oued Righ canal → KPIs track pollutant loads and canal state (erosion).

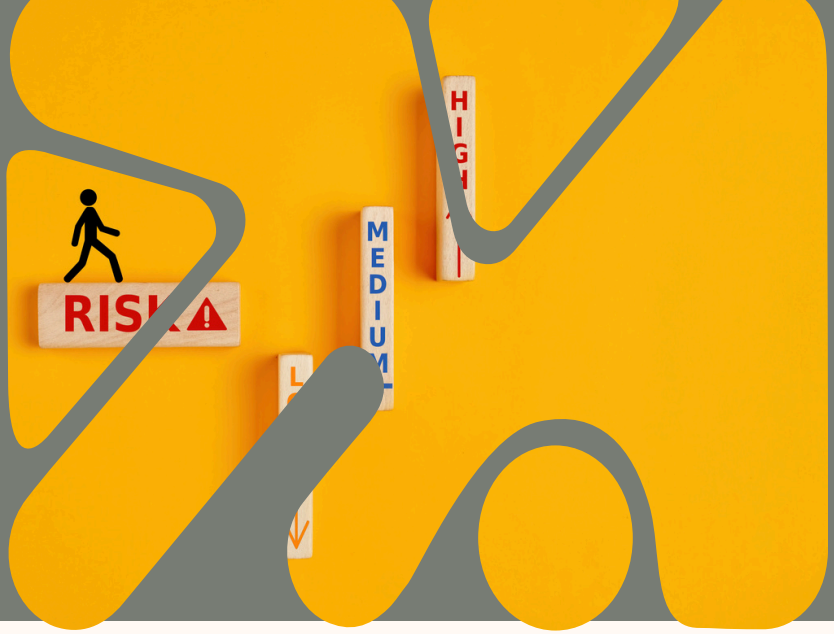
Linking the Tool with Monitoring Systems

Actions to take

- Use monitoring results to validate DSS outputs and refine future use.
- Share monitoring data with citizens to create trust and ownership.
- Establish long-term monitoring commitments in municipal planning.

Pitfalls to avoid

- Avoid implementing NbS without monitoring plans — success cannot be demonstrated.
- Don’t rely on a single KPI; resilience must be measured with multiple indicators.
- Avoid disconnect between DSS and local monitoring systems; they must reinforce each other.



Challenges and Risks

The DSS is a well-designed decision-support tool, but NATMed identified challenges as well as risks that need to be addressed for broader adoption. These issues relate to data quality, governance integration, usability, and the validation process with stakeholders.

NATMed-based Conclusions

Data availability and quality	Limited or outdated monitoring data may reduce DSS accuracy.
Complex decision contexts	DSS cannot fully capture social, legal, and financial constraints of NbS implementation.
User capacity	Municipal staff often need training to operate the DSS effectively.
Transferability risks	Case study solutions may not directly apply to different Mediterranean or non-Mediterranean contexts.
Tool maintenance	Without continuous updates, both the DSS database and indicators risk becoming obsolete.
User feedback loop	DSS development included an early self-verification stage, and the next step is external stakeholder validation to refine usability and credibility.

Challenges and Risks

NATMed Practices

- **Spain (Carrión de los Céspedes) & Greece (Chimaditida):** Data gaps (e.g. evaporation, erosion rates) limited DSS calibration.
- **Italy (Arborea):** Uncertainties due to the spatial heterogeneity of groundwater nitrate data constrained KPI reliability.
- **Türkiye (Bozcaada):** Showed that DSS outputs must be interpreted with governance and stakeholder input.
- **Algeria (Oued Righ):** Limited monitoring data complicated performance validation of wetlands.

Feedback process:

- Early self-verification was carried out internally by NATMed teams and MedCoP members.
- The DSS database is constantly expanded with new case studies.
- Planned external validation will involve municipalities and local stakeholders to assess tool usability and relevance.

Actions to take

- Pair DSS with capacity building and training sessions for municipal staff.
- Incorporate stakeholder feedback at all stages (verification, validation, refinement).
- Present DSS outputs alongside policy and governance discussions to ensure feasibility.

Pitfalls to avoid

- Avoid treating DSS outputs as final prescriptions; they are guidance, not absolute answers.
- Don't ignore feedback loops — without stakeholder validation, the tool risks poor adoption.
- Avoid deploying the DSS in regions without adaptation to local context and regulatory frameworks.

Interface Walkthrough and Demonstration (training activity)

How to Use the DSS – Step-by-Step Guidelines

1. Start the DSS session

- Open the tool as guided by the trainer.
- Familiarize yourself with the main input fields and menus.

2. Enter your local challenge

- Example: water scarcity, flooding, erosion, nitrate pollution.
- Select the challenge that best represents your local situation.

3. Select desired ecosystem services

- Example: groundwater recharge, water purification, biodiversity support.
- Choose the services you aim to improve in your area.

4. Provide site details

- Enter information such as land use type, scale (plot, watershed, municipal), or integration with grey infrastructure.
- Add any relevant socio-economic context if available.

5. Review NbS recommendations

- The DSS will display suitable NbS options validated in NATMed case studies.
- Each option comes with descriptions and practical considerations.

6. Check the linked KPIs

- For each recommended NbS, review the Key Performance Indicators suggested for monitoring (e.g. water reuse volumes, nitrate levels, soil organic matter).
- Discuss which KPIs are most relevant to your local priorities.

7. Compare scenarios

- Test multiple challenge–service combinations.
- Example: Compare NbS options for erosion control vs. water reuse.

8. Discuss planning implications

- Reflect with your peers: How could these DSS outputs fit into local planning or policy frameworks?
- Identify possible governance or funding needs.

9. Provide feedback

- Share your experience during the demo.
- Note: NATMed foresees stakeholder validation — your input helps refine the tool.

Further Information

If you want to learn more about the DSS and how it was developed in NATMed, you can explore the following deliverables:

- D4.3 – NATMed Decision-Making Tool: Provides the full description of the DSS, its objectives, functionality, input structure, case study database, and identified challenges and risks.
- D4.2 – Guidelines: Explains how NbS planning, governance, and monitoring frameworks link with the DSS, ensuring that outputs can be integrated into real policy and planning contexts.
- D3.1 – Monitoring Programme, D3.2 – Baseline, D3.3 – Case Study Assessments: Present the KPI framework and monitoring indicators that are embedded in the DSS to evaluate NbS performance.
- D5.1 – Replication Plan & D5.2 – Participatory Governance Plan: Show how the DSS can support replication and governance processes, connecting tool outputs to decision-making frameworks.

Quiz

Q1. The DSS provides final decisions on which NbS to implement, without the need for expert or participatory input.

- True
- False

Q2. Which of the following input categories does the DSS require?

A) Local challenges
B) Desired ecosystem services
C) Type of NbS
D) Implementation characteristics
E) All the above

Q3. KPIs are embedded in the DSS to help measure and compare NbS performance.

- True
- False

Q4. What is one of the main risks identified for DSS use?

A) Too much monitoring data available
B) Lack of accurate local data
C) Citizens refusing to participate
D) KPIs being optional

Q5. One of the next steps for the DSS is external stakeholder validation to improve usability and credibility.

- True
- False

1-False, 2-E, 3-True, 4-B, 5- True

Glossary

- **CS** Case Study
- **D** Deliverable
- **DSS** Decision Support System
- **NATMed** Nature-based Solutions on existing infrastructures for resilient Water Management in the Mediterranean
- **KPI** Key Performance Indicator
- **MedCoP** Mediterranean Community of Practice
- **FWC_NbS** Full Water-Cycle NbS
- **NbS** Nature-based Solution
- **PTS** Passive Treatment System

NATMed

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