

# D1.5: External Advisory Board - Final Report

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## **REACT4MED External Advisory Board**

### **Midterm Advisory Report**

**Project:** REACT4MED - Inclusive Outscaling of Agro-ecosystem REstoration ACTions for the MEDiterranean (PRIMA, RIA)

## **1 Purpose of this report**

This report refers to the conclusion of REACT4MED. It follows the midterm report, which set out recommendations for the second half, and is based on the final deliverables of the project. It adds the view of an ecologist and governance specialist who works on restoration, protected areas and land management in the southern and eastern Mediterranean, including in fragile settings similar to some in which this project worked. My overall assessment remains positive. The questions here are the ones that belong to a final review: what was delivered against what was promised, what was done with the advice given at midterm, and what will last after the grant.

## **2 Overall assessment**

REACT4MED delivered. The eight living labs completed their cycle, restoration actions were implemented and assessed in all eight pilot areas, the LanDS toolbox is built and running with its dashboard released and code open, and the policy work reached the level of country-specific financing instruments. Eight new factsheets were contributed to the WOCAT global database, leaving a permanent trace outside the project. The scientific record is solid: 37 conference presentations against a target of 27, and 14 peer-reviewed publications against a target of 18. The regional analysis in D6.3 is a genuine piece of work that answers the question the proposal set.

The quality of the work is not the problem. My concerns at close are three: a substantial part of the project's field evidence is not public; the biodiversity indicators I raised at midterm have not yet reached the delivered tool; and the custody of LanDS after the grant is unresolved. The first two are correctable in weeks. The third decides whether the toolbox has a future.

## **3 Delivery against the proposal**

Against its original objectives the project performed well. It set out to capture restoration practice in eight Mediterranean pilot areas, co-develop indicators with local stakeholders, build a decision-support tool that identifies where those practices could be applied more widely, assess cost-effectiveness, and translate the result into policy. Each of those was done.

Two things were reframed rather than delivered as written. The meta-analysis of restoration success (D2.3) became a study of one biophysical relationship, as I noted at midterm. And the “suitability” language of the proposal turned out to mean similarity: the machine-learning procedure clusters areas whose climate, land and socio-economic conditions resemble a pilot area's, and a separate expert filter then applies thresholds. That is a defensible, honest design, and D4.3 and D6.3 describe it accurately. It is worth stating plainly, because “suitable area” invites a stronger reading than the method supports.

The final year required a six-month no-cost extension, which was granted. D3.3, D3.4, D6.3, D6.4, D7.3 and this advisory report were formally rescheduled, and against the revised dates the slippage is weeks rather than months. The cause was the pilot-to-analysis dependency I flagged at midterm, compounded by the conflict in Israel, drought in Morocco and elections in Egypt.

The management decision behind the extension deserves credit. The consortium foresaw the delay, considered dropping the third and fourth workshops in some pilot areas to stay on the original workplan, and chose instead to complete them everywhere and ask for more time without more money. That was the right call: a project about inclusive outscaling that drops the difficult pilots to protect its schedule would have undermined its own premise.

## 4 Scientific and technical progress

The strongest scientific work in the second half is D6.3 and D5.2. D6.3 operationalised the whole analytical chain at Mediterranean scale, producing twelve functional typologies for the 2001–2019 baseline and re-running them under SSP2-4.5 and SSP5-8.5 to 2060. D5.2's main finding is unwelcome: all eight restoration actions returned positive benefit-cost ratios, from 1.03 in Egypt to 2.26 in Türkiye over fifteen years, but the greatest environmental co-benefits did not come from the practices that paid best — the Spanish chipped pruned branches system returned a lower net present value than burning the prunings. With capital needs from about €3,350 per hectare in Egypt to over €330,000 in Cyprus, and implementing farmers bearing disproportionate risk while off-site benefits are public, the project's most important finding is that restoration in these landscapes does not scale on its own economics. It deserves prominence in whatever the consortium publishes next.

Four points need to be made.

- First, on the honesty of the regional analysis, the consortium did much of what I asked. D6.3 states that its outputs are conditioned by the datasets, parameters and thresholds applied, that the maps are relative indications of potential rather than deterministic predictions, and that local validation is recommended before operational use. That is well worded, but it sits in the results section while the executive summary and conclusion omit it, and the dashboard maps a ministry official will actually open carry no such note. The caveat needs to travel with the maps.
- Second, the machine-learning procedure is described two different ways in the project's own final reporting, and this should be resolved before anyone tries to reproduce it. Task 4.2 and Milestone 4.5 describe 51 indicators reduced to 42 by a correlation threshold of 0.95, then principal component analysis, then k-means with k=6 by silhouette analysis; D6.3 describes 56 indicators reduced to 40 and then 20, a threshold of 0.7, and k=12. These are presumably successive versions of the same pipeline, but a reader cannot tell which produced the published maps. One paragraph stating the final configuration would fix it.
- Third, the most consequential results in D6.3 are negative ones. Afforestation of former farmland, organic vineyard restoration, and integrated water and soil conservation for biodiversity register no scenario suitability at Mediterranean scale under the current thresholds, and conservation agriculture contracts sharply across Morocco, Algeria and Iberia. Investment in these landscapes is

difficult — that is why the project exists — and results like these are exactly what make the case for a decision-support system to tell us where to invest. But they rest on fixed expert thresholds and, for the future runs, on a single climate model: forcing with GFDL-ESM4 rather than an ensemble is well argued, and I accept the reasoning about physical coherence, but the maps carry no spread. A finding of this weight should not reach decision-makers without a sensitivity test showing how it moves as the thresholds and model are varied — not a criticism of the method but a request for one more analysis, which the open code makes cheap. Negative results should also be reported consistently: the periodic report describes organic vineyard management as having a contracting envelope where the deliverable itself reports no scenario suitability.

- Fourth, there is still room to strengthen the treatment of biodiversity. The LanDS indicator library implements 56 indicators — temperature and precipitation extremes, aridity, soil salinity, wind, land-cover class and change, population, GDP, elevation and slope — but none is a direct measure of biological condition, and the terms biodiversity, vegetation condition, pollinator and soil biota do not yet appear in D4.3 or D4.4. The groundwork is there: D4.1 records that stakeholders in the Italian pilot asked for biodiversity indicators, and D3.2 shows the co-developed indicator sets did include them — species richness and structural diversity alongside leaf area index and forest tree density in Cyprus, and soil biodiversity and microbial diversity in Egypt. So the material exists; it simply has not yet reached the toolbox. Given the project's alignment with SDG 15 and a restoration action framed around biodiversity, adding three or four ecological-integrity indicators to an open Python library is a small piece of work with a large effect on the credibility of the claim.

## 5 The LanDS toolbox

LanDS is the project's principal innovation and it is real. The repository holds nine pilot-area collections; the data viewer and indicators library are operational, the machine-learning procedure has been applied and documented, the expert filter tool was completed, and the dashboard was released. The code is public on GitLab in three repositories under GNU GPL v3, with a self-hostable Docker stack that lets any organisation run its own instance. This answers the midterm point about an unstated licence, and it is the single most useful thing the consortium did for the tool's future: the asset can no longer be lost.

The asset can still age, which was my actual concern and remains so. The first-period review asked that LanDS be embedded within a network of institutions such as FAO so that it endures beyond the project; the consortium's response, two periods later, records this as still a priority for the final period and beyond. D7.4 lists the securing of hosting commitments among its enabling conditions rather than its achievements, and no party has been named to refresh the indicator library or the underlying data. The risk is unchanged from midterm: the same interface, ageing inputs, and suitability maps no one has checked against the field for years, still carrying the authority of a project-endorsed tool.

One distinction should be drawn clearly in the final reporting. The guarantee that exists covers react4med.eu, the project website. LanDS runs at lands.soft-water.it, which is a

different asset under a different party. A guarantee on the first is not a guarantee on the second, and the two should not be reported as though they were.

I would also flag a tension in the exploitation strategy. D7.4 presents LanDS as the portfolio's highest-value commercial opportunity and sets out a subscription service aimed at ESG investors, agricultural insurers and voluntary carbon market developers, while acknowledging that the GPL licence's implications for commercial deployment remain unresolved. More striking, uncertainty quantification appears there as a premium feature of the paid offering. Uncertainty is not a premium feature; it is a property of the result, and it belongs in the free public version that ministries and extension services will use. I would ask that this be corrected in any revision of the strategy.

## 6 The Living Labs, governance and local ownership

The living labs finished their cycle, and D3.3 is the best deliverable in the set. It documents the backcasting round honestly, compares the pilot areas rather than averaging them, and reflects critically on its own method, including where facilitation was overstretched and documentation too thin to interpret. That kind of self-assessment is rare and should be preserved in whatever succeeds this project.

Its findings on ownership confirm what I asked the Board to watch. Participation in the final round was 54 in Spain, 33 in Egypt, 21 in Greece, 16 in Cyprus, 15 in Turkey, 11 in Italy and 6 in Israel — about 156 people across seven pilot areas, against 272 across eight in the first workshop series. The report is right that depth matters more than headcount, and some were deliberately small working formats. But this is the round in which local actors were meant to commit to actions, and the numbers do not suggest institutions taking hold.

Two further observations. D3.3 documents seven pilot areas; Morocco was excluded from the backcasting round for logistical reasons, which the periodic report states openly. Given that Morocco is one of the two southern-shore pilots and carries the project's largest outscaling result, its absence from the barriers-and-pathways analysis is a real gap rather than a reporting oversight, and a successor effort should fill it. In Israel the team substituted online interviews for workshops because of the security situation, and said so. That was the right decision, well handled, and the clearest illustration in the project of why restoration governance in this region needs redundancy as a matter of course: more than one champion, and knowledge lodged in institutions rather than individuals.

Two of the project's own indicators bear on ownership and should be read carefully. KPI-6 counts stakeholders considering investment in sustainable land and water management, and reports 79 against a target of 80, measured by farmer and land-manager attendance at the last pilot-area workshop; attendance is not intention to invest. KPI-7 counts investments within the living labs, and records that these are so far supported by the Pilot Area Leaders. Both are honestly annotated and I am not disputing the numbers. But together they describe living labs still carried by the project rather than by local institutions, which is the question this final review has to ask.

## 7 Policy and alignment with international agendas

The policy work is where the project responded most fully to the midterm advice. I recommended short, country-specific instruments rather than one large report, and D6.4 delivers close to that: for each of the eight countries it sets out the actual public subsidy channels and private financing mechanisms available for sustainable land and water management, from the Cyprus CAP Strategic Plan and eco-schemes to the Egyptian National Drainage Project and the Agricultural Bank of Egypt, the Puglia Rural Development Programme, and the Turkish rural development investment support programme. That is usable material at the right level of specificity. The joint policy brief produced with sister PRIMA and Horizon initiatives in November 2025 was also well judged; a collective voice carries further than a single consortium's.

The remaining step is small and should be taken. The country sections of D6.4 should be extracted into standalone briefs of a few pages each, in the national language, addressed to the ministry or agency that administers the instrument described. The analysis is done; what is missing is the packaging and the delivery.

## 8 Dissemination and communication

The communications relaunch I asked for happened. Three newsletters were issued, the website drew 8,436 new users against a target of 6,500, and content was made available in eight languages including Arabic, Hebrew, Turkish and French; the practitioner guidebook was prepared in seven languages. For a project whose purpose is outscaling to the southern and eastern Mediterranean, multilingual delivery is not a courtesy but a condition of the objective, and the consortium treated it that way.

Two shortfalls are worth naming. Media coverage fell steadily across the project — 24 press items in 2022, then 8, then 4, then 5, reaching 41 against a target of 70 — so the strongest year for results was the weakest for press: the Nature publication, the guidebook launch and the final workshops all landed in 2025 and generated almost no coverage. Social media reach also stayed modest, with 495 followers on X against a target of 1,000, and website page views finished at 87 per cent of target.

The pattern suggests the communications capacity was concentrated in the launch phase and never rebuilt for the delivery phase, which is when an outscaling project most needs it. This is a lesson for the design of successor proposals rather than a criticism of the final year.

## 9 Data governance, FAIR compliance and preservation

The Zenodo community was established, which addresses the midterm point about DOI-backed deposition, and the LandS code and datasets are properly licensed and citable.

Against this, the openness of the project's own evidence base has gone the wrong way, and this is my most concrete concern at close. Five deliverables central to the project's purpose are marked confidential to the consortium — the WOCAT restoration technologies review (D2.2), the participatory assessment guide (D3.1), the co-developed indicators and metrics (D3.2), the restoration technologies tested and validated (D5.1), and the long-term monitoring system (D5.3) — while D5.2 carries no dissemination level at all. So the participatory method, the indicator framework, the field results from all eight pilots and the monitoring system are closed.

This sits badly against the project's own commitments. D7.4 promotes the participatory guide as a transferable facilitation tool and the indicators framework as a validated cross-site set, both intended for wide use. Yet the same deliverable describes D5.3 in one section as a public open report handed to local decision-makers as a lasting legacy, and in another as a confidential consortium output whose publication would need agreement among all partners. A monitoring system cannot be a legacy for local decision-makers and remain confidential to the consortium.

I do not think this reflects a decision to withhold; it looks like template defaults carried forward from early drafts. The remedy is administrative — review the dissemination level of these six deliverables, reclassify those intended to be public, and deposit them — a matter of days that materially changes what the project leaves behind.

Two further matters. The first is WOCAT, where the reciprocity I asked for at midterm was delivered. New technology factsheets were documented for dry-stone terraces in Cyprus, carob trees in Greece, organic table grape farming in Italy, chipped pruned branches in Spain, no-till in Morocco and food forest conversion in Israel, with approach factsheets for Morocco and Cyprus, all published under a REACT4MED collection in the WOCAT database; a member of the WOCAT Secretariat was subcontracted to train the Pilot Area Leaders in the standard. This leaves the global commons larger than the project found it, in a database the UNCCD recognises, and it should be a headline result rather than a task narrative. The set is not complete — Türkiye and Egypt do not appear, and finishing those two would close the loop.

The second is the Data Management Plan, which the periodic report states does not need updating. I questioned that at midterm and question it again. The plan was written before the project knew what it would produce and has not been revised to record where the LandS code now lives, under what licence, what the Zenodo community contains, or who holds anything after close. A plan unchanged across a project of this length is not a live document.

## 10 Gender, youth and inclusion

The direction set at midterm was right and the intent is visible throughout WP3. The participatory guide and D3.2 both give explicit place to women and younger practitioners, D3.2 carries youth and women's engagement in farming as an indicator in its own right, and the Turkish pilot achieved a majority-female workshop. Reporting also improved: KPI-8 now gives figures rather than impressions, and they are not flattering ones.

Against a target of 50 per cent of participants under 35 and 25 per cent female, the project reached 23 per cent under 40 and 26 per cent female among farmers and land managers. The female target was met, barely; the youth target was missed by a wide margin, and the age band was widened from 35 to 40 in the reporting. Aligning with the EU definition of a young farmer is a defensible reason to change the threshold, and the report says so, but a target missed under a more generous definition is missed by more than the number suggests. D3.3 confirms the pattern: with the exception of Türkiye the majority of participants was male in every pilot area, and the predominant age range was 41 to 60 throughout.

I raised at midterm that the 25 per cent female target was set too low to be informative, and the final data confirm it. Meeting a low target told the project nothing about whether it was reaching the women and young people who do much of the actual land and water

stewardship in these landscapes, and the youth result shows what happens when the harder target goes unmet. For successor work I would recommend dropping the single percentage in favour of reporting participation by pilot area, by round and by stakeholder role, so the pattern is visible early enough to act on.

## 11 Action on the midterm recommendations

Of the ten recommendations made at midterm, three were substantially acted on, four partially, and three were not taken up.

Substantially acted on: the recovery of Milestone 3.3, with the co-developed indicators delivered in April 2024; the communications relaunch, through the newsletter, multilingual content and a website that exceeded its user target; and the reciprocal contribution to WOCAT, completed for six of the eight pilots with training subcontracted from the WOCAT Secretariat.

Partially acted on: sustainability arrangements, where the licence was stated and repositories opened but no maintenance commitment or named local custodian followed; the caution on machine-learning outputs, present in D6.3 but absent from the dashboard and unsupported by a sensitivity analysis; data governance, improved by the Zenodo community but with the Data Management Plan unrevised and the project hub's custody unassigned; and governance redundancy in fragile contexts, applied ably in Israel when needed but not built in deliberately across the pilots.

Not taken up: the biodiversity and ecological-function indicators; the pilot-to-analysis information flow as a named and monitored dependency; and the deepening of participation by women and younger practitioners. A successor effort should know where to start.

One correction to my own earlier note. At midterm I treated the SoftWater hosting arrangement as the main open question for LanDS. The more important question turned out to be the content, not the server, and the consortium was right to prioritise the licensing and open repositories, which do more for durability than a hosting agreement would. The country-specific policy work in D6.4 went further than I asked. Against this, the openness of the deliverable set went backwards, which I did not anticipate at midterm.

## 12 Legacy

REACT4MED finishes with outputs worth keeping — the open, self-hostable toolbox, eight new factsheets in the WOCAT database, the seven-language guidebook, the country financing instruments in D6.4, and the honest account in D3.3 and D5.2 of why restoration does not scale. The eight pilot areas have measured results, including a 60 per cent reduction in soil erosion under chipped pruning mulch in Spanish citrus, and conservation agriculture in the Moroccan pilot region expanding fivefold to 59,350 hectares with wheat yields of 1.3 against 0.6 tonnes per hectare in 2024.

One caution about how that inheritance is counted. KPI-1 reports more than 2,000 square kilometres affected, but the aggregate combines direct implementation, estimated knowledge transfer, documented adoption, and area identified as suitable by the LanDS analysis. The first three happened; the fourth is a model output. Mixing them in a single impact figure will not survive scrutiny by anyone who reads the method, and the

underlying numbers are strong enough that they do not need it. I would report the modelled suitability separately.

What is not yet settled is custody. Three things need a name attached to them: who updates the LanDS indicator library and data, who holds the project hub and the pilot-area collections, and who convenes each living lab. None of these requires funding at the scale the project has already spent. What they require is a decision and a written commitment.

The evidence from the project's own pilots points to where the answer lies. The constraints recorded in D5.1 and D3.3 are almost entirely social, economic and institutional: trust, subsidy design, bureaucracy, an ageing farming population, weak advisory services, the perception of mulch as dirt. The binding constraint on Mediterranean restoration is not the absence of a tool, so its home should be an institution that already works on those constraints — FAO through CIHEAM Bari, the WOCAT network, the UNCCD monitoring architecture, or, from my own field, the UNESCO-MAB Biosphere Reserve and Global Geoparks networks, whose governance-ready Mediterranean sites would give the living-lab model a standing set of hosts.

There is an economic opening here as well, and D6.4 makes the case better than I could. Restoration in these landscapes can support real economic activity when it is built on solid scientific foundations, and an institution that maintains and extends what this research created can seed that activity. That is a more durable legacy than any closing event.

## 13 Recommendations for the second half

In order of priority.

1. Secure a named custodian for LanDS before the final report is filed. Put in writing who maintains the indicator library, who refreshes the data, on what cycle, and under whose mandate; this was also asked for by the first-period review and remains open. If no consortium partner can commit, approach FAO, WOCAT, the UNCCD architecture, or the MAB and Geoparks networks now rather than after close. State separately what the react4med.eu guarantee covers and what it does not.
2. Review and correct the dissemination level of D2.2, D3.1, D3.2, D5.1, D5.2 and D5.3, reclassify those intended to be public, and deposit them on Zenodo with DOIs. Resolve the contradiction in D7.4 over the status of D5.3.
3. Add ecological-integrity indicators to the LanDS library. Three or four measures of vegetation condition, cover and habitat continuity would make the SDG 15 claim defensible, and the library is open Python.
4. Run and publish a sensitivity analysis on the D6.3 suitability results before those maps are used in programme design, showing how the negative findings move under varied thresholds and an alternative climate model.
5. Carry the D6.3 caveat onto the dashboard itself, next to the maps, and move uncertainty quantification out of the paid tier of the exploitation strategy into the free public version.
6. Publish the country sections of D6.4 as standalone briefs in the national languages, addressed to the named ministry or agency responsible for each instrument.

7. Name the institution in each pilot country that will convene the living lab, and state what it has committed to. Where none can be named, say so and record what would be needed.
8. Complete the WOCAT contribution for Türkiye and Egypt, and report the full set of factsheets and the collection link as a headline result rather than inside a task narrative.
9. Revise the Data Management Plan once before close, recording where the code and data now sit, under what licences, and who holds them afterwards. It has not been updated across the project and should not be closed out unchanged.
10. Complete the back matter of the practitioner guidebook, register the ISBN, and deposit the seven language editions in open access — the output most likely to be used by the people the project was for.
11. Give the project's strongest evidence an external, peer-reviewed home. The D5.2 social justice findings and the D3.3 reflections — that the greatest co-benefits do not come from the practices that pay best, and that implementing farmers carry the risk for a public good — are its most transferable result and should not stay inside a deliverable; peer review also suits the cost-benefit analysis and the regional scenarios, and a short outside code and method review would serve the toolbox.

Correct the remaining reporting inconsistencies before final submission: D7.4 describes the project as five years of research and carries the deliverable number D7.6, and D5.2's stated range of net present values does not match its own statement of which intervention returned most. Report KPI-1 with modelled suitability separated from area actually affected.

## 14 Closing

REACT4MED did what it set out to do, across a region where working over nine countries is itself an achievement, and my recommendations are weighted towards reach, persistence, ecological depth and honest uncertainty rather than towards the research, which is sound. I remain available to the coordinator and work-package leaders, and would gladly help open the way into the protected-area, MAB and Geoparks networks, where the LandS toolbox and living-lab model could find a lasting home.

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