



# COASTAL

Collaborative Land-Sea  
Integration Platform

## Deliverable D32 EIP Practice Abstracts Reporting Period III

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## INTRODUCTION

A "practice abstract" is a short summary of around 1000-1500 characters (word count – no spaces) which describes a main information/recommendation/practice that can serve the end-users (farmers, water managers, coastal city mayors) with their daily practice. The practice abstracts make innovative knowledge accessible via the EIP-AGRI website<sup>1</sup> for broad dissemination in the common project language (English) and local language. A target number of 108 practice abstracts is foreseen for the COASTAL project, with the following breakdown by reporting period: 36 abstracts for the first reporting period (delivery M18), 36 for the second reporting period (delivery M36), and 36 for the final reporting (delivery M48). All six Multi-Actor Labs and several Work Packages contributed to the practice abstracts. The topics range from water management and climate adaptation to port development and coastal tourism. Fifty-three abstracts were submitted and have already been published on the EIP-AGRI website<sup>2</sup>.

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<sup>1</sup> <https://ec.europa.eu/eip/agriculture/en/eip-agri-common-format>

<sup>2</sup> <https://ec.europa.eu/eip/agriculture/en/find-connect/projects/platform-voor-land-zee-integratie-en-samenwerking>

# 1. PRACTICE ABSTRACTS REPORTING PERIOD IV

## 1.1. Practice Abstract 73 - System Dynamics modelling of groundwater resources management in SW Messinia

Implementing the Water Framework Directive is very challenging endeavour and achieving the target of Good Ecological Status is not easy when there simply is not enough water to cover current human uses and ecosystem function and services, as is the case in many areas in the most arid regions of South Europe. In the case of Messinia, a tourist destination with approximately 10.000 inhabitants and endless olive orchards, all water uses (agriculture, tourism, domestic and industry) depend on groundwater resources for their water supply. However, these water resources are also the main freshwater provider for Gialova lagoon, a coastal wetland with high ecological and commercial value. At present, the wetland is characterised as saline with hypersaline conditions for nearly 30% of the year. Salinity in the lagoon is expected to increase even more under drier and warmer future conditions, unless freshwater inputs are enhanced by restoring hydrologic connectivity between the wetland and the surrounding freshwater bodies. Balancing societal and ecological needs is the only solution to the problem. Under COASTAL EU project, we have developed Systems Dynamic (SD) models, following participatory modelling strategies which increases understanding about the issues and guides the co-creation of solutions hence increasing social approval during the implementation phase. The model describes how inland groundwater abstraction affects the salinity in the wetland and how the lack of freshwater inputs increases the risk of sea-water intrusion. The model was presented and validated by the MAL stakeholders during the March 2021 meeting and was used as a basis for discussion with stakeholders to promote sustainable decision-making and social learning

### Δυναμική μοντελοποίηση συστήματος διαχείρισης υπογείων υδάτων στη ΝΔ Μεσσηνίας

Η εφαρμογή της Οδηγίας Πλαίσιο για το νερό παρουσιάζει προκλήσεις, ενώ υπάρχουν περιπτώσεις όπου το νερό που φτάνει στα οικοσυστήματα δεν είναι αρκετό για να υποστηρίξει τις λειτουργίες και τις υπηρεσίες τους. Για την περίπτωση της Μεσσηνίας, ενός τουριστικού προορισμού, με περίπου 10.000 κατοίκους και ατελείωτες ελιές, η παροχή νερού για όλες τις χρήσεις (γεωργία, τουρισμός, οικιακή χρήση) εξαρτάται από τα υπόγεια ύδατα.

Ωστόσο, αυτοί οι υδάτινοι πόροι είναι επίσης ο κύριος πάροχος γλυκού νερού στη λιμνοθάλασσα της Γιάλοβας, ενός παράκτιου υγρότοπου με υψηλή οικολογική και εμπορική αξία. Προς το παρόν, ο υγρότοπος χαρακτηρίζεται ως φυσιολογικός με υπεραλίνο οικοσύστημα για σχεδόν 30% του έτους, και αναμένεται αύξηση της αλατότητας κάτω από ξηρότερες και θερμότερες συνθήκες, εκτός εάν οι εισροές γλυκού νερού αυξηθούν με την αποκατάσταση της υδρολογικής συνδεσιμότητας μεταξύ του υγροτόπου και των γλυκών υδάτων. Για να εξισορροπήσουμε τις ανάγκες της κοινωνίας και του οικοσυστήματος στο πλαίσιο του προγράμματος COASTAL, αναπτύξαμε μοντέλα Δυναμικών Συστημάτων σε επικοινωνία με τους τοπικούς ενδιαφερόμενους για τη βελτίωση των αλληλεπιδράσεων χέρσου και θάλασσας. Το μοντέλο διαχείρισης υπογείων υδάτων περιγράφει πως η άντληση υπόγειων υδάτων επηρεάζει την αλατότητα του υγρότοπου και επίσης πώς η έλλειψη εισροών γλυκού νερού αυξάνει τον κίνδυνο διείσδυσης θαλασσινού νερού. Το μοντέλο παρουσιάστηκε και επικυρώθηκε από τους ενδιαφερόμενους φορείς της MAL κατά τη συνάντηση του

Μαρτίου 2021 και χρησιμοποιήθηκε περαιτέρω ως βάση για μια συζήτηση με τους ενδιαφερόμενους και τη συν-δημιουργία βιώσιμων αποφάσεων με ευρύτερη αποδοχή.

## 1.2. Practice Abstract 74 - Digital transition: Participatory activities in the times of COVID

COASTAL project is essentially a participatory project, where knowledge production and modelling processes are based on interactions between scientists and local stakeholders. Such interactions were heavily impacted in 2020 due to the COVID-19 pandemic and the measures taken to contain it. For the case study of Messinia, where the stakeholder groups are also composed of farmers and fishers, many of whom were not familiar with digital technology and virtual meetings, the team was hesitant in organising a virtual MAL. As a result, the initial knowledge exchange meeting (planned for March 2020) had to be cancelled. However, the sudden need for adaptation in response to the COVID-19 pandemic led to the increased use of innovative digital methods and approaches that are supportive of meaningful stakeholder engagement, such as those required for COASTAL. The stakeholders in MAL2 showed an increased adaptive capacity to the emerging conditions, despite a lack of knowledge in new technologies being identified as an issue by communities in previous meetings. Participation was facilitated during the registration to the event, at which digital literacy levels and ability to participate in online events were examined, and help was offered where needed. The discussions were fruitful, and interactive tools like polls and surveys allowed participants that might have been otherwise overshadowed to express their opinions. Overall, the emerging adaptive capacity resulted in a very successful MAL meeting, with online surveys and polls used to increase the interaction and participation of stakeholders rather than reduce it.

### Ψηφιακή Μετάβαση: Συμμετοχικές δραστηριότητες στην εποχή του COVID

Το πρόγραμμα COASTAL είναι ουσιαστικά ένα συμμετοχικό έργο όπου η παραγωγή γνώσεων και η μοντελοποίηση βασίζονται στην αλληλεπίδραση μεταξύ επιστημόνων και τοπικών φορέων. Τέτοιες αλληλεπιδράσεις επηρεάστηκαν σε μεγάλο βαθμό το 2020 λόγω της πανδημίας COVID-19 και των μέτρων που λήφθηκαν για τον περιορισμό της. Για την περιοχή Μεσσηνίας, όπου οι ομάδες ενδιαφερομένων αποτελούνται επίσης από αγρότες και αλιείς, πολλοί από τους οποίους δεν ήταν εξοικειωμένοι με την ψηφιακή τεχνολογία και τις εικονικές συναντήσεις, η ομάδα δίσταζε να οργανώσει ένα εικονικό MAL. Ωστόσο, η ξαφνική ανάγκη προσαρμογής ως απάντηση στην πανδημία, οδήγησε στην αυξημένη χρήση καινοτόμων ψηφιακών μεθόδων και προσεγγίσεων χρήσιμες για την υποστήριξη της ουσιαστικής εμπλοκής των ενδιαφερομένων στις δραστηριότητες που απαιτούνται για ένα έργο όπως το COASTAL. Οι ενδιαφερόμενοι του MAL2 έδειξαν αυξημένη ικανότητα προσαρμογής στις νέες συνθήκες, παρόλο που ως μέρος των προηγούμενων συναντήσεων η έλλειψη γνώσεων στις νέες τεχνολογίες είχε αναγνωριστεί ως ένα από τα θέματα της κοινότητας, με αποτέλεσμα την ομαλή διεξαγωγή του 2ου διατομεακού εργαστηρίου. Η συμμετοχή διευκολύνθηκε κατά την εγγραφή, στην οποία εξετάστηκαν ο ψηφιακός γραμματισμός και η δυνατότητα συμμετοχής και προσφέρθηκε βοήθεια όπου χρειαζόταν. Οι συζητήσεις ήταν καρποφόρες και η χρήση διαδραστικών εργαλείων, όπως οι δημοσκοπήσεις, επέτρεψε τη συμμετοχή και σε συμμετέχοντες που δυσκολεύονται να εκφραστούν. Συνολικά, η αναδυόμενη ικανότητα προσαρμογής οδήγησε σε μια πολύ επιτυχημένη συνάντηση MAL, κατά τη διάρκεια της οποίας ψηφιακά διαδραστικά εργαλεία χρησιμοποιήθηκαν για να αυξήσουν την αλληλεπίδραση και τη συμμετοχή των ενδιαφερομένων, αντί να τη μειώσουν.



### 1.3. Practice Abstract 75 - System Dynamic Model of the Stakeholders' Vision for a Sustainable Messinia

Following the challenges identified by MAL 2 stakeholders (PA 52) regarding the realisation of the Vision of Sustainable Messinia, the modelling team focused its efforts on quantifying the characteristics related to this vision. This resulted in a large social-ecological model of South-west Messinia comprised of three submodels, with which the identified challenges are being analysed from a dynamic-systems perspective. One of the submodels focuses on olive tree cultivation concentrating on the farmers' willingness to change agricultural practices from conventional to integrated, which would result in reduced nitrogen load in rivers and the Gialova lagoon downstream. The second submodel describes the issues affecting the ecosystem status of the lagoon, which is related to both the nutrient loads coming mainly from the agricultural activities and the increased water demand due to both irrigated agriculture and tourism during summer. The third submodel is used to study how heightened tourism development of the area puts strain on agricultural practices and the visual identity of the Messinian landscape, increasing urban water demand and coastal water quality degradation due to limited wastewater and waste management capacities.

#### **Δυναμικό μοντέλο συστήματος του οράματος των ενδιαφερομένων για μια αειφόρο Μεσσηνία**

Μετά την ταυτοποίηση του Οράματος της Αειφόρου Μεσσηνίας από τους ενδιαφερόμενους φορείς του MAL2 (PA XX) και των προκλήσεων για την υλοποίησή του, η ομάδα μοντελοποίησης εστίασε τις προσπάθειές της στην ποσοτικοποίηση των χαρακτηριστικών που σχετίζονται με αυτό το όραμα. Αυτό οδήγησε σε ένα μεγάλο κοινωνικοοικολογικό μοντέλο της Νοτιοδυτικής Μεσσηνίας, το οποίο αποτελείται από τρία υπομοντέλα, όπου οι προσδιορισμένες προκλήσεις αναλύονται μέσω μιας δυναμικής προοπτικής συστημάτων. Ένα από τα υπομοντέλα επικεντρώνεται στην καλλιέργεια ελαιόδεντρων και ασχολείται με την προθυμία των αγροτών να αλλάξουν τις γεωργικές πρακτικές από συμβατικές σε ολοκληρωμένες, γεγονός που θα είχε ως αποτέλεσμα τη μείωση του φορτίου αζώτου στα ποτάμια και στη λιμνοθάλασσα της Γιάλοβας κατάντη. Το δεύτερο υπομοντέλο περιγράφει τα ζητήματα που επηρεάζουν την κατάσταση του οικοσυστήματος της λιμνοθάλασσας, η οποία σχετίζεται τόσο με τα φορτία θρεπτικών ουσιών που προέρχονται κυρίως από τις γεωργικές δραστηριότητες, όσο και με την αυξημένη ζήτηση νερού λόγω της άρδευσης της γεωργίας και του τουρισμού κατά τη διάρκεια του καλοκαιριού. Το τρίτο υπομοντέλο χρησιμοποιείται για τη μελέτη της αυξημένης τουριστικής ανάπτυξης της περιοχής, η οποία ασκεί πίεση στις γεωργικές πρακτικές και την οπτική ταυτότητα του τοπίου της Μεσσηνίας, την αύξηση της ζήτησης αστικών υδάτων και την υποβάθμιση της ποιότητας των παράκτιων υδάτων λόγω περιορισμένης ικανότητας διαχείρισης λυμάτων και αποβλήτων.

### 1.4. Practice Abstract 76 - Certification for the development of sustainable tourism in the Regional Park of las Salinas

The certification System of sustainable nature tourism in the Natura 2000 Network is a management tool created to identify and differentiate the spaces of this Network and the companies that carry out their sustainable tourism activities there. This helps ensuring the compatibility between tourism and biodiversity. The purpose of this System is to promote the development and sustainable management of these activities in the Natura 2000 Network sites through the direct involvement and joint commitment of the manager of the protected areas (Public Administration) and the tourism companies that develop their activities within these

areas. This concerns those companies that carry out activities of observation, enjoyment or knowledge of nature, sports and adventure activities, and those that provide accommodations in the protected area. The Region of Murcia has just begun the process to join this System with the application for inclusion of the Regional Park de las Salinas, located in the surroundings of the Mar Menor. In a second phase, voluntary membership is envisaged for tourism companies operating in the area. The Regional Park's commitment on joining the System will be to improve communication and participation with tourism stakeholders, to provide information material and training on the protected area to companies, and the distinctive promotion of these companies as they develop sustainable ecotourism. On the other hand, the commitment of the companies when joining the System will be to know the conservation objectives of the area, its management model, and a commitment to develop their tourist activities in accordance with them and, finally, to disseminate the Natura 2000 Network among their clients.

### **Certificación sostenible para el desarrollo del turismo en el Parque Regional de las Salinas**

El Sistema de reconocimiento de la sostenibilidad del turismo de naturaleza en Red Natura 2000 es un instrumento de gestión creado para identificar y diferenciar los espacios de esta Red y las empresas que llevan a cabo sus actividades de turismo ahí, de forma sostenible, garantizando así su compatibilidad con la conservación de la biodiversidad. La finalidad de este Sistema es impulsar el desarrollo y gestión sostenible de dichas actividades en los espacios Red Natura 2000, a través de la implicación directa y el compromiso conjunto del gestor del espacio y de las empresas de turismo que operan en él. Estas empresas son aquellas que realizan actividades de contemplación, disfrute o conocimiento de la naturaleza, de deportes y actividades de aventura y también las que consisten en alojamientos en el ámbito del espacio protegido. Desde la Región de Murcia y en relación al Mar Menor, se ha iniciado el proceso de adhesión a este Sistema con la solicitud de inclusión del Parque Regional de las Salinas, situado en el entorno del Mar Menor. En una segunda fase se contempla la adhesión voluntaria de empresas de turismo que operan en él. El compromiso del Parque Regional al adherirse al Sistema será mejorar la comunicación y participación con los actores turísticos; facilitar material informativo y formación sobre el espacio protegido a las empresas, además de la promoción diferencial de las mismas ya que desarrollan un turismo sostenible. Por otra parte, el compromiso de las empresas al adherirse al Sistema será conocer los objetivos de conservación del espacio, su modelo de gestión y un compromiso para desarrollar su actividad turística conforme a ellos, y divulgar la Red natura 2000 entre sus clientes.

### **1.5. Practice Abstract 77 - Blue Science and Technology Summer Training**

At the beginning of September Marine@UGent and the Doctoral Schools of Ghent University organized the Blue Science and Technology Summer Training, which was hosted at Bluebridge. Participants from different scientific background enrolled to be prepared for the rapidly evolving demands of the blue economy sector. The focus of the course was to give an insight on different marine (circular ocean economy, oceans and human health, sustainable seafood, Building with Nature and social innovation) and maritime topics (maritime spatial planning, coastal engineering, renewable energy, robotics and virtual reality). The training finished with an open event for the public, Seayourfuture, where participants presented their final group work and a Blue Economy matchmaking lunch combined with a job Fair took place. COASTAL was also present at this job fair with a stand where more explanation was given on how the environmental, economic, and social interactions of rural and coastal areas in a holistic manner are analysed by Multi-Actor Approaches with System Dynamics.

After two weeks of different topics, it was clear that there are trade-offs and synergies between the different marine and maritime activities and the impact they have on land. As the participants had different backgrounds they could interact with each other, opening their eyes in other disciplines and looking for cross-sectoral connections which should drive them towards multidisciplinary approaches. And there COASTAL can help with its Modelling tool in supporting the prediction and complementary of these interacting activities. Another discussion with the participants was concerning the way how to reach and involve stakeholders in these kinds of holistic approaches.

## Zomertraining voor blauwe wetenschap en technologie

Begin september organiseerde Ugent de “Blue Science and Technology Summer Training”, die gehost werd op Bluebridge. Deelnemers met verschillende wetenschappelijke achtergronden schreven zich in om voorbereid te worden op de snel evoluerende Blauwe economie. De focus van de training lag op het geven van inzicht in verschillende mariene (circulaire oceaan economie, menselijke gezondheid, zeevruchten, bouwen met natuur en sociale innovatie) en maritieme onderwerpen (ruimtelijke ordening, kust engineering, hernieuwbare energie en robotica). De opleiding werd afgesloten met een open evenement, “Seayourfuture”, waar de deelnemers hun groepswork presenteerden en een matchmaking lunch en jobbeurs plaatsvond. COASTAL was ook aanwezig op deze jobbeurs waar meer uitleg werd gegeven over hoe de ecologische, economische en sociale interacties van landelijke en kustgebieden op een holistische manier worden geanalyseerd door multi-actor benaderingen en systeemdynamische modellen. Na twee weken van verschillende onderwerpen, was het duidelijk dat er trade-offs en synergiën zijn tussen de verschillende mariene en maritieme activiteiten en de impact die ze hebben op het land. Aangezien de deelnemers verschillende achtergronden hadden, konden ze met elkaar interageren, hun ogen openen in andere disciplines en op zoek gaan naar sector-overschrijdende verbanden die hen moeten aanzetten tot multidisciplinaire benaderingen. En daar kan COASTAL met zijn modelleringsinstrument bij helpen met de ondersteuning van de voorspellingen en complementariteit van deze activiteiten. Een andere discussie met de deelnemers was de manier waarop belanghebbenden bereikt en betrokken kunnen worden bij dit soort holistische benaderingen.

## 1.6. Practice Abstract 78 - Identification of Long-Lived Legacies Needed for Reducing Nutrient Loads to The Baltic Sea

A range of policies and management measures have been applied over the past decades to mitigate nutrient loads and combat eutrophication in the Baltic Sea region. Yet, mitigation results remain unsatisfactory. For Swedish coastal catchments, a recent data-driven study has shown that this may be due to still unmanaged load contributions from long-lived nutrient legacies to inland and coastal waters. The legacy source contributions to coastal nitrogen and phosphorus loads are found to be dominant, with much higher concentrations than from the active sources. The high nutrient concentrations from legacy sources are also well-correlated with key indicators of anthropogenic rather than natural background origin. The indicators include agricultural land share and population density in the coastal catchments. These results emphasize an important need to identify, distinguish and map the different active, legacy and mixed types of sources for major nutrient loads to the Baltic Sea coast. The distinction methodology proposed in this study can help select appropriate strategies and measures and direct them to the locations where they can most effectively target each source type and achieve significant water quality improvements.

*Source: Chen, Y., Destouni, G., Goldenberg, R., and Prieto, C. (2021) Nutrient source attribution: Quantitative topology distinction of active and legacy source contributions to waterborne loads. Hydrological Processes (Wiley) 35, e14284. <https://doi.org/10.1002/hyp.14284>*

## Identifiering Av Långlivade Ärvda Källor För Effektiv Minskning Av Närsaltsbelastningen På Östersjön

Under de senaste årtiondena har en rad olika strategier och förvaltningsåtgärder tillämpats för att minska näringsbelastningen och bekämpa eutrofiering i Östersjöregionen. Resultaten är dock fortfarande otillfredsställande. För svenska tillrinningsområden längs Östersjöns kust har en aktuell data-driven studie visat att det kan bero på ännu inte hanterad närsaltsbelastning från långlivade ärvda källor till inlands- och kustvatten. De ärvda källornas bidrag dominerar kväve- och fosforbelastningen med mycket högre koncentrationer än från de aktiva källorna. De höga koncentrationerna av näringsämnen från de ärvda källorna är också väl korrelerade med nyckelindikatorer för antropogent snarare än naturligt bakgrundsursprung. Indikatorerna är andel jordbruksmark och befolkningstäthet i kusternas tillrinningsområden. Resultaten understryker ett viktigt behov att identifiera, urskilja och kartlägga de olika typerna av aktiva, ärvda och blandade närsaltskällor för Östersjöregionen. Den urskiljningsmetodik som föreslås i den här studien kan bidra till att välja lämpliga strategier och åtgärder och placera dem där de kan mest effektivt minska belastningen från varje typ av källa och signifikant förbättra vattenkvaliteten.

### 1.7. Practice Abstract 79 - A Melting Pot of Pressures from Land, Open Sea and Climate Affect Coastal Eutrophication

Eutrophication threatens coastal ecosystems around the world and is typically associated with an increase in nutrient (nitrogen and phosphorus) loads to coastal waters from human activities. This increase creates a range of environmental problems in coastal regions, such as oxygen depletion and changes in the food chain. This is also the case for the coastal waters of the Baltic Sea (MAL3 in the project), for which a recent PhD thesis has investigated how different pressures affect coastal eutrophication and its management opportunities, using a combination of modelling, data and literature analysis. Our results show that several pressures, including climate, hydrological conditions and various types of nutrient sources on land, in the coast and in the open sea, interact to influence water quality and ecosystem status in each local coastal zone. For example, warmer and wetter climatic conditions are associated with more difficult remediation of coastal eutrophication than drier and colder conditions. Moreover, management of eutrophication in each local coastal area needs to take into account effects of local land-based sources of nutrient and coastal conditions, but also effects of large-scale regional conditions in the open sea and its whole catchment area. Local sources of nutrient on land are increasingly dominated by long-lived legacy sources, while the open sea can also be regarded as a legacy source. These legacy sources are, however, understudied in the research on Baltic coastal eutrophication. Specific coastal management solutions, like wetlands and mussel farming, are also poorly studied, even though they may in practice be effective against legacy sources.

*Source: Vigouroux, G. Managing coastal eutrophication: Land-sea and hydroclimatic linkages with focus on the Baltic coastal system. PhD Dissertation, Stockholm University, Faculty of Science, Department of Physical Geography (2021). <http://su.diva-portal.org/smash/record.jsf?pid=diva2%3A1604157&dswid=-9021>*

### Övergödning Vid Kusten Beror På En Blandning Av Påverkan Från Land, Öppet Hav Och Klimat

Övergödning hotar kustekosystem över hela världen och är oftast förknippad med en ökning av näringsämnen (kväve, fosfor) från mänskliga aktiviteter till kustvattnet. Tillskottet av näringsämnen ger upphov till tillväxt av alger och en rad relaterade miljöproblem, som syrebrist och förändringar i näringskedjan i kustvattnet. Detta gäller även för Östersjöns kustvatten (MAL3 i projektet), där en ny doktorsavhandling har undersökt hur olika drivkrafter påverkar kustområdenas övergödning, genom kombinerade modell-, data- och litteraturanalyser. Våra resultat visar att flera olika påverkansfaktorer, inklusive klimat, vattenflödesförhållanden och olika typer

av källor av näringsämnen på land, i själva kusten och i det öppna havet samspelar och påverkar vattenkvalitet och ekosystemstatus i varje lokalt kustområde. Till exempel försvårar varmare och fuktigare klimatiska förhållanden reduktion av övergödningen och uppnående av relaterade miljömål för kustområden jämfört med torrare och kallare förhållanden. Effektiv hantering av övergödning i varje lokalt kustområde behöver ta hänsyn till påverkan från lokala närsaltskällor på land och i själva kusten, men också från de storskaliga regionala förhållandena i öppna havet och hela dess storskaliga tillrinningsområde på land. Vidare har kvardröjande ärvda källor av näringsämnen på land och i havet, visat sig väsentligt bidra till näringsbelastningen vid kusterna. Forskningen om Östersjökusternas övergödning har inte i någon större utsträckning beaktat dessa ärvda källor. Specifika åtgärder för förbättring av kustmiljön, som våtmarker och musselodling, är också svagt utforskade, trots att de kan vara effektiva mot de ärvda källorna.

### **1.8. Practice Abstract 80 - Participatory monitoring and evaluation to support implementation of Sustainable Land Management**

The advanced state of land degradation worldwide urges the large-scale adoption of sustainable land management (SLM). Stimulating the creation of tight collaborative networks that enhance farmers' acquisition and sharing of knowledge and stimulate social learning is key for successful SLM adoption. Participatory monitoring and evaluation (PM&E) processes of innovative SLM such as Regenerative Agriculture (RA) are expected to enable social learning. To support the adoption of Regenerative Agriculture, CSIC initiated a PM&E project in SE-Spain bringing together local farmers applying RA in their almond farms and researchers in a 3 year PM&E process. Results showed that PM&E enabled social learning among participating farmers, who strengthened and enlarged their social networks for information sharing, mainly with other farmers, and presented a more complex and broader shared understanding of regenerative agriculture effects and benefits. Participatory research that supports social learning and the science-practice interface is increasingly promoted by the scientific community and policymakers worldwide for its great potential to improve the adoption of large-scale and long-term sustainable management. This is also prominent in the European agenda in the context of the agricultural transition in Europe promoted through the Green Deal and the Soil Mission and through the establishment of Living Labs. PM&E processes, and the joint development of solutions, can provide a very powerful tool to support social learning and the large-scale adoption of SLM in Europe.

More information: <https://doi.org/10.5751/ES-12796-260429>

### **Monitorización y evaluación participativa para apoyar la implementación de Manejos Sostenibles de la Tierra**

El avanzado estado de degradación de la tierra en todo el mundo insta a la adopción a gran escala de Manejos Sostenibles de La Tierra (MST). Estimular la creación de redes estrechas de colaboración que mejoren la adquisición y el intercambio de conocimientos entre agricultoras/es y estimulen el aprendizaje social es clave para una adopción exitosa de MST. Se espera que los procesos de monitorización y evaluación participativos (MEP) de MST innovadores, como la Agricultura Regenerativa (AR), fomenten el aprendizaje social. Para apoyar la adopción de la AR, el CSIC inició un proyecto de MEP en el sureste de España, juntando a investigadoras/es y agricultoras/es que aplican AR en sus fincas de almendros en un proceso de MEP de 3 años. Los resultados mostraron que la MEP favoreció el aprendizaje social en las agricultoras/es participantes en la MEP que fortalecieron y ampliaron el intercambio de información sobre AR, principalmente con otras agricultoras/es de su entorno, y presentaron una comprensión común más compleja y amplia de sus impactos y beneficios. La investigación participativa que apoya el aprendizaje social y la interfaz ciencia-práctica está

siendo crecientemente promovida por la comunidad científica y los desarrolladores de políticas públicas por su gran potencial para mejorar la adopción de MST a gran escala y largo plazo. Esto también es preeminente en la Agenda Europea en el contexto de la transición agrícola en Europa, promovido a través del Pacto Verde Europeo y la Misión del Suelo, y del establecimiento de Laboratorios Vivos. Los procesos de MEP, y el desarrollo conjunto de soluciones, ofrecen una herramienta muy poderosa para apoyar el aprendizaje social y la adopción a gran escala de MST en Europa.

### **1.9. Practice Abstract 81 - Visual Soil Assessment Tools to Favour Knowledge Exchange, Social Learning and Adoption of Sustainable Soil Management**

Restoration of agroecosystems is essential to support the livelihoods of millions of people worldwide, protect biodiversity, and contribute to adaptation and mitigation of climate change. Increasingly promoted Sustainable Land Management (SLM) approaches for agroecosystem restoration focus on the restoration of soil quality to enhance the delivery of multiple ecosystem services. There is an increasing call for Living Labs and transdisciplinary approaches involving farmers, researchers and other stakeholders in the co-design, co-monitoring and co-evaluation of SLM approaches to expedite the transition towards sustainable farming systems. Well-designed Participatory Monitoring and Evaluation (PM&E) processes can enhance farmers access to scientific and local knowledge from different SLM experiences, fostering social learning and favouring progress towards restoration goals. Visual Soil Assessment (VSA) tools are a good example of user friendly practical tools to support PM&E by facilitating the collection, systematization and sharing of field observations between different stakeholders and levels of expertise, and by helping the visualization of impacts. VSA tools can be used to monitor soil quality, to identify constraints for soil functioning, to detect early stages of degradation and restoration and provide a valuable addition to technical soil analyses. VSA tools foster farmers' self-evaluation and self-reflection on individual and community records, and can help in the decision-making towards soil restoration objectives enhancing farmer ownership and community empowerment to adopt long term SLM.

More information: <https://doi.org/10.1016/j.jrurstud.2021.10.017>

### **Herramientas de Evaluación Visual del Suelo Para Favorecer el Intercambio de Conocimientos, el Aprendizaje Social y la Adopción de Manejos Sostenibles de Suelo**

La restauración de agroecosistemas es esencial para apoyar las formas de vida de millones de personas en todo el mundo, proteger la biodiversidad y contribuir a la adaptación y mitigación al cambio climático. Los enfoques de manejo sostenible de la tierra (MST) que son crecientemente promovidos para la restauración de agroecosistemas se centran en la restauración de la calidad del suelo para mejorar la prestación de múltiples servicios ecosistémicos. Existe una creciente llamada a la puesta en marcha de laboratorios vivos y de enfoques transdisciplinarios que involucren a agricultoras/es, investigadoras/es y otras partes interesadas en el co-diseño, co-monitoreo y evaluación conjunta de enfoques de MST para acelerar la transición hacia sistemas agrícolas sostenibles. Los procesos de Monitorización y Evaluación Participativa (MEP) bien diseñados pueden mejorar el acceso de agricultoras/es al conocimiento científico y local de diferentes experiencias de MST, fomentando el aprendizaje social y favoreciendo el progreso hacia la consecución de los objetivos de restauración. Las herramientas de Evaluación Visual de Suelos (EVS) son un buen ejemplo de herramientas prácticas y fáciles de usar para apoyar la MEP, facilitando la recopilación, sistematización e intercambio de información entre diferentes agentes y niveles de experiencia, y ayudando a la visualización de impactos. Las herramientas de EVS pueden usarse para monitorizar la calidad del suelo, identificar factores limitantes en el

funcionamiento del suelo, detectar primeras etapas de degradación y restauración, y son una valiosa contribución a análisis técnicos del suelo. Las herramientas de EVS fomentan la autoevaluación y la autorreflexión por parte de los agricultores sobre los datos registrados a nivel individual y comunitario, y pueden ayudar en la toma de decisiones para lograr los objetivos de restauración del suelo deseados, mejorando el empoderamiento de las comunidades agrícolas para adoptar MST a largo plazo.

### **1.10. Practice Abstract 82- Adapting current policies to support land-sea synergies**

To implement governance responses that effectively support land-sea synergies, actors must acknowledge that ‘interdependency’ is at stake, and develop their governing practices and policy tools accordingly. The policy context matters. While a process of decentralization has marked “terrestrial” environmental governance, including water governance, the French state still holds key decisional powers over maritime issues. As stated in the Business roadmap (BRM), stakeholders seek to develop “territorial approaches” premised upon a sharing of the problem. The territory is critical for developing pertinent land-sea interdependency pathways, even when talking about the implementation of EU policies. Current initiatives have been either implemented to create new spaces for public action over land-sea synergies and tensions, or identified by actors as potentially useful in governing these interdependencies. Policy recommendations include:

- i. expanding the make-up of governance bodies to include coastal stakeholders;
- ii. providing financial and staff resources to ensure equality of rural-coastal participation;
- iii. defining a new and applicable paradigm for water resources as a land-sea continuum;
- iv. improving awareness of cross-cutting issues in the implementation of land-use planning policies;
- v. encouraging regional oversight for the promotion of quality “territorial” products and to ensure an equal representation of land-sea producers’ interests.

### **Adapter les politiques actuelles pour soutenir les synergies terre-mer**

Pour mettre en œuvre une gouvernance qui soutient efficacement les synergies terre-mer, les acteurs doivent reconnaître que « l'interdépendance » est en jeu et développer leurs pratiques de gouvernance et outils politiques en conséquence. Le contexte politique est important. Alors qu'un processus de décentralisation a marqué la gouvernance environnementale « terrestre », y compris la gouvernance de l'eau, l'État français détient toujours des pouvoirs décisionnels clés sur les questions maritimes. Comme indiqué dans la feuille de route opérationnelle, les parties prenantes cherchent à développer des « approches territoriales » fondées sur une mise en commun des problèmes. Une telle approche est essentielle pour développer des voies d'interdépendance terre-mer pertinentes, même lorsqu'on parle de la mise en œuvre des politiques de l'UE. Actuellement, des initiatives ont été soit mises en œuvre pour créer de nouveaux espaces d'action publique sur les synergies et les tensions terre-mer, soit identifiées par les acteurs comme potentiellement utiles pour gouverner ces interdépendances. Les recommandations politiques comprennent:

- i. élargir la composition des organes de gouvernance pour y inclure les parties prenantes côtières ;
- ii. fournir des ressources financières et humaines pour garantir l'égalité de participation entre les zones rurales et les zones côtières ;
- iii. définir un nouveau paradigme applicable aux ressources en eau en tant que continuum terre-mer ;
- iv. améliorer la sensibilisation aux questions transversales dans la mise en œuvre des politiques d'aménagement du territoire ;

encourager la surveillance régionale pour la promotion de produits "territoriaux" de qualité et assurer une représentation égale des intérêts des producteurs terre-mer.

### 1.11. Practice Abstract 83- A sustainable and diversified tourism

Tourism is a key activity in the Charente River basin, which is constantly growing and supporting the development of other activities such as local food production (e.g., shellfish, cognac). However, tourism is now taking place on such a scale that it is beginning to have detrimental effects, notably in coastal areas where it is most prevalent. Mass tourism leads to environmental impacts, overloading of local infrastructure (e.g., water treatment, roads) and competition for housing with the local population (gentrification process). To ensure the perennity of tourism and its associated benefits, the regional authorities aim to achieve more balanced distribution of tourism over the year, more evenly spread between coastal and rural areas. Local stakeholders have put forward a number of potential actions related to this. One key action is the development of transport infrastructure that connects both areas, so that tourists may stay in one area while visiting the other, or simply travel around the region more easily during their stay. Improving accessibility and connectivity within the rural area itself is also necessary. In both cases, the region should focus on public transport for long-distance travel, and cycle paths for shorter trips. To promote rural tourism and alternative forms of tourism (e.g., staying on farms), digital tools can also play an important role, highlighting available tourism activities and "unknown" spots. In addition, regulating seasonal property letting (a common practice in coastal areas) will help keep the accommodation offer and so visitor numbers under control. In extreme cases, local authorities could even establish visitor quotas, as already exist in the South of France, but this kind of drastic action remains undesirable.

#### Un tourisme durable et diversifié

Le tourisme est une activité clé du bassin de la Charente qui ne cesse de croître et soutient le développement d'autres activités telles que la production de denrées locales (ex. : ostréiculture, cognac). Cependant, le tourisme prend aujourd'hui une telle ampleur qu'il commence à avoir des effets néfastes, notamment dans les zones côtières où il est le plus présent. Le tourisme de masse entraîne des impacts environnementaux, une surcharge des infrastructures locales (ex. : le traitement de l'eau, les routes) et une concurrence pour le logement avec la population locale (processus de gentrification). Pour assurer la pérennité du tourisme et des bénéfices associés, les autorités régionales visent une répartition plus équilibrée du tourisme durant l'année et entre les zones côtières et rurales. Les acteurs locaux ont proposé plusieurs solutions potentielles. Une première action à entreprendre est le développement d'infrastructures de transport reliant les deux zones, afin que les touristes puissent séjourner dans une zone tout en visitant l'autre, ou simplement se déplacer plus facilement dans la région pendant leur séjour. Il est également nécessaire d'améliorer l'accessibilité et la connectivité au sein même de la zone rurale. Dans les deux cas, la région devrait privilégier les transports publics pour les déplacements de longue distance et les pistes cyclables pour les trajets plus courts. Pour promouvoir le tourisme rural et les formes alternatives de tourisme (ex. : séjours à la ferme), les outils numériques peuvent également jouer un rôle important, en mettant en évidence les activités touristiques disponibles et les endroits "inconnus". En outre, réglementer la location saisonnière de propriétés (une pratique courante dans les zones côtières) contribuera à maîtriser l'offre d'hébergement et donc le nombre de visiteurs. Dans les cas extrêmes, les autorités locales pourraient même établir des quotas de visiteurs, comme il en existe déjà dans le sud de la France, mais ce type de mesure drastique reste peu souhaitable.



### **1.12. Practice Abstract 84 - A system dynamic model to enhance water management and land sea synergies in a coastal-rural territory in SW France**

The management of water at the scale of river basin is a complex issue. It needs to take into account multiple uses, by economic activities, individuals or ecosystems, and their interactions, in order to regulate its exploitation in a fair and sustainable way. To avoid undesired effects, it should also consider how potential solutions might affect these users in the short and long terms. With the aim of supporting such policy design, we designed a system dynamics model to assess potential development strategies for the Charente River basin (France). This model integrates a hydrological submodel with other sector-specific submodels covering the territory's main activities and components (agriculture, shellfish farming, tourism, infrastructure, tourism and population). It allows examining consequences for coastal and rural activities and populations of regional development scenarios. For instance, it offers the ability to evaluate how the transition of upstream agriculture towards an agroecological model can help the downstream production of shellfish and the preservation of water resources. Based on the COASTAL project's collaborative approach, we involved stakeholders from all these sectors to design and validate the land-sea model and thus provide useful territory-rooted insights. Well-suited to analyse territory-scale development scenarios, the model can also serve as a basis to further integrate detailed activity-specific submodels.

#### **Un modèle en system dynamic pour améliorer la gestion de l'eau et les synergies terre-mer dans un territoire rural et côtier du sud-ouest de la France**

La gestion de l'eau à l'échelle d'un bassin versant est une question complexe. Elle doit prendre en compte les usages multiples, par les activités économiques, les individus ou les écosystèmes, et leurs interactions, afin de réguler son exploitation de manière équitable et durable. Pour éviter les effets indésirables, elle doit également considérer comment les solutions potentielles pourraient affecter ces utilisateurs à court et à long terme. Dans le but de soutenir la conception de telles politiques, nous avons conçu un modèle en langage system dynamic pour évaluer les potentielles stratégies de développement du bassin de la Charente (France). Ce modèle intègre un sous-modèle hydrologique avec d'autres sous-modèles sectoriels couvrant les principales activités et composantes du territoire (agriculture, conchyliculture, tourisme, infrastructures, tourisme et population). Il permet d'examiner les conséquences sur les activités et les populations côtières et rurales de scénarios de développement régional. Par exemple, il offre la possibilité d'évaluer comment la transition de l'agriculture en amont vers un modèle agroécologique peut aider la production de coquillages en aval et la préservation des ressources en eau. Sur la base de l'approche collaborative du projet COASTAL, nous avons impliqué des acteurs de tous ces secteurs pour concevoir et valider le modèle terre-mer et ainsi fournir des informations utiles ancrées dans le territoire. Bien adapté à l'analyse de scénarios de développement à l'échelle du territoire, le modèle peut également servir de base à l'intégration de sous-modèles détaillés spécifiques à une activité.

### **1.13. Practice Abstract 85 - A new label for shellfish farming in the *Pertuis Charentais***

Today's oyster consumers demand perfectly shaped shells and consistently high flesh content. While it is relatively easy to achieve the former, the latter is a much greater challenge due to farming conditions. For this reason, some producers are abandoning Protected Geographical Indication (PGI) label for Marennes-Oléron oysters in favour of their own brands, while others are moving to European production areas where a high flesh content can be more easily obtained. The BRM proposes to create a new label, based on the quality of

the product and covering the whole MAL4 area such as this will call for increased knowledge of the trophic environment in which the oysters grow, and how production is spread out both spatially and over time. There will also be a new set of procedures to manage oyster stocks based on trophic conditions and experience from producers. These procedures need to be sufficiently flexible to be implemented and modified quickly, both in terms of timeframes and locations. This kind of dynamic management is well suited to the changeable nature of coastal zones and their development. The aim of such an approach is that coastal watersheds are no longer seen as a succession of different states punctuated by transition periods but as a single system moving smoothly forward, driven by knowledge and experience.

### **Un nouveau label pour la conchyliculture dans les *Pertuis Charentais***

Les consommateurs d'huîtres actuels désirent des coquilles bien formées et une teneur en chair élevée. Si la forme est relativement facile à obtenir, la teneur en chair est beaucoup plus difficile à contrôler en raison des conditions d'élevage. C'est pourquoi certains producteurs abandonnent l'indication géographique protégée (IGP) huîtres de Marennes-Oléron au profit de leurs propres marques, tandis que d'autres se déplacent vers des zones de production européennes où un taux de chair élevé peut être obtenu plus facilement. La feuille de route conçue pour le territoire propose la création d'un nouveau label basé sur la qualité du produit et couvrant l'ensemble de la zone du MAL4 COASTAL, les Pertuis Charentais. Cette démarche nécessitera une connaissance accrue du milieu trophique dans lequel évoluent les huîtres et de la répartition de la production dans l'espace et dans le temps. Il faudra également mettre en place un nouvel ensemble de procédures pour gérer les stocks d'huîtres en fonction des conditions trophiques et des observations des producteurs. Ces procédures doivent être suffisamment souples pour être mises en œuvre et modifiées rapidement, tant en termes de délais que de lieux. Ce type de gestion dynamique est bien adapté à la nature changeante des zones côtières et à leur évolution. L'objectif d'une telle approche est que les bassins versants côtiers ne soient plus perçus comme une succession d'états différents ponctués de périodes de transition, mais comme un seul et même système évoluant en douceur, sous l'impulsion des connaissances et de l'expérience.

### **1.14. Practice Abstract 86 - Integrated modelling for informed decision making towards sustainable development of the Mar Menor lagoon and the surrounding Campo de Cartagena (Spain)**

The COASTAL project developed the first quantitative System Dynamics model to support informed decision making towards the sustainable development of the socio-ecosystem of the Mar Menor coastal lagoon and the surrounding Campo de Cartagena in close collaboration with stakeholders. The SD-model describes interactions between rural-coastal areas and between sectors (i.e. agriculture, tourism, fisheries, photovoltaic energy production, local populations, NGO, and public administrations). It allows evaluating the impacts of 14 solutions on 10 Key Performance Indicators (KPI) of sustainability and assess the robustness of these solutions under different scenarios of changes in international socioeconomic-policy drivers and climate. The model uses data from 1961 to 2022 and simulates trends and impacts for the coming 50 years. The 14 solutions together represent the Business Roadmap (BRM) that was co-designed with stakeholders through an extensive participatory process.

The SD-model is particularly useful as a Decision Support System to prioritize solutions and support informed decision making based on integrated assessment of impacts on different sectors at short, medium and long-term horizons. The model is designed to identify trends and possible feedback processes resulting in synergies

or trade-offs between sectors. Quantification of impacts on the 10 Key Performance Indicators allows for a comprehensive assessment of the effectiveness of solutions towards sustainable environmental, economic and social development of a complex socio-ecosystem.

*More information Practice Abstract 87.*

## **Modelización integrada para la toma de decisiones informada hacia el desarrollo sostenible del Mar Menor y el Campo de Cartagena (España)**

El proyecto COASTAL desarrolló el primer modelo cuantitativo de Dinámica de Sistemas para apoyar la toma de decisiones informada hacia el desarrollo sostenible del socio-ecosistema del Mar Menor y el Campo de Cartagena, en estrecha colaboración con representantes de los sectores implicados. El modelo representa las interacciones entre zonas rurales y costeras y entre sectores (i.e. agricultura, turismo, pesca, producción de energía fotovoltaica, poblaciones locales, ONG y administraciones públicas). Permite evaluar los impactos de 14 soluciones en 10 indicadores clave de sostenibilidad y evaluar la solidez de estas soluciones bajo diferentes escenarios socioeconómicos-políticos internacionales y de cambio climático. El modelo utiliza datos de 1961 a 2022 y simula las tendencias e impactos para los próximos 50 años. El conjunto de las 14 soluciones representa la Hoja de Ruta diseñada en colaboración con representantes de los diferentes sectores a través de un amplio proceso participativo.

### **1.15. Practice Abstract 87- A Business Roadmap and its impacts for the sustainable development of the Mar Menor lagoon and the surrounding Campo de Cartagena: generating coastal-rural synergies**

In COASTAL we co-designed a Business Roadmap of 14 solutions for the sustainable development of the Mar Menor and Campo de Cartagena, through an extensive participatory process with representatives from all sectors (agriculture, tourism, fisheries, salt marshes, local population, NGOs, public administration, research). We evaluated the impacts of the Business Roadmap on sustainability indicators with a quantitative model developed in COASTAL.

The Roadmap proposes to promote rural and coastal ecotourism, small (agro)photovoltaic installations, and environmental education, reduce the use of fertilisers and keep irrigation within legal limits, among others. In addition, the Roadmap includes 56 practical proposals such as the creation of green corridors connecting places of interest with sustainable transport; the restoration of cultural heritage; the promotion of agro-tourism and organic farming; and the training of the agricultural and tourism sector.

Impact modelling indicates that the Roadmap:

- Reduces the amount of nutrients in the Mar Menor, improving its ecological status.
- Increases the coastal-rural tourism potential and the potential photovoltaic energy installed.
- Increases jobs and gross economic benefit in the medium to long term, despite an initial reduction in both in the short term.
- Increases resilience to international socio-economic-political drivers and climate change.

Restoration of the socio-ecosystem requires time, investment and public-private collaboration between all sectors. Public administrations can support the Roadmap through facilitation, incentives, investment, training, awareness raising, policy development and control of compliance.

*More information Practice Abstract 86.*

## **Hoja de Ruta y sus impactos sobre el desarrollo sostenible del Mar Menor y el Campo de Cartagena: generando sinergias costero-rurales**

En COASTAL co-diseñamos una Hoja de Ruta de 14 soluciones para el desarrollo sostenible del Mar Menor y Campo de Cartagena, a través de un extenso proceso participativo con representantes de todos los sectores (agricultura, turismo, pesca, salinas, población local, ONG, administración pública, investigación). Evaluamos los impactos de la Hoja de Ruta sobre indicadores de sostenibilidad con un modelo cuantitativo desarrollado en COASTAL.

La Hoja de Ruta propone fomentar el ecoturismo rural y costero, pequeñas instalaciones (agro)fotovoltaicas, y actividades de educación ambiental, reducir el uso de fertilizantes y mantener el regadío en los límites legales, entre otros. Además, la Hoja de Ruta recoge 56 propuestas prácticas como la creación de corredores verdes conectando lugares de interés con transporte sostenible; la restauración del patrimonio cultural; fomentar agroturismo y agricultura ecológica, y la formación del sector agrícola y turístico.

La modelización de impactos indica que la Hoja de Ruta:

- Reduce la cantidad de nutrientes en el Mar Menor, mejorando su estado ecológico.
- Aumenta el potencial turístico costero-rural y la potencial energía fotovoltaica instalada.
- Aumenta los puestos de trabajo y beneficio económico bruto a medio-largo plazo, a pesar de una reducción inicial en ambos a corto plazo.
- Aumenta la resiliencia a cambios socioeconómicos-políticos internacionales y al cambio climático.

La restauración del socio-ecosistema requiere tiempo, inversión y colaboración pública-privada entre todos los sectores. Las administraciones públicas pueden apoyar la Hoja de Ruta mediante la facilitación, incentivos, inversiones, formación, sensibilización, el desarrollo y seguimiento de normativas.

### **1.16. Practice Abstract 88- A Public-Private Partnership for enhancing Land-Sea Synergies in SW Messinia**

In Messinia participants in the Multi-Actor Workshops of COASTAL, proposed that the land sea synergies could be enhanced through the development of a Public - Private Partnership that could focus on the promotion of sustainable agricultural practices and sustainable tourism activities, whilst at the same time protecting and restoring Gialova Lagoon. The proposed partnership requires a change of practices and a transition to a more sustainable and inclusive society, which have all been described in a roadmap that was co-developed with the stakeholders. Through Systems Dynamic model developed for the region we were able to evaluate the impacts of the different actions identified in the roadmap which if implemented will: a) Improve protected area management capacity by coordinating responsibilities for management and protection b) Increase farmers income from higher valued olive - oil, receiving payments for Ecosystem Services and Landscape management, diversification of activities and sharing of costs c) develop diverse tourism activities whilst minimising land use change d) Improve the water quality in the lagoon, which is important for supporting a viable fishing sector. The success of the implementation depends upon clear definitions of goals, aspirations and responsibilities of all actors within the partnership and a consistent place-based policy framework that will allow local partnerships participate in a multi-level governance structure.

## Μια Σύμπραξη Δημόσιου Ιδιωτικού Τομέα για την ενίσχυση των συνεργιών ξηράς - θάλασσας στη Μεσσηνία

Στη Μεσσηνία, οι συμμετέχοντες στα Πολυ-Παραγοντικά Εργαστήρια (MALs) του COASTAL, πρότειναν την ενίσχυση των συνεργιών ξηράς θάλασσας μέσω της ανάπτυξης μιας Σύμπραξης Δημόσιου και Ιδιωτικού Τομέα. Ο βασικός στόχος της σύμπραξης θα είναι η προστασία και αποκατάσταση της λιμνοθάλασσας Γιάλοβας και ταυτόχρονα η προώθηση βιώσιμων γεωργικών πρακτικών και δραστηριοτήτων αειφόρου τουρισμού. Η προτεινόμενη σύμπραξη απαιτεί αλλαγή πρακτικών μεταξύ των εταιρών και τη μετάβαση σε μια πιο βιώσιμη και χωρίς αποκλεισμούς κοινωνία. Οι αλλαγές που απαιτούνται για την πραγματοποίηση της μετάβασης έχουν περιγραφεί σε έναν οδικό χάρτη που αναπτύχθηκε από κοινού με τους ενδιαφερόμενους φορείς. Μέσω του μοντέλου Δυναμικών Συστημάτων που αναπτύχθηκε από την ομάδα του COASTAL για την περιοχή μπορέσαμε να αξιολογήσουμε τις επιπτώσεις των διαφόρων δράσεων που προσδιορίζονται στον οδικό χάρτη, οι οποίες εάν εφαρμοστούν θα: α) Βελτιώσουν την ικανότητα διαχείρισης προστατευόμενων περιοχών συντονίζοντας τις αρμοδιότητες διαχείρισης και προστασίας β) βελτιώσουν τα εισοδήματα των αγροτών λόγω της υψηλότερης αξίας των παραγόμενων προϊόντων (ελαιόλαδο), της λήψης αντισταθμιστικών πληρωμών για υπηρεσίες οικοσυστήματος και διαχείριση τοπίου, τη διαφοροποίηση των δραστηριοτήτων και τον επιμερισμό του κόστους μετάβασης και διαχείρισης. γ) Θα ενισχυθεί η ανάπτυξη ποικίλων τουριστικών δραστηριοτήτων με ταυτόχρονη ελαχιστοποίηση της αλλαγής χρήσεων γης δ) Θα βελτιωθεί η ποιότητα του νερού στη λιμνοθάλασσα, η οποία είναι σημαντική για την υποστήριξη των αλιευτικών δραστηριοτήτων. Η επιτυχία της υλοποίησης εξαρτάται από σαφείς ορισμούς στόχων, φιλοδοξιών και ευθυνών όλων των εταιρών που θα συμμετέχουν στη σύμπραξη, και από τη συνοχή των πολιτικών που θα επιτρέψουν την.

### 1.17. Practice Abstract 89- MALs as tools for Multi-Level Governance

"The success of Multi-Level Governance is a challenge for all Natura2000 network areas in Europe. The experience from the implementation of the Multi Actor Labs (MALs) in the area of SW Messinia, shows that such type of governance is possible and can be achieved through structured meetings and the use of innovative participatory tools, such as those developed during duration of the COASTAL EU programme. Through the organization of workshops with the participation of multiple agencies and the gradual modeling of the system combining scientific and empirical knowledge (COASTAL Methodology), the links between science-society-state are strengthened and a common basis for understanding the system and participation is cultivated between the multiple agencies that can participate in the governance of the region.

The pilot application of COASTAL EU tools for the integration of Ecosystem Services in Multilevel Governance, aspires to create a pilot tool for the adoption of the new governance model in the management of the protected areas of the NATURA2000 network in Greece and in Europe. The adoption of Multi-Level Governance models is a key objective for the national FRAMEWORK OF PRIORITY ACTIONS FOR THE NATURA 2000 NETWORK (MDP, 2021-2027), and is fully compatible with water management at catchment level, as defined in the Regional Management Plans based on national and Community Water Framework Directive (2000/60)."

### Τα MAL ως εργαλεία πολυεπίπεδης διακυβέρνησης

"Η επιτυχία της Πολυεπίπεδης Διακυβέρνησης αποτελεί πρόκληση για όλες τις περιοχές του δικτύου Natura 2000 στην Ευρώπη. Ωστόσο, η εμπειρία από την υλοποίηση των Πολυ-Παραγοντικών Εργασιών (MALs) στην περιοχή της ΝΔ Μεσσηνίας, αναδεικνύει ότι μια τέτοιου τύπου διακυβέρνηση είναι εφικτή και μπορεί να επιτευχθεί μέσα από δομημένες συναντήσεις και τη χρήση καινοτόμων συμμετοχικών εργαλείων, όπως αυτά που αναπτύχθηκαν κατά τη διάρκεια του προγράμματος COASTAL EU. Μέσα από την οργάνωση εργασιών με τη συμμετοχή πολλαπλών φορέων και τη σταδιακή μοντελοποίηση του συστήματος συνδυάζοντας την επιστημονική με την εμπειρική γνώση (Μεθοδολογία COASTAL), ενισχύονται οι δεσμοί μεταξύ επιστήμης-κοινωνίας-πολιτείας και καλλιεργείται μια κοινή βάση για την κατανόηση του συστήματος και τη συμμετοχή πολλαπλών φορέων στη διακυβέρνηση της περιοχής.

Η πιλοτική εφαρμογή των εργαλείων του COASTAL EU για την ενσωμάτωση των Οικοσυστημικών Υπηρεσιών στην Πολυεπίπεδη Διακυβέρνηση, φιλοδοξεί να δημιουργήσει ένα εργαλείο πιλότο για την υιοθέτηση του νέου μοντέλου διακυβέρνησης στη διαχείριση των προστατευόμενων περιοχών του δικτύου στην Ελλάδα και στην Ευρώπη. Η υιοθέτηση μοντέλων Πολυεπίπεδης Διακυβέρνησης αποτελεί βασικό στόχο του εθνικού ΠΛΑΙΣΙΟΥ ΔΡΑΣΕΩΝ ΠΡΟΤΕΡΑΙΟΤΗΤΑΣ ΓΙΑ ΤΟ ΔΙΚΤΥΟ NATURA 2000 (ΠΔΠ, 2021-2027), και είναι απολύτως συμβατή με τη διαχείριση των υδάτων σε επίπεδο λεκάνης απορροής, όπως αυτή καθορίζεται στα Περιφερειακά Σχέδια Διαχείρισης με βάση την εθνική και την κοινοτική Οδηγία Πλαίσιο για τα Ύδατα (2000/60)."

### **1.18. Practice Abstract 90- A more complete accounting of greenhouse gas emissions and sequestration in urban-coastal landscapes**

Developing urban areas to accommodate a growing population, while also achieving carbon neutrality is among the most pressing global issues. Most urban areas are located within coastal areas and a large part of the human population around the world live near or by the coast. This study complements the MAL3 nutrient and water pollutant studies for the Norrström and Baltic coast region to also consider climate greenhouse gas emissions in coastal-urban areas, making the study relevant for the COASTAL project.

A novel approach to accounting for the complex interactions involved in the urban-coastal carbon cycling is developed and tested for the surface and coastal waters of Stockholm County within the MAL3 coastal region. The study identifies ways to reduce net greenhouse gas emissions from such urban-coastal regions and provides new insights into the carbon interactions with regional urban green-blue areas. The study area is found to be a considerable source of greenhouse gases to the atmosphere. Stockholm County can reduce its emissions and achieve its goal of local carbon net-neutrality if the green areas are sufficiently maintained to make use of their carbon sequestration potential and thereby offset regional greenhouse gas emissions. An improved understanding of the water (blue) area emissions is also needed to formulate effective planning and policy measures geared towards a reduction in emissions from such urban-coastal areas. A more complete carbon accounting, based on a better understanding of green-blue urban area interactions in the carbon cycling, can help reduce net urban emissions in this and other urban-coastal areas of the world. The findings of this study highlight the need for more comprehensive evaluations of the local carbon cycling implications of green-blue urban-coastal areas, including of the water (blue) areas that can play a significant role in this local cycling.

More information: <https://doi.org/10.1016/j.ancene.2021.100296>

### **En mer komplett redovisning av växthusgasutsläpp och lagring i kustnära stadslandskap**



Utveckling av stadsområden för att kunna ta emot en växande befolkning, samtidigt som man uppnår koldioxidneutralitet är bland de mest pressande globala frågorna. De flesta tätorter ligger vid kustområden och en stor del av den mänskliga befolkningen runt om i världen bor nära eller vid kusten. Denna studie kompletterar MAL3-studierna av näringsämnen och vattenföroreningar för Norrströms- och Östersjökustregionen genom att även beakta klimatutsläpp av växthusgaser i kustnära stadsområden, vilket gör studien relevant för COASTAL-projektet.

Ett nytt tillvägagångssätt för beräkning av komplexa samspel i kolets kretslopp vid kustnära stadsområden har utvecklats och testats för yt- och kustvattnen i Region Stockholm som ligger inom MAL3-kustområdet. Studien identifierar sätt att minska nettoutsläppen av växthusgaser från sådana urbana kustregioner och ger nya insikter om kolkretsloppets beroende på regionala urbana gröna-blå ytor. Studieområdet visar sig vara en betydande nettokälla av växthusgaser till atmosfären. Region Stockholm kan minska sina utsläpp och nå sitt mål för lokal koldioxidneutralitet om tillräckligt med gröna områden kvarhålls för att bibehålla deras potential för kollagring och därmed kompensera för regionens utsläpp av växthusgaser. En förbättrad förståelse av utsläppen från vatten- (blå) ytorna behövs också för att kunna formulera effektiva planerings- och policy-åtgärder inriktade på att minska utsläppen från sådana kustnära stadsregioner. En mer komplett koldioxidredovisning, baserad på en bättre förståelse av kolinteraktionerna i gröna-blå urbana ytor, kan bidra till att minska nettoutsläppen från städer i denna och andra urbana kustområden i världen. Resultaten från denna studie belyser behovet av mer omfattande utvärderingar av konsekvenserna för det lokala kolkretsloppet av de gröna-blå ytorna i kustnära stadsområden, inklusive i deras vatten- (blå) områden som kan spela en betydande roll för detta lokala kretslopp.

### **1.19. Practice Abstract 91- Distinguishing active and legacy source contributions to stream and coastal water quality**

This study focuses on an essential coastal freshwater body, Lake Mälaren, the main water supply for Stockholm City and Region included in the MAL3 case in the COASTAL project. Lake Mälaren drains directly into and interacts with the coastal seawater. In this study we investigate other types of water pollutants than nutrients and, as such, complement the other, nutrient-focused studies in the MAL3 case. In consistency with the nutrient studies, it also uses commonly available stream monitoring data to address and quantitatively distinguish between the pollutant load contributions from active and legacy sources within the Norrström drainage basin that discharges its loads into Lake Mälaren around its whole shoreline and, through the lake, further into the coast. We develop a methodology for this distinction and apply it to stream concentration data of chloride (Cl<sup>-</sup>), copper (Cu), lead (Pb), and zinc (Zn) and corresponding water discharges over the period 1990–2018. The study results show widespread prevalence and dominance of legacy sources, with considerably greater legacy than active concentration contributions for both Cl<sup>-</sup> and the metals. Urban areas are indicated as hotspots of both active and legacy sources of Cl<sup>-</sup>, while old mining activities and their abandoned mine wastes are indicated as legacy hotspots for the metals. Active contributions play a greater role for Cl<sup>-</sup> than for the metals. A key difference between active and legacy load contributions to stream water quality is their respective dependence on water discharge, which makes the dominant legacy source contributions much more highly dependent on hydroclimatic variability than the active source contributions. For good spatial coverage and identification of legacy and active source contributions with higher spatial resolution, water discharge and quality monitoring need to be enhanced and better coordinated. Water concentrations and discharges need to be measured at the same/nearby places and cover the same time

periods with continuous data availability for both. This is paramount for tailoring mitigation measures for each pollutant and source type.

More information: <https://doi.org/10.1002/hyp.14280>

## Särskilja aktiva och ärvda källors bidrag till yt- och kustvattenkvalitet

Denna studie fokuserar på en väsentlig kustnära sötvattenförekomst, Mälaren, huvudvattentäkt för Stockholms stad och region, som ingår i MAL3-fallet i COASTAL-projektet. Mälaren rinner direkt ut i och samspelar med det kustnära havsvattnet. I den här studien tittar vi på andra typer av vattenföreningar än närsalter och kompletterar därmed de övriga närsaltsfokuserade studierna i MAL3-fallet. I överensstämmelse med närsaltsstudierna använder vi också i denna studie allmänt tillgängliga miljöövervakningsdata för att adressera och kvantitativt skilja mellan bidragen till föroreningsbelastningar från aktiva och från ärvda källor inom Norrströms avrinningsområde som strömmar ut i och belastar Mälaren runt hela dess strandlinje och genom sjön också vidare kusten. Vi utvecklar en metodik för detta särskiljande av källor och tillämpar den på data för koncentrationer av klorid (Cl<sup>-</sup>), koppar (Cu), bly (Pb) och zink (Zn) och för motsvarande vattenflöden i vattendrag under perioden 1990–2018. Studieresultaten visar på en utbredd förekomst och dominans av ärvda källor, med betydligt större koncentrationsbidrag än de från de aktiva källorna för både Cl<sup>-</sup> och metallerna. Stadsområden framträder som hotspots för både aktiva och ärvda källor för Cl<sup>-</sup>, medan gammal gruvverksamhet och relaterat övergivet gruvavfall framträder som hotspots för ärvda källor av metallerna. Aktiva bidrag spelar en större roll för Cl<sup>-</sup> än för metallerna. En nyckelskillnad mellan aktiva och ärvda belastningsbidrag till vattenkvaliteten i yt- och kustvatten är deras respektive samspel med vattenflöden, som gör de dominerande bidragen från ärvda källor mycket mer känsliga för klimatförändringar än bidragen från de aktiva källorna. För god rumslig täckning och identifiering av ärvda och aktiva källor med högre upplösning måste mätningar av vattenflöden och vattenkvalitet förbättras och bättre samordnas. Vattenkoncentrationer och vattenflöden behöver mätas på samma/nära platser och täcka samma tidsperioder med kontinuerlig datatillgänglighet för båda. Detta är avgörande för att skraddarsy åtgärder mot vattenförening för olika typer av föroreningar och relaterade källor.

More information: <https://doi.org/10.1016/j.scitotenv.2022.156240>

## 1.20. Practice Abstract 92- Gap identification in coastal eutrophication research – Scoping review for the Baltic system case

Coastal eutrophication affects the Baltic Sea and its coastal waters, including those of MAL3 in the COASTAL project. Effective management responses to coastal eutrophication require good understanding of the interacting coastal pressures from land, the open sea and the atmosphere, and associated coastal ecosystem impacts. This study has looked into and identified key research gaps based on how 832 published research papers on Baltic coastal eutrophication have considered and addressed land-coast-sea eutrophication interactions. The results show that the majority of studies so far have focused on coastal eutrophication pressures (52%) or impacts (39%), while considerably fewer studies have characterized the coastal eutrophication itself (20%). Few studies have investigated both pressures and impacts together or links across the land-coast-sea water continuum, indicating understudied feedbacks and synergies. Among coastal functions, studies considering ecological aspects are dominant, with much fewer studies investigating human aspects or the coastal filter function. Among coastal pressures, studies considering nutrient loads are



dominant, with fewer studies investigating the load sources, especially legacy sources and possible solutions for their mitigation. Overall, few studies investigate synergies, trade-offs and incentives for cross-scale multi-solution mitigation of coastal eutrophication. Thus, more studies are needed on these aspects to help identify concrete effective solution combinations that also account for the coastal filter function and dominant legacy sources and their impacts.

## Identifiering av forskningsluckor för kustnära övergödning – litteraturstudie för Östersjöns kustområden

Övergödning påverkar Östersjön och dess kustvatten, inklusive i MAL3-fallet inom COASTAL-projektet. Effektiva åtgärder mot kustövergödning kräver god förståelse för samspelet i påverkansfaktorer från land, det öppna havet och atmosfären, och relaterade effekter på kustekosystemen. Denna studie har undersökt och identifierat viktiga forskningsluckor baserat på hur 832 publicerade forskningsartiklar om övergödning av Östersjöns kuster har beaktat och behandlat övergödningsinteraktioner mellan land-kust-hav. Resultaten visar att majoriteten av studierna hittills har fokuserat på påverkansfaktorer (52 %) eller effekter (39 %), medan betydligt färre studier har karakteriserat själva kustövergödningen (20 %). Få studier har undersökt både påverkansfaktorer och effekter tillsammans eller kopplingarna över land-kust-havsvattensystemet, vilket tyder på att återkopplingar och synergier är understuderade. Bland kustfunktionerna är ekologiska studier dominerande, medan mycket färre studier undersöker mänskliga samhällsaspekter eller kustfilterfunktionen. Bland påverkansfaktorerna är studier av närsaltsbelastningar dominerande, medan färre studier undersöker belastningskällorna, särskilt ärvda källor och möjliga lösningar för att minska dem. Sammantaget är det få studier som undersöker synergier, avvägningar och incitament för eutrofieringsminskning med kombinationer av olika lösningar på olika skalor. Därför behövs fler studier av dessa aspekter för att hjälpa till att identifiera konkreta effektiva lösningar mot kustövergödningen, med hänsyn tagen till både kustfiltrets funktion och dominerande ärvda källor och deras effekter.

### 1.21. Practice Abstract 93- Managing nitrogen legacies to accelerate water quality improvement

Nitrogen pollution of inland and coastal water bodies from current and past agricultural and other sources threatens humans and ecosystems. Limited water quality improvements have occurred despite implementation of pollution mitigation measures worldwide. These pollution problems also prevail in the coastal waters of the Baltic Sea (MAL3 in the COASTAL project). One of the key drivers of the apparent lack of success in water quality improvement is legacy stores of nitrogen. The research reported in this study identifies knowledge gaps related to nitrogen legacies and proposes a way forward to manage and improve water quality.

Comparison of the timelines of policy and management measures to those of actual changes in eutrophication and hypoxic-zone mitigation reveals lacking change responses to such interventions across Europe and North America. This result is highly relevant for the COASTAL project as it highlights shortcomings that can generally be expected in effectiveness of policy-management instruments for water quality protection and identifies key focus areas for developing solutions to problems associated with nitrogen legacies and an integrated approach to still improve water quality, given the presence of legacies. To achieve successful, effective implementation of pollution mitigation measures, this study proposes a way forward that includes to: (i) quantify realistic lag times associated with the depletion of legacy sources; (ii) develop nutrient management scenarios including nitrogen (N) legacies in upland soils; (iii) estimate spatially explicit legacy N accumulation;

(iv) deploy both field-scale (nutrient management, cover crops) and downstream (wetlands, buffers) mitigation measures to minimize lag times; (v) monitor emissions and concentrations instead of focusing on outlets only; (vi) account for legacy effects in hydro-economic modelling approaches; (vii) evaluate policy implementation success in the long term.

More information: <https://www.nature.com/articles/s41561-021-00889-9>

## Hantera ärvda kvävekällor för snabbare förbättring av vattenkvalitet

Kväveförorening av inlands- och kustvattenförekomster från nuvarande och tidigare jordbruks- och andra källor hotar människor och ekosystem. Förbättringar av vattenkvaliteten har varit begränsade trots genomförande av föroreningsreducerande åtgärder över hela världen. Dessa föroreningsproblem råder även i Östersjöns kustvatten (MAL3 i COASTAL-projektet). En av de viktigaste drivkrafterna bakom den uppenbara bristen på framgång när det gäller att förbättra vattenkvaliteten är ärvda kvävekällor. Forskningen som rapporteras i denna studie identifierar kunskapsluckor relaterade till ärvda källor av kväve och föreslår en väg framåt för att hantera och förbättra vattenkvaliteten.

Jämförelse av tidslinjerna för policy- och förvaltningsåtgärder med de för faktiska förändringar i övergödning och begränsning av syrefria zoner avslöjar bristande förändringsresponser efter sådana åtgärder i Europa och Nordamerika. Detta resultat är högst relevant för COASTAL-projektet eftersom det belyser brister som generellt kan förväntas i effektivitet av policy- och förvaltningsinstrument för vattenkvalitetsskydd och identifierar viktiga fokusområden för att hitta lösningar på problemen med ärvda kvävekällor och en integrerad strategi för att ändå förbättra vattenkvaliteten, med tanke på förekomsten av sådana källor. För att framgångsrikt och effektivt genomföra föroreningsreducerande åtgärder föreslår studien en väg framåt som omfattar att: (i) kvantifiera realistiska eftersläpningstider förknippade med utarmningen av ärvda källor; (ii) utveckla scenarier för närsaltshantering inklusive ärvt kväve (N) i uppströms jordar inom avrinningsområden; (iii) uppskatta explicit den rumsliga ackumuleringen av N; (iv) implementera begränsningsåtgärder i avrinningsområdesskala både uppströms (näringshantering, täckgrödor) och nedströms (våtmarker, buffertar) för att minimera eftersläpningstiderna; v) övervaka både utsläpp och koncentrationer i stället för att enbart fokusera på belastningar vid stora avrinningsområdets utlopp. (vi) redogöra för förekomst och effekter av ärvda källor i hydro-ekonomiska modelleringsmetoder; (vii) utvärdera framgång för genomförande av begränsningspolicy och -åtgärder på lång sikt.