COASTAL
Collaborative Land-Sea Integration Platform

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EIP Practice Abstracts
Reporting Period II

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COASTAL: Collaborative Land and Sea Integration Platform - Co-creating evidence-based business roadmaps and policy solutions for enhancing coastal-rural collaboration and synergies in Europe focusing on economic growth, spatial planning and environmental protection. Project timeframe: 01/05/2018 - 30/04/2022

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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 [1]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[2].

[1] https://ec.europa.eu/eip/agriculture/en/eip-agri-common-format

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

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1. PRACTICE ABSTRACTS REPORTING PERIOD II

1.1. Practice Abstract 37 - Urban development planning for reduced greenhouse gas emissions: development of new model tools and application in Stockholm region

Increased urbanization with more people moving into urban regions, going on globally and entailing changes in land use, which in turn affects the climate. However, how interaction between urbanization and residential behaviours affects greenhouse gas emissions is not part of the traditional calculations of greenhouse gas emissions. To be able to support relevant scenario analysis, community planning and regional development decisions with regard to urbanization and related changes in land use and climate impact, development and testing of new model tools is required. The new model links socio-economic and ecological aspects of urbanization processes and the changes in land use and greenhouse gas emissions that they lead to. The application to the Stockholm region is relevant and important as it is a region with a high population and an estimated population increase of about 50 percent from 2015 to 2050. Modelling different scenarios for such development enables better planning and more informed decisions to limit and reduce future climate emissions through appropriate choice of areas for increased development. One way to reduce the climate impact from urban development is to develop a policy in the region that will counteract the construction of large and sparsely built residential areas. The results show that limitation of buildings in zones that now constitute important carbon sinks, such as natural land and parks, can significantly reduce emissions (by more than 70 percent) compared to a scenario of unlimited urban distribution. The new model tool includes an interface for decision support and simplified communication of results for practical use of community planners, which can also be adapted to and used for other regions and cities.

Samhällsplanering för minskade klimatutsläpp: utveckling av modellverktyg och tillämpning på Region Stockholm

En ökad urbanisering med allt fler människor som flyttar in till stadsregioner, pågår globalt och innebär förändringar i markanvändning, vilket i sin tur påverkar klimatet. Hur urbaniseringen påverkar utsläppen av växthusgaser är dock inte en del av de traditionella beräkningarna av klimatutsläpp. För att kunna stödja relevant scenarioanalys, samhällsplanering och beslut om regional utveckling med hänsyn till urbanisering och relaterade förändringar i markanvändning och klimatpåverkan krävs utveckling och testning av nya modellverktyg. Den nya modellen kopplar ihop socioekonomiska och ekologiska aspekter av urbaniseringsprocesser och de förändringar i markanvändning och utsläpp av växthusgaser som de leder till. Tillämpningen på Region Stockholm är relevant och viktig då det är en region med hög inflyttning och en uppskattad befolkningsökning med cirka 50 procent från 2015 till 2050. Modellering av olika scenarier för sådan utveckling möjliggör bättre planering och mer underbyggda beslut för att begränsa och minska framtida klimatutsläpp genom lämpliga val av områden för ökad bebyggelse. Resultaten visar att begränsning av bebyggelse i zoner som nu utgör viktiga kolsänkor, som naturmark och parker, kan minska utsläppsökningen betydligt (med över 70 procent) jämfört med ett scenario av obegränsad urban utbredning. Det nya modellverktyget inkluderar ett gränssnitt för beslutsstöd och förenklad kommunikation av resultat för praktisk användning av samhällsplanerare, som också kan anpassas till och användas för andra regioner och städer.

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1.2. Practice Abstract 38 - Land-Sea interactions in the coastal-marine system of the Baltic Sea

Both nutrient loads from land to coast, and coastal-marine flows and interaction dynamics on the seaside of coastal areas need to be accounted for, in order to understand the possible evolution and fate of coastal water quality and ecosystem status. This has been done in this study, comparatively for different hydro-climatic and Baltic coast conditions. Source conditions for coastal nutrient loads from Swedish catchments are identified as dominated by legacy sources, still remaining in the subsurface from previous/historic source inputs at the surface. Concentration levels in Swedish discharges to the coast show an expected pattern of increase from the northern, sparsely populated parts of Sweden to the southern, more densely populated parts that also have more extensive agriculture. Under different hydro-climatic conditions, the Baltic Sea itself has a stable flow structure in terms of flux directions between marine basins, but flux magnitudes change, in particular with changing wind conditions. The spreading patterns of solute (tracer, nutrient, pollutant) inputs from different land catchments into the Baltic Sea are mainly determined by the input amounts and not by specific local coastal flow conditions. Open sea conditions, and not just inputs from land, also greatly influence coastal water quality and ecosystem status. Overall, drier-colder hydro-climatic conditions (the opposite to projected forthcoming Baltic change) would be better for higher efficiency of various measures to improve these coastal conditions.

Land och hav interaktioner i Östersjöns kust- och havssystem

Både näringsbelastningar från land till kust, och dynamiken i flöden och interaktioner mellan kust och hav behöver tas hänsyn till för att bättre förstå möjliga utvecklingsscenarier för kvalitet och ekosystemstatus i kustområden. Det har gjorts i denna studie, som också jämför olika klimatförhållanden och kustområden runt Östersjön. Näringsbelastningar från land längs svenska kusten har identifierats som främst dominerade av ärvda källor, som kvarstår i mark och grundvatten från tidigare/historiska källor på ytan. Koncentrationsnivåerna i svenska utsläpp till kusten visar ett förväntat ökningsmönster från de nordliga, glest befolkade delarna av Sverige till de södra, tätare befolkade delarna, som också har mer omfattande jordbruk. Under olika hydroklimat-förhållanden har Östersjön en stabil flödesstruktur i termer av flödesriktningar mellan marina bassänger, men flödesmängderna förändras, särskilt med förändrade vindförhållanden. Spridningsmönstren för utsläpp av ämnen (näringsämnen, föroreningar) från olika kustområden in till öppna havet bestäms huvudsakligen av utsläppsmängderna och inte av specifika lokala kustflödesförhållanden. Förhållandena i öppna havet - och inte bara belastningarna från land - påverkar till stor grad kusternas vattenkvalitet och ekosystemstatus. Torrare och kallare förhållanden (motsatta till förväntade förändringar i Östersjöregionen) skulle generellt vara bättre för högre effektivitet i åtgärder för att förbättra dessa kustförhållanden.

1.3. Practice Abstract 39 - Case study Framework agreement Oudlandpolder Belgium

The Oudlandpolder is a clearly demarcated polder area between Ostend, Blankenberg and Bruges. A Framework Agreement has been signed by 20 partners, and the aim is to enable more differentiated and climate-proof water management in the area. The operationalisation of the framework agreement takes place through the establishment of a land development project "Oudlandpolder" and the aim is to arrive at an easily manageable water model for the entire Oudlandpolder.

The framework agreement "Oudlandpolder" makes implementation-oriented agreements with regard to:

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- further hydrological compartmentalisation of the polder, enabling more area-oriented water management;
- agreeing a more flexible and more area-specific water level management;
- the demarcation and realisation of natural and agricultural structure;
- the realisation of more storage capacity;
- the preservation of discharge possibilities at sea and this in coordination with the needs for coastal defence;
- the phasing of implementation.

This will be taken into account:

- The prioritisation of water use by the various users: water extraction, agriculture, nature, population, tourism, industry, etc.
- With the demand for more climate robustness for the Oudlandpolder due to drought/high water discharge, more intense rain showers.

In the COASTAL project (https://h2020-coastal.eu/) different policy options will be evaluated with the use of systems dynamic modelling.

Case study Raamakkoord Oudlandpolder België

De Oudlandpolder is een duidelijk afgebakend polder gebied tussen Oostende, Blankenberge en Brugge. Als polder vormt het een mooi voorbeeld van interacties tussen land en zee. Met het Raamakkoord ondertekend door 20 partners is het de bedoeling een meer gedifferentieerd en klimaatrobuust waterbeheer in de Oudlandpolder mogelijk te maken. De operationalisering van het raamakkoord gebeurt via de instelling van een landinrichtingsproject “Oudlandpolder” en het doel is te komen tot een goed beheersbaar watermodel voor geheel de polder.

Het raamakkoord Oudlandpolder maakt uitvoeringsgerichte afspraken m.b.t.:

- hydrologische compartimentering van de polder waardoor een meer gebiedsgericht waterbeheer mogelijk wordt;
- het afspreken van een meer flexibel en gebied specifiek waterpeilpeilbeheer;
- de afbakening én realisatie van natuurlijke en agrarische structuur;
- het realisaren van meer bergingscapaciteit;
- het behoud van de lozingsmogelijkheden op zee en dat in afstemming met de noden voor de kustverdediging;
- de fasering van de uitvoering.

Waarbij rekening gehouden wordt:

- de prioritering van het watergebruik door de verschillende gebruikers: waterwinning, landbouw, natuur, bevolking, toerisme, industrie, etc.
- de vraag naar meer klimaatrobuustheid voor de Oudlandpolder i.v.m. droogte/hoogwaterafvoer, intensere regenbuien

Binnen het COASTAL project (h2020-coastal.eu) worden de verschillende beleidsopties voor het gebied geëvalueerd met behulp van een systeemdynamisch model.

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1.4. Practice Abstract 40 - Maritime innovation and development platform Blue Accelerator

Blue Accelerator is an offshore maritime platform and test site of the Regional Development Agency West Flanders (POM West Flanders, Belgium) for blue economy research, development and innovation projects. Located at 500m off the port of Ostend, this offshore platform allows companies, organisations and knowledge institutions to organise a broad range of tests in real life sea conditions. Since March 2020, it is open for testing. Blue Accelerator consists of a monopile with a powerhouse on top, and a surrounding seabed test area of 220 m around the platform. The test platform allows testing above, on and under water. Potential cases include wave energy testing, materials testing, autonomous underwater vehicles, drones and robotics, offshore marine aquaculture and algae, ocean observation. The first use case of Blue Accelerator is the testing of the prototype wave energy converter by the German developer NEMOS GmbH. Blue Accelerator offers fast and easy access from the port of Ostend, is a pre-approved test facility which is embedded in a large blue growth network consisting of industry, academics and government. In this way it connects directly to the economic onshore and offshore activities in the region and ensures further development of a knowledge economy at sea. POM West Flanders offers customised support for funding, consenting and advice for tests. Blue Accelerator was realised with the support of the European Union (ERDF), Flanders and the Province of West Flanders.

Maritiem innovatie- en ontwikkelingsplatform Blue Accelerator

Blue Accelerator is een offshore maritiem innovatie- en ontwikkelingsplatform en testsite van de Provinciale Ontwikkelingsmaatschappij West-Vlaanderen (POM West-Vlaanderen, België) voor onderzoeks-, ontwikkelings- en innovatieprojecten in de blauwe economie. Gelegen op 500m van de haven van Oostende biedt dit offshore testplatform aan bedrijven en kennisinstellingen de mogelijkheid een ruim scala aan testen in zeecondities uit te voeren. Blue Accelerator is open sinds maart 2020.

Blue Accelerator bestaat uit een monopile met powerhouse en een omliggende testzone van 220m. Het testplatform maakt testen boven, op en onder water mogelijk. Potentiële testen zijn golfenergietests, materiaaltesten, autonome onderwatervoertuigen, drones en robotica, offshore mariene aquaculture, oceaanobservatie, De eerste test op Blue Accelerator een prototype golfenergieconverter van de Duitse ontwikkelaar NEMOS GmbH.

Blue Accelerator biedt een snelle toegang vanuit de haven van Oostende, is een vooraf reeds vergunde testfaciliteit, die ingebed is in een groot bluegrowth-netwerk. Op deze manier zorgt het voor een meerwaarde voor de onshore en offshore economische activiteiten in de regio en helpt het bij de uitbouw van een marine kenniseconomie. POM West-Vlaanderen biedt bovendien ondersteuning op maat voor financiering, vergunningen, advies en ondersteuning van testen.

Blue Accelerator werd gerealiseerd met steun van de Europese Unie (EFRO), Vlaanderen en de Provincie West-Vlaanderen.

1.5. Practice Abstract 41 - Use of bioreactors with wood for denitrification of brine in the field of Cartagena

This summary compiles the information obtained in various tests on brine denitrification from desalination plants using the system of wooden bioreactors set up by the Chair of Sustainable Agriculture of the Campo de

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Cartagena and the Task Force for Innovation in Irrigation Water Quality and Environmental Sustainability (AGUAINNOVA).

The system of bioreactors with biomass for denitrification is based on using wood chips or other low-cost ligno-cellulosic materials from the rejection of other activities (straw, cobs, husks, pruning remains, etc.) as a source of carbon so that the microorganisms can complete the denitrification in a container in which the brine is kept stagnant for a long enough time. The supply of carbon facilitates aerobic microbial respiration, which causes a decrease in the level of dissolved oxygen and activates the facultative anaerobic microorganisms, which, as they do not have sufficient oxygen, use nitrate (NO3-) as an electron-acceptor source, transforming it into N2 through the denitrification process.

After laboratory tests with different substrates for denitrification in bioreactors using carob pulp, olive pits, almond shells and citrus chips, two larger scale tests were designed.

The results obtained allow us to conclude that wooden bioreactors are a very efficient and sustainable system for the denitrification at source of brine in the Campo de Cartagena with retention times of only 24 hours and denitrification of 89%.

It is concluded that it is also necessary to implement an experimentation phase with this type of bioreactors in different farms with authorized wells that extract different flows and types of brine (with different salinity and nitrate concentration).

Utilización de biorreactores con madera para desnitrificación de salmueras en el campo de Cartagena

En este resumen se recopila la información obtenida en diversos ensayos de desnitrificación de salmuera de plantas desalinizadoras mediante el sistema de biorreactores de madera establecido por la Cátedra de Agricultura Sostenible del Campo de Cartagena y el Grupo de Trabajo para la Innovación en la Calidad del Agua de Riego y la Sostenibilidad Ambiental (AGUAINNOVA).

El sistema de biorreactores con biomasa para la desnitrificación se basa en la utilización de astillas de madera u otros materiales lignocelulósicos de bajo coste (paja, mazorcas, cáscaras, restos de poda, etc.) como fuente de carbono para que los microorganismos completen la desnitrificación en un recipiente en el que la salmuera se mantiene estancada durante tiempo suficiente. El suministro de carbono facilita la respiración microbiana aeróbica, y provoca una disminución del nivel de oxígeno disuelto y activa los microorganismos anaeróbicos facultativos que, al no tener suficiente oxígeno, utilizan el nitrato (NO3-) como fuente receptora de electrones, transformándolo en N2 mediante el proceso de desnitrificación.

Después de pruebas de laboratorio se diseñaron dos pruebas a mayor escala.

Los resultados obtenidos permiten concluir que los biorreactores de madera son un sistema muy eficiente y sostenible para la desnitrificación en origen de salmuera en el Campo de Cartagena con tiempos de retención de sólo 24 horas y una desnitrificación del 89%.

Se concluye que también es necesario implementar una fase de experimentación con este tipo de biorreactores en diferentes fincas con pozos autorizados que extraen diferentes caudales y tipos de salmuera (con diferente salinidad y concentración de nitratos).

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1.6. Practice Abstract 42 - Conservation and revaluation of traditional salt-pans to protect ecosystem services

For centuries, salt extraction has been carried out in the salt-pans of San Pedro in South-eastern Spain. Its exploitation has undergone a profound change throughout history considering its production, processing and marketing methods, resulting in an "artificial" ecosystem with great ecological value. This has resulted the protection of the territory according to different figures of regional, European and international category and made the saline activity essential for the sustainability of the ecosystem. The exploitation directly employs about 55 people and the average annual salt production can exceed 80,000Tn. LIFE-SALINAS seeks to improve the conservation of present species of fauna (e.g. Audouin's Gull) and habitats considered a priority in the EU (Mediterranean salt steppes) and to protect ecosystem services and increase the quality and production of salt through preparatory (e.g. voluntary agreements for the Custody of the Territory) and conservation actions: 1) increase the number of separation canals between salt ponds to give shelter to bird species during nesting and breeding, and resulting in the improvement of salt production; 2) the creation of a natural pond for the benefit of an endangered fish species, indicator of water quality; 3) the conservation and containment of the coastal dune by depositing dry organic matter of marine origin and planting typical dune species to help preventing sea water intrusions into the salines during storms; 4) monitoring the increase in salt productivity and the number of species; 5) dissemination of results to increase public awareness and valorisation of the salt-pans using product certification and quality labels.

Conservación y revalorización de salinas tradicionales para proteger servicios ecosistémicos

Desde hace siglos se realiza la extracción de sal en las salinas de San Pedro en el sureste de España. Su explotación ha experimentado un profundo cambio a lo largo de la historia en sus métodos de producción, procesado y comercialización que ha formado un ecosistema ‘artificial’ con un gran valor ecológico, que ha merecido la protección del territorio según distintas figuras de categoría regional, europea e internacional y que convierten a la actividad salinera en esencial para la sostenibilidad del ecosistema. La explotación emplea de manera directa a unas 55 personas y la producción media anual de sal puede superar las 80.000Tn. El LIFE-SALINAS busca mejorar la conservación de especies presentes de fauna (p.e. Gaviota de Audouin) y hábitats considerados prioritarios en la UE (estepas salinas mediterráneas) y poner en valor los servicios ecosistémicos además de aumentar calidad y producción de sal mediante acciones preparatorias (p.e. acuerdos voluntarios de Custodia del Territorio) y acciones de conservación: 1) incremento del número de motas (canales de separación entre balsas salineras) diseñadas para albergar durante la nidificación y cría especies de aves protegidas, resultando además en mejorar la producción de sal; 2) mejora del ciclo del agua en una charca natural para beneficio de un pez en peligro de extinción e indicador de la calidad del agua; 3) actuaciones para la contención de la duna costera, colocando materia vegetal de origen marino y plantando especies típicas de la duna, evitando así la entrada de agua de mar a las salinas ante fuertes temporales, 4) seguimiento del aumento de productividad de sal y del número de especies; 5) difusión de resultados para mayor sensibilización pública y puesta en valor con un sello de calidad.

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1.7. Practice Abstract 43 - Effectiveness of land, coast, and sea-based nutrient management measures for improving coastal water quality and ecosystem status

Increasing pressures from human activities decrease coastal water quality through increased amounts of, for example, nutrients, heavy metals, micro-plastics, antibiotics in the water and sediments. Achievement of good coastal water quality and ecosystem status, to comply with current environmental policies, requires more effective nutrient and pollutant management, considering a range of possible measures, e.g., in agriculture, wastewater treatment plants, fisheries, and other sectors on land, the coast, and in the open sea. These considerations also need to account for climate change and its effects on measure effectiveness. A recent study has simulated effects of different combinations of nutrient mitigation measures, under different climatic conditions, on the quality and ecosystem status in the Baltic waters of the MAL3 case. Results show that, at recent average hydro-climatic conditions, land-based measures that can considerably reduce nutrient loads to the coast from its local land catchment can substantially improve coastal water quality and ecosystem status. However, the effectiveness of such local land-based measures decreases with projected wetter and warmer climate conditions. This implies that a combination with sea-based measures of nutrient management is needed for robust and sustainable coastal improvements. The sea-based management measures involve reductions of nutrient loads from the large-scale land catchment of the whole Baltic Sea, and not just in the particular local land catchment of the considered coastal zone. These findings highlight essential multi-scale land and sea influences, challenging a simplistic local source-to-coast view of how to improve local coastal conditions.

Mark-, kust- och havsbaserade åtgärders effektivitet för minskning av närsalter och förbättring av kvalitet och ekosystemstatus i kustvatten

Ökande belastning från mänskliga aktiviteter försämrar kustvattnets kvalitet genom att öka mängderna av, exempelvis, närsalter, tungmetaller, mikroplaster och antibiotika i vatten och sediment. För att uppnå god kvalitet och ekologisk status i våra kustvatten, i enlighet med gällande miljöpolicy, krävs effektivare hantering och kontroll av närsalts- och föroreningsbelastningarna, genom olika möjliga åtgärder i, t.ex. jordbruk, avloppsreningsverk, fiske och andra sektorer på land, i själva kusten och i det öppna havet. Val av åtgärdskombinationer måste också ta hänsyn till klimatförändringar och deras möjliga effekter på åtgärdernas effektivitet. Den nya studie som sammanfattas här har simulerat effekter av olika åtgärdskombinationer för närsaltsminskning, under olika klimatförhållanden, för kvalitet och ekologisk status i Östersjöns kustvatten inom MAL3-fallet. Resultaten visar att landbaserade åtgärder som kan betydligt minska både kväve- och fosforbelastning på kusten från dess lokala avrinningsområde kan väsentligt förbättra kustvattnets kvalitet och ekologiska status. Effektiviteten av sådana lokala landåtgärder minskar dock med våtare och varmare klimatförhållanden, som förväntas framöver. Det betyder att havsbaserade åtgärder också krävs för robust och hållbar förbättring av kustförhållandena. Havsbaserade åtgärder involverar och kräver samordnad minskning av närsaltsbelastningar från Östersjöns hela avrinningsområde och inte bara från den studerade kustzonens egna lokala avrinningsområde. Detta belyser och betonar väsentliga influenser i flera skalor från land och hav och utmanar en förenklad lokal källa-till-kust-syn på hur man kan förbättra lokala kustförhållanden.

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1.8. Practice Abstract 44 - Projecting the decommissioning impact for offshore wind parks

The Belgian part of the North Sea is a densely used space, combining functions ranging from sea transport, fisheries, energy production, recreation, and nature to sand mining. The port of Ostend plays a critical role in the development and maintenance of offshore wind parks, contributing to the achievement of climate neutrality by the year 2050 as part of the EU Green Deal. Current offshore wind turbines have an operational lifetime of typically 20 years, with the first park having been installed in 2009. At the end of their lifetime, wind turbines need to be decommissioned, which is a complex process involving engineering, economic, regulatory, and infrastructural aspects. Simultaneously, decommissioning is an opportunity for regional development and employment. Services, skilled labour, and port infrastructure need to be adapted to handle the decommissioning challenges. By tackling these challenges, the port of Ostend aims to consolidate its key role in the offshore energy economy. An important factor in achieving this is to consider the impact of decommissioning the offshore wind parks. To assess this impact, local COASTAL partners developed a pilot model for forecasting the decommissioning rate, land use, infrastructural needs, and many more, until 2050. This model will serve as a basis for adding the operational, economic, and infrastructure aspects related to port activities demonstrating the strong interaction between land- and sea-based activities.

Voorspelling van de impact van de ontmanteling van offshore windparken

De Belgische Noordzee is een dichtbezette ruimte, die functies combineert van zeetransport, visserij, energieproductie, recreatie en natuur tot zandwinning. De haven van Oostende speelt een cruciale rol in de ontwikkeling en het onderhoud van offshore windparken en draagt zo bij tot het bereiken van klimaatneutraliteit tegen het jaar 2050 in het kader van de EU Green Deal. De huidige windturbines hebben een operationele levensduur van typisch 20 jaar, waarbij het eerste park werd in 2009 geïnstalleerd. Op het einde van hun levensduur moeten de windturbines worden ontmanteld wat een complex proces is, waarbij technische, economische, regelgevende en infrastructurele aspecten een rol spelen. Tegelijkertijd is deze ontmanteling een kans voor regionale ontwikkeling en tewerkstelling. Diensten, geschoolde arbeidskrachten en haveninfrastructuur moeten worden aangepast om de uitdagingen van de ontmanteling aan te kunnen. Door bij te dragen aan de aanpak van deze ontmantelinguitdagingen zal de haven van Oostende haar rol consolideren. Een belangrijke factor hierbij is om de impact van de ontmantelingsactiviteiten na te gaan. Hiervoor ontwikkelen de lokale COASTAL partners een testmodel die zal toelaten het tempo van ontmanteling, het landgebruik, de infrastructurele behoeften en nog veel meer, tot 2050. Dit model zal als basis zal dienen voor het toevoegen van de operationele, economische en infrastructurele aspecten in verband met havenactiviteiten, een demonstratie van de sterke relatie tussen activiteiten aan land en op zee.

1.9. Practice Abstract 45 - The development of the pilot system dynamics model for coastal-rural interactions – Danube's mouths - Black sea case study

Four collaborative workshops were organized by NIMRD during October 2018 - September 2019, focusing on Blue Growth (industry, transport and administration), Tourism and Fisheries&Aquaculture. In Constanta, the workshops included the municipalities from the Constanta and Tulcea counties, entrepreneurs, fishery farmers, tourism industry, NGO's and academia. The participants showed high enthusiasm to give the possibility to discuss common issues like Agriculture, Fishery (freshwater and marine), Tourism, Rural development, and how their activities could impact the quality of the coastal waters. One of the strategic

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objectives of the Danube Delta Strategy is to keep the unique natural values through an environmental management guided by science and strengthening local communities in the role their proactive protectors of this unique world heritage. During workshops, participants and scientists use mental maps and causal loop diagrams to co-create a pilot system dynamic model, with the scope of maintaining natural capital (water quality, biodiversity) as both a provider of economic inputs and outputs. Therefore, we focused on five sub models: agriculture, freshwater and marine fishery, rural and coastal tourism, rural development in connection with a new sub model Ecosystem management.

Taking in view that approximately 65% of the Romanian coastline is in the Danube Delta Biosphere Reserve it is subject to legislative regulations, resulting in conflicts between nature conservation and economic development. Failing to resolve these conflicts has economic and political impacts, which calls for urgent co-creation effort between scientists and stakeholders acting in the Romanian Black Sea coastal zone-Danube Delta area.

Dezvoltarea unui model dinamic pilot privind interacțiunile dintre zonele rurale și costiere - studiu de caz gurile Dunării – Marea Neagră

Patru workshop-uri au fost organizate în perioada octombrie 2018 - septembrie 2019, axate pe domenii de activitate: Creșterea albastră (industrie, transport, administrație), Turism și Pescuit și acvacultură. La întâlnirile organizate în Constanța au participat reprezentantii municipalităților din Constanța și Tulcea, antreprenori, fermieri, industria turismului, ONG-uri, mediul academic. Participanții au arătat entuziasm in discutiile privind abordarea unor probleme comune: Agricultura, Pescuitul (apă dulce și marin), Turism, Dezvoltare rurală și gestionarea ecosistemelor, și modul în care poate fi afectată calitatea apelor costiere. Un obiectiv strategic al Strategiei Deltei Dunării este păstrarea valorilor naturale printr-un management de mediu ghidat de știință și prin consolidarea comunităților locale. În cadrul workshop-urilor s-au utilizat hărți mentale și diagrame cauzale (CLD) in procesul de co-creare a modelului dinamic pilot privind interactiunile dintre zonele rurale si costiere. Pentru menținerea capitalului natural, dar si dezvoltarea economica au fost utilizate cinci sub-modele ale sectoarelor: agricultură, pescuit în apă dulce și marin, turism rural și costier, dezvoltare rurală, în conexiune cu un nou sub-model managementul ecosistemelor.

Având în vedere că aproximativ 65% din litoralul românesc se află în Rezervația Biosferei Delta Dunării făcând obiectul unor reglementări legislative, poate duce la conflicte între conservarea patrimoniului natural și dezvoltarea economică. Eșecul soluționării conflictelor are impact economic și politic, si necesită eforturi urgente ale oamenilor de știință și părților interesate care acționează în zona de coastă a Mării Negre si Deltei Dunării.

1.10. Practice Abstract 46 - Towards sustainable and innovative agriculture in the Charente river basin and adjoining coastal zone

The MAL4 territory is home to a wide range of agricultural activities, which together cover some 70% of its surface area. To the northwest, integrated crop-livestock farming systems now account for less than a third of all farming. Further south, an increase in Cognac vineyards is affecting water quality through pesticide use. In the west and the east, extensive livestock breeding, and associated pastures contribute positively. Land pressure, coupled with difficulties in transferring farms to future generations and farmers entering retirement, means that coastal wastelands and land-use changes could increase. Development of sustainable agriculture would be in synergy with a better-protected water resource: replacing intensive irrigation systems with

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diversified systems and improved practices; sustainable livestock breeding activities; ensuring at least 30% organic farming in the area. The current changes (30% farms) are positive and must be encouraged. Organic farming is developing strongly. This new agriculture adapts to climate change and is founded on demand for quality local produce. It also involves the relocation of processing sites and creating new supply chains, which brings its own added value. Such changes will also call on local authorities and policy-makers to be innovative in terms of economic and legal measures to promote a dynamic rural economy, generating jobs and supporting rural tourism and ports, and a collective management of water resources.

Vers une agriculture durable et innovante dans le bassin de la Charente et sa zone cotiere

L'agriculture est une activité économique majeure et occupe plus de 70 % du territoire. Au nord-ouest, les systèmes de polyculture-élevage représentent maintenant moins d'un tiers des agriculteurs. Au sud, l'expansion du vignoble du Cognac impacte fortement la qualité de l'eau (pesticides). A l'ouest comme à l'est, les élevages extensifs et les prairies associées sont un facteur positif. La forte pression foncière et les difficultés de transmission, accentués par les départs en retraite des agriculteurs, risquent de développer les friches côtières et les changements de destination. Le développement d'une agriculture durable est en synergie avec la protection de la ressource en eau : par une évolution des systèmes intensifs irrigués vers des systèmes diversifiés et une amélioration des pratiques, par le maintien de l'élevage et le développement de l'agriculture biologique jusqu'au moins 30% de la surface agricole. Aujourd'hui 30% des exploitations évoluent positivement et le taux de conversion à l'agriculture biologique est élevé. Cette nouvelle agriculture s'adapte au changement climatique et s'appuie sur la demande sociale en produits locaux de qualité et sur la création de filières locales avec de la valeur ajoutée. Des innovations techniques, économiques et réglementaires sont attendues pour favoriser le maintien d'un tissu rural dynamique créateur d'emplois, en lien avec le tourisme rural et les activités portuaires, ainsi qu'une gestion collective de la ressource en eau.

1.11. Practice Abstract 47 - Protection of the water resources and water uses in the Charente river basin and its coastal zone

In the Charente watershed and adjoining coastal zone, competition between water uses is becoming ever more apparent. French regulations already apply a defined hierarchy to these uses: 1) civil security and drinking water, 2) Ecosystems and water resource protection, and 3) Professional users. Currently, only the first-mentioned use would appear to have adequate access to water resources. For the other two, negotiations are required between stakeholders, who, faced with climate change and evolution of uses, find themselves obliged to:

- Uplift water when the regulations consider there is an excess, and store that water for use at a later date;
- Change their consumption habits to reduce the amount needing to be uplifted.
- These two constraints can have different effects depending on the uses:
- For shellfish farming, the aims are to negotiate an appropriate amount of fresh water into the coastal zone to protect ecosystems and to adapt breeding density by a reduction in volumes or by moving some sites elsewhere.

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- For agriculture, the aim is to use collective management to better regulate water quantity, thus helping to maintain a variety of farming activities, while also regaining control of water quality by encouraging a move to a more sustainable farming model.
- Tourist sites need to adapt the number of guests they can accept to better manage demand for drinking water and, in turn, the amount of water being uplifted from the water table.

Protection et usages de l'eau dans le bassin de la Charente et sa zone côtière

Sur le Bassin Versant de la Charente et sa zone littorale associée, les concurrences entre usages se matérialisent dans les questions de quantité et de qualité d'eau. La réglementation hiérarchise ces usages: 1/ sécurité civile et eau potable, 2/ milieux aquatiques 3/ usages économiques. A l'évidence, Seul le premier point est satisfait, les deux autres faisant l'objet de conciliations entre acteurs, qui sous la contrainte du changement climatique et des variations du climat sont contraints à:

- Prélever de l'eau lorsqu'elle peut être considérée en excès et la stocker pour une utilisation décalée dans le temps.
- -hanger les modalités d'usage pour diminuer les besoins et donc les prélèvements.
- Ces deux préconisations peuvent s'appliquer différemment suivant les usages:
- Pour la conchyliculture, les objectifs sont d'une part d'obtenir par la négociation des apports d'eau douce visant au bon état des milieux aquatiques et d'autre part d'adapter les densités d'élevage par leur diminution ou par la délocalisation de certains.
- Pour l'agriculture, l'objectif est, par une gestion plus collective et intégrée, de gérer les quantités d'eau pour maintenir des productions alimentaires diversifiées et reconquérir la qualité de l'eau en amplifiant la transition agro-écologique des systèmes agraires du bassin.
- Pour le tourisme, la capacité d'accueil des sites doit permettre de contrôler la demande en eau potable et ainsi les prélèvements sur les nappes.

1.12. Practice Abstract 48 - Structure of agricultural production in Romania's coastal area – Case study Tulcea County

The economic development of Tulcea County is strongly influenced by the existence within the region of the Danube Delta Nature Reserve. Agriculture is an important source of income for the rural community in the region. However, the agricultural sector must comply with the environmental restrictions imposed by the legislation in force on protected areas. Knowledge on the structure of agricultural production will be used for predicting the effects of agricultural activities towards the case study area. In the last 30 years, the vegetable sector is characterized by extensive production systems, dominated by cereal cultivation. In Tulcea County, the evolution of cultivated area in the last three decades registered the lowest level in 2007 and the highest in 2012. In 2019, the cultivated area decreased by 5.06% compared to the level of 1990. In the structure of cultivated areas, in 2019, the largest share is held by cereals (167 thousand ha) and oilseeds (73 thousand ha). The average of the last three decades was 161 thousand ha of cereals and 65 thousand ha of oil plants. In the early 1990s, there were areas cultivated with tobacco and sugar beet, but these crops have been permanently abandoned since 1996. In 2019, the livestock was mainly represented by poultry (541 thousand heads), the average number between 1990-2019 being 964 thousand heads, and sheep (345 thousand heads), with an average of 307 thousand heads. In the same period, there was an increase in the goat herds, currently reaching over 83 thousand heads, the average being 48 thousand heads, after a strong decline in 2001 (29 thousand

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heads). It should be noted the drastic decrease in the number of pigs, due to the African swine fever: from 95 thousand heads in 2017 to 13 thousand heads in 2019.

Structura activităților agricole în județul Tulcea, România

Dezvoltarea economică a județulului Tulcea, este puternic influențată de existența în imediata vecinătate a Rezervației Naturale Delta Dunării. Activitățile agricole generează venituri importante pentru comunitatea rurală din regiune. Sectorul agricol trebuie însa să respecte restricțiile de mediu impuse de legislația în vigoare cu privire la ariile protejate. Datele privind dinamica structurii productiei agricole din regiune vor fi utilizate pentru evaluarea efectelor activitatii agricole asupra dezvoltarii regiunii. În ultimii 30 de ani, sectorul vegetal a fost caracterizat prin sisteme de producție extinse, dominate de cultivarea cerealelor. În județul Tulcea, evoluția suprafeței cultivate a înregsitrat cel mai scăzut nivel în 2007 și cel mai ridicat în 2012. În 2019, suprafața cultivată a scăzut cu 5.06% față de nivelul din 1990. În structura suprafețelor cultivate, în anul 2019, ponderea cea mai mare este deținută de culturile de cereale (167 mii ha) si plante oleaginoase (73 ha). Media ultimelor 3 decade a fost de 161 mii ha cereale si 65 mii ha plante oleaginoase. La începutul anilor 90, au existat suprafețe cultivate cu tutun și sfeclă de zahăr, dar aceste culturi au fost abandonate definitiv, începând cu anul 1996. În 2019, sectorul zootehnic este reprezentat în primul rând prin efectivele de păsări (541 mii), media 1990-2019 fiind de 964 mii, si ovine (345 mii capete) respectiv media 307 mii. În aceeași perioadă a existat o tendință ascendentă a efectivelor de caprine, 83 mii de capete in 2019, după o perioadă de declin înregistrată în 2001 (29 mii de capete). De remarcat scăderea drastică a efectivului de porci, datorită pestei porcine africane, de la peste 95 mii de capete in 2017 la 13 mii de capete in 2019.

1.13. Practice Abstract 49 - Pilot system dynamics model for land-sea interactions in for Danube mouths region

The conclusions of all COASTAL participatory workshops organized with Romanian Stakeholders of coastal rural area were in line with the 2030 vision for Danube Delta “An attractive area where people live in harmony with nature, integrating economies of tourism, farming and fishery”.

The goal of the model that will be developed for Romanian coastal area is to explore alternative scenarios to improve the quality of life and sustainability within Danube Delta Biosphere reserve and its marine waters (Black Sea) as one of the most impacted area along the Romanian littoral.

The land-sea interactions that are considered in the model are defined by the ecosystem-based management approach:

- Improve the sustainability of the area. Setting up coherent regulatory framework (legislation) on development strategies for land (agriculture, rural development, freshwater fisheries, tourism) and marine (fishery and aquaculture) activities will lead to proper implementation of ecosystem-based management principles.
- Adaptation and Mitigation to Climate change. As the Danube’s discharge receiver, the Black Sea is impacted by increased discharge of freshwater and pollutants (from agriculture and inadequate infrastructure of rural development) and seawater temperature increase (marine fishery).
- Use of Knowledge to improve sustainability and climate change impacts in the area- Education, training, and research at different levels – workforce, economic activities development, environmental monitoring, scientific research.

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Model de simulare dinamică a interacțiunilor între uscat și mare, în regiunea Dunării

Concluziile intâlnirilor cu stakeholderii, organizate în cadrul proiectului COASTAL au fost în concordanță cu viziunea pentru regiunea Delta Dunării (2030), definită ca" o zonă atractivă, unde oamenii trăiesc în armonie cu natura; integrarea economiilor turismului, agricole și piscicole ".

Scopul modelului care va fi dezvoltat pentru zona de coastă a României îl reprezintă explorarea unor scenarii alternative pentru îmbunătățirea calității vieții și a durabilității în regiunea analizată.

Interacțiunile dintre zona maritima si uscat avute în vedere, au fost definite astfel:

- Îmbunătățirea durabilității zonei. Stabilirea unui cadru legislativ coerent privind strategiile de dezvoltare pentru activitățile desfășurate pe uscat (agricultură, dezvoltare rurală, pescuit în apă dulce, turism) și în zona maritimă (pescuit și acvacultură) va duce la punerea în aplicare corespunzătoare a principiilor de management bazate pe servicii ecosistemice.
- Adaptarea /atenuarea schimbărilor climatice. Calitatea apelor din Marea Neagră este afectată de calitatea apei din Dunare și a posibilelor substante poluante (din agricultură și infrastructura inadecvată a zonelor rurale) iar temperatura apei de mare este în creștere (pescuitul marin).
- Utilizarea cunoștințelor pentru a încuraja dezvoltarea durabilă a regiunii și reducerea impactului schimbărilor climatice. Educația, formarea și cercetarea la diferite niveluri va conduce la creșterea calității forței de muncă, la dezvoltarea activităților economice și la imbunătațirea serviciilor de monitorizare a mediului.la punerea în aplicare corespunzătoare a principiilor de management bazate pe servicii ecosistemice.
- Adaptarea /atenuarea schimbărilor climatice. Calitatea apelor din Marea Neagră este afectată de calitatea apei din Dunare și a posibilelor substante poluante (din agricultură și infrastructura inadecvată a zonelor rurale) iar temperatura apei de mare este în creștere (pescuitul marin).
- Utilizarea cunoștințelor pentru a încuraja dezvoltarea durabilă a regiunii și reducerea impactului schimbărilor climatice. Educația, formarea și cercetarea la diferite niveluri va conduce la creșterea calității forței de muncă, la dezvoltarea activităților economice și la imbunătațirea serviciilor de monitorizare a mediului.

1.14. Practice Abstract 50 - Marine fishery in Danube mouths region - Scenarios and future evolution

The system dynamics sub-model that will be developed within COASTAL activities for marine fishery in Danube mouths region will calculate three main stocks, as follows:

- Marine fish stock,
- Marine aquaculture, which increases with in- and outflows as blue growth element, and
- Marine fishermen welfare.

Awareness and marketing are among the most important drivers for an increase in the consumption of aquaculture products. Thus, in our model, the marine fish stock's dynamics is dependent on the education, training, and research as scientific support for policies and decision-makers (Legislation) regarding the fishing restrictions. Another critical aspect is illegal fishing and pollution, which are causing the marine fish stock to fall. Marine aquaculture production and the marine fish stock are increased by education, training, research,

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and the fish market as one of the main components of the growing fishermen's welfare. All are influenced by pollution from land as one of the main land-sea interactions

The low level of funding was invoked by the stakeholders of the project as being a problem and this why, and it will be considered for creating a scenario for future analysis in the next steps of the COASTAL Activities. For example, the model will calculate how an increased level of funding will influence marine fishermen welfare progress in opposition with fish stock reduction due to pollution from land-based sources, illegal fishing and lack of organized fish market.

Pescuitul marin în regiunea gurilor Dunării - scenarii și evoluție viitoară

Sub-modelul de simulare dinamică a sectorului de pescuit marin, care va fi dezvoltat în cadrul activităților COASTAL pentru regiunea gurilor Dunării va calcula valorile unor factori considerati importanti in ceea ce priveste interactiunea intre activitatile de pe uscat si cele maritime, după cum urmează:

- stocul de pești din apele mării
- productia din acvaculturii
- bunăstarea pescarilor

Conștientizarea și activitatile de marketing reprezintă unul dintre cei mai importanți factori pentru creșterea consumului de produse de acvacultură. Astfel, în modelul nostru, dinamica stocului de pești marini depinde de factori precum educație, formare și cercetare ca suport științific pentru reglementarile legislative cu privire la restricțiile activitatilor de pescuit. Un alt aspect important îl reprezintă pescuitul ilegal nedeclarat și nereglementat și poluarea care influenteaza negativ stocul de pești din apele mării. Creșterea producției de acvacultură și stocul de pești sunt sporite de factori precum educație, formare și cercetare și înființarea pietei de pește - una dintre principalele componente ale bunăstării pescarilor. Toti cei trei factori sunt influențati de poluarea existentă în regiunea analizată.

Sursele limitate de finanțare au fost invocate de catre stakeholderi ca un subiect de discuție, și, de aceea aceastea vor deveni un scenariu pentru analize viitoare în cadrul activităților proiectului. De exemplu, se va estima msura in care un nivel sporit de finanțare va influența progresul bunăstării pescarilor în opoziție cu reducerea stocului de pește din cauza poluării din surse terestre, a pescuitului ilegal și a lipsei unei piețe de pește organizate.

1.15. Practice Abstract 51 - Manure management as an essential condition for maintaining water quality

The Code of Good Agricultural Practice (GAP) for the protection of water against nitrate pollution from agricultural sources, imposes for the livestock sector a number of conditions regarding the management of manure. Moreover, the legislation in force is granting funds for agriculture if cross-compliance norms are observed. The cross-compliance rules also include references regarding the management of manure. In order to reduce the risk of water pollution with nutrients from effluent leaks, caused by improper storage of manure, both in households and on farms, the Ministry of Environment, Waters and Forests is carrying out extensive action to build platforms for communal manure storage, and awareness of GAP compliance. In Tulcea County, there are three such platforms, each with a capacity of 1200 t in the localities of Greci, Jurilovca, Mihai Bravu. For 2021, the construction of a platform in Valea Nucarilor is scheduled to start. For GAP compliance, farmers will either contract communal platforms or build individual platforms. The individual platforms must respect

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the optimal sizing, they must not be built on lands located near watercourses or with groundwater at shallow depths. They must be located at least 50 m from homes and drinking water sources. Proper management of manure will help maintain water quality and soil fertility, while having beneficial effects on ensuring the health of the local population.

Gestionarea gunoiului de grajd - conditie esentiala pentru pastrarea calitatii apei

Codul de bune practici Agricole (CBPA) pentru protecţia apelor împotriva poluării cu nitraţi din surse agricole, impune pentru sectorul zootehnic o serie de conditii referitoare la gestionarea gunoiului de grajd. Mai mult, legislatia in vigoare conditioneaza acordarea unor fonduri pentru agricultura de respectarea normelor de ecoconditionalitate care includ si referiri cu privire la gestionarea gunoiului de grajd. În scopul reducerii riscului poluării apelor cu nutrienţi proveniţi din scurgerile de efluenţi, cauzate de depozitarea necorespunzătoare a gunoiului de grajd, atât în gospodăriile populaţiei, cât şi în ferme, Ministerului Mediului, Apelor şi Pădurilor are in desfasurare o ampla actiune de constructie a unor platforme comunale pentru depozitarea gunoiului de grajd, si de constientizare a importantei respectarii (CBPA). In Judetul Tulcea, exista trei astfel de platforme, fiecare cu o capacitate de 1200 de t in localitatile Greci, Jurilovca, Mihai Bravu). Pentru anul 2021 este prevazuta demararea constructiei unei platforme in localitatea Valea Nucarilor. Pentru conformitatea cu CBPA, fermierii fie vor contracta platforme comunale fie vor construi platforme individuale. Platformele individuale trebuie sa respecte dimensionarea optima, să nu fie amplasate pe terenuri situate în apropierea cursurilor de apă sau cu apă freatică la mică adâncime. Acestea trebuie amplasate la o distanţă de cel puţin 50 m faţă de locuinţe şi sursele de apă potabilă. Gestionarea corectă a gunoiului de grajd va contribui la mentinerea calitatii apei si a fertilitatii solului, avand in acelasi timp si efecte benefice în asigurarea sănătății populației locale.

1.16. Practice Abstract 52 - A vision for a sustainable and environmentally friendly Messinia

During a visionary workshop held with the stakeholders of SW Messinia, MAL participants agreed that they would like to see Messinia portrayed and branded as a Sustainable Area. This vision includes all economic sectors and activities, but if identified and promoted it would create a brand name for the area that could give it an advantage in the tourism and olive making industries. A Sustainable Messinia Brand Name would ensure: a) the maintenance of the Messinian Landscape – Seascape Identity, on which the Brand will be based, b) a good environmental status of the local sensitive ecosystems c) viability of small scale farms and olive oil producers and d) socially and environmentally friendly tourism activities These are not easy tasks and several challenges, as well as barriers, have been identified need to be overcome for reaching a full sustainability transition that can create this brand name. The MAL team is working on identifying these transition pathways, which include radical changes in agricultural practices and the tourism industry. The stakeholders have recognised that such a transition needs: a) reduction on the use of chemicals and in water abstraction in the olive groves, b) full compliance of all olive mills with recent policies regarding the treatment of mill wastewater, c) improvement of the ecosystem status of Gialova Lagoon whilst maintaining viable fishing activity, d) managing the effect of seasonal population increase on local resources (water demand, waste collection and wastewater treatment, beach space), e) opportunities for fishers and farmers to better connect with the tourism industry. COVID-19 mobility restrictions have also highlighted the need for rethinking the high dependence on external sources of capital.

Ένα όραμα για μια Μεσσηνία βιώσιμη και φιλική προς το περιβάλλον

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Κατά τη διάρκεια εργαστηρίου με τους φορείς της ΝΔ Μεσσηνίας οι συμμετέχοντες συμφώνησαν ότι θα ήθελαν να δουν τη Μεσσηνία να σηματοδοτηθεί ως Βιώσιμη Περιοχή. Το όραμα τους περιλαμβάνει όλους τους οικονομικούς τομείς και δραστηριότητες, και αν προωθηθεί, θα μπορούσε να δημιουργήσει ένα εμπορικό σήμα για την περιοχή δίνοντάς της ένα πλεονέκτημα στον τουρισμό και την ελαιοπαραγωγή. Μια βιώσιμη εμπορική ονομασία της Μεσσηνίας θα διασφάλιζε: α) τη διατήρηση του Μεσσηνιακού Τοπίου, στην οποία θα βασίζεται η επωνυμία, β) την καλή περιβαλλοντική κατάσταση των τοπικών ευαίσθητων οικοσυστημάτων γ) την βιωσιμότητα μικρών εκμεταλλεύσεων και των μικρών παραγωγών ελαιόλαδου και δ) τουριστικές δραστηριότητες φιλικές προς το περιβάλλον και την κοινωνία. Αυτοί δεν είναι εύκολοι στόχοι, και έχουν εντοπιστεί αρκετές προκλήσεις, καθώς και εμπόδια, για την επίτευξη μιας μετάβασης, ικανής να δημιουργήσει αυτό το εμπορικό σήμα. Οι συμμετέχοντες στο MAL2 εντοπίζουν ότι η μετάβαση αυτή απαιτεί την ανάγκη ριζικών αλλαγών στις γεωργικές πρακτικές και την τουριστική βιομηχανία. Έχοντας αναγνωρίσει ότι μία τέτοια μετάβαση χρειάζεται: α) μείωση της χρήσης χημικών ουσιών και στην άντληση νερού στους ελαιώνες, β) πλήρης συμμόρφωση όλων των ελαιοτριβείων με τις πρόσφατες πολιτικές για την επεξεργασία λυμάτων, γ) βελτίωση της κατάστασης του οικοσυστήματος της λιμνοθάλασσας της Γιάλοβας διατηρώντας παράλληλα μια βιώσιμη αλιευτική δραστηριότητα, δ) Διαχείριση της επίδρασης της εποχικής αύξησης του πληθυσμού στους τοπικούς πόρους, ε) Σύνδεση των αλιέων και των αγροτών με την τουριστική βιομηχανία. Ενώ, οι περιορισμοί κινητικότητας COVID-19 έδειξαν ότι υπάρχει και ανάγκη επανεξέτασης της υψηλής εξάρτησης από εξωτερικές πηγές κεφαλαίου.

1.17. Practice Abstract 53 - Cloud-based satellite image classification tools to distinguish irrigated agricultural areas

As water in semi-arid regions becomes scarcer and food demands rise with population growth, the need for closely managing water resources used for irrigated agriculture increases. A study at CEBAS-CSIC developed a methodology for unsupervised land cover classification using satellite imagery to distinguish irrigated agricultural areas in the Campo de Cartagena area (Murcia, Spain). Expansion of irrigated agriculture in this area is particularly important in semi-arid regions since it is often related to overexploitation of water resources and nonpoint source pollution of water bodies by the use of excessive nutrients and agrochemicals. In the classification methodology, a set of multi-variable thresholds is used to automatically generate training areas based on characteristic spectral signatures of different land cover classes for the summer and winter seasons. Then, supervised classification is performed using several indices derived from Landsat and Sentinel satellite imagery, after which the irrigated land areas from the seasonal land cover maps are combined to create a map of irrigated areas for a given year. The method was calibrated using existing land cover maps for the years 1997, 2000 and 2009 in the Campo de Cartagena area. So far, validation of the methodology using two independent datasets for the years 2005 and 2017 resulted in accuracies of 74% and 71%, respectively. The study uses Google Earth Engine for image processing, and a simple user interface was developed to allow its use by public administrations or other institutions. These kinds of methodologies can support the identification of irrigated agricultural areas over time.

Herramientas de identificación de áreas agrícolas irrigadas utilizando imágenes satelitales en la nube

A medida que el agua en las regiones semiáridas se vuelve más escasa y la demanda de alimentos aumenta con el crecimiento de la población, aumenta la necesidad de administrar mejor los recursos hídricos. Un estudio del CEBAS-CSIC desarrolló una metodología para distinguir áreas agrícolas irrigadas en el Campo de

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Cartagena (Murcia, España) de manera automática utilizando imágenes de satélite. La expansión de la agricultura de regadío es particularmente importante en las regiones semiáridas, ya que a menudo está relacionada con la sobreexplotación de los recursos hídricos y la contaminación por fuentes difusas de los cuerpos de agua. En esta metodología de clasificación se generan automáticamente áreas de entrenamiento basadas en firmas espectrales características de diferentes clases de cobertura terrestre para las temporadas de verano e invierno. Luego, se realiza una clasificación supervisada utilizando varios índices derivados de imágenes de los satélites Landsat y Sentinel, después de lo cual las áreas de tierras irrigadas de los mapas de cobertura terrestre estacionales se combinan para crear un mapa de áreas irrigadas para un año determinado. El método se calibró utilizando mapas de cobertura terrestre existentes para los años 1997, 2000 y 2009. Hasta ahora, la validación de la metodología utilizando dos conjuntos de datos independientes para los años 2005 y 2017 resultó en precisiones mayores del 70%. El estudio utiliza Google Earth Engine para el procesamiento de imágenes y se desarrolló una interfaz de usuario para permitir su uso por parte de las administraciones públicas u otras instituciones. Este tipo de metodologías pueden apoyar a la identificación y monitorización continua de áreas agrícolas irrigadas.

1.18. Practice Abstract 54 - Towards the co-creation of a Business and Policy Roadmap building on coastal-rural synergies for sustainable development around the Mar Menor coastal lagoon (SE Spain).

Stakeholders and researchers from the COASTAL project are developing a Business and Policy Roadmap to transition towards the Future Vision they designed for the Mar Menor coastal lagoon building on coastal-rural synergies. The Roadmap, developed through an intensive participatory process, identifies four milestones: 1) rural ecotourism, 2) coastal ecotourism, 3) sustainable agriculture, 4) integrated sustainable management. Each milestone consists of several solutions creating coastal-rural synergies. Most tourists currently only visit the coastal areas. At the same time, there is a high potential for rural tourism if the infrastructures and facilities are created and promoted, for example, through agro-tourism. The development of ecotourism and small-scale photovoltaic energy production will create jobs and economic benefit supporting the well-being of local populations. Since the tourist sector is negatively affected by the environmental degradation of the lagoon, nutrient export from agriculture towards the Mar Menor needs to be reduced through sustainable agriculture, including vegetation barriers, crop diversification, reduction in fertilizer use, and denitrification of brine waste. Increased water availability from desalinized seawater, decreased water demand, diversified income and commercialization of sustainable high-quality produce for local and international markets strengthen the agriculture sector. Integrated sustainable management based on policies promoting education and compliance with environmental regulation is crucial to incentivize most of the solutions.

Hacia la co-creación de una hoja de ruta empresarial y política basada en sinergias costero-rurales para el desarrollo sostenible en torno a la laguna costera del Mar Menor (SE de España).

Agentes sociales e investigadores del proyecto COASTAL están elaborando una hoja de ruta empresarial y política para la transición hacia la Visión de Futuro que han diseñado para la laguna costera del Mar Menor. La hoja de ruta, elaborada mediante un intenso proceso participativo, identifica cuatro hitos: 1) ecoturismo rural, 2) ecoturismo costero, 3) agricultura sostenible, 4) gestión sostenible integrada. Cada hito consta de varias soluciones creando sinergias entre la costa y el entorno rural. En la actualidad, la mayoría de turistas

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visitan las zonas costeras, pero existe un gran potencial para el turismo rural si se crean y promueven infraestructuras e instalaciones (p.e. agroturismo). El desarrollo del ecoturismo y pequeñas instalaciones de energía fotovoltaica crearían puestos de trabajo y beneficios económicos, apoyando el bienestar de las poblaciones locales. Dado que el sector turístico se ve afectado negativamente por la degradación ambiental de la laguna, es necesario reducir la exportación de nutrientes agrícolas al Mar Menor mediante una agricultura más sostenible, incluyendo barreras vegetales, diversificación de cultivos, reducción del uso de fertilizantes y desnitrificación de salmueras. El aumento de la disponibilidad de agua de mar desalinizada, la disminución de la demanda de agua, la diversificación de ingresos y la comercialización de productos sostenibles de alta calidad para mercados locales e internacionales fortalecerían al sector agrícola. La gestión sostenible integrada basada en políticas que promuevan la educación y el cumplimiento de la normativa medioambiental es crucial para incentivar la mayoría de las soluciones.

1.19. Practice Abstract 55 - Parliamentary hearing concerning Belgian Aquaculture

The hearing in the Flemish Parliament on 24thMarch 2021, with input from Flemish experts, demonstrated once again the possibilities of aquaculture in Flanders. Various projects, both on land and at sea, were discussed; however, project progress has been slow. This could be due to difficult regulations by the various administrations involved and lengthy start-up procedures. For aquaculture on land, five project components are mentioned which must all harmonise for a successful project. These components are: a suitable location; knowledge of the organic product; technological know-how; marketing; and investment opportunities. These are also listed for aquaculture in the Belgian North Sea, for which the location possibilities are already known as they are determined in the Maritime Spatial Plan (MSP). This MSP also states that only extractive aquaculture, i.e. which does not require additional feeding, is allowed in the Belgian North Sea. This includes the cultivation of shellfish and macroalgae. A major advantage of extractive aquaculture is that it helps to reduce the level of eutrophication and the effects of climate change. Although current initiatives at sea are still in testing phases aimed at producing niche products, they will have to be scaled up in the future to ensure profitability. The sector also noted there will be a need for quality basic training for marine aquaculture to support this increase in scale. The presence at Ostend of different research and educational institutes (VLIZ, ILVO and Marine@Ugent) specialized in marine fauna and flora could be a framework for a marine aquaculture formation. This would attract more people to the MAL1 region for training and provide future marine workers.

Parlementaire hoorzitting Belgische aquacultuur

De hoorzitting in het Vlaams parlement van 24 maart 2021, met inbreng van Vlaamse experten, toonde opnieuw de mogelijkheden aan van aquacultuur in Vlaanderen. Verschillende projecten, zowel op land als op zee, kwamen aan bod. Maar de projecten verlopen traag mogelijks door de moeilijke regelgeving van verschillende administraties en te lange startprocedures. Zowel voor aquacultuur op land als op zee wordt gewag gemaakt van vijf puzzelstukken die in elkaar moeten passen voor een geslaagd project, nl. geschikte locatie, kennis van het biologisch product, technologische knowhow, marketing en investeringsmogelijkheden. Voor de Belgische Noordzee zijn de locatiemogelijkheden al bekend aangezien ze bepaald worden in het Maritiem Ruimtelijk Plan (MRP). In dit MRP staat aangegeven dat er alleen aan extractieve aquacultuur, dus zonder bij te voederen, mag gedaan worden in de Belgische Noordzee. Hierbij wordt gedacht aan de kweek van schelpdieren en macroalgen. Het voordeel van extractieve aquacultuur is dat het meehelpt aan het verminderen van het eutrofiëringsniveau en de effecten van de klimaatsverandering. Hoewel huidige initiatieven op zee eerder testfases zijn gericht op productie van niche producten, zullen die in de toekomst

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een schaalvergroting moeten ondergaan om rendabiliteit te garanderen. Om deze schaalvergroting te ondersteunen, zal er nood zijn aan een kwalitatieve basisopleiding voor mariene aquacultuur. Oostende huisvest verschillende onderzoeks- en opleidingscentra gespecialiseerd in de mariene fauna en flora, die samen een geschikt netwerk kunnen zijn voor deze opleiding. Hierdoor zou de regio rond MAL1 meer mensen kunnen aantrekken voor opleiding en toekomstige mariene werknemers kunnen leveren.

1.20. Practice Abstract 56 - Regenerative Agriculture for restoration of semi-arid rural and coastal landscapes

The UN Decade of Ecosystem Restoration starts in 2021. There are 2 billion hectares of degraded land that can be restored, including agricultural land. Soils provide the basis for many ecosystem services, including food supply; climate regulation, water quality and quantity; biodiversity; and prevention of soil erosion and floods. Healthy soils are therefore essential to the well-being of people in rural and coastal areas. Regenerative Agriculture (RA) aims to restore farmland based on four principles: minimize soil disturbance, improve soil fertility, minimize bare soil, diversify crops, and integrate livestock. Beyond organic farming, RA incorporates practices like reduced/no-tillage, organic amendments, natural covers, and cover crops. To support the transition to RA, CSIC initiated a participatory monitoring project in SE-Spain, involving local farmers applying different combinations of RA practices in 9 almond farms. Together, they compared physical, chemical and biological soil properties and the nutritional status of almond trees under RA and conventional management. Reduced tillage with green manure improved physical soil properties, while reduced tillage with organic amendments improved chemical and biological soil properties. Reduced tillage with green manure and organic amendments showed better soil quality than each individual practice. No-tillage combined with natural covers and organic amendments presented the greatest soil quality improvements. The crop nutritional status was not affected by RA. RA has strong potential to restore the soil quality of Mediterranean farmland without compromising crop performance, thereby enhancing resilience of soils to climate change and long-term sustainability.

Agricultura Regenerativa para la restauración de paisajes rurales y costeros semiáridos

La Década de Restauración de Ecosistemas de la ONU comienza en 2021. Hay 2 mil millones de hectáreas de tierras degradadas que pueden restaurarse, incluidas las tierras agrícolas. Los suelos proporcionan la base para muchos servicios ecosistémicos. La Agricultura Regenerativa (AR) tiene como objetivo restaurar las tierras agrícolas en base a cuatro principios: minimizar la alteración del suelo, mejorar la fertilidad del suelo, reducir el suelo desnudo, diversificar los cultivos y/o integrar el ganado. Más allá de la agricultura orgánica, la AR incorpora prácticas como labranza reducida (LR) o cero (LC), enmiendas orgánicas, cubiertas naturales y cultivos de cubierta. Para apoyar la transición a la AR, el CSIC inició un proyecto de monitoreo participativo en el sureste de España, involucrando a agricultores que aplican diferentes combinaciones de prácticas de AR en 9 fincas de almendros. Juntos compararon las propiedades físicas, químicas y biológicas del suelo y el estado nutricional de los almendros bajo AR y manejo convencional. La LR con abono verde mejoró las propiedades físicas del suelo, mientras que la LR con enmiendas orgánicas mejoró las propiedades químicas y biológicas del suelo. La LR con abono verde y enmiendas orgánicas mostró una mejor calidad del suelo que cada práctica individual. La LC con coberturas naturales y enmiendas orgánicas presentó las mayores mejoras en la calidad del suelo. El estado nutricional del cultivo no se vio afectado por la AR. La AR tiene un gran potencial para

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restaurar la calidad del suelo de las tierras agrícolas mediterráneas sin comprometer el rendimiento de los cultivos, mejorando así su resistencia al cambio climático y la sostenibilidad a largo plazo.

1.21. Practice Abstract 57 - Implementation of ecological solutions for sustainable agriculture

The IDEAS Operational Group is composed of companies, associations, non-governmental organizations and research centres of the Spanish Mediterranean coast. Its objective is a more sustainable horticulture by implementing agri-environmental measures, which maximize crop productivity through the intensification of ecological processes by means of functional biodiversity. Six plots of cooperatives in Campo de Cartagena associated with FECOAM have been studied, both with outdoor and greenhouse crops. The studies involved monitoring the associated auxiliary fauna, the evolution of pests and diseases in the farms, and the biological response of shrub plants established as hedges. The presence of arthropods was evaluated by tapping branches, phytophagous and predators by visual sampling and flower collection, the abundance of pollinating insects by sampling shrub hedges, and companion plants by direct observation. The main groups of natural enemies in the installed hedgerows with a relevant role in agricultural ecosystems were: heteropterans, ants, parasitic hymenopteran mites, spiders, and predatory thrips. In relation to the shrubby plants sampled, predators were mostly observed on the plant Achillea millefolium, while parasites and parasitoids were more evenly distributed among the plants Rhamnus alaternus, Lavandula dentata and Periploca angustifolia. In conclusion, results were generally positive for the different plants sampled, with Achillea millefolium, Ballota hirsuta, Lobularia maritima, Periploca angustifolia, Salvia officinalis and Thymus vulgaris used as biological controllers.

Implementación de medidas ecológicas para una agricultura sostenible

El Grupo operativo IDEAS está formado por empresas, asociaciones, organizaciones no gubernamentales y centros de investigación del litoral mediterráneo español. Su objetivo es una hortofruticultura más sostenible implementando medidas agroambientales que maximicen la productividad de los cultivos a través de la intensificación de los procesos ecológicos mediante la biodiversidad funcional. Se han estudiado 6 parcelas de cooperativas del Campo de Cartagena asociadas a FECOAM, tanto de cultivos al aire libre como en invernadero, realizando seguimiento de fauna auxiliar asociada, evolución de plagas y enfermedades en las explotaciones, y de la respuesta biológica de las plantas arbustivas establecidas como setos. Se ha evaluado presencia de artrópodos por golpeo de ramas, fitófagos y depredadores por muestreo visual y recogida de flores, y la abundancia de insectos polinizadores por muestreo en setos arbustivos y en plantas acompañantes, por observación directa. Los principales grupos de enemigos naturales en los setos instalados con papel relevante en ecosistemas agrarios fueron: heterópteros, hormigas, ácaros himenópteros parásitos, arañas y trips depredadores. En relación con las plantas arbustivas muestreadas se observan los depredadores, mayoritariamente en la planta Achillea millefolium, mientras que parásitos y parasitoides se distribuyen más equitativamente entre las plantas Rhamnus alaternus, Lavandula dentata y Periploca angustifolia, concluyendo unos buenos resultados generales para las distintas plantas muestreadas y resaltando como controladores biológicos a las especies Achillea millefolium, Ballota hirsuta, Lobularia maritima, Periploca angustifolia, Salvia officinalis y Thymus vulgaris.

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1.22. Practice Abstract 58 - Business roadmap solutions for the improvement of coastal-rural areas in Romania

At the beginning of March 2021, an online, multi-actor workshop took place to develop business roadmaps and policy solutions for enhancing the synergies between coastal-land in the Danube Mouth region, Romania. Stakeholders who attended the event belonged to multiple sectors including agriculture, tourism, fisheries, academia, university professors and policymakers. One of the business solutions identified by the stakeholders was "Promoting the integration of producers in the agri-food sector in the value chain, increasing the efficiency of agricultural activity" (e.g. value-added products obtained in organic production systems or planting forest belts).

The proposed solution is expected to bring a positive effect on the coastal-rural area through three areas of impact: (i) the environment - preventing losses of biodiversity and ecosystem services, improving environmental management, and enhancing the local communities' responsivity to environmental issues; (ii) the economy - development of the local green economy based on sustainable consumption and production; (iii) social component - improving production systems to produce healthy food.

The key steps considered for implementing this solution were:

- Organising information/awareness campaigns on the advantages of organic production systems
- Set up advisory services network for farmers
- Development of market analyses regarding consumer behaviour
- Development of market access strategies
- Improving access to a qualified workforce (training programmes relating to agro-ecology, project management, funding instruments, and how to write a business plan).

Soluții pentru îmbunătățirea sinergiilor in zona rurală costieră din România

La începutul lunii martie 2021, a avut loc online un workshop pentru dezvoltarea foilor de parcurs de afaceri și a unor soluții politice pentru îmbunătățirea sinergiilor dintre terenurile de coastă din regiunea Gurile Dunării, România. Stakeholderii prezenți provin din sectoare de activitate diverse, cum ar fi agricultura, turism, pescuit, administratia locală, mediul academic, profesori universitari. Una dintre soluțiile de afaceri identificate de părțile interesate a fost „Promovarea integrării producătorilor din sectorul agroalimentar în lanțul valoric și creșterea eficienței activității agricole (de exemplu, produse cu valoare adăugată obținute în sistemul de producție ecologic sau înființarea de perdele forestiere).

S-a apreciat că soluția propusă va aduce un impact pozitiv asupra zonei rurale de coastă pe trei direcții: (i) mediu: conservarea biodiversității și furnizarea serviciilor ecosistemice; îmbunătățirea managementului de mediu și a capacității de răspuns a comunităților locale la problemele de mediu; (ii) economie: dezvoltarea economiei ecologice locale bazată pe consum și producție durabile; (iii) componenta socială: îmbunătățirea sistemelor de producție către producerea de alimente sănătoase.

Pașii cheie pentru implementarea soluției au fost considerați ca fiind:

- Organizarea de campanii de informare / sensibilizare cu privire la avantajele producției agro-ecologice
- Crearea unei rețele de servicii de consultanță pentru fermieri
- Dezvoltarea analizelor de piață privind comportamentul consumatorului de produse ecologice
- Dezvoltarea strategiilor de acces pe piață

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- Îmbunătățirea accesului la forța de muncă calificată (programe de formare pentru: agro-ecologie, management de proiect, instrumente de finanțare, modul de redactare a unui plan de afaceri).

1.23. Practice Abstract 59 - Deep Stakeholder Integration

When stakeholders co-produce the development of policy actions that directly or indirectly affect them, they are more likely to comply with said regulations – even when the action points may be contrary to their preferred options.

Through participating in this process, end-users – whether in sectors or in policy or as a representative of the general public - will be better equipped to understand the delicate nature of weighing options at the policy level and how ranking sustainability options at times may have contradictory outcomes where choices may have to be made. For example, do you choose to develop aquaculture in an area where a commercial fisher may have a vested interest? What if this development could lead to more jobs, which could fund a local sports team and lead to higher social satisfaction in the area and therefore discourage outward migration? Or do you encourage tourism in your region because of its potential for increased income – when it could also lead to lower water quality for the agriculture sector because of the high number of users of the system during peak periods? What are the potential challenges, and what are the potential synergies between businesses in coastal and rural areas? How do they affect one another – positively or negatively – and what can be done to encourage the former and mitigate against the latter.

Models developed by first identifying the real challenges on the ground, with farmers, olive oil producers, wineries, fishers, or aquaculture industry can help not only policymakers – but also other related sectors - uncover possibilities when working together. It can open our eyes to synergies between sectors and even future job opportunities.

Dyp Brukergruppeintegreing

Når sluttbrukere av en gitt regulering som vil påvirke dem enten direkte eller indirekte er med på å utvikle denne – enten det er sammen med forvaltning eller forskning – økes sannsynligheten for at reguleringen vil følges. Selv om den ikke nødvendigvis er i tråd med deres foretrukne valg.

Ved å delta i en slik prosess vil sluttbrukeren ha en dypere forståelse for hvor delikat prosessen av vekting av forskjellige muligheter er – enten vedkommende representerer industri, forvaltning eller publikum generelt. De vil også forstå hvor utfordrende det kan være å måtte rangere bærekraftsmål som alene kan være logiske, men når sett i sammenheng, kan ha tidvis motsigende resultat.

Hvordan velger du for eksempel mellom det å utvikle lakseoppdrettsnæringen i et område hvor det også er historiske fiskeriinteresser? Hva om utviklingen kan føre til flere jobber, ringvirkninger, som også kan finansiere lokale idrettslag og føre til at det jevnt over blir flere fornøyde beboere i en kommune – noe som igjen kan føre til mindre fraflytting? Er det da verdt å ofre en annen næring? Eller skal du heller oppmuntre til økt turisme i kommunen dine på grunn av potensialet for økte inntekter – når dette også kan føre til lavere vannkvalitet for landbruket i området på grunn av så mange brukere av systemet i pressperioder? Eller er det andre verdier som er viktigere enn lønnsomhet og inntekt for et lokalsamfunn, som heller bør belyses? Hva er mulighetene og hva er utfordringene, og hva er potensialet for synergier mellom kyst- og innlandsnæringer?

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Hvordan påvirker de hverandre – positivt eller negativt – og hva kan gjøres for at det ene kan minske risikoen for den andre?

Vi har utviklet modeller ved å involvere sluttbrukerne helt fra begynnelsen av prosjektet slik at vi sammen kunne identifisere de virkelige utfordringene og mulighetene - der de skjer. Vi har snakket med bønder, olivenoljeprodusenter, vinprodusenter, fiskere, havbruksnæringen og mange flere. Disse modellene er utviklet slik at de ikke bare er til hjelp for forvaltningen – men også for næringen. Modellene kan avdekke muligheter ved å jobbe sammen og de kan åpne øynene våre for synergier mellom næringer – og nye fremtidige jobbmuligheter.

*Skrevet av Rachel Tiller (*SINTEF Ocean*)*

1.24. Practice Abstract 60 - Systems modelling of rural gentrification

Rural gentrification is defined as the process where farms and farming land are being converted to serve other purposes, such as residential and recreational use. This inflates the prices of farms and farming land, and results in less farms and farming land being available for agricultural production. In 2015, approximately 10 % of the statutory farming land in Flanders was estimated to be used for non-agricultural purposes [1]. This figure is growing, posing policy issues related to food production, employment opportunities for starting farmers, and land-use planning. By itself, this gentrification is a complex process involving aspects relating to spatial planning policy, the real-estate market, nature restoration, demographic changes, and cultural aspects. COASTAL, together with the Flemish Land Agency (VLM) and the Institute for Agriculture, Fisheries and Food Research (ILVO), is examining which factors are interacting and how. System Dynamics (SD) models provide added value for testing the sensitivity of different policy actions, where linear extrapolation of historic patterns is inadequate. Current expertise and historic data will be exploited further to develop a better understanding of the long-term impacts on farm prices, farming profitability, and the number of farms.

[1] Verhoeve A, Dewaelheyns V, Kerselaers E, Rogge E and Gulinck H. Virtual farmland: grasping the occupation of agricultural land by non-agricultural land uses. Land Use Policy 42, 547-556, 2015. dx.doi.org/10.1016/j.landusepol.2014.09.008

Systeemmodellering van rurale gentrificatie

Rurale gentrificatie wordt gedefinieerd als het proces waarbij boerderijen en landbouwgrond worden omgevormd om andere doeleinden te dienen, zoals gebruik voor bewoning en recreatie. Hierdoor stijgen de prijzen van boerderijen en landbouwgrond, en zijn minder boerderijen en landbouwgrond beschikbaar voor landbouwproductie. In 2015 werd geschat dat ongeveer 10 % van de wettelijke landbouwgrond in Vlaanderen een niet-agrarisch gebruik had [1]. Ondertussen neemt dit cijfer verder toe, wat beleidsvraagstukken opwerpt in verband met voedselproductie, tewerkstellingskansen voor startende landbouwers en ruimtelijke ordening. Op zichzelf is deze gentrificatie een complex proces, dat in verband staat met het ruimtelijke-ordeningsbeleid, de vastgoedmarkt, natuurherstel, demografische veranderingen en culturele aspecten. COASTAL, samen met de Vlaamse Landmaatschappij (VLM) en het Instituut voor Landbouw-, Visserij- en Voedselonderzoek (ILVO), onderzoekt welke factoren op welke manier op elkaar inwerken. System Dynamics (SD) modellen hebben een toegevoegde waarde voor het testen van de gevoeligheid van verschillende beleidsacties wanneer lineaire extrapolatie van historische patronen ontoereikend is. De huidige expertise en historische gegevens zullen verder worden benut om een beter begrip te ontwikkelen van de effecten op lange termijn op de landbouwprijzen, de rendabiliteit van de landbouw en het aantal landbouwbedrijven.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 773782.

[1] Verhoeve A, Dewaelheyns V, Kerselaers E, Rogge E and Gulinck H. Virtual farmland: grasping the occupation of agricultural land by non-agricultural land uses. Land Use Policy 42, 547-556, 2015. dx.doi.org/10.1016/j.landusepol.2014.09.008.

1.25. Practice Abstract 61 - Inland and coastal water quality improvement in the semi-enclosed Baltic Sea region

There is fragmented understanding of the interactions and feedbacks that affect inland and coastal water quality in coastal areas around the world. Coastal water quality is impacted by both local land catchment and marine conditions. Socio-economic factors also affect inland and coastal water quality, highlighting the need for local and scientific knowledge integration for synergistic planning and management of coastal water quality. For the Swedish water management district of Northern Baltic Proper, including its main Norrström drainage basin and associated coastal areas (the MAL3 case), we have conducted a semi-quantitative analysis of stakeholder-identified land-sea system interactions of relevance for inland and coastal water quality. This aimed to explore various possible management strategies for improving water quality, considering the impacts of both human pressures and climate change. The results show that synergistic local management measures, including long-lived nutrient legacy sources, are needed to improve inland water quality. For coastal water quality improvement, management measures need to be synergistic over both various spatial and temporal scales; as coastal water quality is affected by both inland water quality and nutrient/pollutant management over the whole Baltic Sea and its total drainage basin.

Source: Seifollahi-Aghmiuni, S., Kalantari, Z., and Destouni, G. Use of co-created causal loop diagrams and fuzzy-cognitive scenario analysis for water quality management. European Geoscience Union (EGU) General Assembly (Online) (2021). https://doi.org/10.5194/egusphere-egu21-5210.

Förbättring av söt- och kustvattenkvalitet i Östersjöregionen

Förståelsen är fragmenterad för de interaktioner och återkopplingar som påverkar söt- och kustvattenkvalitet i kustområden över världen. Kustvattenkvaliteten påverkas av förändringar i både det lokala avrinningsområdet och det öppna havet. Socioekonomiska faktorer påverkar också inlands- och kustvattenkvaliteten och belyser behov att integrera lokal och vetenskaplig kunskap för synergistisk planering för hållbar hantering av kustvattenkvaliteten. För det svenska vattenförvaltningsområdet norra Östersjön och dess huvudsakliga avrinningsområde Norrström med tillhörande kustområden (fallet MAL3), har vi genomfört en semi-kvantitativ analys av intressent-identifierade interaktioner mellan land och hav med betydelse för söt- och kustvattenkvalitet. Analysen syftade till att undersöka olika möjliga strategier för att förbättra vattenkvaliteten med tanke på effekter av både mänskliga belastningar och klimatförändringar. Resultaten visar att synergistiska lokala hanteringsåtgärder, inklusive för långlivade ärvda källor, behövs för att förbättra sötvattenkvaliteten. För att förbättra kustvattenkvaliteten måste hanteringsåtgärderna vara synergistiska över både olika rumsliga och olika tidsmässiga skalor, då den påverkas av både sötvattenförhållandena och näringsämnes/förorenings förhållanden i hela Östersjön och dess totala avrinningsområde.

Seifollahi-Aghmiuni, S., Kalantari, Z., and Destouni, G. Use of co-created causal loop diagrams and fuzzy-cognitive scenario analysis for water quality management. European Geoscience Union (EGU) General Assembly (Online) (2021). https://doi.org/10.5194/egusphere-egu21-5210.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 773782.

1.26. Practice Abstract 62 - Synergistic policy and technical solutions in coastal-rural collaboration for improving Baltic coastal water quality

Our integrated land-sea system analysis for the Baltic coast (MAL3) aims to promote collaborative coastal-rural synergistic solutions in strategic business and policy decision making for addressing water quality and eutrophication problems in Baltic coastal areas. Four key solution alternatives are highlighted by stakeholders from inland, coastal and sea-based sectors for this case. These include “improved knowledge transfers between sectors”, “integrated risk assessment of nutrient losses from agricultural soil to surface water”, “nutrient recovery in wastewater treatment plants”, and “changed municipal monopoly planning policy”. They represent a combination of technical and policy solutions, and synergistic planning measures to address water quality and eutrophication problems across local coast and regional Baltic scales. These will further be considered as a basis for co-designing action plans and roadmaps to mitigate Baltic coast eutrophication and pollution – a general goal of the Helsinki Commission (HELCOM) for the Baltic Sea region.

Authors: Samaneh Seifollahi and Georgia Destouni - Stockholm University.

Samverkande policy- och tekniska lösningar i land-kust-samarbete för att förbättra Östersjöns kustvattenkvalitet

Vår integrerade land-hav-analys för Östersjökusten (MAL3) syftar till att förbättra samverkande lösningsstrategier i strategiska affärs- och beslutsbeslut för kust- och landsbygdsområden för att hantera vattenkvalitets- och övergödningsproblem i Östrsjöns kustområden. Fyra lösningsalternativ har lyfts fram av intressenter från inlands-, kust- och havsbaserade sektorer för detta fall. De inkluderar "förbättrad kunskapsöverföring mellan sektorer", "integrerad riskbedömning av närsaltsförluster från jordbruksmark till ytvatten", "återvinning av näringsämnen i reningsverk" och "ändrad policy för kommunalt planeringsmonopol". Dessa representerar en kombination av tekniska och policy-lösningar och synergistiska planeringsåtgärder för att ta itu med vattenkvalitets- och eutrofieringsproblematiken i Östersjöns kustområden på lokal och regional skala. De kommer vidare att användas som grund för gemensam utformning av handlingsplaner och färdplaner för lösning övergödnings- och föroreningsproblemen i Östersjöns kuster - ett allmänt mål för Helsingforskommissionen (HELCOM) för Östersjöregionen.

Samaneh Seifollahi and Georgia Destouni - Stockholm University.

1.27. Practice Abstract 63 - Policy and research recommendations for nutrient management in the Baltic Sea region

The Baltic Sea is particularly vulnerable to nutrient (nitrogen and phosphorus) loads from agriculture and wastewater. Although the region has reduced the use of conventional fertilizer and improved wastewater treatment since early 1990s, for example, phosphorus levels still remain high in the Baltic Sea. Phosphorus-driven annual algae blooms fix more nitrogen from the atmosphere than what originates from anthropogenic riverine loads. Further reductions in phosphorus and nitrogen loads are therefore necessary to abate the current levels of Baltic Sea eutrophication. A key policy recommendation is that harmonized regulations of both phosphorus and nitrogen are needed to manage and balance agriculture surpluses. Although nitrogen reuse in agriculture within the EU is regulated by the Nitrates Directive, phosphorus is only regulated nationally in just some EU countries. Eco-technologies for capturing and reusing nutrients should be promoted to reduce their losses and loads to inland and coastal waters by closing the nutrient loops upstream in their catchments.

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Research should focus on identifying hotspots of nutrient leakages and locations where management and mitigation measures would be most effective.

Source: BONUS RETURN – Reducing emissions to the Baltic Sea by turning nutrients and carbon into benefits, Final project report – results, conclusions and recommendations, December 2020. https://www.bonusreturn.eu/wp-content/uploads/2020/12/BONUS-RETURN-Final-Report-Dec-2020.pdf. Authors: Samaneh Seifollahi and Georgia Destouni - Stockholm University.

Policy- och forskningsrekommendationer för närsaltshantering i Östersjöregionen

Östersjön är särskilt utsatt och känslig för näringsämnen (kväve och fosfor) från jordbruk och avloppsvatten. Även om regionen har minskat användningen av konventionella gödselmedel och förbättrat avloppsreningen sedan början av 1990-talet, är till exempel fosforhalterna fortfarande höga i Östersjön. Fosfordrivna årliga algblomningar fixerar mer kväve från atmosfären än vad som kommer från antropogena källor med flodavrinningen. Ytterligare minskningar av fosfor och kväve behövs därför för att minska övergödningen i Östersjön. En viktig policyrekommendation är att det behövs harmoniserade regler för både kväve och fosfor för att hantera och balansera deras överskott from jordbruket. Även om återanvändning av kväve i jordbruket inom EU regleras av nitratdirektivet, så regleras fosfor endast nationellt i bara vissa EU-länder. Naturbaserade lösningar för att fånga upp och återvinna näringsämnen bör främjas för att minska förluster och belastning till söt- och kustvatten, genom att stänga näringskretslopp uppströms i avrinningsområdena. Forskning bör fokusera på att identifiera hotspots för näringsläckage och platser där hanteringsåtgärder skulle vara mest effektiva.

BONUS RETURN – Reducing emissions to the Baltic Sea by turning nutrients and carbon into benefits, Final project report – results, conclusions and recommendations, December 2020. https://www.bonusreturn.eu/wp-content/uploads/2020/12/BONUS-RETURN-Final-Report-Dec-2020.pdf. Authors: Samaneh Seifollahi and Georgia Destouni - Stockholm University.

1.28. Practice Abstract 64 - Paradigm shift needed in policy and strategies for coastal water quality improvement and eutrophication mitigation in the Baltic Sea coasts

Despite various policy frameworks developed and applied in the Baltic Sea region to improve coastal water quality and mitigate eutrophication, opposite change trends are still seen in the Baltic coastal waters. Our recent data-driven investigation of Baltic coastal conditions finds and highlights the coastal waters and their quality to be melting pots of impacts from both the local land-catchment of each coast and whole-sea water quality conditions. These findings challenge simplified unidirectional source-to-sea paradigms for coastal water quality and eutrophication policy and management strategies. They point at a required paradigm shift in coastal policy and strategy to account for the mixed local-catchment and whole-sea influences on coastal conditions and the possibilities to improve coastal water quality and combat eutrophication. In addition, they show that coastal water quality in more isolated coasts (less open-sea exchange) are more related to phosphorus concentrations, while it is more related to nitrogen concentrations in less isolated coasts. In both cases, dual (nitrogen and phosphorus) policy and management strategies are still needed to improve coastal and marine water quality and combat eutrophication in the Baltic Sea.

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Source: Vigouroux, G., Kari, E., Beltrán-Abaunza, J.M., Uotila, P., Yuan, D., Destouni, G. (2021) Trend correlations for coastal eutrophication and its main local and whole-sea drivers – Application to the Baltic Sea. Science of the Total Environment, 779, 146367. https://doi.org/10.1016/j.scitotenv.2021.146367.

Paradigmskifte behövs i policy och strategier för att förbättra vattenkvalitet och minska övergödning i Östersjöns kuster

Trots flertal policys och förvaltningsstrategier som utvecklats och tillämpats för att förbättra vattenkvalitet och minska eutrofiering i Östersjöns kust- och marina vatten, ser vi fortfarande motsatta förändringar i Östersjöns kustområden. Vår aktuella data-drivna undersökning av Östersjöns kustförhållanden visar och belyser kustvattnet och dess kvalitet som en smältdegel av påverkan från både det lokala avrinningsområdet för varje kust och havets vattenkvalitetsförhållanden. Dessa resultat utmanar ett förenklat och enkelriktat källa-till-hav-paradigm i policy och strategier för förbättring av Östersjökusternas vattenkvalitet och minskning av deras övergödning. De pekar på ett nödvändigt paradigmskifte i policy och strategier, som tar hänsyn till den kombinerade påverkan från lokalt avrinningsområde och hela havet på kustförhållandena och möjligheterna att förbättra kustvattenkvaliteten och bekämpa övergödningen. De visar också att vattenkvaliteten i mer isolerade kuster (mindre utbyte med öppna havet) är relaterar mer till fosforkoncentrationer, medan den relaterar mer till kvävekoncentrationer i mindre isolerade kuster. I båda fallen behövs dock konsekventa policy och förvaltningsstrategier för både kväve och fosfor för att kunna förbättra kust- och havsvattenkvaliteten och bekämpa övergödningen i Östersjön.

Vigouroux, G., Kari, E., Beltrán-Abaunza, J.M., Uotila, P., Yuan, D., Destouni, G. (2021) Trend correlations for coastal eutrophication and its main local and whole-sea drivers – Application to the Baltic Sea. Science of the Total Environment, 779, 146367. https://doi.org/10.1016/j.scitotenv.2021.146367.

1.29. Practice Abstract 65 - Shellfish farming in a globally sustainable system

Global consumer demand is shifting towards oysters with a higher meat content. These founded the reputation of Marennes-Oléron when salt marshes were converted into oyster fattening marshes between 1860 and 1960. Growing consumer demand, coupled with the extinction of the Portuguese species due to disease, pushed 1970s oyster farmers to prioritise quality over quantity. Demand for quality prompted some Marennes-Oléron producers to relocate their farms to other European locations with better potential for high meat content, such as Ireland and Portugal. Over time, these producers have gradually abandoned quality labels, such as IGP Marennes-Oléron, to focus on more commercial branding. While a Europe-wide market and production system satisfy global demand and are beneficial to companies whose setup allows them to take advantage of such a configuration, the more recent development of organic farming and direct sales places greater emphasis on the importance of a product's origins, specifically the environment in which it was grown. The business roadmap for the COASTAL project shows that Marennes-Oléron oyster farms can produce oysters with a high meat content, thus satisfying consumer demand, while at the same time keeping their production rooted in their local area. By harnessing the unique know-how of producers, the specific climate of the territory, and its spatialized trophic capacity, the foundations are there to achieve a more sustainable mode of shellfish farming, in synergy with other local environments and economic activities.

La conchyliculture dans un système globalement soutenable

La demande mondiale des consommateurs évolue vers des huîtres à haute teneur en chair. Ce type de produit a fait la renommée des huîtres de Marennes-Oléron grâce au travail de reconfiguration des marais salants en marais d'affinage ostréicole entre 1860 et 1960. L'explosion de la consommation et la disparition par maladie

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de l'huître portugaise ont conduit dans les années 1970 les professionnels à privilégier la quantité au détriment de la qualité. Un renouveau de la demande de qualité par les consommateurs a conduit certains producteurs de Marennes-Oléron à délocaliser leurs élevages dans des sites européens aux eaux plus riches, par exemple l'Irlande et le Portugal. Ces professionnels ont délaissé des labels de qualité comme l'IGP Marennes-Oléron au profit de marques d'entreprise. Cette européanisation du marché et de la production permet de satisfaire la demande globale et certaines entreprises engagées dans ces mutations. Cependant le développement du bio et de la vente directe obligent à reconsidérer l'importance du territoire d'élevage dans la plus-value apportée au produit. Ainsi, la feuille de route du projet Coastal stipule qu'un fort taux de chair issu d'élevages localisés sur le territoire peut satisfaire la demande de produits à haute teneur en chair et aussi la cohérence d'un métier et d'un produit ancré sur un territoire. Les savoir-faire des professionnels, les particularités physiques, biologiques et climatiques de ce territoire, la capacité trophique temporalisée et spatialisée, le partage de la ressource trophique optimisée et à la bonne densité, tous autorisent une redéfinition des conditions de la durabilité de la conchyliculture en englobant plusieurs environnements différents et plusieurs activités.

1.30. Practice Abstract 66 - Towards a desirable future: changing agricultural systems and practices

The development of new farming systems, in synergy with other activities, is a major step forward towards a desirable future for the territory. As a major economic activity, agriculture shapes the landscape and interacts with continental and marine hydro systems. A switch to organic farming calls for diversification of crops, development of short supply chains (at least 20%) and employment, while reducing the environmental impact of agriculture (zero pesticide, less nutrient loads, more biodiversity). These new systems take into account the current market demand for more vegetable-based foods: more protein crops, field vegetables, food and feed production. Organic farming systems are more diversified, and this incentive will continue within the new CAP. The CAP has already increased incentives for more diverse crop rotations and agri-environmental efforts (AEIs) via the green payment (30% of decoupled aid payments or approximately 80 €/ha). Diversification of crops also implies diversification of commercial outlets, both for food and non-food products. Economic operators and traders are running initiatives to develop local supply chains (lentils, chickpeas, popcorn, vegetables, fruits, essential oils, aromatic herbs, etc.) or feed (soya, beans, legumes, etc.). They are also developing other commercial outlets, such as industrial hemp or plants for energy use. Farmers have to balance organic crop rotations and nutrient inputs must come from organic/sustainable agriculture. The choice for non-irrigated rotations is therefore limited (triticale, winter bean, sunflower, etc.). A proportion of alfalfa could be sold locally to livestock farmers, favouring the continuation of high-quality breeding and associated grasslands.

Vers un future désirable: changer les systèmes et les pratiques agricoles

L'évolution vers de nouveaux systèmes agricoles en synergie avec les autres activités est une étape décisive pour atteindre le futur désirable du territoire. L'agriculture, activité économique majeure, modèle les paysages et interagit avec les hydrosystèmes. Son évolution vers l'agriculture biologique implique de diversifier les cultures et les assolements, de développer les circuits courts sur le territoire (au moins 20%) et l'emploi tout en réduisant l'impact environnemental (zéro pesticides, moins d'azote, plus de biodiversité). Ces nouveaux systèmes répondent la demande soutenue pour une alimentation plus végétale: plus, de protéagineux, de légumes de plein champ, de productions pour l'alimentation humaine et animale. Les systèmes en agriculture biologique sont plus diversifiés qu'en agriculture conventionnelle et cette incitation se poursuit avec la

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nouvelle PAC. La PAC incite déjà à plus de diversité des assolements et d'infrastructures agro-environnementales (IAE) via le paiement vert (30 % des aides découplées, environ 80 €/ha). La diversification des cultures suppose aussi celle des débouchés, alimentaires ou non: les opérateurs économiques d'aval multiplient les initiatives pour développer des filières locales pour la consommation humaine ou animale. Ils développent également des débouchés non alimentaires comme le chanvre ou à valorisation énergétique. Les rotations doivent être équilibrées en azote et les intrants issus de l'agriculture biologique/durable: le choix des cultures en sec reste donc limité (triticale, féverole d'hiver, tournesol, etc.). Une partie de la luzerne pourrait être vendue localement, permettant le maintien d'un élevage bio de qualité et des prairies associées.

1.31. Practice Abstract 67 - Management of irrigation and water efficiency

Achieving the desirable future will call for major changes in water demand by human activities. Irrigation, still mainly focused on maize (around 60% of irrigated area), has already decreased due to summer shortages, representing a shortfall of 17% in certain areas. Current climate scenarios point to scarcer water resources and longer periods of shortage. Agriculture, like other local activities, will need to adapt to this new reality. Farmers need to develop and implement innovative practices, with improved water efficiency, to achieve water savings of at least 30% for the same yield. The key challenge here will be how to reconcile reduced water abstraction without reducing the surface area requiring irrigation. Current pressure on water resources, coupled with the cost of storage infrastructure, means that irrigation costs are likely to increase sharply in the future. Increased water storage as a concept remains a highly contentious issue. It would therefore appear that irrigation is only worthwhile for high-profit crops. The business roadmap aims to assist in the re-development of the irrigated area, introducing new crops such as soybeans, vegetable seeds, field vegetables, arboriculture, and spring crops. The new make-up of the area will depend on several drivers: water availability, regulations (authorisations, quotas, and subsidies), price, quality of territorial dialogue, and new synergies in the territory. There could also be the opportunity to introduce mixed crop systems, including some more drought-resistant varieties, such as sorghum. Less irrigation, but with a wider spread across farms could become the new normal. Climate change could also mean irrigation of vineyards, not currently favoured by producers.

Irrigation et utilisation efficace de l'eau

Atteindre le future désirable pour le territoire demande des changements majeurs dans la demande en eau des activités humaines en général. L'irrigation concerne encore largement le maïs (environ 60% de la sole) et les surfaces ont diminué en raison de la contrainte sur la ressource jusqu'à 17% localement. Les prévisions climatiques indiquant une contrainte plus forte sur la ressource et de plus longues périodes de déficit hydrique, l'agriculture comme les autres activités devra s'adapter. Les agriculteurs doivent développer et généraliser des pratiques innovantes qui permettent d'économiser 30% de volume supplémentaire en préservant les rendements. Cependant, un challenge sera de gérer la diminution des prélèvements face aux surfaces à irriguer. Compte-tenu de la contrainte sur la ressource en eau et des coûts du stockage (qui reste controversé) les couts d'irrigation devraient augmenter sensiblement. L'irrigation devient réservée aux cultures à forte valeur ajoutée. La feuille de route tient compte de cette reconfiguration de la sole irriguée. Plusieurs cultures annuelles ou permanentes sont envisageables : soja, maraîchage, légumes de plein champ, arboriculture, cultures de printemps… Cette nouvelle sole dépend de la disponibilité en eau, de la réglementation (autorisations, quotas, incitations), du prix, de la qualité du dialogue territorial et des nouvelles synergies. Des systèmes mixtes où certaines cultures sont irriguées, des cultures plus économes en eau (sorgho) peuvent

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émerger. Moins d'irrigation plus largement répartie pourrait devenir le nouveau normal. Le changement climatique pourrait enfin conduire à devoir irriguer les vignes, bien que cette solution ne soit actuellement pas favorisée par la profession.

1.32. Practice Abstract 68 - An attractive and diverse territory, promoting local products

To achieve the desirable future for the territory, development of sustainable shellfish farming and agriculture must be accompanied by equally sustainable forms of tourism (e.g., green tourism, pescatourism, rural tourism, gastronomy…). Moving agriculture and shellfish farming towards a more sustainable model benefits both the people working in these professions and local residents, with the latter being able to continue to live and work in an economically and environmentally balanced setting. Increasing the attractiveness of the territory will also mean that local produce will be better promoted, combining seafood and other produce to create a truly diverse food and drink offering, including fruit and vegetables, shellfish, salt, wine and cognac, and other high-quality products. This strategy goes hand in hand with territorial food projects or "zero carbon territory" projects, supported by local authorities, which provide for the development of plant (50%) and high-quality animal production. Another key factor in the success of this desirable future will be the creation of alliances between proponents of various sectors, with the aim of collectively promoting the territory and its produce. These should focus in particular on: i/ high-quality local food and drink, and their inherent health benefits ii/ features of the territory in terms of sustainable tourism and iii/ marketing local produce for new and emerging markets.

Un territoire diversifié et attractif, avec des produits de qualité

Le futur désirable du territoire s'appuie sur la durabilité des principales activités économiques comme la conchyliculture, l'agriculture et en parallèle le développement d'un tourisme plus soutenable (tourisme vert, tourisme rural, pescatourisme, autour de la gastronomie et du pineau/cognac…). L'évolution de l'agriculture et de la conchyliculture vers des activités durables bénéficient à ces professions mais aussi aux habitants qui peuvent rester vivre et travailler sur place, dans un territoire harmonieux. Le renforcement de l'attractivité du territoire sera profitable pour la valorisation des produits locaux dans une logique de synergie terre mer (produits locaux, fruits et légumes, pineau cognac, coquillages, sel, salicorne, etc.). Cette stratégie est cohérente avec les projets alimentaires territoriaux ou les projets de "territoire zéro carbone", soutenus par les collectivités locales, qui prévoient entre autre le développement de la production végétale (50%) et animale de qualité. Des alliances entre secteurs d'activité sont à trouver pour promouvoir en commun des produits différents : offre de qualité se référant à une dimension santé environnement, offre du territoire, associé à un tourisme « durable », offre multi-produits de meilleure qualité, nouveaux marchés.

1.33. Practice Abstract 69 - Towards a more water efficient and resilient territory

Access to a quality water resource is crucial for the main economic actors in the territory, and a prerequisite for sustainable development. This issue will only become more complex when combined with that of climate change. Two key notions come into play here: water supplies are by no means infinite, and the treatments needed to keep water safe for human consumption are difficult and costly. To achieve a harmonious territory, it is necessary to adjust requirements to what can realistically be generated and to consider the land-sea

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system as one single entity. However, the resolution of water use conflicts should not be based on the level of blame to be attributed to each party, but rather by measuring added value at the territorial level, i.e. the development of a win-win situation in which a new synergy offers guarantees to the various stakeholders. Individual saving actions, collective actions, laws and regulations, education, urban planning, and landscape and resources management are all levers that can be activated. Increased pressure on resources must go hand in hand with stronger governance, independent of private interests, which can consider and prioritise uses based on the public interest and the interest of the territory as a whole. Another key issue is managing competition for space in the coastal zone. This is a major challenge in the face of climate change and rising sea levels, which may lead to a retreat of part of the territory by the end of the roadmap. This managed retreat should take into account demographic pressures, by preserving high-value biological and natural areas ahead of any potential urbanisation.

Vers un territoire plus résilient et économe

L'accès à une ressource en eau de qualité est une préoccupation importante pour les principales activités économiques du territoire (agriculture, conchyliculture, tourisme…) et une nécessité pour le maintien et le développement durable de ces activités. Le problème va s'aggraver avec les perspectives du changement climatique. En effet, les fortes augmentations des besoins en eau et les effets du changement climatique font émerger deux notions clé : la ressource n'est pas infinie et les contraintes de sécurité alimentaire obligeraient à des traitements coûteux et complexes. Pour retrouver un territoire harmonieux, il convient d'une part d'ajuster les besoins aux potentialités de la ressource et d'autre part de considérer le système eau-territoire comme un tout indissociable. Ainsi, la résolution des conflits liés à l'utilisation de l'eau ne doit pas être basée sur le niveau de responsabilité de chaque partie, mais plutôt sur la mesure de la valeur ajoutée au niveau territorial, c'est-à-dire le développement d'une situation gagnant-gagnant dans laquelle une nouvelle synergie offre des garanties aux différents acteurs. Les actions d'économie, l'adaptation des lois et règlements, l'éducation, l'urbanisme, la gestion des paysages, la protection des ressources, autant de leviers à actionner pour atteindre cet objectif. Gérer la compétition pour l'espace sera également un enjeu majeur face au changement climatique et à la montée du niveau de l'océan qui peut conduire à un repli d'une partie du territoire. Ce repli stratégique devra tenir compte de la pression démographique en préservant en priorité les sols agricoles à forte valeur biologique et les espaces naturels, avant toute urbanisation.

1.34. Practice Abstract 70 - New policies to support the business roadmap

Synergy within the territory can only be improved through a clear understanding of its complexity. This cannot be tackled simply by dividing it into sectors of human activity and environmental resources to be shared, as is currently the case. The roadmap proposes a change in logic, and thinking on a territorial scale, rather than that based on resource sharing and the balance of power. A need for more integrative policies was highlighted during collaborative workshops. There are still many policies (e.g., water) where upstream and downstream sectors are clearly not considered as a whole ("silo" policies). This is even worse when it comes to management of land-sea interface areas. Spatial planning can also better consider the need to preserve the proper functioning of ecosystems, water, and carbon storage through various measures: "If there is no more water, that means no more for anyone" (quote from a workshop). Similarly, some aids or incentives are only aimed at professionals in a single sector of activity (farmers, shellfish farmers, tourism operators, etc.), whereas actions to strengthen land-sea synergies must be "territorial" and not sectoral, and therefore accessible to the full spectrum of economic actors. Beyond the individual or collective economic choices that activities can make,

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the business roadmap requires an ambitious plan at regional level and/or specific incentives at national level, with the possibility of state aid that transcends sectors. Training and the exchange of know-how, expertise, field experiments, shared information, cross-dialogues between stakeholders are also essential to the success of the roadmap.

De nouvelles politiques publiques en appui à la feuille de route

La synergie du territoire ne peut être améliorée que par la prise de conscience de la complexité du système. Cette complexité ne peut être abordée seulement par le découpage en secteurs d'activité humaine et de ressources à partager. La feuille de route propose de changer de logique et de réfléchir à l'échelle territoire au lieu de s'engager dans une logique de répartition et de rapports de force. Il a été souligné pendant l'ensemble des ateliers collaboratifs la nécessité d'avoir des politiques plus intégratives. Il reste encore beaucoup de politiques où les secteurs amont et aval sont clairement différenciés et ne sont pas considérés globalement. C'est encore pire pour les zones d'interface terre-mer. L'aménagement du territoire peut également mieux prendre en compte la nécessité de préserver le bon fonctionnement des écosystèmes, de l'eau et du stockage du carbone par diverses mesures : "S'il n'y a plus d'eau, il n'y en a plus pour personne" (citation). De même, certaines aides ou incitations ne s'adressent qu'aux professionnels d'un seul secteur d'activité (agriculteurs, conchyliculteurs, acteurs du tourisme etc.) or les actions propres à renforcer les synergies terre-mer doivent être pensées « territoire » et non sectorielles, donc accessible à différents acteurs économiques. Au-delà des choix économiques individuels ou collectifs que peuvent faire les acteurs, la feuille de route appelle un plan ambitieux à l'échelle régionale et/ou des aides adaptées qui transcendent les secteurs. La formation et l'échange de savoir-faire, l'accès à l'information partagée, les dialogues croisés et entre tous les acteurs du territoire sont également indispensables à la réussite de la feuille de route.

1.35. Practice Abstract 71 - Achieving synergy within the territory

The COASTAL roadmap for a desirable future is provided for the watershed territory and its associated coastal zone. The notions of synergy, harmony, interface, and sustainability bring into play the spatial and temporal interactions between the different stakeholders with the capacity to act in that territory. These interactions, which are the object of public policies, are often based on old divisions which, by failing to define synergies, simply reproduce the same conflicts of use time and time again. Because of this, these conflicts are often managed by focusing on common resources. Is there a better way to manage this situation than simply forcing each sector to define its own sustainability based on constraints created by the sustainability of other sectors? The COASTAL project is based on the premise that achieving synergy within a territory is not simply the search for a resource-sharing summit, but rather a "modus vivendi", where a win-win situation is the preferred outcome. Territorial management, for example, is often approached in a very fragmented way, with regional land-use planning, transport, ecology, tourism, and urban planning competing for attention. Our philosophy is to replace these spatial divides (and their associated fractures) with a "landscape", which combines different geographical territories, and aims to understand the full spectrum of activities influencing the operation of those territories.

Quelles synergies pour le territoire

La feuille de route COASTAL pour un futur désirable se décline à l'échelle du territoire du bassin versant et de sa zone littorale associée. Les notions de synergie, d'harmonie, d'interface, de durabilité mettent en jeu les interaction spatiales, temporelles et entre différents acteurs ayant possibilité d'agir sur ce territoire. Ces

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interactions qui sont l'objet de politiques publiques s'appuient malgré tout sur des divisions anciennes qui, faute souvent de définir des synergies, redessinent plan après plan, schéma après schéma les conflits d'usage entre acteurs. Les politiques publiques sont donc souvent dans l'obligation d'organiser la gestion de ces conflits autour de ressources communes. Existe-t-il une manière de considérer qu'il y a mieux à faire que de forcer chaque secteur à définir sa durabilité sous contraintes de celles des autres ? Le projet COASTAL fait le pari que la synergie d'un territoire n'est pas que la recherche d'un « sommet » du partage des ressources mais plutôt d'un « modus vivendi », une manière de vivre ou les procédures du gagnant-gagnant sont recherchées. Cette démarche nécessite ipso facto une transversalité des connaissances et des politiques publiques. La gestion des espaces territoriaux, par exemple, est souvent abordée de manière fragmentée dans les schémas régionaux d'aménagement du territoire, de développement de l'agriculture, du tourisme, de l'urbanisme de la cohérence écologique, des transports ou même des plan locaux d'urbanisme. Au-delà de ces plans et schémas qui découpent l'espace à différentes échelles, y creusant ainsi des fractures, on peut imaginer de les compléter en utilisant, par exemple, les concepts de paysages qui lient les espaces géographiques et ce qui les fait vivre.

1.36. Practice Abstract 72 - Towards sustainability: management of densities in shellfish farming

The mission of achieving sustainable shellfish farming typically involves identifying maximum usable stocks, without exceeding the volume of trophic resources that the environment is able to supply. This "classical" interpretation of trophic capacity was scrutinised as part of the COASTAL project. The first point of note is that in coastal zones, the relationship between shellfish stocks and the environment does not work in a single direction (i.e., trophic resources to end user). In reality, living and non-living things establish their own network of relationships and interact with each other on a regular basis. Shellfish affect their environment (through mobilisation of sediment, pseudofeces, etc), as much as their environment affects them. The spatial layout of shellfish farms will also have an effect on this delicate balance. While movement of sediment, resuspension, and phytoplancton production are difficult to control, the volumes of shellfish that can be produced within a farm are subject to regulations. The regulator can impose a number of limitations, such as volume of oysters per bag, number of bags per hectare, and maximum surface area per farm. With biodiversity in mind, this type of regulation aims to position oysters in such a way that trophic capacity is continually regenerated, and biodiversity is maintained. New technology (such as Australian baskets or new regulator measures (i.e., volume limits) ought to be developed in collaboration with stakeholders possessing the necessary know-how.

Vers plus de durabilité: gérer la densité des élevages conchylicoles

La durabilité de la conchyliculture passe par la définition du stock maximal exploitable sans mettre en péril la ressource trophique que le milieu aquatique peut lui mettre à disposition. Cette version classique de la capacité trophique mérite d'être discutée dans le projet COASTAL. Tout d'abord, dans les zones côtières les relations entre un stock de coquillages et son environnement ne sont pas à sens unique (ressources trophiques vers utilisateur). Le territoire est un espace ou les êtres vivants ou non vivants établissent des relations, interagissent les uns avec les autres. Ainsi les coquillages agissent autant sur leur environnement (remobilisation de sédiment, enrichissement par les pseudofeces, etc) que l'environnement agit sur eux (ressource trophique. De plus, cet équilibre est dépendant de la forme que peut prendre l'agencement spatial des élevages. En effet, si les mouvements de sédiments, la resuspension et la production de phytoplancton

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sont difficiles à maitriser et contrôler, les densités d'élevages sont soumises à réglementation. Densités d'huîtres par poche d'élevage, nombres de poches à l'hectare, surface des concessions sont autant de facteurs sur lesquels le législateur peut jouer pour optimiser les relations entre les coquillages et leur milieu. Dans un esprit de durabilité, il s'agit de positionner les animaux afin qu'ils permettent de régénérer continuellement une capacité trophique et une biodiversité ad hoc. Les solutions innovantes technologiques (par exemple, paniers australiens) ou règlementaires (densités) doivent être élaborées en concertation avec les acteurs dépositeurs des savoir-faire empiriques.

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