SMART URBAN COASTAL SUSTAINABILITY

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EU-CONEXUS European University for Smart Urban Coastal Sustainability

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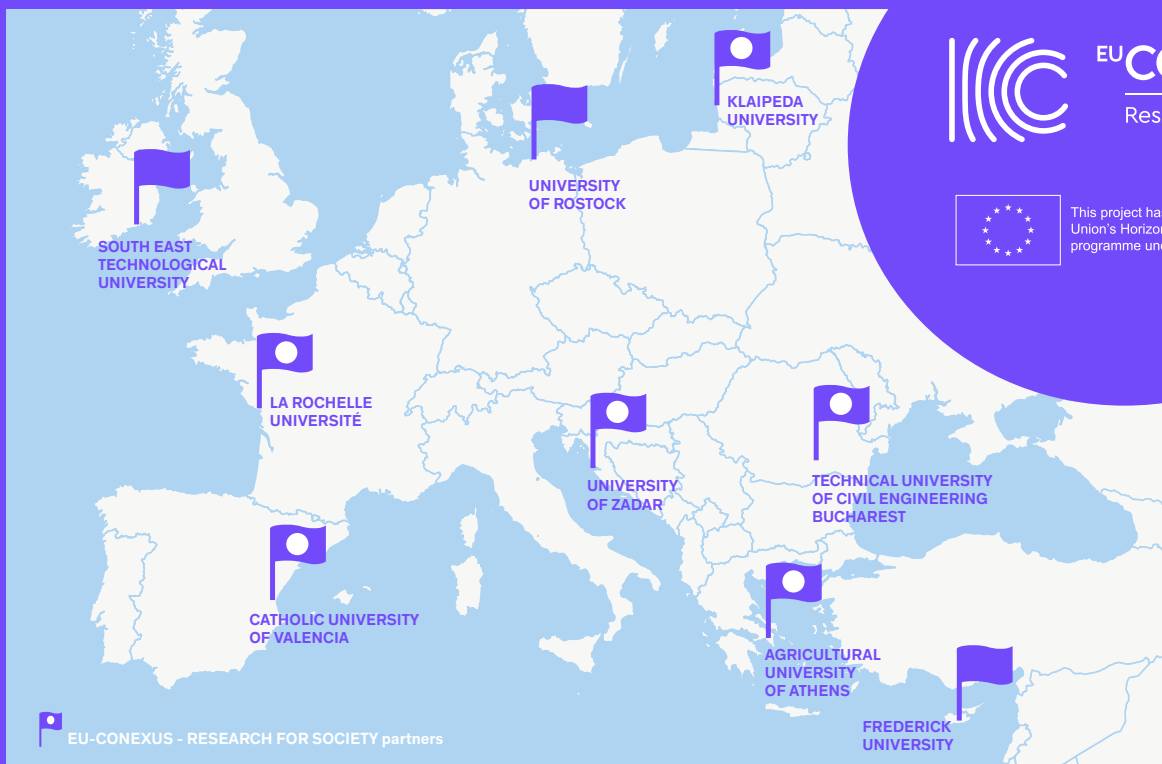
Strategically distributed over European coastal regions, the EU-CONEXUS partner institutions aim to implement a brand-new model of a European inter-university campus with a signature challenge-based focus on smart and sustainable development of urban coastal areas.

As part of its Horizon-2020-funded project, EU-CONEXUS-Research For Society, the partners are creating an online open access popular science journal on Smart Urban Coastal Sustainability topics available to all stakeholders, industry, policy-makers, other researchers, students, and the general public.

This journal aims to popularise peer-reviewed scientific articles written by researchers from EU-CONEXUS universities, that are already published and available in open access repositories in order to showcase EU-CONEXUS research to the public.

In this first edition, we will dive into an array of exciting topics: in Ireland, researchers intend to make submarine power cables used in offshore wind energy systems more damage-resistant. In Croatia, you will discover how marine underwater habitats dominated by a seagrass called Posidonia oceanica play an essential role in fish communities. In France, researchers are exploring adaptation strategies for coastal cities facing increased erosion and submersion risks due to climate change. And much more...

Happy reading!

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Living on shaky ground: a call to update Seismic Design Codes

ABSTRACT

Earthquakes are one of the most costly and deadliest natural disasters. This perspective paper presents a discussion focused on the role of seismic design codes in risk perception and seismic risk reduction in Europe.

The seismic design codes are a key component for both the design of new buildings, as well as for the vulnerability assessment of existing ones. The impact of seismic design codes on seismic risk reduction is discussed using as case-study countries, Italy, Turkey, Greece, and Romania, which according to the recent European seismic risk model 2020 have the largest expected mean annual losses due to earthquakes.

The evaluation of the seismic exposure of the four countries shows that from the entire population of more than 170 million people, about 130 million live in buildings designed using no or low level seismic design.

The mean annual expected losses due to earthquakes are of the order of 0.1–0.2% of the national GDP. Moreover, the mean annual death probability due to earthquakes is 10–6 which represents a risk level not of great concern to the average people.

However, large earthquakes in Europe from the past 50 years have produced losses in excess of 10 billion Euros and several hundred thousand affected people.

A solution for a better communication of seismic risk in order to increase seismic risk perception might be to provide exceedance probabilities of specific macroseismic intensity levels for time frames of 10 or 20 years, instead of annual values. Macroseismic levels from past earthquakes might be used in order to have a better understanding of the results and should complement the seismic design maps. In addition, in the case of seismic vulnerability, the use of simple terms (e.g., inhabitable or uninhabitable) along with their associated occurrence probabilities in the same time frame as in the case of the seismic hazard, might be a solution. Financial incentives for seismic strengthening, as well as a clear definition of an earthquake-prone building are also very useful for increasing seismic risk perception.

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Abstract in original language 🇷🇴

Cutremurele reprezintă unele dintre cele mai costisitoare și mai mortale dezastre naturale. Această lucrare prezintă o discuție axată pe rolul codurilor de proiectare seismică în percepția și reducerea riscului seismic în Europa. Codurile de proiectare seismică sunt o componentă esențială atât pentru proiectarea clădirilor noi, cât și pentru evaluarea vulnerabilității celor existente. Impactul codurilor de proiectare seismică asupra reducerii riscului seismic este discutat folosind ca studiu de caz Italia, Turcia, Grecia și România, care, conform recentului model european de risc seismic 2020, au cele mai mari pierderi medii anuale din cauza cutremurelor. Evaluarea expunerii seismice a celor patru țări arată că din întreaga populație de peste 170 de milioane de oameni, aproximativ 130 de milioane locuiesc în clădiri la a căror proiectare nu s-au folosit coduri seismice sau s-au utilizat coduri seismice de nivel inferior. Pierderile medii anuale asociate cutremurelor sunt de ordinul 0,1–0,2% din PIB-ul național. Probabilitatea medie anuală de deces din cauza cutremurelor este de 10–6, ceea ce reprezintă un nivel de risc care nu produce îngrijorare pentru populație.

Cu toate acestea, cutremurele mari din Europa din ultimii 50 de ani au produs pierderi de peste 10 miliarde de euro și au afectat sute de mii de oameni. O soluție pentru o mai bună comunicare a riscului seismic în scopul creșterii percepției riscului seismic ar putea fi furnizarea probabilităților de depășire a unor niveluri de intensitate macroseismică pentru intervale de timp de 10 sau 20 de ani, în locul unor valori anuale. Nivelurile de intensități macroseismice observate la cutremure din trecut ar putea fi utilizate pentru a înțelege mai bine rezultatele și pentru a completa hărțile de proiectare seismică. În plus, în cazul vulnerabilității seismice, utilizarea unor termeni simpli (de exemplu, locuibil sau nelocuibil) împreună cu probabilitățile lor de apariție asociate în același interval de timp ca și în cazul hazardului seismic, ar putea fi o soluție. Stimulentele financiare pentru consolidarea seismică, precum și o definiție clară a unei clădiri vulnerabile la cutremur sunt, de asemenea, foarte utile pentru creșterea percepției riscului seismic.
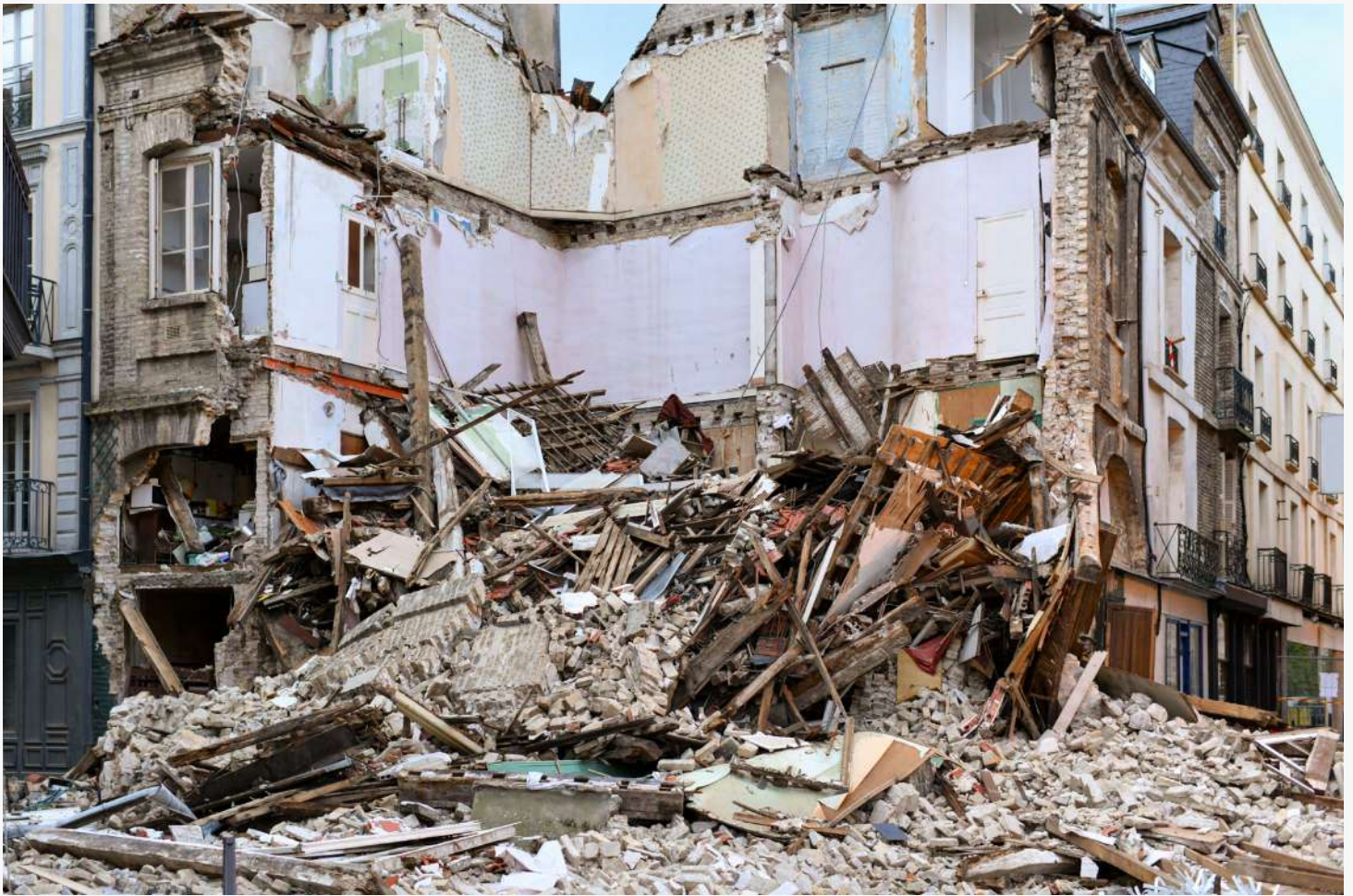
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ARTICLE ━━━━━━━━━━━

Earthquakes represent one of the deadliest and most costly natural disasters in the world, including in Europe. The International Disasters Database assigns a number of more than 70 000 deaths, more than 13 million affected people and losses of over 250 bn euros caused by earthquakes in Europe between 1950 and 2022.

In building regulations, seismic design codes are key elements in the design of new buildings and in the assessment and strengthening of existing buildings. They provide provisions and guidance to ensure that structures can adequately resist earthquakes effects.
Florin Pavel, lecturer at the Technical University of Civil Engineering Bucarest and leading expert in Earthquake Engineering, highlighted in a recent paper the role of seismic design codes in risk perception and seismic risk reduction in Europe.

His research, focusing on Greece, Italy, Romania and Turkey - the European countries most affected by earthquakes - advocates for seismic design codes to be more understandable in order to help people make more informed decisions about where they live. It also highlights the importance of seismic design code enforcement and seismic risk perception on seismic risk reduction.

In Europe, the most important documents from the past 20 years for seismic design and assessment of structures which have been adapted nationally by a significant number of countries are the "Eurocode 8—Part 1" for new buildings and "Eurocode 8—Part 3" for existing buildings. Local damaging earthquakes and results of national and global practice change influence the evolution of seismic design in each country. →

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"*Low-level codes*" and "*moderate codes*" represent the first and second generation of seismic design codes (they follow the no-code period), while modern seismic design codes are considered as "*high-code*". This new generation of seismic codes increases the level of building safety, resulting in an expected increased seismic performance during future earthquakes.

In the four countries of the case study, the seismic design code was enforced between 1978 and 1996. Romania and Greece changed from low-code to moderate-code generation following significant earthquakes (1977 Vrancea earthquake and 1978 Thessaloniki earthquake), while the change from low to moderate-code occurred 10 to 15 years later in Italy and Turkey (they were respectively affected by the Irpinia 1980 earthquake and the Kocaeli 1999 earthquake).

The study shows that in these countries, the current building stock mainly consists of buildings designed using no- or low-level seismic design code. About 130 million people (3/4 of the total population of the four countries) live in such buildings.

Nevertheless, seismic risk is not a great concern for the average person. Between 1980-2022, the average annual losses due to earthquakes was of the order of 0.1-0.2% of the national GDP, and the mean annual death probability due to earthquakes is about 3 in a million – about 10 times smaller than that due to air travels or building fires. These figures suggest that the risk level associated with death due to earthquakes is low.

However, large earthquakes in Europe can generate losses 10 to 20 times larger and affect hundreds of thousands of people. →

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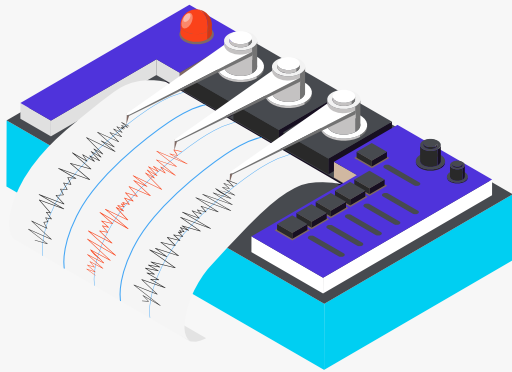
As a consequence, communication strategies need to be adapted in order to increase seismic risk perception. A solution for a better communication of seismic risk might be to provide exceedance probabilities (probability that a certain value will be exceeded in a predefined future time period - measure used to predict extreme events such as floods, earthquakes, and hurricanes) of seismic intensity levels for time frames of 10 or 20 years, instead of annual values.

Moreover, seismic codes contain complex matters that are not easy to grasp for the general public. For example, the maps showing how an earthquake is felt and its effects are not commonly associated with seismic design codes, as they used to be in the past. The correct perception of seismic risk is correlated with the vulnerability of buildings. A seismic awareness study performed in Bucharest in 2018 showed that residents expected minor to moderate damage to occur to their building in case of an earthquake, regardless of the construction year of the building. It shows that many people do not understand seismic design codes. Instead of using complex engineering jargon, the study suggests using more simple terms such as "inhabitable" or "uninhabitable" to describe how a building might fare in an earthquake.

Finally, the research also highlights that a clear definition of an earthquake-prone building and government financial incentives to encourage seismic strengthening of existing buildings can be very useful for increasing seismic risk perception, pointing out to recent measures adopted in Italy and New Zealand. Risk reduction can be enhanced by policies linking together house improvements, maintenance loans and seismic risk reduction strategies. .

Communicating seismic risks to the general population is a complex issue. In that regard, updating the presentation of seismic design codes is a key factor to help people make informed decisions about the areas they live in and increase seismic risk perception.

Read the scientific paper >

Underwater meadows: a key to richer marine life in the Adriatic Sea

Abstract

Marine underwater habitats dominated by seagrass Posidonia oceanica play an essential role in fish community assembly, affecting taxonomic and functional diversity, abundance and fish behavior. The value of seagrasses as habitat depends on the spatial arrangement of the seascape elements and the availability of alternative habitats. Little is known about the effect of the seascape context of P. oceanica meadows on fish assemblages in the Mediterranean Sea. To identify P. oceanica meadows' relative importance as a habitat for fishes, fish communities in the Croatian Adriatic Sea were investigated, using SCUBA lure-assisted visual census. The results show a significant effect of different arrangements of P. oceanica meadows' seascape elements and surrounding habitats on fish community structure. Fragmented mosaic meadows with P. oceanica growing directly on and between rocky-algal reefs/boulders had significantly higher fish abundances compared to both types of continuous meadows (bordering rock and bordering sand).

Continuous meadows bordering sand harbored the highest number of unique species. Evidence that alternative structured habitats within proximity to seagrass beds may affect the community structure of associated fish assemblages is provided, highlighting the need to consider P. oceanica meadows' seascape context in conservation management and experimental design for fish community structure.

Key words

seagrass fish assemblage structure lure-assisted underwater visual census

Abstract
in original language 🇭🇷 ——

Naselja morske cvjetnice Posidonia oceanica igraju važnu ulogu u strukturiranju zajednica riba te utječu na takso-nomsku i funkcionalnu raznolikost, brojnost i ponašanje riba. Relativna vrijednost naselja morskih cvjetnica ovisi o prostornoj organizaciji elementa podmorskog okoliša te dostupnosti alternativnih staništa. Međutim, nedovoljno je poznato koji sve čimbenici utječu na strukturu zajednice riba povezanih s ovom morskom cvjetnicom. S ciljem ut-vrđivanja utjecaja različite prostorne organizacije elementa podmorskog okoliša na zajednice riba, proveden je vizualni cenzus uz pomoć mamca u naseljima cvjetnice P. oceanica u hrvatskom dijelu Jadranskog mora.

Utvrđen je značajan utjecaj različite prostorne organizacije elementa podmorskog okoliša na strukturu zajednice riba – u rascjepkanim mozaičnim naseljima u kojima se P. ocea-nica isprepliće s kamenom podlogom obraslom makro-al-gama zabilježena je značajno veća brojnost riba u odnosu na kontinuirana cjelovita naselja (uz sediment ili uz kamenitu obalu). U radu su predstavljeni dokazi da dostupnost al-ternativnih strukturiranih staništa u neposrednoj blizini naselja morske cvjetnice P. oceanica utječe na strukturu zajednice riba koje u njoj žive. Neophodno je uzeti u obzir kontekst prostornog rasporeda elemenata podmorskog oko-liša kojima dominira morska cvjetnica P. oceanica prilikom planiranja znanstvenih istraživanja, ali i kod upravljanja priobalnim područjima.

Posidonia oceanica
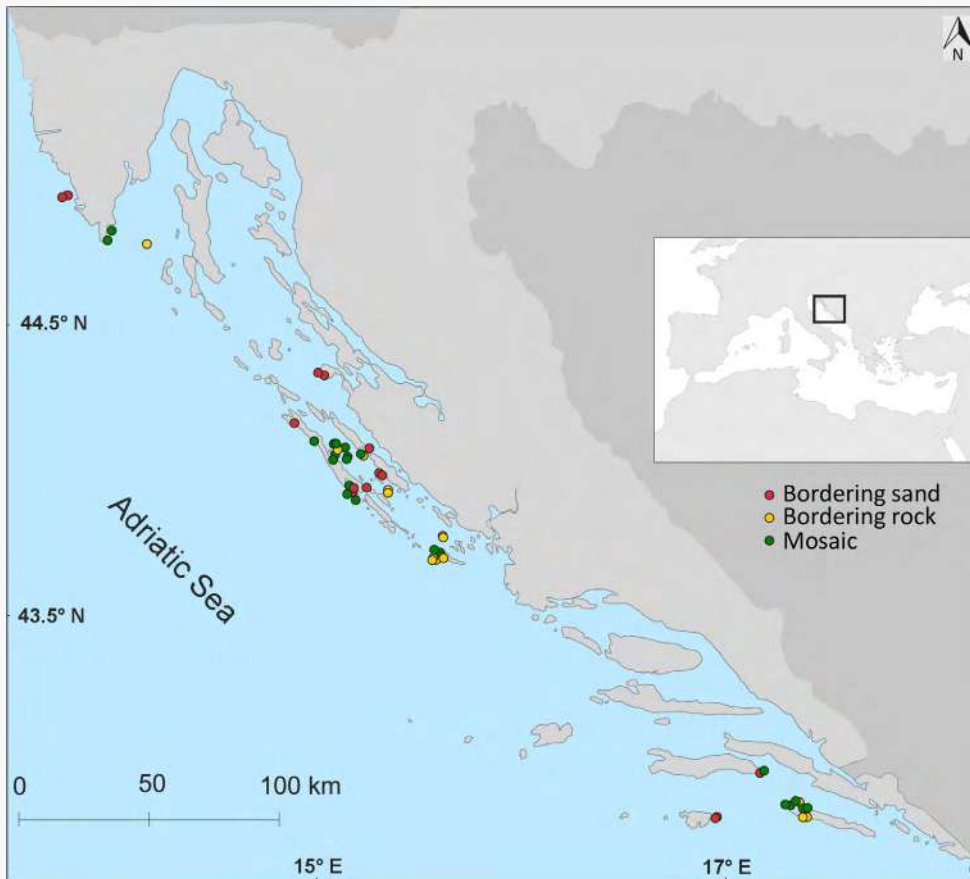
Locations of surveyed fish assemblages within Posidonia oceanica seagrass meadows in the Eastern Adriatic Sea, Croatia

Article

Underwater habitats with seagrass called *Posidonia oceanica* are crucial for fish communities. They affect the diversity, abundance, and behavior of fish. However, the value of these seagrass habitats depends on how they are arranged in the overall seascape and the availability of other habitats. We still need to learn more about how the surrounding context of *Posidonia oceanica* meadows in the Mediterranean Sea impacts fish populations.

To understand the importance of *Posidonia oceanica* meadows as fish habitats, researchers from the Department of Ecology, Agronomy and Aquaculture at the University of Zadar and from the Marine Explorers Society 20 000 Leagues (a research society focusing on marine biology) studied fish communities in the Croatian Adriatic Sea using SCUBA lure-assisted visual census. They found a significant difference in the number of fish among different seascape contexts of *Posidonia oceanica* meadows. "Fragmented Mosaic" meadows, with *Posidonia oceanica* growing on

and between rocky-algal reefs and boulders, had more fish than "continuous" meadows bordering sand or rocks. Yet, meadows bordering sand had the highest number of unique fish species.

These results indicate that the arrangement of *Posidonia oceanica* meadows and the surrounding habitats significantly impact the structure of fish communities: fragmented mosaic meadows had more fish than continuous meadows, while the latter bordering sand had more unique species. The study also suggests that fish choose their habitats based on their specific needs such as food, shelter, mates and predator avoidance. The presence of alternative structured habitats near seagrass beds can affect the composition of fish communities. →

These findings emphasize the importance of considering the seascape context of *Posidonia oceanica* meadows in conservation management and experimental design for studying fish communities. Understanding the intricate mosaic of habitats in which seagrass is embedded and its influence on fish function, movement and habitat preference is crucial. This knowledge can help develop more realistic models and conservation plans for fish communities in the Adriatic Sea and other similar regions.

Indeed, *Posidonia oceanica* and other seagrasses are threatened by coastal development, anchoring, pollution, overfishing, and climate change, including biological invasions.

Conservation strategies for Posidonia oceanica meadows include:

— By establishing Marine Protected Areas (MPAs) around *Posidonia oceanica* meadows, seagrass habitats are protected from fishing, anchoring, and other damaging activities.

— Restoration techniques include reseeding or transplanting seagrass shoots or using artificial structures to accelerate recovery and improve the ecological performance of seagrass meadows.

— Education on the ecological importance of *Posidonia oceanica* may motivate responsible behavior and seagrass protection. ∎

Read the scientific paper >

Posidonia oceanica

Posidonia oceanica, sometimes known as Neptune grass, is a seagrass endemic to the Mediterranean Sea. It has long, ribbon-like leaves of dark green color and uses a sophisticated root system to anchor to the bottom. The majority of its vegetative growth is due to subsurface rhizomes generating new shoots. In general, Posidonia meadows in the Mediterranean Sea can be found in three seascape contexts:

01

Continuous meadows bordering sand

02

Continuous meadow bordering rocky-algal reefs

03

Mosaic meadows where Posidonia grows directly in thecrevices of rocks and between rocky boulders with macro-algae

Top 3 reasons why Posidonia meadows are important

© University of Zadar

Habitat and nursery grounds: Seagrass meadows support a high level of bio-diversity. Many marine animals live in seagrass meadows. Many fish, invertebrates and marine animals use them for shelter, refuge, food, and reproduction. In addition to providing protection from predators, the complex structure of the meadows also supports a web of ecological relationships. Seagrass meadows support a diverse range of commercially and environmentally important fish, crabs and mollusks.

Seagrass meadows help to keep the coast from eroding. Dense vegetation reduces wave and current force, allowing sediments to settle and reducing beach erosion. They safeguard coastal ecosystems.

Posidonia meadows efficiently capture and store CO2 from the atmosphere, making them important carbon sinks. *Posidonia oceanica* and other seagrasses convert CO2 into organic matter through photosynthesis, which they store in their sediments. Because the sediments are usually anoxic, the organic matter remains in the sediment for a very long time. By lowering greenhouse gas levels, this process mitigates climate change.

What is SCUBA lure-assisted visual census?

The SCUBA lure-assisted visual census is used to measure the abundance and diversity of marine fish populations. Underwater lures (usually the piece of lead at the end of a fishing line) attract fish during SCUBA dives, making them easier to identify and count. The lure-assisted strategy increases the likelihood of locating fish that are hidden in the habitat. Divers keep track of fish species, sizes, and numbers.

Physical education teachers' perceived digital competences: are they prepared for the challenges of the new digital age?

Abstract

The development of information and communication technologies impose great changes that require teachers to be constantly updated. Therefore, it is interesting to analyze the Digital Competence perceived by teachers and their ability to use digital devices in the classroom. The aim of this study is to investigate the technological resources and difficulties that Physical Education teachers have in schools, in addition to the training and methodological strategies required to adequately teach Physical Education classes in present times. For this, through a previously validated survey, we will observe the Digital Competence of teachers and whether there are differences between genders, according to age and teaching experience.

A survey has been undertaken by 50 Physical Education teachers of secondary school students. The results show statistically significant differences according to teaching experience and age. In addition, younger teachers have a better perception of their ability to apply Digital Competence in the Physical Education classroom setting.

Key words

Digital Competence   **physical education teachers' perceptions**   **ICT information technologies communication technologies**

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Abstract in original language

El desarrollo de las tecnologías de la información y la comunicación impone grandes cambios que obligan a los docentes a estar permanentemente actualizados. Por ello, es interesante analizar la Competencia Digital percibida por los docentes y su capacidad para utilizar dispositivos digitales en el aula. El objetivo de este estudio es investigar los recursos tecnológicos y las dificultades que tienen los profesores de Educación Física en los centros educativos, además de la formación y las estrategias metodológicas necesarias para impartir adecuadamente las clases de Educación Física en los tiempos actuales.

Para ello, a través de una encuesta previamente validada, observaremos la Competencia Digital del profesorado y si existen diferencias entre géneros, según edad y experiencia docente. Se ha realizado una encuesta a 50 profesores de Educación Física de alumnos de secundaria. Los resultados muestran diferencias estadísticamente significativas según la experiencia docente y la edad. Además, los profesores más jóvenes tienen una mejor percepción de su capacidad para aplicar la Competencia Digital en el aula de Educación Física.

Article

Technological revolution of the last few decades has brought an enormous global transformation in all sectors of society. The school environment has not been oblivious to this revolution, and there is a broad consensus in the educational field that Information and Communication Technologies - ICT: computers and peripherals like scanner and printer, interactive whiteboards, devices for recording and editing audio, video and other multimedia supports such as iPads or tablets - are inherent into today's culture and, therefore, must be meaningfully integrated into all areas of the curriculum.

Digital Competence is a key ability to promote lifelong learning. ICT play a key role in the education sector, producing new demands and changes that significantly affect teachers, mainly generating a constant need for training and updating. Several studies highlight that the use of ICT in educational practice has not yet reached desirable levels. This is because many didactic processes implemented with the use of technological devices do not show a clear and true innovation or learning increase compared with traditional teaching and learning ways. Indeed, in most cases new technologies are incorporated into schools without having a well-founded pedagogical project based on the transversality of ICT. Moreover, teachers are not provided with the optimal training needed to carry out this process. Therefore, insignificant modifications are made in the way of teaching and learning, as in many cases both teachers and students are used to traditional teaching methods.

In 2021, a study published by a group of researchers at the Catholic University of Valencia in Spain analysed the Digital Competence perception from Physical Education teachers in Secondary School, considering three relevant variables: age, gender and teaching experience.

During three weeks between April and May of the 2020-2021 academic year, they collected data from 50 physical education teachers (34 men and 16 women) working in secondary schools. The average age of the teachers surveyed was 40 years, with ages ranging from 26 to 58 years.

They used a questionnaire of 21 questions to measure what these physical education teachers thought about digital competence and then applied different statistical methods to analyze their responses.

The questionnaire showed that Physical Education teachers prove to have a high level of basic knowledge of how a computer, iPad or similar works, yet both male and female Physical Education teachers had a lower score in terms of knowing different methodologies for working in a technological environment. There were no significant differences between men and women in terms of digital competence in the area of Physical Education, however there were significant differences according to the age and teaching experience of male and female teachers. →

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The study found that teachers who claim to have a basic knowledge of computers or similar, also perceive themselves as being able to use ICT to investigate, explore or solve problems related to physical education. It also found that teachers who perceive themselves as qualified to apply ICT strategies are also related to the perceived capacity to promote ethical and legal use of computer applications. Finally, younger teachers consider themselves to have a greater knowledge and use of technology in physical education, while more experienced teachers perceive themselves as less competent in digital issues.

Digital Competence involves the critical and safe use of information society technologies. This competence, basic in teacher training, encompasses a set of skills, knowledge, abilities and attitudes related to the integration of technology in the design and development of teaching-learning processes. In an increasingly digitally-connected world, **Digital Competence in teaching should be a fundamental skill developed in teacher training**, as it can enhance the acquisition of other competencies and can even **help to optimize the effectiveness of teaching and learning processes.** ∎

Read the scientific paper >

The future of Smart Cities: the need for effective decision-making tools

Abstract

Evidence-based decision making is promoted as offering efficiency and effectiveness; however, its uptake has faced barriers such as underdeveloped supporting culture, limited access to evidence, and evidence that is not fully relevant. Smart city conceptualizations offer economic and environmental sustainability and better quality of life through evidence-based policy decision-making. We wondered whether smart city theory and practice has advanced the knowledge of evidence-based decision-making. We searched major databases for literature containing a mention of smart cities, decision-making, and policy. We identified relevant literature from a range of disciplines and supplemented these by following backwards and forwards citations. Evidence-based decision-making was found mostly in literature regarding the theory and practice of smart city operations, and, to lesser extents, the articles regarding policy decisions and tactical decisions.

Better decision-making which supported the achievement of city sustainability objectives was reported in some articles; however, we found significant obstacles to the further achievement of city objectives in the areas of underachievement in collaborative decision-making, privileging of big data evidence, and artificial intelligence agents as decision-makers.

We assembled a definition of smart city decision-making and developed an agenda of research which will support city governments, theorists, and practitioners in better achieving sustainability through improved decision-making.

Key words

artificial intelligence   big data collaboration   decision-making evidence-based   local government public administration policy smart city

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Abstract in original language

Faktine informacija grįstas spedimų priėmimas praktikoje vertinamas kaip efektyvus, į kryptingą tobulėjimą orientuotas sprendimų priėmimo būdas. Vis dėlto, praktikoje juo vadovaujantis susiduriama su tokiomis kliūtimis, kaip nepakankamai išvystyta informacijos sisteminimo ir vertinimo metodika, ribota prieiga prie faktinės informacijos ir susidūrimas su informacija, kuri yra faktiškai svarbi, tačiau neaktuali konkrečiame kontekste. Išmanių miestų modelis orientuotas į ekonominio ir aplinkos tvarumo kūrimą bei gyvenimo kokybės kėlimą – abiejų tikslų siekiama būtent per faktine informacija grįstą sprendimo priėmimo procesą, kuriuo vadovaujamasi sprendžiant vidinės politikos klausimus. Šiuo darbu siekėme išsiaiškinti, ar išmanių miestų teorija ir praktika yra pažengusi faktine informacija grįstų sprendimų priėmimo atžvilgiu. Tyrimo metu išanalizavome pagrindines duomenų bazes, ieškodami literatūros, kurioje būtų paminėti išmanūs miestai, sprendimų priėmimas ir politika. Identifikavome atitinkamą literatūrą iš įvairių teminių sričių ir papildėme ją, sekdami tekstuose cituojamus šaltinius ir literatūrą, kurioje remiamasi pirminiais tekstais.

Faktine informacija grįstas sprendimų priėmimas daugiausiai buvo aptartas literatūroje, susijusioje su išmanių miestų veiklos teorija ir praktika. Taip pat - nors ir mažesniu mastu - faktine informacija grįstas sprendimų priėmimas buvo aptariamas straipsniuose apie politinius ir taktinius sprendimus. Kai kuriuose straipsniuose buvo pranešama apie geresnį sprendimų priėmimą, kuris padėjo efektyviau siekti miesto tvarumo tikslų; remdamiesi ištirta literatūra, taip pat nustatėme svarbias kliūtis, trukdančias tolesniam miesto tikslų pasiekimui. Trys pagrindinės kliūtys – tai nepakankamas bendradarbiavimas priimant kolektyvinių pastangų reikalaujančius sprendimus, neproporcingai didelis dėmesys dideliems duomenų rinkiniams faktinės informacijos vertinimo procese, bei augantis dirbtinių intelektinių agentų vaidmuo sprendimų priėmimo procese. Remiantis šiomis įžvalgomis, suformulavome išmanaus miesto sprendimų priėmimo apibrėžimą ir parengėme tyrimų darbotvarkę, kuri paremtų miesto vyriausybes, teoretikus ir praktikus siekiant efektyvesnio tvarumo per pagerintą sprendimų priėmimo procesą.

Article

Smart cities aim to be economically and environmentally sustainable while making life better for everyone. But as progress continues, the concept and development of smart cities increasingly relies on evidence-based decision making, disregarding the complexity and limitations of this approach (lack of support, limited access to useful information, irrelevance of available information etc.).

This paradox is the backbone for "Evidence-Based Public Policy Decision-Making in Smart Cities: Does Extant Theory Support Achievement of City Sustainability Objectives?". This article is authored by David Mills and Steven Pudney (Faculty of Science and Engineering, Southern Cross University, Australia), Primož Pevcin (Faculty of Public Administration, University of Ljubljana, Slovenia) and Jaroslav Dvorak (Department of Public Administration and Political Sciences, Klaipeda University, Lithuania).

In collaboration, the researchers explored the role of evidence-based decision-making in smart city government policy-making. They shared insights from an in-depth analysis of databases about smart cities, decision-making, and policies, highlighting that most of the information about making decisions based on evidence is in literature about how smart cities operate.

Overall, the researchers focused on three types of decision making, looking into literature sources concerning operational decisions (implementing an established policy), policy decisions (planning for the future), and tactical decisions (managerial decisions taken to implement a policy decision).

Together, they identified operational decision-making as the dominant focus of the literature on decision-making, with policy-making being addressed but to a distinctly lesser extent. Besides, they noted that the articles regarding evidence-based policy decisions in smart cities did not carry out examinations of factors impacting performance and capacity of evidence-based decision-making systems. Tactical decision making was mentioned even less frequently, but evidence showed that data used for real-time decision-making were in some instances also used later for tactical and policy decision-making. They also noted that many of the articles on real-time decision-making focused on the experience of road traffic or transportation and mobility, in which decision-making was made by humans in control centres or by artificial intelligence agents. →

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In terms of the impact of evidence-based decisions, they were found to boost the achievement of city objectives at all three - operational, tactical and policy - levels. On a different note, whilst smart city theory places strong emphasis upon citizen participation in decision-making, no evidence of citizens taking part in governance decisions was found. Rather, citizens were invited in to contribute to the wider decision-making process.

Turning to some of the barriers hinder the achievement of sustainable city objectives through better decision-making, the researchers also identified three main obstacles:

——   Underachievement in collaborative decision-making;
——   Overreliance on big data evidence over other forms of evidence;
——   Increasing use of artificial intelligence agents (algorithmic systems, for example) as decision-makers.

Addressing those challenges in a constructive way, the researchers suggested a proactive approach, suggesting changes within city governments and pointing out knowledge gaps that need to be addressed. Firstly, they urged government organizations to find a more efficient way to share data and foster consistent collaboration. Secondly, they pointed out the importance of finding a balanced focus on long-term policy decisions instead of overemphasizing big data. And finally, admitting that AI is becoming more and more prevalent, they noted that more research efforts are needed to understand its impacts and challenges specific to smart cities.

As a final insight, the researchers proposed a definition of smart city decision-making, encouraging others to build upon their literature analysis through empirical research and feedback from cities' experiences. ■

Read the scientific paper >

Interview

The article is not the result of experiments, measurements or observations, but a reflection that develops from a study and synthesis of previous publications on the subject. This is what we call a "state of the art", something we are not necessarily familiar with, which shows that research is a process that gradually accumulates knowledge and that periodically needs to take stock on this knowledge with prospective articles that do not imply "lab experimentation". Could you tell us more about this study?

Jaroslav Dvorak: *We wondered whether smart city theory and practice had advanced the knowledge of evidence-based decision-making. We searched major databases for literature containing a mention of smart cities, decision-making, and policy. We identified relevant literature from a range of disciplines and supplemented these by following backwards and forwards citations.*

Evidence-based decision-making was found mostly in literature regarding the theory and practice of smart city operations, and, to lesser extents, the articles regarding policy decisions and tactical decisions. Better decision-making which supported the achievement of city sustainability objectives was reported in some articles; however, we found significant obstacles to the further achievement of city objectives in the areas of underachievement in collaborative decision-making, privileging of big data evidence, and artificial intelligence agents as decision-makers.

How did you proceed to prepare the article? Did you do a bibliographic research using databases and journals? Did you aim to be exhaustive or instead be selective given the volume of existing publications? Did you use specific tools to speed up this work?

Jaroslav Dvorak

Head of Dept. of Public Administration

& Political Sciences at Klaipeda University

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JD: *Preparing the article and the research itself took quite a long time because, in the initial version, we collaborated only with my colleague dr. David Mills to prepare an article for a special issue I am coordinating in another magazine. Since the selection and reading of the articles took time, and in addition, we realized that some competencies were missing, we each invited one more co-author who had competencies that we needed. A special software was used for the selection of articles. During our research, we found that algorithm-based decision-making in the smart city context is examined in the literature on urban management, urban planning, and transportation and mobility. This means, in the future, AI will be used even more widely and intensively in decision-making.*

Your article is at the intersection of two subjects: on the one hand, "Evidence-based policy decision making" and on the other hand, "Smart cities". Evidence-based policy making is not really a discipline, but rather a process that involves gathering and analysing evidence to inform decision makers. →

This method was first applied in the medical field and has since been applied in a variety of fields, including public policy. Your research area is political science, and more specifically public administration. Can you tell us more about the development of evidence-based practices in the public sphere: is it a practice on which we are beginning to gain some perspective? Are there areas of the public action (justice, education, finance, etc.) where they are more developed and countries where they are more widely applied?

JD: *Along with scientific practice, evidence-based management is concerned with the systematic creation of knowledge and is the basis of ontology, epistemology and methodology. Evidence-based management makes it easier for decision-makers to understand under what circumstances a policy or program works, how to make different measurements and interventions more effective, and what are the unintended side effects of an intervention. In other words, evidence-based government policy tries to foresee future problems and foresee the transitional stages of their solution.*

The knowledge created can reduce uncertainty and ambiguity about the decision being made. Evidence-based management helps to understand why the results were obtained. In other words, it can help civil servants and politicians find objective answers about which measures work well and which don't. The creation of an array of knowledge is likely to reduce uncertainty about the decision being made, and ambiguity cannot be reduced simply by gathering information, as it is itself an expression of many ways of thinking about the same circumstances or phenomenon.

Therefore, evidence-based management is understood as the interpretation of potential or already existing consequences and outcomes of public policy. However, when viewed critically, evidence will not always be objective, as all knowledge is relational and developed in a social context. Known states with powerful intellectual abilities use evidence in decision-making all the time, usually the USA, Great Britain, Australia, Germany and the like.

Smart cities is a cross-disciplinary topic that brings together EU-CONEXUS partner universities as part of the core challenges addressed by the European University Alliance – smart and sustainable development of urban coastal areas. It is a broad concept and can sometimes seem like a catch-all. How do you define it?

JD: *In general, a smart city is the use of various technological solutions to create a better, more convenient, and more attractive city for residents, while also collecting technology data that can contribute to better decision-making.* →

A few key points emerge from the article:

—— Political, philosophical and moral issues surrounding public decision-making: when and how is it legitimate, effective, shared. From the point of view of decision-makers, evidence-based policy offers these guarantees.

—— A very high-tech conception of the smart city, with the development of digital decision-support systems enabling action to be taken in real time, but also in anticipation (strategy and predictive models).

— Data feeding these systems is consequently of paramount importance, not just as a stock but as a flow, produced in huge masses, with different sources that need to be cross-referenced and reconciled. How can we identify and manipulate this data, and prevent it from being privatised?

— Difficulty in defining what data is probative and feeds the evidence: statistics, algorithms, sorting keys, data typology: is all data useful, meaningful, exploitable? The analysis objective we set ourselves also influences the choice and meaning of the data.

— The multiplicity of decision-makers: national and local authorities, economic players, citizens, but also algorithms

Could you comment on your study findings? Why and how these parameters ultimately affect our environment and our way of life?

JD: *Our findings about smart city decision-making led us to recommend a precise definition of smart city decision-making and also to recommend separate streams of research drawing on sources from both outside and within smart cities. These streams of enquiry would seek to better understand both the existing theory and practice as to decision-making, not only by the experience of smart cities, but also in the wider public sector, how successful collaborative decision-making arrangements are sustained in any sector, and the types of evidence used in decision-making, in particular the role of AI as a decision-maker.*

We propose that this knowledge would be interrogated to assist in the development of smart city-specific theory as to decision-making at the operational, tactical, and policy levels.

Yet our wider knowledge as to what works in smart cities, and what does not, leads us to reflect that there are bigger issues beyond the research that we recommend, in the wider smart city ecosystem which may constrain the effectiveness of the reforms possible from that research. A Smart Cities Study conducted in 2017 found that 85% of cities have specific projects to promote smart and digital physical infrastructure; however, only 60% of cities have a formalized smart strategy, raising concerns for us as to whether the areas of research and reform regarding decision-making and evidence on which we focus will be effective in the absence of an overall smart strategy in the city. Similarly, the main barrier observed in the Smart Cities Study was the complexity of the existing bureaucratic processes at the various administrative levels, combined with the lack of coordination and collaboration between actors. This problem was highlighted in 2016 by Meijer and Bolivar, who advocate institutional transformation to achieve collaboration between city government and other city actors. Collaboration delivers shared decision-making. Consequently, we see distinct constraint upon the effectiveness of the decision-making reforms that we advocate research pursues, until institutional changes within city administrations are affected. ■

WATCH THE VIDEO

Future of Smart Cities : the need for effective decision-making tools

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Adaptation pathways to climate change in coastal areas

Nicolas Rocle, Hélène Rey-Valette, François Bertrand, Nicolas Becu, Nathalie Long, Cécile Bazart, Didier Vye, Catherine Meur-Ferec, Elise Beck, Marion Amalric, Nicole Lautrédou-Audouy, 2020. Paving the way to coastal adaptation pathways: an interdisciplinary approach based on territorial archetypes, Environmental Science & Policy, 110, 34-45.
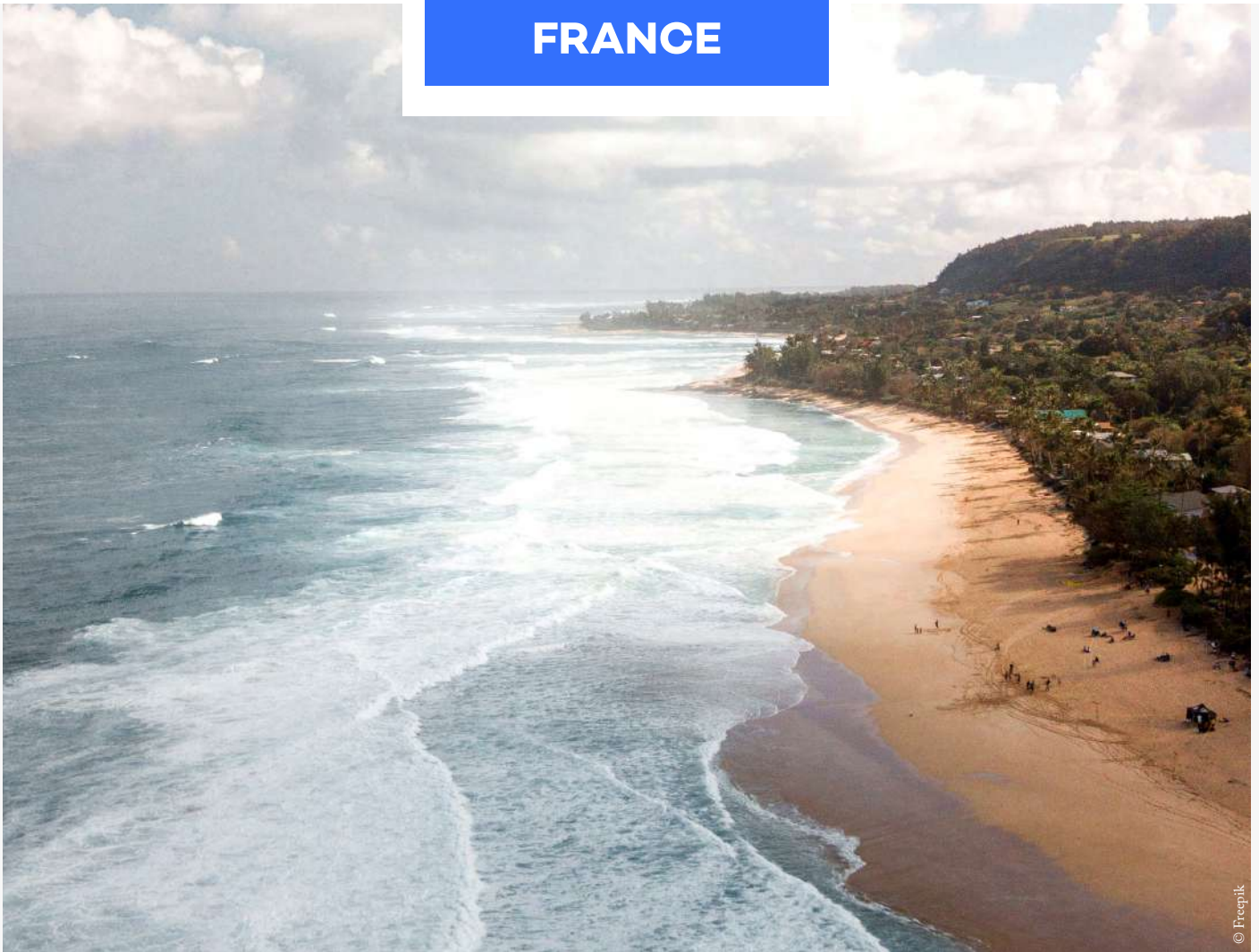
Abstract

The attractiveness and urbanisation of coastal zones increase their vulnerability to climate change and sea-level rise, in particular to flooding and marine erosion. In the face of the projected increase in losses and damages, the anticipation and measures needed for adaptation involve physical, socioeconomic and political dimensions at different governance levels and timescales. A large literature addresses these various issues, generally in a targeted way. Drawing on adaptive policy pathways approaches and on research results of the past decade in mainland France, this article proposes an interdisciplinary characterisation of long-term adaptation pathways in coastal areas. Among the different variables and processes of change that characterise coastal zones and their future, particular emphasis is placed on social and institutional dynamics.

This work contributes to the debate about adaptive governance in a highly uncertain context as well as to recent work to explore pathways and tipping points in support of climate adaptation policies. This work is based on a dozen research programmes, including 10 quantitative surveys (20,000+ people) and the analysis of a dozen governance and adaptation support systems. The work involved geographers, economists, sociologists, modellers, geologists, oceanographers, anthropologists, ecologists and political scientists.

Key words

**Sea-level rise   Adaptation pathways
Anticipation   Climate change
Uncertainty   Interdisciplinarity**

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Abstract in original language 🇫🇷

L'attractivité et l'urbanisation des zones cô-
tières augmentent leur vulnérabilité au chan-
gement climatique et à l'élévation du niveau
de la mer, en particulier aux inondations et à
l'érosion marine. Face à l'augmentation pré-
vue des pertes et des dommages, l'anticipation
et les mesures nécessaires à l'adaptation im-
pliquent des dimensions physiques, socio-éco-
nomiques et politiques à différents niveaux de
gouvernance et à différentes échelles de temps.
En s'appuyant sur les approches des politiques
d'adaptation et sur les résultats de la recherche
de la dernière décennie en France métropoli-
taine, cet article propose une caractérisation
interdisciplinaire des voies d'adaptation à long
terme dans les zones côtières.

Parmi les différentes variables et processus de
changement qui caractérisent les zones côtières
et leur avenir, l'accent est mis sur les dyna-
miques sociales et institutionnelles. Ce travail
contribue au débat sur la gouvernance adapta-
tive dans un contexte très incertain ainsi qu'aux
travaux récents visant à explorer les trajectoires
et les points de basculement en soutien aux
politiques d'adaptation au climat. Ce travail
est basé sur une douzaine de programmes de
recherche, dont 10 enquêtes quantitatives (20
000+ personnes) et l'analyse d'une douzaine
de systèmes de gouvernance et de soutien à
l'adaptation. Ces travaux ont impliqué des
géographes, des économistes, des sociologues,
des modélisateurs, des géologues, des océano-
graphes, des anthropologues, des écologistes et
des politologues.

Article

In a world where climate change is no longer a distant threat but a present reality, coastal communities, with their growing urbanisation, are finding themselves on the front line of a battle against rising sea levels and increased erosion. While a large literature addresses these issues in a targeted way, a new study titled "Paving the way to coastal adaptation pathways: An interdisciplinary approach based on territorial archetypes" conducted by a French research team offers a glimmer of hope, providing a blueprint for survival.

The research, which gathered different fields of study from geographers, economists, sociologists, modellers, oceanographers, to anthropologists, ecologists and political scientists, delves into the complex issue of coastal adaptation to climate change and more particularly to sea-level rise. The team has developed a relevant interdisciplinary approach to characterise long-term adaptation pathways, focusing on social and institutional dynamics. Six territorial archetypes representative of the French coastal territories with different morphological, urban and economic configurations, and levers for adaptation were analysed - for example major coastal cities, rural seaside resorts or islands. In the study, two adaptation trajectories per archetype were proposed depending on a slow or rapid sea-level rise hypothesis.

Drawing on adaptive policy pathways approaches and on research results of the past decade in France, the study explores the levers locally available to anticipate whether conditions to adaptation are favourable or not. It offers an alternative to "hazard-centered" and "globalising" approaches by illustrating a diversity of possible trajectories depending on the social, historical, economic and political systems of the regions concerned. This variety of trajectories reflects territorial differences as well as the importance of governance mechanisms, in particular the key role of learning and anticipation capacities.

The study allows to identify key variables that need to be taken into account in adaptation strategies, such as the financial resources of communities, the attractiveness of the location, the institutional strategy for coastal risk management, triggering natural events, changes in the socio-cultural profile of the population, state-local authority relations, and sense of place. Not only these characteristics have to be considered but their relevance depends on territorial types, and whether the territory is confronted to a slow or a fast sea-level rise.

The study's findings are stark. A rapid rise in sea level significantly reduces the capacity for structural changes in coastal territories. However, the silver lining is that an ambitious and early mitigation policy can result in more robust adaptation. But what does this mean for the people living in coastal areas? The article highlights a range of possible coastal futures depending on territorial configuration. Understanding the potential impacts of climate change on coastal areas is a significant issue for coastal dwellers and could help these regions in developing mitigation strategies. →

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This article differs from adaptation pathway scenarios based on bifurcation trees. The approach developed in this article places greater emphasis on path dependency, on the importance of taking territorial specificities into account, and on the interdependence of economic, political, social and technical factors. The wide range of factors involved goes beyond the role often played by legal and financial constraints alone, and demonstrates the influence of individual and collective strategies and the importance of multi-stakeholder partnerships.

In the face of climate change, survival is not just about resilience; it is about adaptation. This research aims to consider adaptive management in a context of high uncertainty and to propose adaptation decisions depending on territory resources and adaptive capacities. It puts in light the key role of governance arrangements in adaptive capacities.

It could be useful for policymakers in order to anticipate the implementation of strategies and assessing the region's strengths and weaknesses to move towards a particular strategy that protect vulnerable communities from the impacts of sea-level rise.

In conclusion, the study underscores the vulnerability of "fast" sea-level rise scenarios, highlighting their limited resilience and potential for unpredictable structural changes, emphasizing the importance of urgent mitigation policies to ensure equitable and robust adaptation pathways in the face of climate change. ∎

Read the scientific paper >

Malpigmentation of Common Sole affect gene transcription

Abstract

Common sole (Solea solea) is an important species for the aquaculture industry. Defects in pigmentation of the species are very common during rearing. Differences in gene expression between normally pigmented juveniles and those that present both sides full pigmented, ocular and blind, were investigated. Differentially expressed transcripts were functionally annotated, and gene ontology was carried out.

The results indicated that ambicolored juveniles showed a significant upregulation of genes involved in the signal transmission at the synaptic level and regulation of ion channels, affecting the plasticity and the development of the synapses, as well as the transmission of signals or ions through channels.

Key words

Solea solea
next-generation sequencing
pigmentation   ambicoloration
ion channels   synapses

Abstract in original language

Η κοινή γλώσσα (*Solea solea*) είναι ένα οικονομικά σημαντικό είδος για τη βιομηχανία των υδατοκαλλιεργειών. Κατά τη διάρκεια της εκτροφής, το συγκεκριμένο είδος παρουσιάζει χρωματισμούς στο δέρμα που αποκλίνουν από το κανονικό. Στην παρούσα εργασία μελετήθηκε η διαφορική γονιδιακή έκφραση ανάμεσα σε κανονικά χρωματισμένα και αποχρωματισμένα άτομα και εντοπίστηκαν τα γονίδια τα οποία σχετίζονται με αυτήν τη μεταβολή. Τα αποτελέσματα υπέδειξαν γονίδια που σχετίζονται με τη μεταγωγή του σήματος στις συνάψεις και στη ρύθμιση των καναλιών ιόντων. Κατά συνέπεια, φαίνεται να επηρεάζεται η πλαστικότητα και η ανάπτυξη των συνάψεων, καθώς και η μεταγωγή των σημάτων και η ιοντοανταλλαγή.

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Article

In a research published in 2021, a group of researchers including Menelaos Kavouras from the University of Thessaly and Emmanouil Malandrakis from the Agricultural University of Athens in Greece investigated the differences in gene transcription levels between normal and ambicolored (both sides pigmented) common sole individuals, to identify biological and molecular pathways that affect the pigmentation process.

Flatfish display a chromatic asymmetry: the mild to dark coloration of the ocular (upper) side aims to conceal and make them difficult to track by emulating the shades of the seafloor environment. Flatfish also present a lower "blind" side, which is usually white. This chromatic pattern appears during the metamorphosis, a stage during which the eyes also migrate to the upper side.

Defects in pigmentation of the species are very common in farmed conditions. External factors such as stress conditions, dietary composition, and endocrine disorders are also related to the pathways involved in pigmentation, provoking malpigmentation such as ambicoloration (both sides are fully pigmented), pseudo-albinism (depigmentation of the upper side), and hypermelanosis (blind side presents dark spots).

In order to investigate the differences in gene transcription levels between normal and ambicolored individuals, the researchers extracted RNA from 9 normal pigmented individuals and 9 ambicolored ones. The samples were chosen from a population that has been controlled and acclimated since the larval stage.

This research pointed out the link between pigmentation and crucial functions of the central nervous system, but also the transport through ionic channels, muscular and cardiac function, and others. The association of pigmentation with the development of the nervous system, suggests that it is easily disrupted since the beginning of development.

Deviation from normal pigmentation has an impact on the survival of the species in the marine environment, as well as on the sale price of the farmed animals. Anomalies in chromatic patterning are rarely seen in the wild flatfish population.

Better farming conditions for soles comes from understanding biological and molecular pathways. And better farming conditions means a higher survival rate, and less expensive common soles for the customer. ∎

Read the scientific paper >

Linking for longevity: the durability factor in submarine power cables

Abstract

Multi-strand, copper conductors in submarine power cables (SPCs) for offshore wind are susceptible to fretting wear and fatigue, due to multiplicity and complexity of contacts, subjected to potentially severe dynamic loading. This paper presents (i) a global-local methodology for coupled hydro-aero-elastic dynamic loading of a representative SPC for identification of local inter-wire fretting-related conditions, (ii) fretting wear characterisation of copper conductor material, and (iii) local fretting multiaxial wear-fatigue finite element models for fretting fatigue life assessment of SPC copper conductor contacts.

Predicted fretting fatigue lives are shown to be consistent with previously published bending fatigue test data on SPC copper conductors. Fretting fatigue life is shown to be significantly affected by aero-hydrodynamic loading, wear, slip regime and wire diameter.

Key words

**Fretting Fatigue   Fretting wear
Life prediction   Finite element models
Submarine Power Cables
Offshore renewable wind**

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Article

In a study that could revolutionise the renewable energy sector, a team of researchers has made significant strides in understanding the wear and surface damage of submarine power cables used in offshore wind energy systems. This research is a collaboration between researchers in the University of Galway led by Seán B. Leen, and Sinéad O'Halloran at South East Technological University in Waterford and includes industry partners, Wood plc.

Offshore wind turbines, floating in the sea, are a promising source of clean energy. But the power they generate needs to be transmitted to the grid through submarine power cables. These cables face a lot of stress and friction, leading to wear and cracking over time. The team's research delves deep into this issue, aiming to make these cables more durable and efficient.

The researchers developed a four-step computer simulation to predict how these cables behave under various conditions. They conducted simulations of the cables at four different scales under different wind speeds to see how much tension and bending the power cables could withstand. Think of it as a virtual stress-test for power cables. This model helps them understand how much

resistance the cables face when parts rub against each other.

But the team didn't stop at simulations. They put their theories to the test with real-world materials and tested copper used in the cables to measure its friction and wear parameters under different conditions.

The study also provides a handy guide to the different types of cables used in offshore wind energy. Some cables are designed to stay put or be buried under the seabed, while others need to be flexible to connect moving platforms.

So, why does all this matter to you and me? Well, more durable and efficient power cables mean offshore wind farms can transmit more power, more reliably. This can lead to lower energy costs, more stable power supply, and a big step forward in our shift away from fossil fuels. In the fight against climate change, every bit of efficiency counts!

In a world increasingly turning to renewable energy, this research is not just about power cables. It's about powering our future in a sustainable way. ∎

Read the scientific paper >

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