



POSVET V OKVIRU TSG3: GRADBENI POSEGI V MORJU IN NA MORSKEM OBREŽJU IN DOSEGANJE DOBREGA OKOLJSKEGA STANJA MORJA CONSULTATION WITHIN TSG3: CONSTRUCTION ACTIVITIES IN THE SEA AND ON THE SEASHORE AND ACHIEVING GOOD ENVIRONMENTAL STATUS OF THE SEA

Povzetek posveta / Summary of the consultation

Uvod / Introduction

Med številnimi dogodki 9. Tedna sredozemske obale in makroregionalnih strategij je v okviru okoljskega stebra Jadransko Jonske makrostrategije (EUSAIR) potekal tudi posvet na temo gradbenih posegov v morju in na morskem obrežju in doseganju dobrega okoljskega stanja morja. Posvet je bil organiziran na osnovi programa dela Nacionalnega odbora Desetletja oceanov (NODO), ki deluje pod okriljem Slovenske nacionalne komisije za UNESCO in s sodelovanjem Tematske usmerjevalne skupine EUSAIR za kakovost okolja ter Javnim zavodom za spodbujanje podjetništva in razvojne projekte Občine Izola. Tako Temarska usmerjevalna skupina kot JZP Občine Izola sta namreč tudi vključena v projekt Spodbujanje trajnostne rasti Jadransko-jonske regije z implementacijo integralnega upravljanja obalnih območji ter pomorskega prostorskega načrtovanja kot prispevek k skupnemu regionalnemu načrtovanju ICZM po Barcelonski konvenciji na ravni EUSAIR.

Poglavitni namen posveta je bil spodbuditi razpravo o preprečevanju ali zmanjševanju negativnih vplivov na morski ekosistem ob gradbenih posegih v morju in na morskem obrežju. Razprave in pogovori na to temo so nedvomno aktualni, tako zaradi predvidenega poseganja v obalni pas med Izolo in Koprom in siceršnje gradnje infrastrukture, namenjene turizmu in rekreaciji, še bolj pa v luči bistveno bolj pomembnih in nedvomno tudi bolj potrebnih posegov namenjenih prilagajanju podnebnim spremembam in dvigovanju morske gladine. Vse navedeno namreč ne more mimo dejstva, da nam okoljska zakonodaja nalaga zagotavljanje dobrega okoljskega stanja morja, kar med drugim pomeni tudi varovanje ogroženih vrst in življenjskih okolij ter ohranjanje celovitosti in funkcionalnosti struktur na morske dnu. Poiskati je torej treba rešitve, ki bodo spremenile / preobrazile naš dosedanji način ravnanja z morjem in morskim obrežjem ter s tem tudi pri načrtovanju in izvajanju gradbenih posegov zagotovile uresničevanje ciljev trajnostnega razvoja.

Posvet je bil razdeljen na štiri sklope. V prvem sklopu so strokovnjakinje in strokovnjaki z geološkega oddelka Naravoslovnotehniške fakultete, z Morske biološke postaje Nacionalnega inštituta za biologijo in z Agencije RS za okolje predstavili naravne danosti slovenskega morja in morskega obrežja, od geoloških in geomorfoloških značilnosti in biotske pestrosti, do možnih scenarijev dvigovanja morske gladine.

V nadaljevanju posveta so bili prispevki predstavnic in predstavnikov Fakultete za gradbeništvo in geodezijo Univerze v Ljubljani ter sodelavk in sodelavcev na področju urbanizma in prostorskega načrtovanja namenjeni nedavno sprejetemu Morskemu prostorskemu planu Slovenije, ki določa rabo morskega prostora ter pogoje zanjo ter zahtevam in značilnostim gradenj v morju in na morskem obrežju. Posebej je bilo poudarjeno, da se s predvidenim dvigovanjem morske gladine pomembno povečuje delovanje valov na umetne in naravne strukture. Kar nekaj razprave je bilo namenjeno tudi nekaterim zamislim izvedbe protipoplavne zaščite Pirana, saj je akvatorij okoli piranske punte med najpomembnejšimi deli slovenskega morja z vidika ohranjanja biotske pestrosti ter zavarovan kot naravni spomenik.

V popoldanskem delu posveta so sodelujoči najprej razpravljali o potencialnih in dejanskih negativnih vplivih, ki jih povzročajo gradbeni posegi v morju in na morskem obrežju. Izpostavljeni



so bili predvsem vplivi na življenjske pogoje posameznih vrst in združb zaradi podvodnega hrupa, spreminjanja morfologije obrežja in morskega dna, hidrodinamike, resuspenza sedimenta ipd. ter posledično na izgubo biotske pestrosti. Ob negativnih vplivih na morske organizme in združbe je bil poudarjen tudi velik vpliv gradenj na podobo morske krajine, na našo zaznavo in nenazadnje tudi na identiteto prostora.

Posvet se je zaključil s predstavitvami in razpravo o nedavno sprejetem zakonu EU o obnovi narave, o temeljnih razlogih za izgubo biotske pestrosti in možnih spremembah dosedanjih praks, vključno z dojemanjem morskega in obalnega okolja kot praznega prostora, pripravljenega za tako ali drugačno rabo ter na nujnost izboljšanja razumevanja kumulativnih vplivov stresorjev na morski in obrežni ekosistem.

Among the many events of the 9th Mediterranean Coast and Macroregional Strategies Week, a panel on construction interventions in the sea and on the seafront and achieving good environmental status of the sea took place within the framework of the Environmental Pillar of the Adriatic-Ionian Macrostrategy (EUSAIR). The consultation was organised on the basis of the work programme of the National Ocean Decade Committee, which operates under the auspices of the Slovenian National Commission for UNESCO and with the cooperation of the EUSAIR Thematic Steering Group on Environmental Quality and EUSAIR Facility point of the Municipality of Izola. Both are namely involved in the project Promoting Sustainable Growth in the Adriatic-Ionian Region through the Implementation of Integrated Coastal Zone Management and Maritime Spatial Planning as a contribution to the joint regional ICZM planning under the Barcelona Convention at the EUSAIR level.

The main purpose of the consultation was to stimulate debate on how to prevent or reduce negative impacts on the marine ecosystem from construction activities in the sea and on the seashore. Discussions and debates on this topic are undoubtedly topical, both in the light of the planned encroachment on the coastal zone between Izola and Koper and the construction of infrastructure for tourism and recreation, but even more so in the light of the much more important and undoubtedly more necessary encroachments aimed at adapting to climate change and sea level rise. All of the above cannot overlook the fact that environmental legislation requires us to ensure the good environmental status of the sea, which means, among other things, protecting endangered species and habitats and maintaining the integrity and functionality of structures on the seabed. Solutions must therefore be found to change/transform the way we have been treating the sea and the seafront, thereby ensuring that the objectives of sustainable development are met in the design and implementation of construction interventions.

The consultation was divided into four parts. In the first part, experts from the Geology Department of the Faculty of Natural Sciences and Engineering, the Marine Biological Station of the National Institute of Biology and the Slovenian Environment Agency presented the natural features of the Slovenian sea and sea coast, from geological and geomorphological characteristics and biodiversity to possible sea level rise scenarios.

The conference continued with contributions by representatives of the Faculty of Civil Engineering and Geodesy of the University of Ljubljana and colleagues in the field of urban and rural planning on the recently adopted Marine Spatial Plan of Slovenia, which defines the use of marine space and the conditions for it, as well as on the requirements and characteristics of construction in the sea and on the sea shore. In particular, it was pointed out that the projected rise in sea level significantly increases wave action on man-made and natural structures. Some discussion was also devoted to some ideas for the implementation of flood protection in Piran, as the area around the Piran punta is one of the most important parts of the Slovenian sea in terms of biodiversity conservation and is protected as a natural monument.

In the afternoon session, participants first discussed the potential and actual negative impacts caused by construction activities in the sea and on the seashore. In particular, impacts on the habitats of species and communities due to underwater noise, changes in the morphology of the coast and seabed, hydrodynamics, sediment resuspension, etc., and the consequent loss of biodiversity were highlighted. In addition to the negative impacts on marine organisms and communities, the major impact of the developments on the seascape, on our perception of it and, ultimately, on the identity of the area was also highlighted.

The consultation concluded with presentations and discussion on the recently adopted EU Nature Recovery Act, the underlying causes of biodiversity loss and possible changes to current practices, including the perception of the marine and coastal environment as an empty space ready to use, and the need to improve understanding of the cumulative impacts of stressors on marine and coastal ecosystems.

Povzetki predstavitev / Abstracts of the presentations

Geologija slovenske obale / *Geology of the Slovenian Coast*

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Območju slovenske obale sestavljajo več sto metrov debela zaporedja eocenskih flišnih kamnin, z izjemo območja Izole, kjer so prisotni paleocensko-eocenski alveolitno-numulitni apnenci. Ti so nastali pri sedimentaciji karbonatov na jadransko-dinarski karbonatni platformi, ki je v paleogenu razpadla. Območje se je poglobilo, oblikoval se je predgorni bazen, kjer so nastajale flišne kamnine. Od konca miocena do danes je na tem območju Istrsko-Furlanska cona podrivanja zaradi katere so tu nastale narivne strukture, med drugim tudi Izolska antiklinala. Pod morjem flišne in karbonatne kamnine prekrivajo več sto metrov debeli pliokvartarni kontinentalno-morski sedimenti. Nad njimi najdemo še nekaj metrov holocenskih morskih sedimentov. Na morskem dnu se pojavljajo antropogene (predvsem zaradi Luke Koper) in naravne geomorfološke oblike. Med naravne spadajo barhanske dune, kotanja pred rtom Madona, paleostruge ter podmorske kotanje z žveplenimi izviri.

The Slovenian coastal area consists of Eocene flysch sequences several hundred metres thick, with the exception of Izola, which consists of Palaeocene-Eocene alveolite-numulite limestones. These were formed by the sedimentation of carbonates on the Adriatic-Dinaric carbonate platform, which disintegrated in the Paleogene. The area deepened and a foreland basin was formed where the flysch was deposited. From the end of the Miocene to the present day, the area has been part of the Istria-Friuli underthrust zone, resulting in the formation of thrust structures, including the Izola anticline. Under the sea, the flysch and carbonate rocks are covered by Plio-Quaternary continental-marine sediments several hundred metres thick. Above them, there are a several metres of Holocene marine sediments. The seabed is characterised by anthropogenic (mostly due to the Port of Koper) and natural geomorphological forms. The latter include barchan dunes, the Cape Madona scour, paleo-river channels, as well as submarine pockmarks with sulphurous springs.

Morsko dno in bentoški habitatni tipi, združbe in vrste v slovenskem morju / *Sea bottom and benthic habitat types, communities and species in the Slovenian Sea*

Borut Mavrič, Nacionalni inštitut za biologijo – Morska biološka postaja / *National Institute of Biology - Marine Biology Station*

Slovensko morje je vroča točka biotske raznovrstnosti, kar se izkazuje v številu bentoških habitatnih tipov, združb in vrst, ki jih gosti. Med njimi je tudi več ogroženih in redkih vrst ter različni pomembni

habitatni tipi, predvsem tisti biogenega izvora, kot je na primer koralni greben. Čeprav je slovensko morje zelo plitvo, s povprečno globino 17 m, cirkalitoralni pas predstavlja okoli 97 % celotne površine morskega dna, ki se začne že okoli 10 m globine. Infra- in mediolitoral zavzemata le ozek pas ob obali. Razlog za veliko opaženo biotsko pestrost je heterogenost okolja, natančneje velika prostorska heterogenost in velika nihanja drugih okoljskih pogojev, kot so slanost, temperatura itd. Zaradi majhnosti slovenskega morja (213 m²) in velike mozaičnosti morskega dna so tudi populacije, združbe in habitatni tipi zelo majhni, njihova razširjenost pa pogosto razdrobljena, posledično pa so zato tudi bolj ranljivi oz. občutljivi za različne pritiske.

The Slovenian Sea is a biodiversity hot spot, which is reflected in the number of benthic habitat types, communities and species it hosts. Amongst them are also several endangered and rare species as well as different important habitat types, especially those of biogenic origin, such as for example coral reef. Although the Slovenian Sea is very shallow, with average depth of 17 m, circalittoral belt represents around 97 % of the whole surface area of the sea bottom, starting already around 10 m depth. Infra- and mediolittoral occupy only a narrow strip along the coast. The reason for high diversity observed is the environmental heterogeneity, more specifically spatial heterogeneity and high variations in other environmental conditions, like salinity, temperature, etc. Due to smallness of the Slovenian Sea (213 m²) and high mosaicity of the sea bottom, populations, communities and habitat types are very small, and their distribution often fragmented and consequently also more susceptible to different pressures.

Dvig gladine morja in obalne poplave v severnem Jadranu / *Mean Sea Level Rise and Coastal Flooding in the Northern Adriatic*

Matjaž Ličer, Agencija RS za okolje in Nacionalni inštitut za biologijo – Morska biološka postaja / *Slovenian Environment Agency and National Institute of Biology - Marine Biology Station*

Predstavitev obravnava izzive, povezane z dvigom srednje gladine morja in obalnimi poplavami v severnem Jadranu s poudarkom na slovenski obali. Na podlagi podatkov in projekcij IPCC ter drugih virov raziskuje zgodovinske trende dviga gladine morja v Koprju ter morebitne prihodnje scenarije, vključno z ekstremnimi dogodki, kjer bi se srednja gladina morja lahko nad običajne projekcije dvignila še za dodaten meter. Verjetnost takšnih dogodkov je morda nizka, vendar so potencialne posledice ogromne, kar zahteva strateško načrtovanje in oceno tveganj za ublažitev prihodnjih vplivov.

This presentation addresses the challenges of sea level rise and coastal flooding in the Northern Adriatic, with a focus on the Slovenian coastline. Based on data and projections from IPCC and other sources, it explores the historical trends of sea level rise in Koper and potential future scenarios, including extreme events where the water level could rise by up to an additional meter above the usual projections. The probability of such events may be low but the potential damage is immense, calling for strategic planning and risk assessments to mitigate future impacts.

Pomorski prostorski plan Slovenije – tri leta po sprejetju / *Slovenian Maritime Spatial Plan – Three years after Adoption*

Gregor Čok, Univerza v Ljubljani, Fakulteta za gradbeništvo in geodezijo / *University of Ljubljana, Faculty of Civil and Geodetic Engineering*, **Manca Plazar**, s.p., arhitekturna in urbanistična dejavnost / *Architectural and Urban Planning Activities*

Slovenija je leta 2021 kot prva država v vzhodnem Sredozemlju sprejela pomorski prostorski plan. Plan uvaja številne inovacije na področjih prostorsko razvojnih in varstvenih prioritet, usklajevanja interesov na kopnem in morju, opredelitve upravnih pristojnosti ter podaja nabor prostorskih in upravljaljskih ukrepov za njegovo izvajanje. Plan obsega tudi določbe glede načrtovanja obalnega pasu, kateri se praviloma načrtuje v okviru Občinskih podrobnih prostorskih načrtov (OPPN). V prispevku so predstavljene določbe plane, ki imajo posreden ali neposreden vpliv na načrtovanje, oblikovanje in dimenzioniranje intervencij v obalnem pasu. Predstavljen je tudi seznam do sedaj izvedenih aktivnosti in projektov. Tri leta po uveljavitvi ugotavljamo, da se plan izvaja skladno s pričakovanji. V tem obdobju so se izvedle ali pričele izvajati številne naloge, tako v domeni sektorskih resorjev kot lokalnih skupnosti.

In 2021, Slovenia was the first country in the Eastern Mediterranean to adopt a Maritime Spatial Plan. The plan contains numerous innovations in the fields of spatial development and conservation priorities, coordination of interests on land and sea, designation of authorities and provides a set of spatial planning and management measures for its implementation. The plan also contains provisions on planning for the coastal zone planning, which is generally planned within the framework of municipal detailed spatial plans (OPPNs). The paper presents the provisions of the plan that have an indirect or direct influence on the planning, design and dimensioning of interventions in the coastal zone. It also presents a list of activities and projects carried out to date. Three years after implementation, we can state that the plan is being implemented as expected. During this period, numerous tasks have been carried out or started, both in the domain of sectoral departments and in the local communities.

Geotehnika in obalne konstrukcije / Challenges of geotechnical engineering of coastal structures

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Predstavitev je zaradi interdisciplinarnosti udeležencev dogodka zastavljena kot seznanitev udeležencev o tem kaj geotehnika sploh je, s čim se ukvarja, kaj so njene posebnosti znotraj gradbeništva. Uvodoma predstaviva še celo posebnosti gradbeništva glede na druge inženirske panoge, saj gre za industrijo unikatnih izdelkov, pri čemer vsak objekt gradimo samo enkrat v edinstvenih okoliščinah. Še prav posebej pa to velja za geotehniko, ki povezuje značilnosti lokalnih tal, grajen ali načrtovan objekt in druge lokalne danosti, kot so podzemna voda, vremenske značilnosti. Prispevek prikaže osnovne značilnosti tal v Koprskem zalivu. Tehnični izzivi, ki sledijo iz geološke zgradbe, so zlasti temeljenje obalnih konstrukcij na zelo mehkih tleh oziroma stabilnost strmih brežin na flišnih klifih. Dodatne izzive pa predstavljajo zahteve po zmanjševanju okoljskih obremenitev in ohranjanju naravnih virov ter spremenljivost pogojev in obremenitev konstrukcij zaradi klimatskih sprememb, tehnološkega napredka in zahtev standardov za projektiranje gradbenih konstrukcij.

The presentation is designed to introduce participants to what geotechnics is, what it deals with, and its specificities within civil engineering, due to the interdisciplinary nature of the event. Initially, we will

also present the peculiarities of construction compared to other engineering fields, as it is an industry of unique products, where each structure is built only once in unique circumstances. This is especially true for geotechnics, which connects the characteristics of local soils, the built or planned structure, and other local conditions such as groundwater and weather characteristics. The contribution shows the basic characteristics of the soils in the Koper Bay. The technical challenges arising from the geological structure are particularly the foundation of coastal structures on very soft soils and the stability of steep slopes on flysch cliffs. Additional challenges include the requirements for reducing environmental impacts and preserving natural resources, as well as the variability of conditions and loads on structures due to climate change, technological developments, and the requirements of standards for the design of structures.

Obremenitve obalnih konstrukcij ob dvigu morske gladine / *Loads on coastal structures due to sea level rise*

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Dvig morske gladine vpliva tudi na višino in delovanje valov na obalo. Preoblikovanje valov na obali je odvisno od globine, naklona dna in značilnosti valov na odprtem morju. Obalo lahko dosežejo višji valovi in prelijejo obalne konstrukcije, valovi se lahko rušijo bližje obali ali neposredno na obalnih konstrukcijah ali pa se spremeni način rušenja valov. Višji valovi lahko povzročijo močnejše erozijske tokove ob obali. Za zagotovitev varnosti in stabilnosti obale je zato treba obstoječe strukture nadgraditi ali sprejeti nove ukrepe na obali ali v morju pred obalo. Na grajeni obali je ena od rešitev nadvišanje in ojačanje obstoječih obalnih konstrukcij. Za uravnavanje rušenja valov pred obalo je mogoče zgraditi potopljene valobrane. Skalomete je treba podaljšati in dimenzionirati na pričakovane valove. Ukrepi za preprečevanje erozije obale vključujejo jezbe, obloge in z obalo nepovezane valobrane. Ustrezni ukrepi morajo biti sprejeti v konsenzu med prostorskimi načrtovalci, biologi in gradbenimi inženirji.

Sea-level rise also affects the height and impact of waves on the coast. The transformation of waves at the coast depends on the depth, the slope of the seabed and the wave characteristics in the open sea. Higher waves may reach the shore and overtop coastal structures, wave breaking may occur closer to the shore or directly on coastal structures, or the way waves break may change. Higher waves can lead to stronger erosive currents along the coast. Existing structures should therefore be upgraded or new measures should be taken on the coast or offshore to ensure the safety and stability of the coast. On the built coast, one solution is to raise and strengthen existing coastal structures. Submerged breakwaters can be used to regulate the breaking of waves in front of the coast. Rock revetments need to be extended and designed according to the expected waves. Measures to prevent coastal erosion include groynes, revetments and detached breakwaters. Appropriate measures must be adopted in consensus between spatial planners, biologists and civil engineers.

Poplavna varnost Pirana v luči podnebnih sprememb / *Flood safety in Piran in the perspective of climate changes*

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V prispevku so predstavljeni rezultati analize vpliva spremenjene pojavnosti poplav morja ob upoštevanju različnih scenarijev dviga srednje gladine morja ter posledičen obseg poplavne škode na območju mesta Piran. Ocena izpostavljenosti prebivalstva in raznih prostorskih elementov znotraj mesta Piran je bila izvedena s prekrivanjem hidrološko povezanih poplavnih površin z različnimi nabori prostorskih podatkov. Obsegi poplavljanja in porazdelitve globine vode na poplavnih območjih so bili uporabljeni kot vhodni podatki v model KR PAN za oceno poplavne škode za različne scenarije dviga srednje gladine morja. Ocene škode so bile izvedene z upoštevanjem različnih povratnih dob poplav morja in nadalje uporabljene za izdelavo verjetnostnih škodnih krivulj. Rezultati študije so pokazali, da se bo pogostost pojavljanja sedanjih ekstremnih poplav morja na slovenski obali drastično povečala za približno faktor 2 na vsakih 10 cm dviga morske gladine. Rezultati jasno kažejo, da bo poplavna škoda na območju mesta Piran zaradi dviga morske gladine vse večja in da se bo lokalna skupnost morala neizbežno soočiti z vse večjimi posledicami naraščajoče gladine morja.

This paper presents the results of an analysis of the impact of changing sea flood incidences under different scenarios of mean sea level rise and the resulting extent of flood damage in the area of Piran. The assessment of the exposure of the population and various spatial elements within the city of Piran was carried out by overlaying hydrologically connected floodplains with different spatial datasets. The inundation extents and water depth distributions in the floodplains were used as inputs to the KR PAN model to estimate flood damage for different scenarios of mean sea level rise. Damage estimates were made taking into account different return periods of sea flooding and further used to generate probabilistic damage curves. The results of the study showed that the frequency of occurrence of current extreme sea floods on the Slovenian coast will increase dramatically by a factor of about 2 for every 10 cm of sea level rise. The results clearly show that flood damage in the Piran area will increase due to sea level rise and that the local community will inevitably have to cope with the increasing consequences of rising sea levels.

Vplivi antropogenega hrupa na velike morske vretenčarje / Effects of anthropogenic noise on large marine vertebrates

Jure Železnik, Morigenos – slovensko društvo za morske sesalce in Univerza v Aarhusu / *Morigenos – Slovenian Marine Mammal Society & Aarhus University – Department of Ecoscience, section for Marine Mammal Research*

Zvok je ključnega pomena v morskih okoljih in zajema biofonijo, geofonijo ter antropofonijo. Antropofonija, hrup iz človeških dejavnosti, kot so ladijski promet, gradnja in raziskovanje virov, vse bolj moti akustično okolje, bistveno za življenje morskih živali. Te vrste uporabljajo zvok za funkcije, kot so parjenje, iskanje hrane, navigacija in izogibanje plenilcem. Antropogeni hrup lahko povzroči akustično maskiranje, kjer so biološki zvoki preglaseni, kar otežuje komunikacijo, v hujših primerih pa tudi poškodbe sluha. Za oceno dolgoročnih vplivov antropogenega hrupa na vrste in ekosisteme potrebujemo boljše metode monitoringa in modeliranja. Potrebne so tudi strategije za zmanjšanje hrupa, kot so tihe cone, tehnologije za zmanjševanje hrupa (npr. mehurčkaste zavese) in uvedba standardov in predpisov. Te rešitve lahko znatno zmanjšajo podvodni hrup, zaščitijo morske vretenčarje in ohranijo ekosisteme.

Sound is crucial in marine environments, consisting of biophony, geophony, and anthropophony. Noise from human activities such as shipping, construction, and energy exploration, increasingly disrupts the acoustic environment vital to marine life. Marine species depend on sound for essential functions like mating, foraging, navigation, and predator avoidance. Anthropogenic noise can cause acoustic masking, where critical biological sounds are drowned out, hindering communication. In worse cases it can also lead to hearing damage. In order to assess the effects of the long-term impacts of noise species and ecosystems we need to resort to better continuous monitoring and modeling. Besides that, effective noise reduction strategies should take place, such as: establishing quiet zones, bubble curtains, and setting noise standards and regulations. These combined approaches can significantly reduce underwater noise levels, protect marine vertebrates, and maintain ecosystem integrity.

Obalne gradnje in njihovi pritiski ter vplivi na bentoške habitatne tipe, združbe in vrste v slovenskem morju / *Coastal constructions and their pressures and impacts on benthic habitat types, communities and species in the Slovenian Sea*

Borut Mavrič, Nacionalni inštitut za biologijo – Morska biološka postaja / *National Institute of Biology - Marine Biology Station*

Slovensko morje je del visoko urbaniziranega območja in je izpostavljeno številnim antropogenim dejavnostim in obremenitvam. Kar zadeva obalno območje, je le približno 20 % ohranjenih v skoraj naravnem stanju, preostanek pa je pod pritiskom zaradi urbanizacija in obalnih gradenj. Najhujši vplivi se kažejo na območjih, kjer je bilo morje spremenjeno v kopno. Največji tak poseg v novejšem času se je zgodil na območju industrijskega pristanišča v Kopru, v zadnjih letih pa so bili odvzemi morskega območja namenjeni predvsem izgradnji turistične in rekreacijske infrastrukture. Eden najbolj zaželenih ukrepov upravljanja obale na območju kopališč je vnos rečnega proda. Ta alohton material ustvarja habitatne tipe, ki v našem morju niso naravno prisotni in so biotsko zelo revni, saj gostijo zelo malo organizmov. Obalni zaščitni objekti neposredno vplivajo predvsem na mediolitoralni in zgornji infralitoralni pas, pri čemer močno zmanjšajo njihovo površino, spremenijo pa tudi sestavo in zgradbo morskega dna. Na večini takih konstrukcij se pojavljajo vrste in skupnosti, ki se razlikujejo od naravnih, med njimi je tudi veliko neavtohtonih vrst.

The Slovenian Sea is part of highly urbanised area and is exposed to many anthropogenic activities and pressures. Regarding the coastal area, only about 20 % remains in near natural condition, the rest is adversely affected by urbanisation and coastal construction. The most severe consequences seen are several land claims, where the sea was turned into dry land. The biggest recent land claim happened in the area of the industrial port in Koper, but there were also more recent land claims, designated mainly for touristic and leisure facilities. One of the most desired coastal management actions in bathing areas is introduction of riverine gravel. This allochthonous material creates habitat types that are not naturally present in our sea and host really low number of organisms. Coastal protection facilities directly affect mainly mediolittoral and upper infralittoral belt, severely diminishing their surface area, but also changing the composition and structure of the seabed. Most such constructions promote presence of species and communities different from naturally occurring, amongst them many non-indigenous species.

Analiza zasipavanj podvodnih habitatov na primeru Kopskega zaliva / *Analysis of underwater habitats burial in the study case of Koper bay*

Rok Soczka Mandac, Inštitut za vode RS / *Institute for Water of the Republic of Slovenia*

Zaradi različnih interesov se je obala Koprskega zaliva v zadnjih desetletjih močno spreminjala, kar vpliva na spreminjanje prostorskih porazdelitev rečnih vnosov plavin (sedimentov) in neposredno tudi na zasipavanje bentoških habitatov. Za razumevanje prostorskih in časovnih dinamik vnosa rečnih plavin v priobalnem morju, na primeru Koprskega zaliva, so potekale meritve in analize širokega nabora podatkov ter modeliranje. Rezultati analiz nakazujejo na večje količine vnesenih rečnih plavin (18×10^3 ton/letno) in posedanja 31 kg m^{-2} plavin predvsem v bližini ustja reke Rižane. V analizi je vključen primer ocene povzdigovanja morskega sedimenta zaradi manevra ladji pred Luko Koper, ki je ocenjena na 100 ton povzdignjenega sedimenta za obravnavani primer. Rezultati analiz vpliva manevra ladij nakazujejo na dodaten vir zasipavanja bentoških habitatov zaradi povzdigovanja in premeščanja sedimenta.

Due to various interests, the coastline of the Gulf of Koper has changed considerably over the last decades, changing the spatial distribution of riverine inputs of sediment and directly affecting benthic habitats. In order to understand the spatial and temporal dynamics of fluvial sediment input in the coastal sea (Gulf of Koper), a wide range of data was measured, analysed and modelled. The results of the analyses indicate significant amounts of river sediment input (18×10^3 tonnes/year) and sedimentation of 31 kg m^{-2} mainly in the vicinity of the mouth of the Rižana River. The analysis also includes the case of resuspension of marine sediment due to the manoeuvring of a ship in front of the Port of Koper, which in this case amounts to about 100 tonnes of resuspended sediment. The results of the ship manoeuvring impact analyses suggest an additional source of sediment burial of benthic habitats due to sediment resuspension and relocation.

Morske krajine - med spremembo in ohranjanjem / *Sea Landscapes – between change and conservation* **Tina Trampuš, Bela breza – svetovanje za sobivanje z naravo**

Morje je bistvo morskih krajin. Vse kar v njem ali ob njem gradimo, vpliva na njegovo dinamiko in podobo ter našo zaznavo prostora. Čeprav je prostrano, imajo največji vpliv posegi na obali in v ožjem obalnem pasu. Spremembe so stalnica, tako zaradi naravnih dejavnikov, kot tudi gradnje, s tem pa se spreminja tudi identiteta prostora. Morske krajine privlačijo zaradi vode, raznolikosti in odprtosti. V prostoru navidezne neskončnosti je 'morje' interesov. Gradnja pomeni trajne posege za redne ali le občasne dejavnosti. Bomo znali s spoštovanjem prisluhniti kakovostim ter ohraniti danosti in identiteto edinstvenih krajin Sredozemlja?

The Sea is the essence of Seascales. Everything we build in it or on the shore affects its dynamics and image, as well as our perception of space. Although it is vast, interventions in the narrow coastal zone have the greatest impact. Changes are a constant, both due to natural factors and construction, and with this the identity of the space also changes. Seascales are attractive because of water, diversity and openness. In the space of apparent infinity there is a 'sea' of interests. Construction means permanent interventions for regular or only occasional activities. Will we be able to respect the qualities and preserve the givens and identity of the unique landscapes of the Mediterranean?

Obnova narave v kontekstu znanosti in politike: kaj pomeni za gradnjo? / *The imperative of restoration of nature – what does it mean for construction in the Sea and on the Seashore*

Jerneja Penca, ZRS Koper, Mediteranski inštitut za okoljske študije / *Science and Research Centre Koper, Mediterranean Institute for Environmental Studies*

Ukrepi, namenjeni obnovi narave, so pridobili moč kot ključna komponenta varstva narave, poleg ohranjanja vrst, habitatov in ekosistemov, trajnostnega upravljanja virov, nadzora invazivnih vrst in podnebnih ukrepov. V skladu z najnovejšim globalnim sporazumom o biotski raznovrstnosti (CBD 2022) se pričakuje, da bodo države vključile obnovo v svoje strategije biotske raznovrstnosti in razširile dejavnosti obnove. Evropska unija z nedavno sprejetim zakonom o obnovi narave (Uredba 2024/1991) obnove narave ne le spodbuja kot priložnost, temveč jo je postavila kot obveznost za vse države članice. Ta pristop je bil v nekaterih okoljskih krogih sprejet z velikim navdušenjem, pot do sprejema zakona pa je nakazovala številne zadržke in ovire pri uvajanju sprememb v smer trajnosti. Ali lahko v času, ko so nujne fundamentalne in celovite spremembe, da se prakse človeštva uskladijo z mejami planeta, ta nova zakonodaja doseže potrebno preobrazbo? V prispevku nakazujem kritične vidike in vodila za izvajanje zakona o obnovi narave.

Restoration actions have gained traction as a crucial component alongside species, habitat and ecosystem conservation, sustainable resource management, invasive species control, and climate action. Under the latest global biodiversity agreement (CBD 2022), countries are expected to integrate restoration into their biodiversity strategies and expand restoration activities. The European Union (EU) has not only promoted restoration as an opportunity but made it an obligation with the recently adopted Nature Restoration Law (NRL; Regulation 2024/1991). The legal approach has been greeted with much enthusiasm in environmental circles but has to date generated little discussion of the contents of the law, or its transformative potential. At a time when change is urgent to bring humanity's actions in line with planetary boundaries, can such novel restoration legislation achieve the needed transformation? The contribution will indicate critical aspects for implementation of the Nature Restoration Law.

Ocena sprejemljivosti in kumulativnih vplivov za prostorske ureditve načrtovane s Pomorskim prostorskim planom Slovenije / *Assessment of acceptability and cumulative impacts for spatial arrangements planned with the Maritime Spatial Plan of Slovenia*

Sabina Cepuš, ZaVita d.o.o., Ljubljana

Predstavitev se osredotoča na izvedbo naloge "Ocena sprejemljivosti in kumulativnih vplivov za prostorske ureditve, načrtovane z Pomorskim prostorskim načrtom Slovenije," ki vključuje analizo kumulativnih vplivov antropogenih dejavnosti na celotnem morju (CEA) ter določitev meja sprejemljivih sprememb (LAC) v obalnem pasu ob izbranih krajših odsekih obale. Analiza CEA kaže, da pritiski zaradi gradbenih dejavnosti, kot so fizične motnje morskega dna, motnje vrst in hrup, pomembno prispevajo k vplivom na okolje, še posebej v kombinaciji s pomorskimi prometom in ribolovom. Pristop LAC določa mejne vrednosti sprejemljivih sprememb v občutljivih obalnih območjih, pri čemer se osredotoča tudi na fizične izgube, kakovost vode in stanje habitatov v kontekstu gradbenih dejavnosti. Nujno je izvajanje ciljno usmerjenih omilitvenih ukrepov za zagotovitev trajnostne gradnje, ki uravnotežuje razvoj z ohranjanjem morskih ekosistemov.

The presentation focuses on the implementation of the task "Assessment of acceptability and cumulative impacts for spatial arrangements planned with the Maritime Spatial Plan of Slovenia," which includes an analysis of the cumulative impacts of anthropogenic uses in the entire sea (CEA) and the determination of limits of acceptable changes (LAC) in the coastal zone along selected shorter sections of the coastline. The CEA highlights that construction pressures, such as physical seabed disturbances,

species disruption, and noise, contribute significantly to environmental impacts, especially when combined with maritime traffic and fishing. The LAC approach sets thresholds for acceptable changes in sensitive coastal zones, focusing also on physical losses, water quality, and habitat status in the context of construction activities. The presentation recommends implementation of targeted mitigation measures to ensure sustainable construction that balances development with marine ecosystem preservation.

Omilitveni ukrepi za zmanjšanje podvodnega hrupa, ki ga povzročajo antropogene dejavnosti / *Mitigation measures to reduce underwater noise generated by human activities*

Andreja Popit, Inštitut za vode RS / *Institute for Water of the Republic of Slovenia*

Podvodni hrup v morju zaradi antropogenih dejavnosti je lahko kontinuiran (npr. pomorski promet) ali pa impulzen (npr. udarno zabijanje pilotov), ki ima lahko škodljive učinke na morske živali. V ta namen je treba uporabljati ustrezne omilitvene ukrepe za zmanjšanje podvodnega hrupa v morski vodi, ki bodo predstavljeni v okviru predavanja.

Underwater noise in the sea generated by anthropogenic activities can be continuous (e.g. marine traffic) or impulsive (e.g. pile driving), which can have harmful effects on marine animals. For this reason, it is necessary to use appropriate mitigation measures to reduce underwater noise in marine water, which will be presented in the lecture.

Naravovarstvena presoja gradbenih posegov v morje in morsko obrežje / *Nature conservation assessment of construction interventions in the sea and on the seashore*

Tina Centrih Genov, Zavod RS za varstvo narave / *Institute of the Republic of Slovenia for Nature Conservation*

Zavarovanje dela narave je najbolj neposreden ukrep varstva narave. Zavarujejo se lahko posamezne naravne vrednote oziroma širša območja z večjo gostoto naravnih vrednot ali območja, pomembna z vidika ohranjanja biotske raznovrstnosti. Za posege v prostor je na na območjih, ki imajo opredeljen poseben naravovarstveni status (zavarovana območja, območja Natura 2000 in območja naravnih vrednot), potrebno pridobiti naravovarstveno mnenje, ki opredeljuje pogoje in/ali omejitve glede posegov v prostor. Pri tem gre lahko za časovne in/ali druge prostorske oz. tehnične omejitve glede načina izvajanja del. Pogoji in priporočila so podana z namenom ohranjanja naravnih lastnosti oz. elementov biotske raznovrstnosti, zaradi katerih je na območju opredeljen naravovarstveni status. Poudariti velja, da je celotno slovensko morje, vključno z morskim obrežjem opredeljeno kot ekološko pomembno območje. Čeprav Uredba o ekološko pomembnih območjih določa, da so vsi posegi in dejavnosti na tovrstnih območjih možni, jih je potrebno načrtovati tako, da se v čim večji možni meri ohranja naravna razširjenost habitatnih tipov ter habitatov rastlinskih ali živalskih vrst, njihova kvaliteta ter povezanost habitatov populacij. Uredba prav tako navaja, da se pri izvajanju posegov in dejavnosti morajo izvesti vsi možni tehnični in drugi ukrepi, da je neugoden vpliv na habitatne tipe, rastline in živali ter njihove habitate čim manjši.

Establishing a protected area is the most direct measure of nature conservation. Either individual Natural Values or entire areas with a higher density of Natural Values or areas important for protecting biodiversity can be protected. In case of construction interventions in areas that have a defined nature conservation status (Protected Areas, Natura 2000 areas and areas of Natural Value), it is necessary to obtain a nature conservation expert opinion, which imposes conditions and/or restrictions regarding the intervention - for example, time limits and/or other spatial or technical restrictions relating to the

intervention in question. The conditions and restrictions issued in the expert opinion are given with the intent to preserve the natural properties or elements of biodiversity for which the area in question has been designated as an area with nature conservation status. It is also important to note that under the Decree on Ecologically Important Areas the entire Slovenian sea and seashore are designated as an ecologically important area. Even though the Decree states that all interventions and activities on Ecologically important areas are possible, they have to be planned and executed in a way as to preserve the natural distribution of habitat types and habitats of plant or animal species as much as possible, their quality and the connectivity of the habitats of the populations and enable reconnection, should this be interrupted by a planned intervention or activity. Furthermore, the Decree also states that all possible technical and other measures must be taken when carrying out interventions and activities to minimize the adverse impact on habitat types, plants and animals and their habitats.

Preobrazbene spremembe pri načrtovanju in izvajanju gradbenih posegov v morju in na morskem obrežju / *Transformative changes in planning & building coastal structures*

Robert Turk, Slovenski Nacionalni odbor Desetletja oceanov / *Slovenian National Decade Committee*

The main reasons for the growing number of artificial structures in estuarine, coastal and marine environments are well known - human population growth, residential and commercial developments, tourism infrastructure, international shipping as well as the attractiveness and popularity of waterfront lifestyle. However, as one of the consequences of climate changes, sea level rise is probably becoming the most important driver of construction activities. In order not to turn our back to the Sustainable Development Goals and aim to the ocean we want, as defined in the Ocean Decade Implementation Plan, we would need to transform our ocean science, the planning and execution of construction works in the sea and on the seashore but also our perception of the ocean as an empty space ready to use. We need to become aware that it is the habitat of marine organisms and that it is crucial for the ecosystem services that are the basis for our well-being.

Glavni razlogi za naraščajoče število umetnih struktur v rečnih ustjih, obalnih in morskih okoljih so dobro znani - rast človeškega prebivalstva, stanovanjski in poslovni razvoj, turistična infrastruktura, mednarodni ladijski promet ter privlačnost in priljubljenost življenja ob morju. Vendar pa postaja dvig morske gladine kot ena od posledic podnebnih sprememb verjetno marsikje najpomembnejše gonilo gradbenih posegov v morju in na morski obali. Da ne bi obrnili hrbta ciljem trajnostnega razvoja in si prizadevali za ocean, ki si ga želimo, kot je to opredeljeno v Izvedbenem načrtu Desetletja oceanov, bi morali spremeniti našo znanost o oceanih, načrtovanje in izvajanje gradbenih del v morju in na morski obali ter tudi naše dožemanje oceana kot praznega prostora, pripravljenega za takšno ali drugačno rabo, ne gele na posledice. Zavedati se moramo, da je to življenjski prostor številnih organizmov in nenazadnje, da je ključen za ekosistemske storitve, ki so osnova za našo blaginjo.

Zaključki in priporočila / Conclusions and recommendations

Večina slovenske obale je sestavljena iz fliša, kombinacije izmeničnih plasti laporovca in peščenjaka. Flišni klifi, kot je 80 metrov visoki Strunjanski klif, so lahko nevarni zaradi podorov, ki jih sprožijo padavine, veter in temperaturna nihanja.

Most of the Slovenian coastline consists of flysch, a combination of alternating marlstone and sandstone layers. Flysch cliffs, such as the 80-meter-high Strunjan cliff, can be dangerous due to rock falls triggered by rainfall, wind, and temperature fluctuations.

Slovensko morje je vroča točka biotske raznovrstnosti, saj kljub skromni površini in dolžini morskega obrežja gosti preko 2000 vrst makroorganizmov. Osnovne značilnosti so izrazita hidrodinamika ter velika nihanja temperature in slanosti, skromen delež naravnega obrežja - predvsem pršnega in bibavičnega pasu, marsikje pa tudi zgornjega infralitorala, zaradi geoloških in oceanografskih značilnosti slovenskega morja in morskega obrežja pa tudi izjemno omejen prostor, ki ga lahko naseljujejo ključne bentoške združbe.

The Slovenian sea is a biodiversity hotspot, hosting over 2000 species of macro organisms despite its modest surface area and length of coastline. The main characteristics are the pronounced hydrodynamics and large fluctuations in temperature and salinity, the modest proportion of natural shoreline - mainly the supra- and intertidal zone, and in many places also the upper infralittoral, and, due to the geological and oceanographic characteristics of the Slovenian Sea and its coastline, the extremely limited space available for the key benthic communities.

Dvig morske gladine je dejstvo in tudi verjetnost ekstremnih scenarijev z dvigom gladine za 2 m in več, čeprav nizka, ni zanemarljiva. Potencialne posledice takega scenarija bi bile namreč zelo obsežne, zato mora biti vključen v strategije protipoplavne zaščite. Nizke zanesljivosti napovedi namreč ne gre enačiti z nizko verjetnostjo pojava takega dogodka.

Sea level rising is a fact and the probabilities for extreme scenarios (SLR > 2 m) are not zero, which means that they are too high. Low reliability of the forecasts does not mean low probability of such an event occurring and the damage would undoubtedly be immense. That is why we must not ignore these scenarios in strategic documents, but rather develop a strategy to prepare for them if they occur. Risk assessments must begin to take them into account.

V procesu oblikovanja Pomorskega prostorskega plana Slovenije, ki je bil sprejet leta 2021, so bili sektorski interesi usklajeni ter obstoječe rabe formalizirane. Plan tudi opredeljuje odgovornost za načrtovanje in upravljanje morja in obale.

In the process of drafting and adopting the Slovenian MSP the sectoral interests were coordinated and aligned and the existing uses formalized. The plan also defines responsibilities for planning and management in the sea and on the coast.

Pri načrtovanju posegov je ključno zgodnje sodelovanje med disciplinami, natančna analiza tal, dobro poznavanje prostorskih, družbenih in okoljskih pogojev gradnje ter ustrezna izbira primernih tehnologij za izgradnjo.

Communication between disciplines at the very early stages of the activity is of key importance as well as a complete knowledge of the spatial, societal and environmental conditions.

Dvig povprečne morske gladine bo med drugim povzročil spremembe v delovanju valov na obali oz. povečanje vpliva slednjih na obalne strukture in naravno obalo. Krepitev, dvig ali preoblikovanje in obnova obalnih struktur morajo temeljiti tudi na premisleku o obremenitvi z valovi.

Mean sea-level (MSL) rise will inter alia induce changes in wave action at the coast, including an increased impact on coastal structures as well as on and natural coast. Reinforcing, raising or redesigning and rebuilding should be based on reconsidered wave loading. Resilience of coastal structures and natural coasts require different approaches and measures, adopted in consensus between spatial planners, marine biologists and civil engineers.

Pogostost poplavnih dogodkov se bo v povprečju povečala za faktor 2 na vsakih 10 cm dviga povprečne morske gladine, pri čemer niso upoštevani vplivi vremenskih pojavov. Pričakovana letna škoda za mesto Piran kaže izrazito naraščajoč trend, od ocenjene vrednosti 0,68 milijona EUR na leto v sedanjih razmerah do približno 10,2 milijona EUR na leto v primeru najbolj ekstremnega scenarija. Zato bi bilo nujno čim prej celovito pristopiti k načrtovanju ukrepov za zaščito pred poplavami in/ali prilagajenje nanje.

The frequency of flood events will increase by a factor of 2 on average for every 10 cm of MSL rise, without taking into account the impact of weather events. The expected annual damage in the city of Piran shows a marked upward trend with a projected increase in the MSL from an estimated value of EUR 0.68 million/year under current conditions up to approx. EUR 10.2 million/year in the case of the most extreme scenario of MSL increase. It would be therefore urgent to take a comprehensive approach to planning flood protection and adaptation measures as soon as possible.

Vplivi gradenj, kot so fizični posegi v morsko dno, degradacija habitatov vrst in združb ter hrup, znatno prispevajo k okoljskim vplivom, zlasti v povezavi s pomorskim prometom in ribolovom. Izjemno pomembno je zagotoviti trajnostne gradbene prakse, ki bi uravnotežile razvoj z ohranjanjem morskega ekosistema. Priporočajo se možni ukrepi, kot so blažitev fizičnih motenj in hrupa, prostorsko specifični standardi ter celostno spremljanje stanja ekosistema.

The construction pressures, such as physical seabed disturbances, species disruption, and noise, contribute significantly to environmental impacts, especially when combined with maritime traffic and fishing. It is of uttermost importance to ensure sustainable construction practices that would balance development with marine ecosystem preservation. Possible measures such as mitigation of physical and noise disturbances, zoning and area specific standards and collaborative monitoring are recommended.

V skladu z zakonom EU o obnovi narave, ki je bil sprejet junija 2024, naj bi bilo do leta 2030 obnovljenih 30 % ekosistemov, ki niso v dobrem stanju. Njegovo izvajanje bi moralo biti osredotočeno na temeljne vzroke za izgubo biotske raznovrstnosti, onesnaževanje in podnebne spremembe ter tudi na odnos človeka do narave.

According to the EU Natural restoration law, adopted in June 2024, 30% ecosystem should be under restoration by 2030 to improve to good condition. Its implementation should focus on root causes of biodiversity loss, pollution and climate change as well as on human's relationship with nature.

Gradbeni posegi v morju in na morskem obrežju (vključno z oblikovanjem prodnatih plaž) pomenijo v prvi vrsti fizično uničenje posameznih delov oziroma celotnega obrežnega pasu in posledično izgubo habitatov. Umetne strukture fragmentirajo naravni obrežni pas ter s tem povečujejo njegovo ranljivost oz. zmanjšujejo njegovo odpornost na strese, spreminjajo hidrodinamične in erozijske procese ter transport sedimenta, zmanjšajo ali onemogočijo povezljivost posameznih gradnikov ekosistema in nenazadnje so zaradi umetnih materialov in oblik pogosto idealna podlaga za tujerodne in invazivne vrste.

Construction activities in the sea and on the coast (including the creation of shingle beaches) primarily involve the physical destruction of parts or the whole of the coastline and the consequent loss of habitats. Artificial structures fragment the natural coastline, increasing its vulnerability and reducing its resilience to stressors, alter hydrodynamic and erosion processes and sediment transport, reduce or interrupt the connectivity in the ecosystem and, last but not least, often providing an ideal breeding ground for non-native and invasive species due to their artificial materials and shapes.

Med najpomembnejšimi posledicami gradbenih del v morju in na morskem obrežju je dvigovanje (resuspenz) sedimenta, kar ima lahko uničujoče posledice za bentoške vrste in združbe. Poseganje v morsko dno je posebej problematično v 100-metrskem pasu ob morskem obrežju, kjer sta prisotni tako obe bentoški rastlinski združbi – morski travniki ter algalni sestoji ter drugi ključni elementi morske biotske raznovrstnosti, kot so biogene formacije in prekoraligenske združbe.

One of the most important consequences of construction works in the sea and on the seashore is the uplift (resuspension) of sediment, which can have devastating effects on benthic species and communities. Seabed intervention works are particularly problematic in the 100 m zone along the seafront, where both benthic plant communities - seagrass meadows and algal associations, as well as other key elements of marine biodiversity, such as biogenic formations and pre-coralline communities are present.

Podvodni hrup v morju zaradi antropogenih dejavnosti je lahko kontinuiran (npr. pomorski promet) ali pa impulzen (npr. udarno zabijanje pilotov), ki ima lahko škodljive učinke na morske živali. Za zmanjšanje podvodnega hrupa v morski vodi je treba uporabljati ustrezne omilitvene ukrepe.

Underwater noise in the sea generated by anthropogenic activities can be continuous (e.g. marine traffic) or impulsive (e.g. pile driving), which can have harmful effects on marine animals. Appropriate mitigation measures should be used in order to reduce underwater noise in marine water.

Gradnje v morju in na morskem obrežju pomembno vplivajo na podobo morske krajine ter na našo zaznavo prostora. Največji vpliv imajo prav posegi na obali in v ožjem obalnem pasu, kjer poleg negativnih učinkov na vrste in združbe v morju, pomembno spreminjajo tudi identiteto prostora.

Everything we build in the sea or on the shore affects the image, as well as our perception of space. The interventions in the narrow coastal zone have the greatest impact not only on the benthic species and communities but they also permanently change the identity of the seascape.

Glede na skromen delež preostalega naravnega morskega obrežja z ohranjenimi supra, medio in infralitoralom bi se veljalo na teh območjih gradbenim posegom popolnoma odpovedati. V primeru gradbenih dejavnosti na območjih, kjer sta pršni in bibavični pas že urbanizirana, ohranjen pa je infralitoral, se obstoječih umetnih struktur (primeroma skalometov) praviloma ne odstranjuje, premika ipd. ter s tem preprečuje dvigovanje sedimenta. Lahko se jih dopolnjuje (dograjuje) na način, da poseg ne povzroča poškodb na morskem dnu in/ali dodatne fragmentacije obrežnega ekosistema, da ne spreminja ekoloških pogojev za bentoške združbe in predvsem ne vpliva negativno na ključne elemente biotske pestrosti. Navedene omejitve veljajo tudi za umeščanje dostopov v morje, pomolov, kopalnih ploščadi in druge infrastrukturo.

Given the modest proportion of remaining natural coastline with preserved supra, medio and infralittoral, it would be advisable to avoid building in these areas altogether. In the case of construction activities in areas where the intertidal zone is already urbanised but the infralittoral zone is preserved, existing artificial structures (e.g. rockeries) should not normally be removed, moved, etc., thereby preventing sediment uplift. They may be supplemented (upgraded) in such a way that the intervention does not cause damage to the seabed and/or further fragmentation of the coastal ecosystem, does not alter the ecological conditions for benthic communities and, above all, does not adversely affect key elements of biodiversity. These restrictions also apply to the location of sea accesses, jetties, bathing platforms and other infrastructure.

V pravni akt (uredbo, pravilnik), ki določa pogoje glede načina označitve ter ograditve gradbišča in načrta organizacije gradbišča, ukrepe in zahteve z namenom preprečevanja in zmanjševanja emisij, ki pri tem nastajajo ter ravnanje z odpadki na gradbišču je treba vključiti določbe, ki vse to podrobneje določajo v primeru gradnje v morju in/ali na morskem obrežju ter tako sistemsko vključiti ukrepe za preprečevanje resuspenza sedimenta, povzročanje podvodnega hrupa ipd.

The legal act (regulation, by-law) that lays down the conditions for the marking and fencing of the construction site and the site organisation plan, the measures and requirements to prevent and reduce emissions and the management of waste on the construction site should include provisions that specify all of this in more detail in the case of construction in the sea and/or on the seafront, thus systematically incorporating measures to prevent the resuspension of sediment, the generation of underwater noise, and so on.

Spremeniti moramo percepcijo morja in morskega obrežja kot praznega prostora v zavedanje, da gre za življenjski prostor številnih organizmov, da gre za ekosistem čigar zdravje in delovanje je ključno za ekosistemske storitve, ki so temelj naše dobrobiti, da gre za omejen prostor, v katerega je smiselno posegati zgolj v primeru in na način, da ne vplivamo negativno na naravne procese in biotsko pestrost.

We need to transform the perception of the sea and the seashore as an empty space into an awareness that it is the habitat of many organisms, that it is an ecosystem whose health and functioning is crucial for the ecosystem services that are the basis of our well-being, that it is a limited space that should only

be encroached upon when and in a way that does not negatively impact natural processes and biodiversity.

Povzetek uredil:
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