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Dear Readers,

It is my great pleasure to announce the Volume 23, Number 2 of the *Časopis Pomorskog fakulteta Kotor – Journal of Maritime Sciences*. As promised in the first issue, we shall strive to preserve the spirit of high-quality research in maritime and marine sciences and translate up-to-date maritime-related and blue-growth topics into valuable scientific papers. The current issue comprises ten papers written by authors from four countries. Just as with the first issue of our Journal, we start our *voyage* with the invited paper dedicated to the seventieth anniversary of the Maritime Museum of Montenegro in Kotor and proceed with two original manuscripts, six reviews and one short report. In this issue, the authors dwell on actual problems dealing with marine engineering and energy efficiency, maritime education, transportation models, navigation and maritime law.

In our future work, the Editorial Board will keep putting their best efforts in maintaining the Journal more competitive and recognizable in the interdisciplinary scientific community. Therefore, I encourage all future authors to submit their papers and enhance the critical standpoint and interdisciplinary discussion in the maritime domain.

Editor-in-Chief:
Špiro Ivošević, Assoc. Prof.

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Invited paper

The Seventieth Anniversary of the Maritime Museum of Montenegro in Kotor

Danijela Nikčević

Abstract: In September 2022 the Maritime Museum of Montenegro celebrated the solemn academy on its seventieth anniversary. This significant anniversary was marked by the solemn academy held in the church of Saint Spirit – the concert hall of the Music School "Vida Matjan" Kotor. Also, we arranged the exhibition named *A Walk through Time* and *Events* by the authors Radojka Abramović, Danijela Nikčević, Dijana Đurašković, Ilija Mlinarević and Tomislav Bonić. The aim of the solemn academy and the exhibition was to sum up, reflect and recapitulate the achievements during the last seven decades of the existence and work of the Maritime Museum of Montenegro. According to the Decision of the Ministry of Maritime Affairs of 17th December 1949 on the establishment of the Museum, the Museum had the task to "collect and purchase, arrange, exhibit and maintain objects and documents of relevance for the historical heritage of Boka with the aim to explore history and publish the results of its work". The founders of the Museum were aware of the importance of the historical and cultural heritage that has been accumulated for centuries in the palaces and captains' mansions. With its establishment, the existence of the museum and archival material was officially declared, and the collecting process was continued during all seventy years by enriching the records through purchase and donations. Nowadays, the Maritime Museum is a public institution of a specialized type, the institution dealing with collecting, protecting, archiving and professional procession and the presentation of the object and portable cultural goods from the maritime past of the Montenegrin coast. In 2012 the Maritime Museum of Montenegro was named the home museum for maritime-technical collections preserving the maritime heritage of Montenegro.

Keywords: the seventieth anniversary of the Maritime Museum of Montenegro, 10th September, solemn academy, exhibition, recapitulation of the achievements, the concept and the task of the museum.

1. Uvod

Početkom XX vijeka javlja se potreba za većim proučavanjem bogate pomorske baštine, baštine koja je ostala kao nasljeđe velike pomorske aktivnosti tokom prethodnih vjekova. Propašću jedrenjaka duge plovidbe jedno poglavlje pomorstva, koje je vjekovima donosilo prosperitet stanovnicima naše obale, se zatvorilo.

Trebalo je odati počast moru, pomorstvu i pomorskoj privredi, zaslužnima za stvaranje bogate kulturne baštine Boke Kotorske. To je, ujedno, bio i povod za početak realizacije ustanovljenja jednog muzeja u Kotoru, posebno ako znamo da su muzeji mjesta od posebnog značaja za očuvanje identiteta jednog naroda, oni doprinose samospoznaji vlastite prošlosti. Pored toga, Muzeji su i jedinstvena otkrića gdje se otvaraju vidici za nove ideje, što ujedno predstavlja suštinski korak u izgradnji bolje budućnosti.

Označiti godišnjicu jednog Muzeja znači zapisana sjećanja pretvoriti u život, spojiti prošlost sa sadašnjošću kako bi se prepoznala njihova vrijednost kad su zajedno. Tako smo 10. septembra 2022. godine sumirali, osvrnuli se i napravili rekapitulaciju postignutog u proteklih sedam decenija njegovog postojanja i rada.

2. Istorijat Pomorskog muzeja Crne Gore

Pomorski muzej Crne Gore, smješten u Palati Grgurina (Gregorina), sagrađenoj u drugoj polovini ili na samom kraju XVII vijeka, lociran je u centralnom dijelu starog kotorskog urbanog jezgra, na jednom od jedanaest živopisnih gradskih trgova, danas zvanično nazvanom Trg Bokeljske mornarice. Pokazujući preko svojih bogatih zbirki, kontinuirano, kroz vjekove u svim razdobljima, razvoj pomorstva i kulture ovog važnog područja, Pomorski muzej predstavlja jednu od najznačajnijih kulturno-naučnih institucija Kotora i Crne Gore. Tradicija pomorstva utkana u kulturne tekovine grada koji baštini pomorsku i civilizacijsku prošlost Boke Kotorske i Crnogorskog primorja, dala je živi pečat ovoj instituciji, gdje se prošlost i sadašnjost, dvije naoko nepomirljive kategorije, prate i dopunjavaju. Palata Grgurina, u kojoj je smješten Pomorski muzej Crne Gore, žila je kucavica kulturnih dešavanja u gradu, živo središte naučnih usmjerenja i tumačenja prošlosti, kao i savremenih naučnih otkrića na polju pomorstva i kulture. Svojom stalnom postavkom predstavlja tiho sidrište modela i slika jedrenjaka, parobroda, motornih brodova i raznih ratnih plovnih jedinica, smiraj pobijeđenih i izgubljenih bitaka na moru, stanište kapetana, plemića, brodovlasnika, pomorskih boraca, dok su starinske dvorane, u kamenu okovanih prozora i portala unutar palate, nijemi čuvari dragocjenih muzejskih predmeta raznorodnog sadržaja. Muzejski stručnjaci

brižnim istraživanjem, sakupljanjem, izlaganjem, čuvanjem, naučnom obradom i prezentacijom muzejskih predmeta širokoj javnosti čuvaju od zaborava njihovu svrsishodnost i ljepotu, kult prošlosti i plovidbene rute.[1]

Bratovština Bokeljska mornarica pod imenom Plemenito tijelo Bokeljske mornarice bila je nosilac ideje, još krajem XIX vijeka, o formiranju jedne zbirke predmeta od istorijske i kulturne vrijednosti, što se smatra početkom muzeološke djelatnosti u Kotoru. Prva muzejska zbirka iz 1880. godine, takozvani Kabinet Bratovštine kotorskih pomoraca, svjedoči o tome da se ideja o formiranju muzeološke službe u ovom kraju pojavila još u to davno vrijeme društvenog preporoda. Danas je izložena u odjeljenju Bokeljske mornarice.[2] Vrijedna zbirka predmeta, vezana uglavnom za djelatnost bratovštine ni po razmišljanju njenih članova, intelektualaca, zanatlija, mornaričkog podmlatka, nije bila dovoljno opremljena i popunjena onako kako to priliči pravom muzeju, pa se u okviru ove organizacije rodila ideja o formiranju Istorijskog muzeja u Kotoru, koji bi bio usmjeren na istoriju pomorstva, kao i na civilizacijsku i kulturnu prošlost Boke Kotorske. Jedan od najstarijih utemeljivača muzeja bio je vrijedni sakupljač starina, kotorski zanatlija Josip Jakičević, član uprave Bratovštine Bokeljske mornarice. Njegovim trudom sređena je i otvorena za javnost zbirka Bokeljske mornarice, koju su sačinjavali staro oružje i nošnja, ali i ostali predmeti značajne kulturno-istorijske vrijednosti. Ova zbirka, formirana 1900. godine, predstavljala je začetak budućeg Pomorskog muzeja, prvobitnog Muzeja Bokeljske mornarice. Na sjednici Opštinskog vijeća 28. januara 1906. godine, koja je slijedila pošto su članovi Mornarice učestvujući u raznim kulturnim institucijama vodili diskusiju o potrebi formiranja muzeja u Kotoru, vijećnik Ivan Radimir, prepozit stolne Crkve Svetog Tripuna, predložio je da se na sljedećoj sjednici vijeća ovaj opšteprihvaćen predlog usvoji. Obrazlažući potrebu za osnivanjem muzeja, istakao je: [Red je dakle da jednom započnemo i time se pokažemo dostojni sinovi vrijednih naših pređa, podignućemo Boku na veći stepen kulture i steći priznanje izobraženog svijeta. Razni su faktori da sudjeluju tome prosvjetnome cilju: obe crkovne vlasti, gradske i druge bokeljske opštine, konzervatori spomenika, profesori povijesti i klasične filologije, društva, dušebrižnici i pučki učitelji. Nu između tih faktora treba birati uži promicateljni odbor od osam do dvanaest lica koji bi imao sljedeće zadatke: 1) da osnuje pravilnik starinarskog društa; 2) da priskrbi barem privremeno pomješće (!) za smještenje već iznađenih spomenika (prostorije Mornarice su bile veoma male); 3) da prikupi dobrovoljne prinose za prve nužne troškove; 4) da

[1] R. Abramović, Monografija Pomorskog muzeja Crne Gore (u pripremi), JU Pomorski muzej Crne Gore Kotor, Kotor, 2022.

[2] Fotografija prvobitnog Kabineta Bokeljske mornarice se vodi pod IB 566.

pozove sve faktore i poznatije rodoljube po Boki na skupštinu u kojoj bi se pretresao i odobrio pravilnik, upisali članovi i birala uprava starinarskog društva za bokeljske spomenike sjelom u Kotoru. Poslije ovog saopštenja izabran je inicijativni odbor od osam članova: „za zaveđenje muzeja bokeških starina u gradu Kotoru".[3] Jedan od članova ovog društva bio je unuk admirala Antona Rosija, njegov imenjak, zaslužan za uspostavljanje i inventarisanje prvobitne zbirke kamenih ulomaka Kotorskog lapidarijuma. Uprava Mornarice i kapetan Pavo Kamenarović iz Dobrote, narodni prvak i pjesnik, podadmiral Bratovštine, u cirkularnim pismima koja su slali Bokeljima širom svijeta, ponovo navode da je uprava Bratovštine „odlučila utemeljiti jedan povijesni muzej u kojemu namjerava smjestiti staro oružje, isprave i sve ono što je kadro da proslavi uspomenu opstajanja Bokeljske mornarice. Uz to kani sakupiti u posebnoj galeriji slike i fotografije svih zaslužnih i znamenitih otadžbenika, da tako potomcima sačuva njihovu uspomenu].

Prvi svjetski rat prekinuo je aktivnosti Starinarskog društva, tako da je i sama zbirka, koju je utemeljio Josip Jakičević pretrpjela manje štete.[4] Nakon više godina poslije Prvog svjetskog rata 07. oktobra 1934. godine otvorena je velika izložba istorijskog blaga u Palati Grgurina, današnjem Pomorskom muzeju, u organizaciji tek formiranog Narodnog univerziteta Boke Kotorske. Predstavljala je pravi podstrek formiranju muzeja i zajedno sa djelovanjem Starinarskog društva bila od presudne važnosti za formiranje savremene muzeologije na ovim prostorima.[5] Predsjednik Narodnog univerziteta Petar Šerović, bio je ugledni naučni i kulturni radnik,[6] u to vrijeme načelnik sreza. Prof. Predrag Kovačević bio je njegov vjerni saradnik, naročito po pitanju sastavljanja budućih aktivnosti Univerziteta. Kulturna javnost Boke Kotorske na ovoj velikoj i sveobuhvatnoj izložbi bila je u prilici da po prvi put, na jednom mjestu, na prvom spratu Palate Grgurina, vidi ogroman dio sačuvanog kulturnog bogatstva, preko 700 eksponata,[7] koji su se u Boki nakupljali vjekovima. Dakle, svi predmeti koji su ostali sačuvani nakon rata i koje austrougarske vlasti nisu oduzele, bili su izloženi na ovoj sveobuhvatnoj izložbi. Veliki broj izloženih predmeta pripadao je Bokeljskoj mornarici. Najveća zasluga u realizaciji ove izložbe pripada poznatom

[3] S. Mijušković, *Kotorska mornarica*, CANU 28, 7, Podgorica, 1994, str. 263–264.

[4] J. Martinović, „Dvadesetogodišnjica rada Pomorskog muzeja u Kotoru u novim *uslovima"*, *GPMK XX*, 1972, str. 9.

[5] P. Šerović, „Značaj kulturno-istorijske izložbe NU", *Glasnik NU*, br. 2 od 30. 12. 1934, str. 9.

[6] Don N. Luković, „Petar Šerović", *GPMK XVII*, 1969, str. 251; V. Ivošević, „U spomen Petra Šerovića (povodom desetogodišnjice smrti)", *Boka 10*, Herceg Novi 1978, str. 347–357.

[7] Spisak predmeta izložbe Narodnog univerziteta, poklon akademika Dejana Medakovića, nalazi se u Biblioteci Pomorskog muzeja.

bokeljskom rodoljubu, gospodinu Sigismundu Sbutegi,[8] tadašnjem glavnom kućevlasniku reprezentativne Palate Grgurina, kao i gospodinu Jovanu Griviću, predstavniku jednog dijela njenih vlasnika. Ova izložba popraćena je sa najvećim interesovanjem, a svojim bogatstvom, postavkom i duhom ponovo je podstakla krug poštovalaca i ljubitelja umjetnosti, poznavalaca kulturno-istorijske prošlosti Kotora da oforme jedan kompleksan muzej sa muzeološkom postavkom, koji će uporedo sa ulogom Bratovštine Bokeljske mornarice u razvoju pomorstva ovog kraja njegovati i ostale pomorske i kulturne tekovine Boke Kotorske. Nakon 1934. godine, velikim zalaganjem podadmirala Bokeljske mornarice Rudolfa Đunija, zakupio se i adaptirao dio prvog sprata Palate Grgurina u kojem je do tada bilo smješteno Sresko načelstvo, a najveći dio troškova platilo je parobrodarsko društvo „Zetska plovidba“ iz Kotora.

Novoformirani Muzej Bokeljske mornarice, sa stalnom postavkom, otvoren je početkom februara 1937. godine, za vrijeme Tripundanskih svečanosti. U ovaj muzej je nova uprava reorganizovane Bokeljske mornarice, na inicijativu Rudolfa Đunija, sa novoizrađenim Statutom od 27. decembra 1934. godine, čije je reforme omeo početak Drugog svjetskog rata, uspjela 1938. godine da prenese sve istorijske predmete iz dotadašnjeg Kabineta u Palatu Grgurina. Na prvom spratu Palate Grgurina postavljena je nova muzejska zbirka–Muzej Bokeljske mornarice. Ovakav muzej, smješten u novoadaptiranim odjeljenjima, predstavljao je, i pored određenih manjkavosti muzeološkog tipa, znatni napredak u odnosu na stari muzej, tačnije Zbirku Bokeljske mornarice, koja se nalazila u prizemlju Palate Drago, na Trgu Sv. Tripuna. Muzejski predmeti u novonastalom muzeju sadržali su gotovo istu muzejsku koncepciju uz izvjesne dodatke. Ovdje su bile izložene originalne slike naručene za bokeljske pomorce, originalna djela mariniste Vasilija Ivankovića, kopije njegovih originalnih slika, kao i kopije slika, uglavnom nepoznatih autora iz svetilišta Gospe od Škrpjela, koje su slikali Anastas Bocarić i Ivan Mirković. Zidove su krasili i brojni portreti bokeljskih pomoraca, zbirka grbova vlasteoskih porodica Boke, a u vitrinama su bili izloženi modeli starih brodova, brodski instrumenti, staro oružje i nošnje, uniforme Bokeljske mornarice, odnosno uniforme članova Bratovštine, razne arhivalije: brodski dnevnici, portolani, atlasi, povelje, diplome.[9] Drugi svjetski rat prekinuo je redovnu djelatnost muzeja. Italijanske okupatorske vlasti ispraznile su za svoje potrebe kompletnu palatu Grgurina. Zaslugom Marka Kurijala restauratora, dobrovoljnog

[8] P. Šerović, ,,Kulturno-istorijska izložba Boke Kotorske", *Glasnik Narodnog univerziteta Boke Kotorske*, br. 1, Kotor, 7. oktobra 1934, str. 7–8.

[9] J. Martinović, ,,Dvadesetogodišnjica rada Pomorskog muzeja u Kotoru u novim uslovima", *GPMK XX*, 1972, str. 10–17.

kustosa, koji se starao i o održavanju muzeja (kabineta) Bokeljske mornarice i radio bez novčane nadoknade u novonastalom muzeju sve do 1945. godine, kada je njegov položaj pravno regulisan, zbirke su se očuvale za vrijeme rata, sklonjene su na sigurno mjesto i vraćene u muzej, odmah po oslobođenju. Marko Kurijal ostao je na mjestu kustosa Muzeja u osnivanju sve do svoje smrti tačno na Tripundan, 3. februara 1952. godine, nešto manje od sedam mjeseci prije zvaničnog otvaranja Pomorskog muzeja.

Zbog neriješenog statusa Bokeljske mornarice u poslijeratnom periodu, staranje o muzeju preuzeo je Mjesni, a kasnije Sreski narodni odbor sa sjedištem u Kotoru sve do 17. decembra 1949, kada je osnovan Pomorski muzej Kotor. Osnivanju muzeja u Kotoru dat je veliki značaj na nivou tadašnje države FNR Jugoslavije. Angažovana je Jugoslavenska akademija znanosti i umjetnosti (JAZU) iz Zagreba da preko svog Jadranskog instituta formira četiri muzeja u Rijeci, Splitu, Dubrovniku i Kotoru, što je bilo od posebnog značaja za očuvanje pomorske i kulturne baštine većeg dijela istočne obale Jadranskog mora, koji je pripadao tadašnjoj državi Jugoslaviji. U jesen 1948. godine došla su u Kotor tri predstavnika ovih ustanova, akademik prof. dr Branislav Gušić, sekretar JAZU i dr Bernard Stulli, direktor Jadranskog instituta i delegat Ministarstva pomorstva FNRJ u vladi SR Hrvatske. U Kotoru je održan zbor građana na kojem su oni izložili svoje ideje. Njihovi planovi o osnivanju Pomorskog muzeja u Kotoru bili su podržani i s oduševljenjem prihvaćeni. Na predlog don Nika Lukovića bio je naznačen i jednoglasno podržan budući kandidat za direktora muzeja, Pavo Verona. S obzirom na to da JAZU nije mogla ni pravno, ni finansijski preuzeti Pomorski muzej, on je prešao u nadležnost Ministarstva pomorstva FNRJ u Beogradu, što su delegati JAZU dogovorili na Cetinju sa tadašnjim predsjednikom Vlade Crne Gore Blažom Jovanovićem. Ovo je bilo i zvanično ozakonjeno Dekretom Ministarstva pomorstva FNRJ od 17. decembra 1949, od kada pravno postoji Pomorski muzej.[10] Iako u poslijeratnom periodu prioriteti društva nisu počivali na kulturi, ipak 1949. godine, na inicijativu Ministarstva pomorstva FNRJ, dolazi do jedne veoma važne opštedruštvene akcije. Pristupilo se reorganizaciji čitave mreže pomorskih muzeja u svim većim centrima na Jadranskoj obali (Rijeka, Split, Dubrovnik), pa i kotorskog Muzeja. Nakon toga započelo se sa izradom projekta revitalizacije i adaptacije postojeće zgrade, Palate Grgurina. Planovi pravljeni tokom 1950. godine realizovani su u ljeto 1951, kada je preduzeće, kome su povjereni poslovi, „Pomgradnja“ iz Bara preuzelo radove na zgradi. Unutrašnjost zgrade bila je zapuštena brojnim pregradnjama, uslijed neshvatanja značaja ovog važnog kulturno-istorijskog spomenika. Pristupilo se izradi planova za

[10] I. Zloković i J. Martinović, ,,Pomorski muzej Crne Gore – Kotor (1952 – 1982", *GPMK XXIX/XXX*, 1981–1982, str. 13–21.

restauraciju i adaptaciju zgrade, kako bi mogla poslužiti potrebama muzeja. Poslije iscrpnih studija planove je izradio dipl. inž. Lazar Katurić, šef Građevinskog odsjeka Pomorske oblasti Južnog Jadrana u Kotoru. Stručnu pomoć tokom radova pružili su inž. arh. Vojislav Đukić, saradnik Republičkog zavoda za zaštitu spomenika kulture na Cetinju, kao i direktor ovog Zavoda, prof. Milutin Plamenac. Konsultovani su, takođe, inž. Vinko Đurović i inž. Milan Zloković, redovni profesori Velike tehničke škole u Beogradu. Nacrte postavljenog namještaja i radove nadgledao je Lujo Matejan, tehnički rukovodilac Tvornice namještaja „Mašo Brguljan" u Kotoru.[11] Ova fabrika izradila je stilski namještaj za potrebe Muzeja. Stolarske i gvožđarske radove izvelo je Sresko zanatsko preduzeće, a ukrasni gvožđarski radovi vezani su za ime izvanrednog majstora, Mata Gržetića. Ostalu opremu je nabavilo Ministarstvo pomorstva, koje je odobrilo sve kredite za restauraciju i adaptaciju zgrade i „Jadroliniji" iz Rijeke povjerilo da snabdije Muzej materijalima za opremu, koje je bilo veoma teško nabaviti.[12] Veliku zahvalnost za preuzimanje brige o Muzeju i njegovoj rekonstrukciji dugujemo tadašnjem ministru pomorstva, Vicku Krstuloviću i njegovom pomoćniku Spasoju Velimiroviću. Proširen i preuređen, na osnovu projekata i elaborata za restauraciju i adaptaciju zgrade uz učešće domaćih majstora pod rukovođenjem Luja Matejana i Tonka Premužića, Muzej je svečano otvoren 10. septembra 1952, u popodnevnim časovima, na tadašnji jubilej–desetogodišnjicu Dana Ratne mornarice, pomorskog i riječnog brodarstva[13]. Na muzejskoj terasi okupili su se predstavnici narodne vlasti, JRM, vojske, prosvjetno-kulturnih ustanova, pomorskih nadleštava, kao i brojni pomorci koji su pristigli u Kotor. Ministra pomorstva zastupao je njegov pomoćnik Spasoje Velimirović. Govor je održao u ime Gradskog narodnog odbora Vojo Brinić, koji je istakao da se otvaranje muzeja povezuje sa Danom mornarice. Muzika je poslije održanih govora svirala državnu himnu, a mali admiral istakao je na glavni balkon Muzeja državnu zastavu. Dizanje zastave bilo je pozdravljeno puščanim plotunom postrojenog odreda Bokeljske mornarice. Ovim je bilo obznanjeno mnogobrojnom okupljenom narodu ispred Palate Grgurina da je Pomorski muzej otvoren.[14]

Novi muzej bio je podijeljen po zbirkama:

[11] J. Š. Jovanović, „Pomorski muzej u Kotoru o 50-godišnjici", *GPMK I*, 1952, str. 47.
[12] I. Zloković i J. Martinović, „Pomorski muzej Crne Gore – Kotor (1952–1982)", *GPMK XXIX-XXX*, 1981–1982, str. 16.
[13] Isto.
[14] Isto.

1. Zbirka modela i slika brodova u vlasništvu Bokelja u periodu od srednjeg vijeka do razdoblja Francuske okupacije (1807–1813), modeli, slike brodova i brodski instrumenti u XIX vijeku;

2. Brodograđevinsko (ribarsko) odjeljenje sa starim tipovima plovnih objekata, brodograđevinskog alata, pribora za ribarstvo i rijetkih primjeraka flore i faune;

3. Zbirka Bratovštine Bokeljske mornarice sa izloženim fotografijama članova Bratovštine i raznih jubilarnih svečanosti;

4. Etnografska zbirka sa primjercima nošnji Boke Kotorske i uniformama Bokeljske mornarice, izabranim komadima starinskog namještaja, upotrebnim i dekorativnim predmetima korišćenim u bokeljskim kućama, muškim i ženskim nakitom;

5. Legat kapetana Vlada Ivelića iz Risna, salon sa originalnim slikama mariniste Vasilija Ivankovića, porodičnim portretima i portretima ruskih carica Katarine II i Jelisavete Petrovne;

6. Salon bokeljske kapetanske kuće iz druge polovine XIX vijeka;

7. Oružarnica u kojoj je izložena bogata zbirka hladnog i vatrenog oružja od XIV do druge polovine XIX vijeka, zajedno sa primjercima brodskog naoružanja;

8. Odjeljenje sa predmetima vezanim za Prvi svjetski rat, sa naglaskom na zbivanja u Boki u vrijeme Ustanka mornara austrougarske flote 1. februara 1918. godine.[15]

Svakako da ni ova podjela unutar institucije nije kompletno zadovoljavala muzeološke potrebe, ali kvalitetan kadar uspješno je rješavao zadatke koji su se nametali. Ovakva organizacija zbirki već je na početku ukazivala na to da je Pomorski muzej kompleksnog karaktera, a njegova osnovna strukturna podjela na tri muzejske zbirke: Pomorsko-tehničku, Istorijsko-umjetničku i Etnološku.

Najveći broj muzejskih predmeta nastao je ostavštinom Muzeja Bokeljske mornarice, ali i otkupima i donacijama i to u periodu od početnog formiranja Muzeja 1952. godine do sedamdesetih godina prošloga vijeka. Ukupan broj predmeta danas iznosi 5.165, od toga je u ekspoziji oko 900, a ostatak je pohranjen u depoima gdje se čuvaju u skladu sa Zakonom o muzejskoj djelatnosti.

3. Aktivnosti Pomorskog muzeja Crne Gore 1952-2022. godine

Staranje o zbirkama preuzelo je Muzeološko odjeljenje, uvodeći i stručno obrađujući novoprispjele muzejske predmete, koji su stizali preko

[15]J. Martinović, ,,Dvadesetogodišnjica rada Pomorskog muzeja u Kotoru u novim uslovima", *GPMK XX*, 1972, str. 12.

otkupa i poklona, dok je Naučnoistraživačko odjeljenje obogaćeno pomorskim arhivom oformljenim predajom starije arhivske građe raznih pomorskih ustanova i lučkih kapetanija na Crnogorskom primorju, kao i mikrofilmovanim dokumentima arhiva iz zemlje i inostranstva. Ovaj period velikog entuzijazma, koji se ogledao u svim segmentima rada u Muzeju, doveo je i u okviru naučnoistraživačke djelatnosti do formiranja specijalizovane naučno-stručne biblioteke, uglavnom pomorskog karaktera. Biblioteka je oformljenja za stručno osposobljavanje muzejskog kadra, ali i za lica koja su se bavila proučavanjem pomorske, civilizacijske i kulturne prošlosti Boke i Crnogorskog primorja. Kao rezultat potrebe da se objave rezultati obrade dokumenata i muzejskih predmeta došlo je do osnivanja naučne i stručne publikacije–*Godišnjaka Pomorskog muzeja u Kotoru*, čiji je prvi broj izašao na Dan mornarice i pomorstva, 10. septembra 1952. godine, kao propratni sadržaj važnog događaja–osnivanja Muzeja u poslijeratnom periodu. Prvi broj bio je štampan spontano, bez velikih pretenzija, formata 20 x 14 cm, sa 78 strana i 3 fotografije. Međutim, odmah je, po svom sadržaju i kvalitetu, ispunio očekivanja i postao neraskidivi dio rada Muzeja. Ocijenjen kao časopis visoke vrijednosti, uprkos brojnim problemima vezanim za njegovo finansiranje, ubrzo se istakao kao jedna od najozbiljnijih publikacija pomorskog i kulturnog karaktera, te je 1967. nagrađen visokim priznanjem SR Crne Gore, Trinaestojulskom nagradom.[16]

Obnavljanje trgovačke flote na Crnogorskom primorju inicirao je upravo Pomorski muzej Crne Gore, dvije godine kasnije osnovano je parobrodsko preduzeće Jugoslovenska oceanska plovidba u Kotoru, a odmah zatim Prekookeanska plovidba sa sjedištem u Baru, a i brodogradilište „Bijela“ u Bijeloj opremljeno je za novogradnju i remont brodova.

Poslije Drugog svjetskog rata, nakon prekida od preko 20 godina rada drevne bratovštine Bokeljske mornarice, krenulo se sa inicijativama za njenom obnovom. Stoga je u Kotoru u Pomorskom muzeju 18. februara 1947. godine formiran poseban Redakcioni odbor za izradu novog Statuta Mornarice sastavljen od saradnika Muzeja i Istorijskog arhiva iz Kotora. U Pomorskom muzeju su 12. septembra 1959. godine proslavljene 1150. godišnjica pomorske bratovštine Bokeljska mornarica i stogodišnjica završene plovidbe kapetana Iva Vizina oko svijeta (1852–1859). Svečanosti su prisustvovali visoki državni funkcioneri, kapetan Benedikt Simović i zamjenik admirala Bokeljske mornarice Mato Petrović, narodni poslanik Savezne skupštine. Ovom prilikom u kotorsku luku uplovio je novoizgrađeni

[16] I. Zloković, ,,Godišnjak Pomorskog muzeja u Kotoru 1952-1972", *GPMK XX*, 1972, str. 19.

razarač „Kotor“, gdje je obavljeno i krštenje broda. Bokeljska mornarica je tada na rivi izvela svoje tradicionalno kolo.

Rad na pripremi Statuta, koji se sastojao u pronalaženju arhivske dokumentacije, pripremi Statuta i organizovanju stručnih saradnika, otpočeo je 18. februara 1947. godine, kada je osnovan Odbor za izmjenu Statuta, nastavljen je 1959. godine, a naročito je bio intenzivan od početka 1964. godine do 30. avgusta iste godine, kada je izglasan izmijenjeni Statut ove organizacije.

Aktivnosti Pomorskog muzeja u periodu od 1952. do 2022. godine povezane su sa potrebama ove institucije da kroz svoju programsku djelatnost izrazi snažnu interakciju između Muzeja i javnosti, ali i sa namjerom da pokažu da su aktivnosti Muzeja ujedno i odraz društveno-političkih i istorijskih okolnosti.

Konstituisanje Muzeja u poslijeratnom periodu, tačnije 1952. godine, značilo je početno vrlo razgranate aktivnosti koje su se odnosile na proučavanje i unapređenje pomorstva, što je dalo veliki podsticaj Pomorskom muzeju u Kotoru da razvije mrežu svojih aktivnosti sa srodnim institucijama gradova, Korčule, Orebića, Splita, Malog Lošinja, Zadra, Šibenika, Banja Luke, Pirana, Beograda, Zagreba, Sarajeva, Venecije, Trsta, Moskve, Lenjingrada… Ovaj period od osnivanja Muzeja pa do zemljotresa 1979. godine prepoznatljiv je po vrlo intenzivnoj djelatnosti, kruna te djelatnosti bili su brojni naučni skupovi u zemlji i inostranstvu. Nerijetko kustosi i naučni radnici Muzeja napuštaju staro muzejsko zdanje da bi prisustvovali brojnim naučnim skupovima u zemlji i inostranstvu, gdje razmjenjuju i proširuju svoja zdanja iz struke i vraćaju se bogatiji za nova saznanja u svoju matičnu instituciju.

Naučni radnici i saradnici Muzeja u ovom periodu aktivno su učestovali u pisanju velikog broja pomorskih i istorijskih publikacija za institucije republika u sastavu SFRJ, brojnih kulturno-naučnih edicija, enciklopedija, ali i vrlo važnih lokalnih publikacija kojima su obilježavani jubileji. Ovaj period prepoznatljiv je i po izložbenoj djelatnosti, naučnim skupovima, muzičkim, koncertnim manifestacijama, konzervacijama spomenika kulture, arheološkim istraživanjima, kao i po, u okviru arheoloških istraživanja, ispitivanjima morskog dna.

Muzej je bio centar kulturnih dešavanja, u njemu su otvorene brojne izložbe za koje su korišćeni muzejski predmeti unutar Muzeja i muzejskih depoa, ali i predmeti iz ostalih, srodnih, institucija kulture, izložbe su, ujedno, svjedočile plodnu međuinstitucionalnu saradnju. Proslave značajnih jubileja poput: „300-te godišnjice rođenja baroknog slikara Tripa Kokolje“, „40-godišnjice Ustanka mornara bivše austrougarske mornarice“; „Stogodišnjice osnivanja i djelovanja turističke organizacije u Jugoslaviji“; rad na izdavanju spomen knjige o „20-godišnjice rada Sekcije društva istoričara SRCG“,

uslovile su mogućnost da se ove istorijske, jubilarne teme približe publici, studentima i đacima, ljudima iz uže struke.

Pored izlaganja vrijednih dokumenata, koji su bili prateći sadržaji brojnih tematskih izložbi, Muzej je bio centar mnogih likovnih izložbi, akademskih slikara i slikara amatera koji su na svojim platnima predstavljali uglavnom bokeljske motive. U sklopu 300. godišnjice rođenja našeg najslavnijeg baroknog slikara Tripa Kokolje iz Perasta 1962. otvorena je izložba dokumenata grada Perasta od XVI do XVIII vijeka, a 1964. izložba ikona Bokokotorske ikonografske škole Dimitrijević–Rafailović iz Risna (XVII–XIX vijeka). Povodom kongresa Saveza bibliotekara SFRJ u Budvi je 1965. otvorena izložba inkunabula–starih štampanih knjiga između 1450. i 1500. godine, sačuvanih u Biblioteci Franjevačkog samostana u Kotoru. U prostorijama Povijesnog muzeja u Zagrebu organizovana je u februaru 1970. godine veoma uspješna izložba pomorstva Boke Kotorske koja je, sa tematski odabranim, najvrijednijim muzejskim predmetima, uz propratne sadržaje, koncerte, predavanja, književne večeri sa temama iz Boke dala sveobuhvatnu impresiju pomorske i kulturne prošlosti Boke.

U Izložbenoj sali Pomorskog muzeja, koja je upriličena za raznorazne izložbe, organizovane su izložbe domaćih slikara, ali i stranih, kojima je Boka Kotorska bila inspiracija. Juna 1966. godine otvorena je izložba slika akademskog slikara Mata Đuranovića, a avgusta iste godine izložbe akademskog slikara Vaska Lipovca, povodom proslave 800. godišnjice Katedrale Sv. Tripuna, u Kotoru, i slikara amatera Milenka Žebeljana. Od jula do avgusta 1971. organizovane su izložbe amaterskih slikara Jelke Čenčer i Ivana Vuličevića Vaivana. U julu 1972. godine Pomorski muzej otvorio je izložbu slika i karikatura Aleksandra Klasa.[17] Postajući istinski hram kulture, čiji zadatak nije samo očuvanje muzejskih predmeta, već i da bude živo tkivo koje aktivno učestvuje u svim događajima vezanim za pomorsku i kulturnu tematiku, Pomorski muzej organizuje razne manifestacije i proslave jubilarnog karaktera:

1954. godine u Muzeju je radio i zasijedao Odbor za proslavu 150. godišnjice Prvog srpskog ustanka;

1958. Odbor za proslavu 40. godišnjice Ustanka mornara u Boki Kotorskoj;

1962. Odbor za proslavu 300. godišnjice rođenja baroknog slikara Tripa Kokolje;

1966. Odbor za proslavu 800. godišnjice Katedrale Sv. Tripuna u Kotoru;

1968. Odbor za proslavu 50. godišnjice Ustanka mornara, ponovljen u većem obimu;

[17] J. Martinović, ,,Dvadesetogodišnjica rada muzeja u novim uslovima", *GPMK XX*, 1972, str. 9–17.

1969. Odbor za proslavu 100. godišnjice Prvog bokeljskog ustanka protiv austrijske vlasti.

Pomorski muzej u ovom periodu postaje nosilac brojnih nagrada i priznanja. Povodom stogodišnjice osnivanja i djelovanja turističke organizacije u Jugoslaviji, Turistički savez dodjelio je Pomorskom muzeju u Kotoru plaketu u znak priznanja za uspješan rad i postignute rezultate u unaprijeđenju turizma, Pomorski muzej nagrađen je 1970. godine od žirija za dodjelu Plave vrpce „Vijesnika" iz Zagreba za podvige u pomorstvu 10. septembra iste godine, na Dan pomorstva i Ratne mornarice.[18]

U nastavku ulaznog hola Pomorskog muzeja bili su smješteni ulomci kamene plastike, od kojih su neki reljefi visokog umjetničkog kvaliteta. Zbog važnosti institucije i nedostatka adekvatnog prostora koji je jedan osavremenjeni muzej morao posjedovati, Skupština opštine Kotor otkupila je i predala na upravljanje Muzeju jednu manju zgradu koja se nalazi iza začeljnog dijela muzejske zgrade. Do prekida rada Muzeja usljed oštećenja zgrade u katastrofalnom zemljotresu 1979. godine, Muzej je posjedovao 16 muzejskih odjeljenja, oko 1.700 muzejskih predmeta, čiji se broj permanentno povećavao. Od 1972. do 1977. godine uvećan je za 140 muzejskih predmeta, od kojih su neki visoko ocijenjeni kao svjetski rariteti, povećan je i fond od oko 9.000 knjiga i pomorski arhiv za 600.000 prikupljenih dokumenata i preko 2.400 svezaka. Vrijedna donacija, dostojna zasebne pohvale, jeste poklon od 1.505 knjiga koje je donirala SANU iz Beograda i JAZU iz Zagreba sa 60 knjiga iz oblasti muzeologije. Fond dokumenata lučkih kapetanija Crnogorskog primorja, koji je bio smješten u Pomorskom muzeju, zbog neadekvatnog prostora prenesen je po dogovoru Arhiva SR Crne Gore, kao matičnog arhiva, Istorijskog arhiva u Kotoru i Pomorskog muzeja, u depo Istorijskog arhiva u Kotoru. Predato je 1.120 fascikli sa spisima, kao i 1.491 pomoćna knjiga. Pojedini, vrlo vrijedni, dokumenti ostali su kao zaostavština privatnih porodičnih arhiva, pohranjeni su i dobrim dijelom izloženi u Pomorskom muzeju. U toku 1975. godine, vrijednom timu muzejskih stručnjaka pridružila su se dva saradnika sa visokom stručnom spremom: Mileva Pejaković, diplomirani etnolog, i diplomirani inženjer riječnog i pomorskog saobraćaja Petar Palavršić, čime je uveliko poboljšana kadrovska struktura muzeja, a zbirke po tematici dobile kustose koji će se starati o njima.[19]

Veliki entuzijazam i radni polet Muzeja, kao što je rečeno, prekinula je strahovita prirodna stihija, katastrofalni zemljotres 15. aprila 1979. godine. Kao posljedica ovog razornog zemljotresa zgrada Muzeja pretrpjela je

[18] Katalog izložbe – *Hod kroz vrijeme i događanja*, autori kataloga R. Abramović i D. Nikčević, JU Pomorski muzej Crne Gore Kotor, Kotor, 2022.

[19] J. Martinović, ,,Srebrni jubilej muzeja 1952–1977", *GPMK XXV*, 1977, str. 13–15.

znatna oštećenja. Usljed slijeganja temelja pojavile su se brojne pukotine i razmicanje zidova u gornjim partijama zgrade, pa je bilo neophodno izvršiti kompletne sanaciono-restauratorske radove na zdanju. Sanacioni i revitalizacijski projekat izradili su arhitekta Franc Vardijan i inženjer Stojan Ribnikar iz Ljubljane, a projekat enterijera Muzeja arhitekta Bernardo Bernardi iz Zagreba. Radove na Palati izvelo je građevinsko preduzeće „Trudbenik" iz Ohrida.

Zgrada bi pretrpjela mnogo veća oštećenja, pa čak i obrušavanje objekta da, po mišljenju relevantnih stručnjaka, nije bilo horizontalnh željeznih zatega. Ovo je dokaz da su stari graditelji, poučeni iskustvima ranijih razornih zemljotresa, naročito onog iz 1667. godine, prilikom gradnje kuća uvodili novu sigurnosnu tehnologiju.[20] Proširena muzejska odjeljenja sa savremenim enterijerom omogućila su posjetiocima Muzeja mnogo pristupačnije razgledanje muzejskih predmeta, a shodno novoj koncepciji prostora mogućnost lakšeg kretanja po prostorijama.

Radovi na sanaciji zgrade Muzeja zvanično su počeli 22. novembra 1982. godine. U isto vrijeme kada su izvođeni građevinsko–zanatski radovi izrađen je projekat enterijera. Od 15. aprila 1979. godine radnici Muzeja usmjerili su svoju djelatnost u više pravaca. Najprije su se posvetili spasavanju eksponata, koje su smještali na različite lokacije: u depoe Istorijskog arhiva ili u podrume novoizgrađenih zgrada u Škaljarima. Uporedo sa sanacijom Muzeja, u granicama realnih mogućnosti, obavljali su se konzervatorsko-restauratorski radovi na najugroženijim eksponatima.

Po kompletnoj sanaciji i revitalizaciji muzejske zgrade, poslije 67 mjeseci od aprilske katastrofe, Pomorski muzej Crne Gore ponovo je otvorio svoja vrata za javnost - 20. novembra 1984. godine. U pozdravnoj riječi, kojom je započeta svečanost ponovnog otvaranja Muzeja, tadašnji direktor Milan Begović obratio se zvanicama, visokim državnim funkcionerima, predstanicima gradske vlasti, predstavnicima vjerskih zajednica i ostalim prisutnima. Posebnu zahvalnost izrazio je, u ime kolektiva Pomorskog muzeja, svim projektantima, Građevinskoj radnoj organizaciji „Trudbenik" iz Ohrida, glavnom izvođaču radova, Radnoj organizaciji „Jadran-komerc" iz Zagreba i njihovim kooperantima, Radnoj organizaciji „Obnova" iz Kotora, koja je savjesno obavljala poslove za račun investitora. Izrazio je i izuzetnu zahvalnost Opštinskom zavodu za zaštitu spomenika kulture u Kotoru i direktoru Jovanu Jovici Martinoviću, dugogodišnjem direktoru Pomorskog muzeja, akademskom slikaru Vasku Lipovcu, koji je svojim reljefima u bronzi

[20] M. Begović, ,,Pomorski muzej Crne Gore u Kotoru (1979–1984) – sanacioni radovi zgrade i ostale djelatnosti", *GPMK XXXI–XXXII*, 1983–1984, str. 195–201.

ukrasio ulazni hol Muzeja, ali i značajno doprinio rodnom gradu ostalim likovnim djelima visokog kvaliteta.[21]

Neposredno poslije svečanog otvaranja Pomorskog muzeja u Kotoru slijedile su izložbe „Pomorstvo Boke kroz vjekove“, a u Londonu je predstavljena izložba „Narodna umjetnost Crne Gore“ na kojoj je Pomorski muzej bio zastupljen jednim brojem izabranih muzejskih predmeta.

Nastavlja se izložbena aktivnost vezana za brojne važne datume i ličnosti, poput izložbenih aktivnosti u okviru proslave „Evropske godine baroka“. Kao sjećanje na pomorskog kapetana, našeg najuglednijeg marinistu XIX vijeka, u Pomorskom muzeju otvorena je izložba slika „Slike mariniste Vasilija Ivankovića u Boki Kotorskoj“, izložba „Kotor starinska kamena dvorana“ postavljena u Etnografskom muzeju u Beogradu. Ustupljuju se muzejski predmeti za izložbe izvan muzeja i filmske projekcije. Obilježen je pored ostalih i jedan važan jubilej „300 godina Pomorskog školstva i pedagoškog rada kapetana Marka Martinovića“, svečanim otvaranjem Muzeja grada Perasta poslije zemljotresa iz 1979., 21. novembra 1988. godine. Ratna događanja devedesetih usporila su razvoj muzejskih aktivnosti.

Živa i sadržajna muzejska aktivnost je brojčano u malom opsegu ako je upoređujemo sa snažnom ekspanzijom muzejskih aktivnosti koje su uslijedile uglavnom od 2002. godine sve do najnovijeg datuma. Nastavljaju se naučni skupovi, promocije knjiga, postavljaju se izložbe iz oblasti pomorske tematike, etnografske izložbe na temu starih zanata, ljepote zlatne niti, sjaja starih kandila. More i jedrenjaci okosnica su brojnih izložbi, okruglih stolova, naučnih skupova.

Brojne su izložbe sa filatelističkom tematikom, prigodne koverte i markice upriličene povodom brojnih pomorskih jubileja, oplovljenja Iva Visina oko svijeta, borbi slavnih Dobroćana, braće Ivanovića u Patrasu i Pireju protiv moćnih tripolitanskih gusara, markica i prigodnih koverata sa likom kapetana Petra Želalića, kapetana Iva Vizina, sa motivima jedrenjaka predstavljenim na Ivakovićevim marino slikama. Iskovana je bronzana medalja sa Vizinovim likom, unikatne vrijednosti, rad akademskog slikara Dalibora Parače, povodom pomenutog jubileja 150. godina od Vizinovog oplovljenja svijeta. Brojni su i omaži posvećeni slavnim ličnostima: omaž Miroslavu Štumbergeru, uvaženom kapetanu i modelaru, povodom 120 i 130 godina od njegovog rođenja, omaž priznatoj etnološkinji dr Đurđici Petrović, omaž akademskom slikaru i skulptoru Vasku Lipovcu.

Muzej se svojom izložbenom djelatnošću predstavljao kako u državama nekadašnje Jugoslavije, tako i u inostranstvu. Gostovao je u Sevilji, Parizu,

[21] M. Begović, ,,Otvoren Pomorski muzej Crne Gore u Kotoru", *GPMK XXXIII–XXXIV*, 1985–1986. godina, str. 13–16.

Atini, Plovdivu i Nesebaru. Takođe, Pomorski muzej ima blisku saradnju sa Kotorskom Biskupijom zahvaljujući kojoj je realizovano niz tematskih izložbi sa kojima smo gostovali u inostranstvu i predstavili kulturno blago Crne Gore.

U saradnji sa g-dinom Predragom Jankovićem, u prizemlju palate Grgurina otvorena je 2005. godine galerija „Ticijan" izložbom Ljubomira Brajovića. U saradnji sa pomenutom galerijom u muzeju su postavljane brojne izložbe renomiranih crnogorskih umjetnika, kao i onih sa prostora bivše Jugoslavije: Vaska Lipovca, Marija Maskarelija, Miodraga Vartabedijana, Milene Jeftić Ničeve Kostić, Predraga Španjevića Španje, Đorđija Bata Pravilovića, Aleksandra Prijića, Ratka Šoća, Milivoja Đurovića, Luke Berberovića, Mikija Radulovića, Eleonore Apolonio, Filipa Jankovića, Saše Lončarića, ali i slikara starijeg datuma Vasilija Ivankovića. Pored njih, Muzej je ugostio i brojne slikare amatere: Batu Subotu, Čedomilu Ivanović, Vesnu Oborinu…

Ista praksa je nastavljena 29. jula 2018. kada je u prizemlju palate Grgurina otvorena Galerija nakon višemjesečne sanacije i adaptacije prostora, izložbom »Boja lica«, crnogorskih akademskih umjetnika Tijane Gordić i Adina Rastodera.

Razvoj i rast Ustanove, u korak je pratila i izdavačka djelatnost. Muzej je izdavač brojnih knjiga iz kulture i umjetnosti, a svakako je nezaobilazna edicija *Godišnjak Pomorskog muzeja u Kotoru,* koja predstavlja kultno izdanje u kojem su svoje tekstove utkali mnogi značajni ljudi, naučnici, arhitekte, arheolozi, istoričari umjetnosti, mislioci, književnici, poznavaoci pomorskih nauka. Godišnjak se u kontinuitetu štampa od 1952. godine do današnjeg dana, a do kraja 2022. godine će izaći iz štampe njegov 70. broj. Sa zadatkom objedinjavanja i obavještavanja o svim važnim mjesečnim aktivnostima institucije 2010. godine uspostavljen je mjesečni bilten *Jedra Boke* u digitalnom obliku.

Jedna od obaveza svakog muzeja je dostupnost. Tako je 2016. godine izrađen vodič na Brajevom pismu na crnogorskom i engleskom jeziku, a ove godine realizovan je prvi muzejski vodič na znakovnom jeziku. U Muzeju postoji i odjeljenje za OSI populaciju i audio gajd koji Muzej posjeduje već 15 godina.

Pored izložbene i izdavačke djelatnosti, zadatak Muzeja je da pomorsko blago, sve pokretne predmete koji ga definišu, sačuva od propadanja i iznošenja iz Crne Gore kako otkupom, tako i vrijednim donacijama građana koji su prepoznali njegovu misiju. Posebno su posljednje dvije decenije rada Muzeja prepoznatljive po brojnim donacijama, kojih je bilo preko 300. Ovim vrijednim predmetima obogaćene su i obnovljene zbirke, a rezultat je vidljiv i kroz nove izložbene muzejske predmete u stalnim postavkama Muzeja.

Sve muzejske aktivnosti zabilježene su u katalogu izložbe povodom 70 godina Muzeja *Hod kroz vrijeme i događanja*, autora Radojke Abramović, Danijele Nikčević, Dijane Đurašković i Tomislava Bonića. Pomenuta izložba dokumentarnog karaktera otvorena je 08. oktobra 2022. u galeriji Pomorskog muzeja, čini je izbor iz bogate i raznovrsne dokumentacije prikupljane tokom navedenog perioda. Katalog donosi popis realizovanih izložbi (197), kao i popis izdatih publikacija.

Kao kruna svega uspostavljene su brojne nagrade sa temom iz oblasti pomorstva, povodom 150. godina Vizinovog oplovljenja oko svijeta, nagrada najboljem učeniku Pomorske škole i studentu Fakulteta za pomorstvo.

U Pomorskom muzeju Crne Gore 2004. godine upriličena je nagrada „Merito Navali“, u čast počasne bijele zastave koju je proslavljenom Ivu Visinu dodijelio austrougarski car Franjo Josif 1860. godine. Nagrada se dodjeljivala priznatim kulturnim stvaraocima i ljudima koji su, kao prijatelji, mnogi i radnici muzeja, doprinjeli afirmaciji ove ustanove. Ovogodišnju nagradu primio je g-din Slavko Dabinović, dugogodišnji bibliotekar Pomorskog muzeja. Pored njega, dobitnici nagrade su bili: dr Miloš Milošević, kap. Milan Sbutega, g-din Antun Tomić, g-din Zoran Radimir, mr Jovan J. Martinović, g-din Petar Palavršić i mons. Anton Belan.

4. Posjete Pomorskom muzeju

Posjete visokih zvanica Pomorskom muzeju Crne Gore, započete šezdesetih godina, a najbrojnije sedamdesetih, povezane su s društveno-političkim i istorijskim okolnostima u Jugoslaviji i Crnoj Gori. Kulturno-političko otvaranje Jugoslavije i Crne Gore prema Zapadu nagovjestili su na saveznom i nacionalnom nivou britanski laburisti, odnosno njihova delegacija koja je boravila kod Josipa Broza Tita. Crnu Goru je početkom 1950. godine posjetio britanski laburistički poslanik Džon Parker, koji je o svojoj posjeti Crnoj Gori pisao u članku objavljenom 14. februara 1950. u *Mančester gardijanu*. Pišući vrlo pozitivno o Crnoj Gori, osvrnuo se na njenu istoriju, nacionalni identitet, nastojanje Jugoslavije da se odupre Informbirou, a pozitivno se izrazio i o naporima Crne Gore na unaprijeđenju ekonomije. Ovom posjetom Parker je otvorio put promociji Crne Gore i posjetama drugih uticajnih laburista. Oni su bili prvi koji su promovisali otvaranje Crne Gore prema Zapadu, pogotovo ono iz domena ekonomije, naročito turizma.[22]

Pomorski muzej u Kotoru posjećivali su uvaženi pojedinci, parovi, državne i političke delegacije, krunisane ličnosti, ljudi iz filmske umjetnosti,

[22] Katalog izložbe – *Hod kroz vrijeme i događanja,* autori kataloga: R. Abramović i D. Nikčević, JU Pomorski muzej Crne Gore, Kotor, 2022.

poslanici iz svijeta kulture, iz zemlje i inostranstva. Sjećanje na njihove posjete čuva se među koricama dvije muzejske Knjige utisaka – starije i nove. U starijoj Knjizi utisaka, braon kožnog poveza, zabilježeni su utisci svih uvaženih posjetilaca Muzeja od 12. juna 1968. godine do 9. septembra 2018, kada je knjiga kompletno ispisana, zatvorena i pohranjena u Biblioteci Pomorskog muzeja kao dragocjena riznica uspomena.[23] Tada je otvorena nova Knjiga utisaka, svijetloplavih korica, koje asociraju na more, kao tematsku okosnicu čitave muzejske postavke. Zlatno utisnuta slova na naslovnoj strani – Knjiga utisaka, daju joj poseban, elegantan ton. Prva posjeta uvaženih gostiju upisana je u novu Knjigu utisaka 21. novembra 2018. godine.

Šezdesetih godina Muzej su najviše posjećivali visoki politički i vojni funkcioneri iz zemlje i inostranstva, naročito visoke vojne ličnosti SSSR i političari Nesvrstanih zemalja, koji su bili u prijateljskim odnosima sa SFRJ. Najznačajnija posjeta muzeju bila je 15. maja 1969. godine, kada je Josip Broz Tito, predsjednik Socijalističke Federativne Republike Jugoslavije sa suprugom Jovankom posjetio Muzej.[24]

Josipa Broza Tita kroz Pomorski muzej proveo je Jovan Martinović. Tito je bio prvi od zvanica koji se u Knjigu utisaka upisao u reprezentativnom Žutom salonu. Tom prilikom je napisao: „Zadivljen sam sa velikom i slavnom prošlošću Boke Kotorske i njenih sinova koji su pronijeli svojom sposobnošću tu slavu širom svijeta“.[25]

Neposredno poslije Titove višednevne posjete Crnoj Gori, Pomorski muzej posjetio je poznati filmski par, glumica Sofija Loren sa suprugom, poznatim režiserom i producentom Karlom Pontijem. Zabilježene su i posjete okrunjenih ličnosti: japanskog prijestolonasljednika princa Akihita sa suprugom Mičiko 1979.; princeze Margaret Rouz, grofice od Snoudona, mlađe sestre engleske kraljice Elizabete II 1970.; kraljice Margarete II od Danske 1977.; sinova kraljice Elizabete II – Čarlsa, princa od Velsa 1978. i Endrua, vojvode od Jorka 2009.; princa Alberta II od Monaka 2013.; ali i tajlandske princeze Maha Čakri Sirindhorn, koja je Muzej posjetila 2018. godine. Oko kamere ovjekovječilo je i posjetu Luisa de Almeide Kabrala – predsjednika nezavisne Gvineje, ali i predsjednika Zaira Mobuta Sese Sekoa, zatim posjetu predsjednika Hrvatske Stjepana Stipe Mesića, predsjednika Albanije Alfreda Mojsijua, Bugarske Georgija Prvanova, Makedonije Đorđa

[23] Katalog izložbe – *Hod kroz vrijeme i utiske*, autori izložbe i kataloga: R. Abramović i D. Nikčević, JU Pomorski muzej Crne Gore, Kotor, 2020.

[24]Isto.

[25]M. Begović, ,,Pomorski muzej Crne Gore u Kotoru (1979 – 1984) – sanacioni radovi zgrade i ostala djelatnost", *GPMK XXXI–XXXII*, 1983–1984, str. 21.

Ivanova, Hrvatske Iva Josipovića, Malte Džordža Abele, Slovačke Ivana Gasparovića, Bugarske Rumena Radeva, Mađarske Janoša Adera.

Pored predsjednika država, Pomorski muzej posjećivale su i druge poznate ličnosti. Već 1967. godine u Knjigu utisaka upisuju se Sergej Georgijevič Gorškov, admiral Flote SSSR i Rodion Jakovljevič Malinovski, a nakon njih i švedski admiral Stig H: son Ericson; Dolores Ibaruri Gomez – španska političarka, generalna sekretarka Komunističke partije Španije; Aleksander Aleksandrovič Novikov, glavnokomandujući maršal Sovjetske avijacije za vrijeme Drugog svjetskog rata; Kiro Gligorov – predsjednik skupštine SFRJ; Sirimavo Ratvake Dijas Bandaranaike, premijerka Cejlona i Šri Lanke; Kosta Nađ – general Armije JNA; Mohameda Daud Kan – premijer Avganistana; Milka Planinc – predsjednica Saveznog izvršnog vijeća; Luka Bebić – predsjednik Hrvatskog sabora i ministar odbrane Hrvatske; Jona Mecger – vrhovni rabin Izraela; baronesa Helen Valeri Hajman – nekadašnja predsjednica Doma lordova Parlamenta Ujedinjenog Kraljevstva Velike Britanije i Sjeverne Irske; Ban Ki Mun – generalni sekretar UN; Irina Georgijeva Bokova – generalna direktorka UNESCO-a i mnogi drugi.[26]

Tradicija pomorstva utkana u kulturne tekovine grada, koja baštini kulturnu i civilizacijsku prošlost Boke Kotorske i Crnogorskog primorja, doprinjela je da je Pomorski muzej i danas nezaobilazno mjesto posjeta brojnih delegacija, državnih poglavara, slavnih ličnosti koji se upisuju u Žutom salonu, ispunjavajući stranice nove, svjetloplave Knjige utisaka.

5. Zaključak

Novija istorija, vjerujemo, nastavlja bogatu i slavnu tradiciju. Iskazuje se veliko divljenje i poštovanje svima onima koji su bili zaposleni u Pomorskom muzeju, kao i rukovodiocima i direktorima kojih je bilo pet: prof. Pavo Verona, prof. Ignjatije Zloković, mr Jovan J. Martinović, prof. Milan Begović i mr Mileva Pejaković Vujošević. Danas je direktor Muzeja Andro Radulović, koji je nastavio misiju svojih prethodnika-misiju očuvanja, prezentacije i istraživanja pomorskog i kulturnog nasljeđa Boke Kotorske. Pomorski muzej ovakav kakav je najvažnija je institucija kulture, čuvar i promoter kako pomorske tako i kulturne baštine Kotora, Boke Kotorske, Crnogorskog primorja i čitave države Crne Gore, institucija je koja prima hiljade posjetilaca iz cijelog svijeta i predstavlja nas svijetu.

Takođe, Pomorski muzej Crne Gore je član regionalne asocijacije ICOM SEE, zahvaljujući ovom članstvu nastaviće se rad na planu međunarodne i

[26] D. Nikčević, „Izložba Hod kroz vrijeme i utiske“, *GPMK LXIV-LXV*, 2020., str. 287-296.

regionalne saradnje. Od juna 2018. godine JU Pomorski muzej Crne Gore postao je punopravni član Asocijacije Pomorskih muzeja Mediterana–AMMM, da bi 2021. godine od Nacionalne Turističke organizacije dobio međunarodnu oznaku za sigurna putovanja *Safe Travels*, prethodno ispunivši pred Komisijom sve propisane uslove za dobijanje i upotrebu ove oznake, iza oznake stoji Svjetski savjet za turizam i putovanja.

Ono što je sigurno je da u XXI vijeku Muzeji postaju institucije koje u centar aktivnosti postavljaju publiku. U njima se kroz širi spektar programskih aktivnosti uči, ali i zabavlja. Savremeni muzej predstavlja atrakciju koja, pored predmeta i informacija o njima, posjetiocima nudi i potpuni doživljaj, a to je preduslov ponovnog obilaska. Ovako koncipirani muzeji odgovarajući na najveći izazov savremenog doba – pitanje komunikacije, postaju važni kulturni centri današnjice, otvoreni prema publici iz svog okruženja, ali i prema turistima. Time postaju značajne turističke atrakcije, generatori razvoja kulturnog turizma i turizma uopšte, a posredno i opšteg razvoja. U godinama koje slijede to će svakako biti i jedan od prioriteta i zadataka Pomorskog muzeja – nastojati i odgovoriti zahtjevima novog doba.

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Sedamdeset godina Pomorskog muzeja Crne Gore u Kotoru

Danijela Nikčević

Sažetak: Septembra 2022. godine navršilo se 70 godina od osnivanja Pomorskog muzeja Crne Gore Kotor. Ovaj značajni jubilej obilježen je svečanom akademijom u crkvi Svetog Duha–koncertnoj dvorani Muzičke škole "Vida Matjan" Kotor, a upriličena je izložba pod nazivom *Hod kroz vrijeme i događanja,* autora Radojke Abramović, Danijele Nikčević, Dijane Đurašković, Ilije Mlinarevića i Tomislava Bonića. Cilj svečane akademije, kao i izložbe, bio je sumirati, osvrnuti se i napraviti rekapitulaciju postignutog u proteklih sedam decenija postojanja i rada Pomorskog muzeja Crne Gore. Rješenjem Ministarstva pomorstva od 17. decembra 1949. donijeta je odluka o osnivanju Muzeja sa zadatkom da "prikuplja i otkupljuje, a zatim sređuje, izlaže i održava predmete i dokumenta koja se odnose na istoriju pomorstva Boke i da ovu istoriju proučava te istovremeno objavljuje rezultate svoga rada". Utemeljivači Muzeja bili su svjesni važnosti očuvanja istorijskog i kulturnog nasljeđa koje se vjekovima akumuliralo u palatama i kapetanskim kućama. Osnivanjem Muzeja ozvaničeno je postojanje muzejske i arhivske građe, a prikupljanje je nastavljeno tokom svih sedamdeset godina, bogaćenjem zbirki putem otkupa i donacija. Pomorski muzej danas je javna ustanova specijalizovanog tipa, ustanova koja se bavi sakupljanjem, čuvanjem, zaštitom, stručnom obradom i prezentacijom predmeta i

pokretnih kulturnih dobara iz pomorske prošlosti Crnogorskog primorja. Pomorski muzej Crne Gore 2012. godine imenovan je za matični muzej za pomorsko-tehničke zbirke koje čuvaju pomorsku baštinu Crne Gore.

Ključne riječi: sedamdeset godina Pomorskog muzeja, 10. septembar, svečana akademija, izložba, rekapitulacija postignutog, pojam i zadatak muzeja.

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Review paper

Competitiveness of the Market of New Heavy Commercial Vehicles - the Case of Slovenia

Alen Host, Lari Host, Alen Jugović

Summary: Globalization has had its established dynamics for many years. The world markets became more and more integrated, the availability of goods and security of supply was very high. However, the year 2020 and the COVID-19 crisis, followed by the war in Ukraine, showed the great vulnerability of the global economy and its dependence on established logistics routes. Price competitiveness of goods and services for the entire range of products is no longer the primary goal, but the key factor is ensuring security of supply. In such conditions, the market of new heavy commercial vehicles, which enables the smooth flow of goods between the economies of different countries, is under special attention.

Keywords: Competitiveness, Heavy commercial vehicles, Slovenia, EU

1. Uvod

Slovenija je imala svoj razvojni put koji se u bitnoj mjeri razlikuje od drugih država bivše Jugoslavije, a njezino gospodarstvo je pošteđeno ratnih razaranja. Politika Slovenske narodne banke koju karakterizira umjerena inflacija u 1990-im godinama, izbor slabijeg tečaja slovenskog tolara te izbor adekvatne ekonomske politike omogućio je slovenskoj državi očuvanje velikog dijela gospodarstva tranzicijskom razdoblju.

Izlazak sa zajedničkog jugoslavenskog tržišta na koje je otpadalo 36% ukupne slovenske proizvodnje nadoknađen je već sredinom devedesetih te se stvara osnova za dodatni razvoj i ulaganja. Još kao dio Jugoslavije, Slovenija je bila najrazvijenija u segmentu prijevoza roba, koji je povezan s industrijskom proizvodnjom koja je sačuvana u tranzicijskom razdoblju. Rast prometa Luke Kopar i pozicija na paneuropskim transportnim koridorima, uključivanje u Europsku uniju i ulazak u šengenski prostor donose jačanje prijevozničke djelatnosti u Sloveniji. Premda Luka Trst na temeljem potpisanih kinesko-talijanskih ugovora raste u broju prekrcanih kontejnera, konkurentnost Luke Kopar se nastavlja povećavati intenzivnim infrastrukturnim investicijama.

2. Analiza trgovine novim teškim gospodarskim vozilima

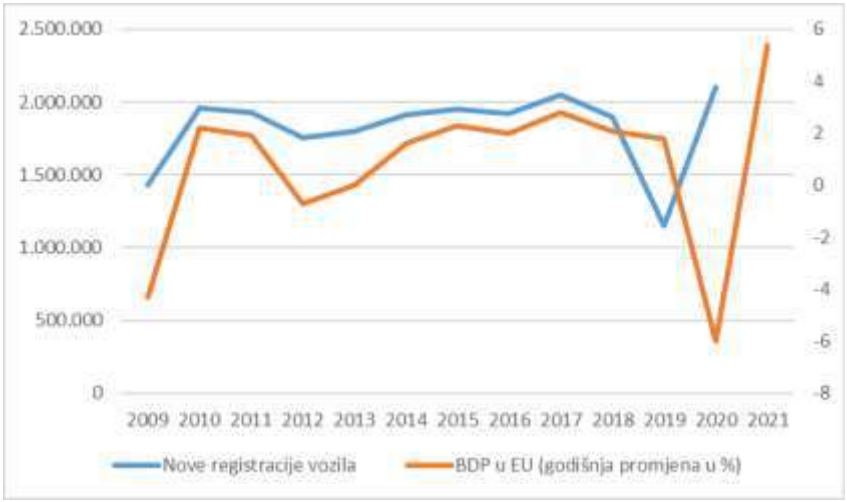
Cestovni promet čini 73,1% svih tereta koji se voze kopnom u EU. U modernim gospodarstvima 85% cestovnog tereta prevozi se na udaljenosti do 150 km, jer drugi oblici prometa nisu konkurentni (tablica 1).

Tablica 1. *Broj registracija novih teških gospodarskih vozila (maksimalne mase preko 15.000 kg) na tržištu EU, Švicarske, Norveške, Velike Britanije i Bosne i Hercegovine.*

Godine	2017.	2018.	2019	2020.	2021.
Ukupno komada	351.134	362.729	364.511	263.914	309.597

Izvor: *Ford Otomotiv Sanayi A.Ş. [29]*

Istraživanja pokazuju da prodaja teških gospodarskih vozila u znatnoj mjeri ovisi o rastu ili padu BDP-a, geografskom položaju i integriranosti, razini industrijske proizvodnje, kao i značaju i snazi pomorskih luka u državi (grafikon 1). Ključni ograničavajući faktor koji ograničava rast tržišta trenutno je broj raspoloživih vozača. U Sloveniji je konstantna potražnja za preko 500 vozača, koja se ne može zadovoljiti na nacionalnom tržištu rada. U susjednim je državama ovaj problem jednako tako prisutan, te se tržište rada alimentira uvozom vozača iz država Azije.



Izvor: Ford Otomotiv Sanayi A.Ş. [29]

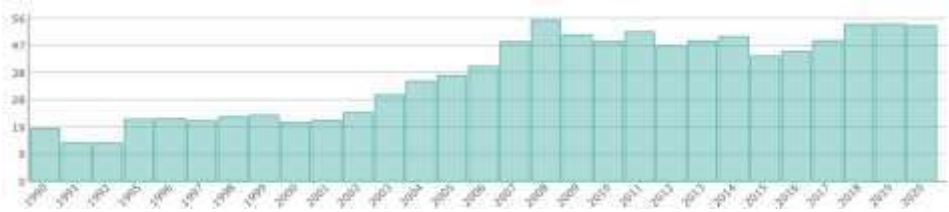
Grafikon 1 - *Kretanje registracija novih gospodarskih vozila i BDP-a u EU.*

Slovensko tržište reagira poput ostalih europskih tržišta. Reakcija na promjene u BDP-u je povezana s brojem registracija vozila, a pad tržišta u 2020. godini bio je veći od prosjeka EU. U godinama rasta BDP-a, slovensko

tržište raste više od najvećih europskih tržišta. Međutim, negativan trend u 2019. i 2020. godini rezultirao je pogoršanjem niza financijskih pokazatelja uz porast EBITDA-marže i koeficijenta tekuće likvidnosti, kao i smanjenja dana vezivanja.

3. Analiza tržišta novih teških gospodarskih vozila u Sloveniji

Slovenija ima sva obilježja malog gospodarstva koje brzo raste i izvozno je usmjereno [21]. U Jugoslaviji je Slovenija imala najrazvijenije gospodarstvo [20, 22], a osamostaljenjem, privatizacijom i internacionalizacijom počelo je dugo razdoblje stabilnog rasta (grafikon 2). Slovenija je od 01. svibnja 2004. članica Europske unije, a od 01. lipnja 2007. dio euro-zone. Sve je to povećalo njezinu međunarodnu konkurentnost, te Slovenija pripada skupini gospodarski najpropulzivnijih država svijeta [23].



Izvor: *Worlddata.info, 2020. [32]*

Grafikon 2 - *Kretanje BDP-a u Sloveniji, 1990. – 2020. godine (mlrd. USD).*

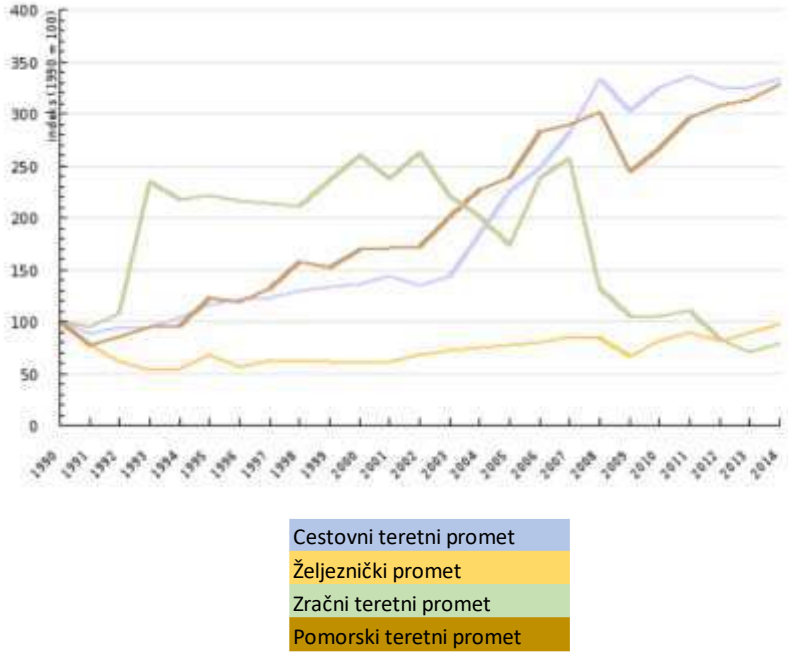
Geostrateški položaj Slovenije rano je potaknuo razvoj logističke i transportne industrije. Luka Kopar je najveća slovenska luka u čiju se infrastrukturu neprestano ulaže. Rastuće potrebe za razvoj međunarodnog prijevoza roba osigurati će joj drugi kolosijek željezničke pruge i opsežna modernizacija infrastrukture koja će trajati do 2025. godine [38]. Slovenske željeznice će strateškim povezivanjem s Holdingom Daniela Kretinskog iz Praga stvoriti novo društvo s ambicijom liderstva na području željezničke logistike u jugozapadnoj Europi koje će dovesti do udvostručenja dobiti i 50% rast prihoda u roku od 5 godina [19].

U 2022. godini kapacitet Luke Kopar bit će 1,5 milijuna TEU-a, pri čemu nešto manje od 50% otpada na cestovni teretni prijevoz. To ima direktan utjecaj na prodaju teških motornih vozila.

Kineska inicijativa 'Jedan pojas, jedan put' naišla je na pozitivan odjek u Sloveniji, te je obostrana želja da Luka Kopar postane kineska vrata u Europu. Rast i razvoj Luke Kopar, rast gospodarstva, rani ulazak Slovenije u Europsku uniju, manji troškovi poslovanja, jeftinije registracije vozila privukle su mnoge poduzetnike iz drugih država okruženja da registriraju svoje tvrtke u Sloveniji. Unatoč značajnom broju tvrtki u stranom vlasništvu,

okosnicu ipak čine tvrtke u slovenskom vlasništvu. Procjenjuje se da je u Sloveniji registrirano 1800 hrvatskih kamiona [17] iako je brojka vjerojatno manja te ovu procjenu treba uzeti sa zadrškom.

Iz Grafikona 3 vidljiv je porast cestovnog prijevoza tereta u Sloveniji od osamostaljenja 1991. godine. Vidljivo je da je prve tri godine od osamostaljenja cestovni prijevoz u Sloveniji stagnira, a već 1994. dolazi do linearnog rasta. Ulaskom Slovenije u EU rast se ubrzava do 2009. godine. Tržište novih teških gospodarskih vozila prati ključne gospodarske parametre ekonomske trendove i rast teretnog prijevoza.

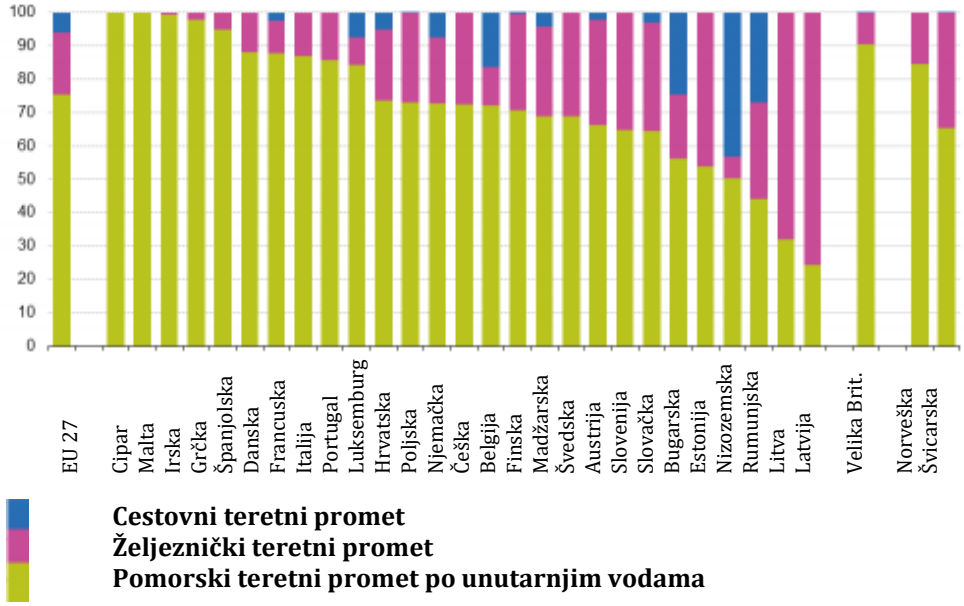


Izvor: *Statistični urad Republike Slovenije, 2014.*

Grafikon 3 - *Teretni prijevoz i promet u Sloveniji u razdoblju 1990.-2014.*

Napomena: (cestovni prijevoz unutarnji i međunarodni– milijunima tkm (tonskih kilometara), željeznički prijevoz – neto milijuna tkm na teritoriju Slovenije, lučki promet – 1000 t ukrcanog i iskrcanog tereta u lukama, zrakoplovni promet – t ukrcanog ili iskrcanog tereta u zračnim lukama)

O važnosti cestovnog prijevoza tereta govori grafikon 4. Iako će završetkom željezničke infrastrukture željeznica preuzeti jedan dio transporta i dalje će cestovni prijevoz robe zadržati svoj primat.

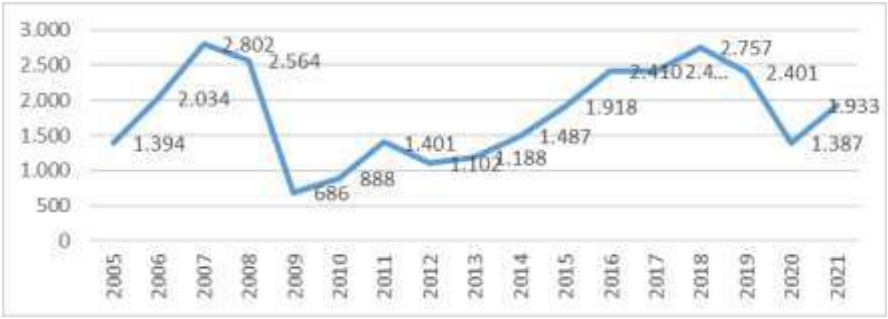


Izvor: *Ec.europa.eu. 2022. [33]*

Grafikon 4 - *Udjeli prijevoza u ukupnom teretnom prijevozu (% tkm=tonski kilometar) u 2018. u izabranim europskim državama.*

Iz grafikona 4 na osnovi podataka o prevezenim tonskim kilometrima (umnožak mase prevezenog tereta i prevezenih kilometara) vidljivo je značenje cestovnog prijevoza kao i dalje najzastupljenijeg oblika prijevoza robe u EU.

Iz grafikona 5 uočava se učinka gospodarske krize koja je najizraženija 2009. godine i povratak na razine prodaje prije krize u 2016. godini. Kontrakcija ovoga tržišta u 2020. godini odraz je krize uzrokovane pandemijom COVID-19. U 2021. godini, kao što je slučaj s drugim sektorima gospodarstva, dolazi do brzog opravka tržišta. Zbog nedostatka mikroprocesora, globalnih problema u opskrbnim lancima i kašnjenja u isporuci broj novoregistriranih vozila značajno je manji od broja ugovorenih vozila.



Izvor: *obrada autora temeljem podataka iz Statistični urad Republike Slovenije, 2022*

Grafikon 5. *Kretanje slovenskog tržišta novih teških gospodarskih vozila.*

Slovenija u konjunkturnim godinama ima značajno veći broj prodanih novih kamiona po stanovniku od gospodarski najvećih europskih zemalja, što potvrđuje da se radi o državi s izrazito razvijenom prijevozničkom djelatnošću. Indeks broja tegljača u ukupnom broju teških gospodarskih vozila je iznad 70%, budući da se radi o državi koja se bazira na međunarodnom transportu.

Za države Jugoistočne Europe karakteristična je usmjerenost na uvoz rabljenih teških gospodarskih vozila. Uvoz rabljenih teških gospodarskih vozila statički se bilježi u Sloveniji, ali je vidljivo da se on uglavnom odnosi na novija rabljena vozila starosti do tri godine [39].

3.1. Analiza uvoznika novih teških gospodarskih vozila Republici Sloveniji

Tržišna uspješnost uvoznika teških teretnih vozila na slovenskom tržištu može se identificirati putem registracije novih teških gospodarskih vozila.

Iz tablice 2 razvidno je da su uvoznici MAN-a, SCANIA-e, VOLVO-a i MERCEDES-a od 2018. do 2021. godine ostvarili 76 do 79,5% tržišta. Cjenovnim repozicioniranjem Scania je izgubila dio kupaca koje uglavnom preuzima MAN. U istom razdoblju DAF gubi 1,2 % tržišta godišnje, a zbog povećanja cijena pokazuje veliku ranjivost te se predviđa daljnji gubitak tržišnog udjela. Rast IVECO-a u 2021. uvjetovan je prvenstveno zbog dostupnosti kamiona bez čekanja, ali i dalje ostvaruje samo 78% prodaje iz 2018. godine.

Tablica 2. *Registracija novih teških gospodarskih vozila u Sloveniji u razdoblju 2018.-2021.*

	Ukupno tržište				Tržišni udio			
Marka	**2018**	**2019**	**2020**	**2021**	**2018**	**2019**	**2020**	**2021**
MAN	561	531	355	493	20,3%	22,1%	25,6%	25,5%
Scania	582	515	235	279	21,1%	21,4%	16,9%	14,4%
Mercedes	480	446	240	366	17,4%	18,6%	17,3%	18,9%
Volvo	482	378	273	347	17,5%	15,7%	19,7%	18,0%
DAF	324	247	132	156	11,8%	10,3%	9,5%	8,1%
Renault	165	149	67	121	6,0%	6,2%	4,8%	6,3%
Iveco	152	105	64	118	5,5%	4,4%	4,6%	6,1%
Ford	9	21	13	50	0,3%	0,9%	0,9%	2,6%
Ostale marke	2	9	8	3	0,1%	0,4%	0,6%	0,2%
Ukupno	**2.757**	**2.401**	**1.387**	**1.933**	**100%**	**100%**	**100%**	**100%**

Izvor: *Tablica autora rada izrađena temeljem podataka iz Statistički urad Republike Slovenije, 2022.*

Kao što je vidljivo u tablici 2, kod COVID-19 krize najveću stabilnost u zadržavanju udjela na tržištu imali su uvoznici MAN-a, Mercedesa i Volva. Za razliku od ukupnog tržišta, veće su oscilacije prisutne u segmentu tegljača. Scania je u segmentu tegljača zbog rasta cijene i nedovoljne količine vozila na raspolaganju za isporuku izgubila preko 9% tržišnog udjela. Ovaj su udio preuzeli uvoznici MAN-a, Mercedes-a, IVECO-a i FORD-a. Za razliku od dobrih prodajnih rezultata u Europi, DAF na slovenskom tržištu gubi svoj tržišni udio (tablica 3).

Tablica 3. *Broj registriranih novih tegljača u Sloveniji u razdoblju 2018.-2021.god.*

	Tržište tegljača				Tržišni udio tegljača			
Marka	**2018**	**2019**	**2020**	**2021**	**2018**	**2019**	**2020**	**2021**
Scania	486	440	188	216	25,5%	27,6%	20,6%	16,1%
Volvo	420	316	233	290	22,0%	19,8%	25,5%	21,6%
MAN	359	319	222	319	18,8%	20,0%	24,3%	23,8%
DAF	277	202	110	138	14,5%	12,7%	12,0%	10,3%
Mercedes	208	199	87	173	10,9%	12,5%	9,5%	12,9%
Renault	84	81	37	88	4,4%	5,1%	4,1%	6,6%
Iveco	67	17	25	79	3,5%	1,1%	2,7%	5,9%
Ford	8	19	11	38	0,4%	1,2%	1,2%	2,8%
Ukupno	**1.909**	**1.593**	**913**	**1.341**	**100%**	**100%**	**100%**	**100%**

Izvor: *Tablica autora rada izrađena temeljem podataka iz Statistički urad Republike Slovenije, 2022.*

3.2. Definiranje konkurentskih prednosti ili slabosti uvoznika novih teških gospodarskih vozila u Republici Sloveniji

Konkurentska prednost ili slabost uvoznika teških gospodarskih vozila proizlazi iz snage principala i njegovog proizvoda i snage uvoznika. Nove CASE (Connected - povezane, Autonommous – autonomne, Shared&Services - dijeljene i uslužne, i Electric - Električne) tehnologije postaju osnova transformacije tržišta teških gospodarskih vozila (tablica 4). Navedena transformacija donijet će velikim tradicionalnim proizvođačima nove konkurente u vidu novih start-up-ova i novih ponuđača. Godina 2022. obilježena je rastom nepredvidljivosti, porastom inflacije te ratnim zbivanjima na granicama EU. Pražnjenje nekretninskih balona, kripto balona, rat, nestašica i cijena plina ili ubrzavanje inflacije, mogu imati brzi i negativan utjecaj na proizvodnju, trgovinu i prijevoz. Problemi u opskrbnim lancima proizvođačima onemogućavaju produkciju željene količine vozila. Potražnja za novim kamionima značajno je veća od 2017. godine, ali je ipak 2021. godine registrirano značajno manji broj novih kamiona od 2017. godine.

Tablica 4. *SWOT analiza grane uvoznika novih teških gospodarskih vozila*

	Snage	**Slabosti**
Unutarnji faktori	Poznavanje tržišta	Tržište je ograničeno i ne omogućuje veći rast i razvoj
	Velika lojalnost kupaca prema brendovima	Negativan trend profitabilnosti cijele grane
	Akumulirano znanje i iskustvo u postprodaji	Nedostatak obučenih servisnih djelatnika
	Prilike	**Prijetnje**
Vanjski faktori	Povećanje potražnje usljed ekonomskog rasta	Nestabilnost globalne ekonomije
	Ekstra zarada kroz plasman vozila iz BUY BACKA	Dolazak novih konkurenata s boljom tehnologijom
	Nove tehnologije koje će omogućiti poslovanje uz manje troškove	Novi kanali prodaje teških gospodarskih vozila
		Smanjeni servisni potencijal u budućnosti
		Transformacija tržišta
		Pad tržišta usljed krize i pad vrijednosti vozila iz Buy Backa

Europski proizvođači početkom 2022. godine imaju 25.000-40.000 komada nezavršenih novih kamiona. To je izravan razlog za manjak rabljenih kamiona na tržištu. Smanjena ponuda i povećana potražnja podignula je cijenu novih kamiona do rekordne visine. Sredinom 2022. godine se ne nazire trend stabilizacije cijena rabljenih kamiona, niti trend zaustavljanja rasta cijena novih vozila. Navedeni problemi u opskrbnim lancima i rastuća potražnja prolongirali su rokove isporuke s uobičajenih 45-90 dana do 2020. godine na 12-16 mjeseci. Također, to znači da su otkupi vozila realizirani na visokim razinama cijena što predstavlja rizik u slučaju bilo kakve korekcije tržišta. Narudžbe, koje često nisu pokrivene

predujmovima predstavljaju potencijalni rizik za poslovanje većeg broja uvoznika.

Ciklička kretanja gospodarstva negativno utječu na poslovanje uvoznika teških gospodarskih vozila, te nespremne može značajno unazaditi, a slabije i gurnuti u stečaj. Godina 2021. okončana je s velikom zalihom novih i rabljenih turističkih autobusa. Prodaja rabljenih autobusa i novih autobusa, kada do nje dođe, generirat će značajno smanjenje cijena i sigurne gubitke za sve one koji ih imaju na zalihi.

4. Ocjena konkurentnosti uvoznika novih teških gospodarskih vozila

S obzirom da uvoznici teških gospodarskih vozila ostvaruju prihode iz raznih izvora ocjena konkurentnosti uvoznika teških gospodarskih vozila nije nimalo jednostavna. U tablici 5 uspoređena je konkurentnost uvoznika na osnovi ključnih financijskih pokazatelja.

Tablica 5. *Usporedba konkurentnosti uvoznika teških gospodarskih vozila.*

	Autocommerce d.o.o.		Benussi d.o.o.		Cordia d.o.o.		KAM I BUS importer d.o.o.		MAN Bus & Truck Slovenija d.o.o.		Scania Slovenija d.o.o.		Volvo d.o.o.		Grana	
	19/18	20/19	19/18	20/19	19/18	20/19	19/18	20/19	19/18	20/19	19/18	20/19	19/18	20/19	19/18	20/19
Obrtaj ukupne imovine	-	-	-	-	-	-	+	+	-	-	-	-	-	+	-	-
Dani vezivanja potraživanja	+	-	+	+	+	+	-	+	+	-	-	+	+	+	-	-
Dani vezivanja zaliha	+	-	+	-	-	+	+	-	+	+	+	+	+	-	+	+
Ukupni prihodi	+	-	+	-	-	-	+	+	-	-	-	-	-	-	-	-
EBITDA marža	-	-	+	+	-	+	+	-	+	-	+	+	+	+	-	+
ROA	-	-	+	-	-	-	+	-	-	-	-	-	-	+	-	-
ROE	-	-	+	-	-	-	-	-	-	-	-	-	-	+	-	-
Novostvorena vrijednost	-	-	+	-	-	-	+	+	-	-	-	-	-	-	-	-
Koeficijent tekuće likvidnosti	-	-	-	-	-	+	+	-	+	-	-	-	+	+	-	+
Koeficijent financijske stabilnosti	+	-	+	-	+	-	+	-	+	+	+	+	-	-	+	-
Broj pozitivnih promjena	4	0	8	2	2	4	8	4	5	2	3	4	4	6	2	3
Broj negativnih promjena	6	10	2	8	8	6	2	6	5	8	7	6	6	4	8	7

Pozitivno odstupanje u odnosu na prethodnu godinu	+
Negativno odstupanje u odnosu na prethodnu godinu	-

Izvor: *autori rada izrađen temeljem podataka iz javno objavljenih financijskih izvještaja preuzetih s www.ajpes.si. [34]*

Iz Tablice 5 moguće je iščitati da je trend 2019. na 2020. godinu koja je bila obilježena krizom uzrokovanom bolesti COVID-19. Iz podataka o prodaji vidljivo je da je Mercedes isporučio 46% manje novih kamiona, te da je u 2019. došlo do velikog rasta zalihe. Konačno ostvaren je pad svih 10 promatranih pokazatelja.

Brzom prilagodbom Volvo d.o.o. je, usprkos padu isporuka za 35% uspio zadržati pozitivniji trend od grane i ostvariti 6 pozitivnih promjena, nasuprot 4 negativne.

MAN truck&bus Slovenija d.o.o je usprkos rekordnom tržišnom udjelu ostvario gubitak, a vidljivo je negativno kretanje 8 od 10 indeksa. Vrlo je vjerojatno da je pod pritiskom velike zalihe rasprodavao vozila s manjom zaradom. Gubitak, praćen negativnim promjenama je ostvario i Kam in bus importer d.o.o.

Svi ostali konkurenti imali su značajne poteškoće i usporavanje prodaje. Stvarne gubitke COVID-19 razdoblja bit će moguće procijeniti tek nakon likvidiranja zalihe turističkih autobusa.

5. Zaključak

Kriza uzrokovana bolešću COVID-19 se vrlo brzo sa zdravstvenog područja prelila i na gospodarstvo. Dubina i dramatične promjene u funkcioniranju gospodarstva uzrokovale su veliku nestabilnost i neizvjesnost što se nužno odražava i na auto industriju.

Analiza konkurencije pomaže u objektivnoj valorizaciji rezultata poslovanja i korištenju punog potencijala tržišta. Temeljem analize financijskih podataka uvoznika novih teških gospodarskih vozila vidljivo je da svi uvoznici ne koriste jednako potencijal tržišta, te da vodeća pozicija u prodaji ne znači nužno i pozitivan rezultat. Također, vidljivo je da je kriza uzrokovana pandemijom bolesti COVID-19 negativno na sve uvoznike, te da je samo jedan od njih uspio svojom prilagodbom poboljšati dio svojih pokazatelja i na taj način umanjiti negativan utjecaj krize.

Slovenija je članica EU, OECD-a, koja ima dobru geostratešku poziciju, konkurentnu industriju, jaku infrastrukturu i Luku Kopar što sve skupa pogoduje razvoju cestovnog prijevoza. Tržište novih teških gospodarskih vozila Slovenije u odnosu na broj stanovnika jedno je od najznačajnijih europskih tržišta gdje su prisutni svi europski proizvođači teških gospodarskih vozila.

Analiza i segmentacija tržišta ključna je za prepoznavanje tržišnih niša u koje se isplati ulagati i podlogu za promjenu prodajne organizacije. Utvrđeno je da cijela grana uvoznika teških gospodarskih vozila ima graničnu financijsku stabilnost, te posluje uz smanjenu profitabilnost i sve veće neto troškove poslovanja. U takvim uvjetima poznavanje komparativnih prednosti i mana konkurencije i pravovremeno prepoznavanje omogućenih tržišnih prilika postaje jednako važno kao i poznavanje i razumijevanje potreba kupaca.

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Konkurentnost tržišta novih teških gospodarskih vozila – slučaj Slovenije

Alen Host, Lari Host, Alen Jugović

Sažetak: Globalizacija je dugi niz godina imala svoju ustaljenu dinamiku. Svijet se sve više trgovinski integrirao, dostupnost roba i sigurnost dobave je bila vrlo visoka. Međutim, 2020. godina i COVID-19 kriza, na koju se nadovezao rat u Ukrajini pokazala je veliku ranjivost globalnog gospodarstva i ovisnost o ustaljenim logističkim putevima. Cjenovna konkurentnost roba i usluga za cijeli niz proizvoda više nije primarni cilj, nego je ključni faktor osiguranje sigurnosti dobave. U takvim je uvjetima pod posebnom pažnjom tržište novih teških gospodarskih vozila koje omogućava nesmetani protok roba između gospodarstava različitih država.

Ključne riječi: konkurentnost, teška gospodarska vozila, Slovenija, EU

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Numerical Research on the Mathematical Model of Echosounder for Distance to Bottom Measurement

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Abstract: In recent years, we can observe a dynamic development of numerically tested algorithms dedicated to AUV (Autonomous Underwater Vehicle) and ROV (Remotely Operated Vehicle). Simulations can provide valuable experience at the preparation stage to avoid irregularities in research in the real environment. This article presents a mathematical model of the echosounder for measuring the distance from the bottom implemented and simulated in MATLAB. The presented algorithm's operation example confirms the correctness of the model.

Keywords: Echosounder, AUV, Trajectory-tracking.

1. Introduction

In recent years, we can observe a dynamic development of numerically tested algorithms dedicated to AUV and ROV. An example may be path planning and collision avoidance algorithms, where a much more significant amount of simulation tests has been noticeable compared to tests performed in a real environment [1]. Preparation for real-world research related to testing systems implemented in underwater vehicles is usually time-consuming. It must be preceded by an appropriate analysis, including the impact of the environment on the tested object. Making a mistake during the tests may result in unpredictable consequences, such as destruction or loss of the tested vehicle. Numerical simulations can provide valuable experience at the preparation stage to avoid irregularities in research in the real environment. Therefore, it is necessary to develop models of sensors, actuators, controllers, and propulsion [2 - 5]. Additional information about possible design or construction errors can be obtained by performing tests in laboratory conditions on specially prepared and tested stands [6].

This article presents a mathematical model of the echosounder for measuring the distance from the bottom developed in the project entitled "Development of a system for detecting underwater obstacles, mapping the environment and avoiding underwater obstacles by autonomous

underwater vehicles (AUV)". The mathematical model of the echosounder was implemented and simulated in MATLAB. The simulated example of the model confirms its correct operation.

The article is organized as follows Chapter 2 presents theoretical assumptions for the hydroacoustic system. Chapter 3 shows the concept of the sonar model and describes the algorithm. Chapter 4 presents a simulation check of the operation of the echosounder model installed in the AUV moving along a given trajectory. Finally, Chapter 5 contains conclusions and future works.

2. Parameters of the hydroacoustic system

The operation of the echosounder is based on the propagation of an acoustic wave in an underwater environment. It is used to measure the distance, e.g., to the bottom or other objects, depending on the method of installation on an underwater vehicle. A frequent application of the echosounder is bathymetry, where it can be used to measure and visualize the bottom of water reservoirs. Distance measurement by the echosounder is based on transmitting acoustic pulses in an underwater environment. Part of the signal reaching the object is reflected and returned to the transducer. The detected object distance is calculated from the sound propagation time underwater according to the following equation:

$$R = \frac{ct}{2} \tag{1}$$

where:
c – speed of sound in an underwater environment,
t – time for the sound to reach the target and back to the transducer.

Sound propagation in the underwater environment can be represented by the plane wave equation (depending on spatial variations in pressure and time) as below [7]:

$$p(x,t) = A\sin\left(2\pi f t - \frac{2\,\pi\,x}{\lambda}\right) = A\,\sin\,(\omega\,t - k\,x); \tag{2}$$

where:
A – peak amplitude of the acoustic pressure of a plane wave,
f – frequency in Hz,
λ – wavelength,
ω – angular frequency in rad/s,
k – wave number in rad/m.

The transmitted beam takes the shape of a cone. Its aperture angle is determined by the physical parameters of the echosounder.

The basic equation representing the performance of the echosounder, taking into account the parameters of the object, the environment, and the transducer, is shown below [8].

$$SE = (SL + TS - 2PL) - N - DT \tag{3}$$

where:

SL - Source Level,
TS – Target Strength,
PL – Propagation Loss,
N – Noise Level,
DT – Detection Threshold.

Based on the above equation, it is possible to calculate the transmitter power needed to detect an object of a given size at a known distance. The equation shows the relationship for the sonar signal but is also true for the echosounder. The difference between devices such as FLS, Side Scan Sonar, and Echosounder is usually the shape of the beam, range, frequency, number of pulses, etc. A typical echosounder is characterized by a narrow beam and a respectively high power level that allows for determining the distance to an object in a particular direction.

3. The concept of the mathematical model of echosounder for distance to bottom measurement

The mathematical model is based on the parameters of the real Tritech Micron Echosounder, shown in Figure 1. The Echosounder is characterized by the following parameters:

- Operating frequency 500 kHz,
- Beamwidth 6° conical,
- Minimum range of 0.3 m,
- Maximum range of 50 m,
- Depth rating to 750 m,
- Communication protocol RS485 or RS232.

Fig. 1 – *Tritech Micron Echosounder [9]*

Like other devices of this type, the Micron Echosounder generates a conical beam with a specific opening angle, in this case, 6 °. Such a value of the aperture angle causes the AUV located 10 m above the bottom with the echosounder directed towards the bottom "examines" an obstacle in a circle whose diameter is more than 1 m. At a maximum range of 50 m, the echosounder "sees" a circular area with a diameter of more than 5 m. When AUV is tilted or trimmed examined area of the bottom will no longer be a circle but, in simple terms, a projection of the circle onto a plane close to an ellipse. Therefore, it should be noted that when examining the depth of the bottom and the height of any obstacles related to the bottom, it is essential to study a circular area with a diameter depending on the average distance from the bottom. The next important thing is the orientation of the AUV in space, particularly tilt and trim angles.

The algorithm for determining the mean and minimum distance from the seabed implemented and evaluated in the MATLAB environment is described below. The algorithm requires the following input data:

- echo sounder location coordinates (wspEcho),
- AUV orientation angles (*orien*),

- Echosounder beamwidth (*szer*),
- minimum sonar view range (*zasmin*),
- maximum sonar view range (*zasmax*),
- maps of the bottom and obstacles in the form of a depth matrix (**Map1**) and a reflections coefficient matrix (**Map2**),
- map resolution (*rozdz*),
- map dimension in the x-axis (wX),
- map dimension in the y-axis (wY).

First, the algorithm calculates the coordinates of the centre of the circular area at the maximum defined view range. The values of the previously mentioned coordinates are computed with regard to the AUV orientation angles using the Transform.m function. Then, the average value of the depth is calculated by averaging the values of the elements of the **Map1** depth matrix that are located in the area of the previous-mentioned circle. The knowledge of the current AUV immersion depth allows the calculation of the average distance from the bottom, which, in turn, is used in the next iteration of the algorithm when the circular area of view range is determined to equal the calculated average distance from the bottom. Points determined in a given circular area are examined in terms of two criteria:

1. Does the base of the cone extend beyond the environment?
2. Does the point with the given height belong to the cone?

Both conditions are verified based on the cone equation.

Finally, from the obtained set of depth matrix elements meeting the previous-mentioned conditions, the minimum value of *DnoMin* is selected, and the average value of *DnoSr* is calculated. Additionally, based on elements of the reflection coefficient matrix selected according to the same criteria, the average value of the power of the reflected signal *MocSr* is calculated. In the current version of the *MocSr* algorithm, it is not taken into account, but it is expected that this parameter will be taken into account after the planned tests in real conditions. Probably, for a certain threshold of the *MocSr* parameter, errors in measuring the distance from the bottom will be obtained. There is no information on this in the manufacturer's documentation.

4. Example of the algorithm's operation

As an example of the echosounder operation, a simulation of AUV movement was carried out according to a given trajectory in the 3D environment with static obstacles. Figure 2 shows the simulated trajectory of the vehicle, taking into account the obstacles and constraints related to the implemented propulsion models and control elements.

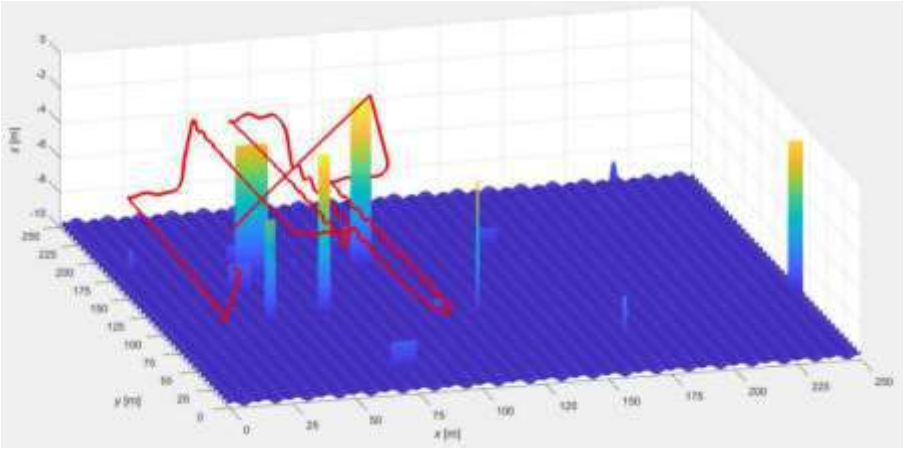

Fig. 2 – *Simulated trajectory of the AUV*

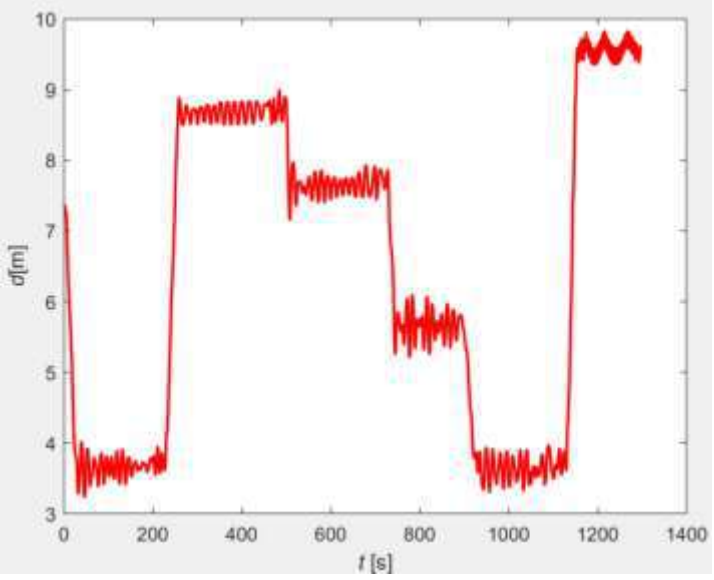

Fig. 3 – *Distance to the bottom measured by using the echosounder model*

Figure 3 presents changes in the vehicle depth based on the applied mathematical model for determining the distance from the bottom. Due to the bottom unevenness, slight fluctuations in the measured distance from the bottom are visible while the vehicle is moving. It confirms the correct operation of the echosounder model.

5. Conclusion

The article presents a mathematical model of the sonar designed to measure the distance from the bottom. The obtained results of simulation tests of the developed echosounder model for AUV moving along a given trajectory in an environment with obstacles confirm its correctness. After the research results in the real environment, further fine-tuning of the developed model is foreseen.

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Student Advancement During Simulator Training*

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Abstract: This paper presents the organization and results of a test that attempted to evaluate the success of training students of Marine Engineering on the simulator during the regular course in the third year of the Faculty of Maritime Studies in Split. Sixteen students were assessed at the beginning of the course, then after completing the first part of the training, and finally at the end. The progress of the students was measured using a questionnaire and by performing actual tasks on the simulator. Measuring the success of the simulator training showed a very high success rate that 93.75% of the students met all requirements and passed all tests.

Keywords: Maritime Training, Simulators, STCW & Familiarization.

1. Introduction

Maritime educational institutions in Croatia must follow all rules set by the state [1], as well as meet all requirements regulated by the Convention on Seafarers Training, Certification, and Watchkeeping (STCW) [2]. The convention regulates the use of simulators for training and certification in Maritime Education and Training processes. In accordance with the above rules and regulations, the Faculty of Maritime Studies in Split conducts training for its students on simulators. The Faculty has a large number of simulators, which are used by different departments and different studies and different courses of study. The Department of Marine Engineering has three real-time engine room simulators capable of simulating numerous different engine room configurations (for example steam propulsion, slow-speed diesel engine, medium-speed diesel engine, diesel-electric...). These simulators are Kongsberg Neptune K-Sim Full Mission Engine Room Simulator, Wartsila (Transas) ERS 5000W simulator (2D - ER simulator on the PC), and Wartsila (Transas) ERS 5000W 3D Full Mission Engine Room Simulator. Described simulators are used in the training of marine

* An earlier version of this paper was presented at the 1st Kotor International Maritime Conference – KIMC 2021, Kotor, Montenegro.

engineering students as part of the curriculum. The courses are structured in such a way that the students are learning to demonstrate the theoretical knowledge in the "real" environment (simulator), i.e., to put the theory into virtual practice [3], which is the best solution when people are not on the ship. The course instructors are experienced Marine Engineering Officers and Chief Engineers (some of them are authors of this article) trying to pass on their knowledge and experience to the students and trying to achieve the goal set by Malik and Zafar: "*When properly used, supported by well trained and experienced instructors, simulator training, through its risk-free environment, can contribute to a reduction in accidents and improve capability and efficiency, by providing trainees with the necessary experience and self-confidence to carry out their roles, functions and tasks*" [4]. Despite the high-quality equipment and the effort of the instructors, there is always a question that Sellberg [5] formulated during his research on the use of simulators in training: "*Although the practice of using simulators is well regulated and widespread in Maritime Education and Training, it seems few studies address the pedagogical use and benefits of simulator-based training in this domain*".

The real-time simulator training process is very useful for marine engineers working on real vessels and can provide various types of training that are in accordance with industry needs as it is described by Shen et al. [6]: "*to fit different training purposes, the system provides three training mode: standalone and multi-user collaborative training and evaluation*". The real-time simulator has modeled effects in the VMS and can provide special training for crisis management, e.g. fire or flooding that cannot be performed on real vessels: "*the most severe accidents in the maritime sector involve fire or a loss of stability due to flooding*" [7].

To determine the effects and benefits of simulator-based training, an internal evaluation has been conducted in the 2020/2021 academic year. Details on the simulators and the evaluation are presented in the article.

2. Engine Room Simulators and the training concept

The engine room simulator training is conducted in two courses during the third year of undergraduate studies. The condition that trainees should have theoretical knowledge of ship and ship systems [3] is thus fulfilled. The training is organized in such a way that the engine room itself and its systems are first studied on the Wartsila (Transas) ERS 5000W simulator – 2D Simulator presented in Figure 1.

The simulator consists of the Instructor Station, the Engine Control Room (connected to the Bridge Simulator), and the classroom with 10

independent student stations (Figure 2). Each student station consists of a PC with two monitors where students explore systems and a virtual environment.

Fig. 1 – *Wartsila (Transas) Simulator Classroom* (2D Simulator).

Models and analyzed systems are the same as in the 3D simulator. Student stations are controlled from the instructor's station i.e., "*each workstation is connected with the trainer independently of the other stations and performs individual tasks, the results of which are not related with the work of other stations*" [8].

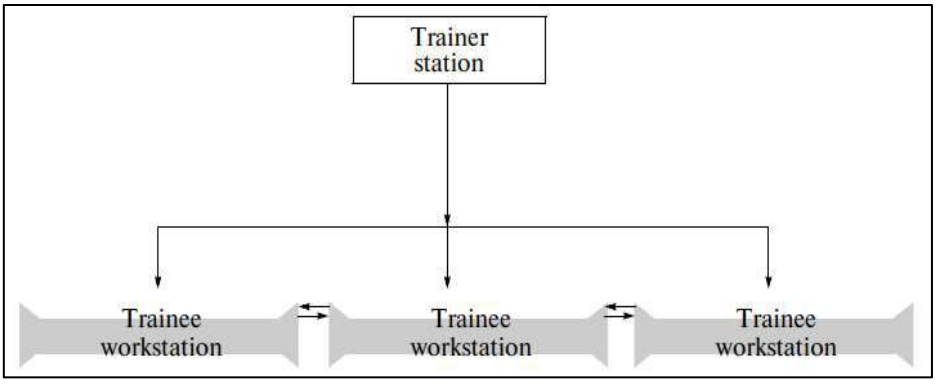

Fig. 2 – *Simulator network configuration [8].*

After learning the characteristics of ER systems and ER equipment layout, students are transferred to the Wartsila (Transas) ERS 5000W 3D Full Mission Engine Room Simulator (Figure 3).

This simulator consists of twenty-two interconnected computers and more than thirty touch screen monitors. The simulator is divided into five separated locations trying to resemble ER layout. Those locations are the instructor station (Figure 3, bottom right), the Engine Control Room with the Main Switchboard (Figure 3, top), the engine room (Figure 3, bottom left), the machinery spaces outside ER, and Emergency Generator Room. Students perform various tasks on this simulator, in an environment simulating the real ER.

Fig. 3 – *Wartsila (Transas) Full mission Simulator (3D Simulator).*

3. Assessment of the benefits of Simulator-based training

A very simple test was conducted to assess how practicing on the simulator affected the students' performance in the engine room and the execution of actual tasks. The idea behind the test was to assess the students' skills and abilities at various stages of the training, starting at the beginning. Sixteen students participated in the test, divided into four groups. The training was conducted separately, and all topics and materials were the same.

At the beginning of the course, the introduction is made and briefly described the layout of ER, followed by the introduction of the ER checklists (lists describing steps required to perform certain tasks). The next step was to abruptly introduce the students to the engine room simulator and give them real tasks, along with the questionnaire [9] about necessary steps and

related machinery. Tasks include starting the various machinery systems and/or performing various real-time tasks. Students' skills are assessed in two different modes:

- Monitoring all actions performed (sequence of actions, student's confidence in the correctness of the procedure, use of checklists, errors in the work...,
- Answering a prepared questionnaire which consists of thirty questions (with multiple answers offered) related to the design of analysed ER systems, machinery working principles, machinery starting sequences, possible malfunctions, prevention, maintenance,…

After the first test, students began training on the Wartsila (Transas) ERS 5000W simulator (Figure 1) in the classroom. The training is based on outcome-based education [10], students learn through practice on the simulator by modifying the provided checklists and creating their own. After they have completed classroom training, the same test is given to the same students. Finally, students are given additional instruction in the Wartsila (Transas) ERS 5000W 3D Full Mission Engine Room Simulator environment, giving them additional self-confidence. During this familiarization, students who did not pass the questionnaire had the opportunity to answer questions. Most students took advantage of this and successfully completed that part of the test. At the end of this phase, an assessment of the actions was conducted. The results of all three assessments are shown in Table 1.

Table 1 – *Student assessment.*

	The number of students who passed the test							
	Group 1		Group 2		Group 3		Group 4	
	Skills	Quest.	Skills	Quest.	Skills	Quest.	Skills	Quest.
Initial	0	1	0	1	0	0	0	1
After Classroom	3	3	2	4	2	3	3	4
At the end	4	4	4	4	3	3	4	4

Results of the benefits of simulator-based training are summarized in Figure 4. Only one of all students failed to finish the course without the need for additional instructions and explanations.

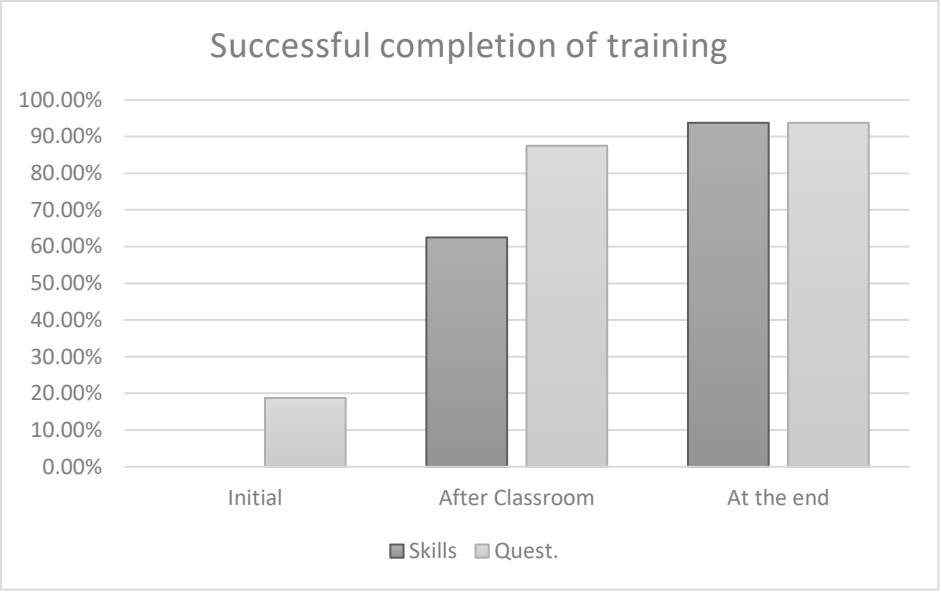

Fig. 4 – *Successful completion of training.*

4. Conclusion

From the results of the tests administered, it is evident that a significant increase in student learning outcomes and awareness was achieved through simulator training. At the beginning of the course, the evaluation of the students was very poor despite their previous knowledge, only 18.75% of the students passed the questionnaire and no one passed the skill test. The situation changed drastically after the training, which was conducted in the classroom on the 2D simulator. The students showed much better results, 62.5% of them passed the skill test and 87.5% passed the theoretical questionnaire. The additional familiarization on the 3D simulator was also beneficial, at the end of the training 93.75% of the students fulfilled all the requirements, i.e., only one student did not fulfill all the required tasks.

This assessment shows that although the students had all the required knowledge for the test before the simulator training, they did not pass the test with success. Simulator training helps them to recall their previous lessons, they manage to combine materials from several different subjects and direct them to solve simulated problems. For 2/3 of the students, this kind of training is sufficient to pass all tests successfully, although the training was not completed.

The total number of students who passed the test after training on the simulator is quite high, which confirms quoted sentence that the simulator can *"improve capability and efficiency, by providing trainees with the necessary experience and self-confidence to carry out their roles, functions and tasks*".

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Review paper

Belt and Road Initiative with Global Energy Interconnection*

Žarko Koboević, Zvonimir Šoša, Nikša Koboević

Abstract: Belt and road initiative delivers an idea for Global Energy Interconnection (GEI) as globally interconnected strong and smart grid based on Ultra-High Voltage (UHV). Global Energy Interconnection is an infrastructure platform that can be used for clean energy production, transition and consumption worldwide. GEI facilitate efforts to meet global power demand with clean and green alternatives as low carbon energy. GEI is promoting integration of energy, information and transportation networks, enlarging global power trade, ensuring universal electricity service. GEI optimizes resource allocation and utilization by converting various energy sources including coal, oil, hydro, wind and solar into electricity and transmitting over long distance. It can achieve mutual support and free trade of clean energy from different regions, and maximize energy efficiency and economy by taking advantages of time-zone, seasonal and price difference. Actually, Global Energy Interconnection is a system that consist of "Smart Grid", "UHV Grid" and "Clean Energy". Smart Grid integrates modern smart technologies with respect to advanced power transmission, smart control, new energy integration and new energy storage. UHV Grid is mainly composed of 1000 kV (and above) AC and +-800 kV (and above) DC transmission lines, featuring long transmission distance, large capacity, high efficiency, low line loss, less land use and high security. The shaping up of GEI can be divided into three phase: domestic, intra-continental and intercontinental interconnection. UHV Grid result is visible in already tested in practice transmission lines of DC and AC voltage. Over 20 UHV networks have been built in China. There is one network longer than 2000 km in Brazil, and two networks of UHV in India.

Keywords: Belt and road initiative, Ultra-high voltage grid, Energy interconnection, Renewable energy resources.

* An earlier version of this paper was presented at the 1st Kotor International Maritime Conference – KIMC 2021, Kotor, Montenegro.

1. Introduction

Environmental issues, climate change, energy supply for sustainable socioeconomic development and other issues are currently faced by the international community affect, directly or indirectly, human's survival and development. The demand for energy transition is a challenge of the aforesaid issues.

In 2016, traditional energy and economy were severely impacted: fossil energy faced with resource depletion and price downturn; investment in the energy industry slowed down and grew sluggishly; energy trade protection and "anti-globalization" were intensified; climate change and environmental problems caused by the use of fossil energy worsened. The energy system dominated by fossil energy and the demand for socioeconomic development became acute. In this context, it is hard to continue the old energy structure.

Chinese President Xi Jinping proposed the initiative on establishing a Global Energy Interconnection (GEI), to facilitate efforts to meet global power demand with clean and green alternatives at the United Nations Sustainable Development Summit on September 26th, 2015. As a remarkable innovation in the traditional concept of energy development, this proposal indicates that the essence of establishing GEI is to build energy community which is characterized by green and low carbon energy, connectivity, co-construction and sharing. Suggested is a new blueprint for the global green and low-carbon energy development, which will break new grounds for combating climate change. This has been widely acknowledged and positively responded by the international community.

With the execution of the Paris Agreement, concepts including cleanness, low-carbon and international cooperation and development have taken root in people's mind, and GEI has been widely recognized by the international community. In March 2016, the Global Energy Interconnection Development and Cooperation Organization (GEIDCO) was founded with 80 members from 14 countries scattering across the five continents, marking the beginning of GEI from a new prospect of discussion, construction, sharing and win-win globally.

The vision of GEI is to create a globally connected ultra-high voltage smart grid as the backbone of the transportation system. Such a system can serve as a platform for the extensive development, deployment and use of clean energy. It is based on the principle of accelerating the energy transition from fossil fuels to renewable energy sources. The paper gives an overview of electricity consumption in the world, explains the concept of global energy connectivity. The completed projects and the results they have achieved are presented.

2. Materials and methods – electricity in the world and conditions of global interconnections

Providing an affordable and stable price for energy supply and the need for energy itself to be sustainable and to reduce the negative impact on climate change is a fundamental goal of economic progress. Its fulfillment requires large investments in new energy infrastructure and technology, as well as the upgrade of existing energy supply systems. Global Energy Interconnection (GEI) is a globally interconnected robust and smart grid which takes Ultra-high voltage grid as its backbone. It serves as a global platform for extensive development, delivery and utilization of clean energy. In essence, GEI is "Smart Grid + UHV Grid + Clean Energy". Smart grid is the foundation, UHV grid is the key, and clean energy is the priority. Establishing GEI and implementing it could build a new energy structure dominated by clean energy, centered on electricity and allocated globally, realize global energy transition from fossil energy dominating to clean energy dominating.

Renewable energy sources are largely limited by time and space. The largest sources of wind and solar energy are often located far from the centers of their demand (e.g., wind energy in northern China or solar energy in the southwestern United States). Technological advances in the use of wind and solar energy allow their power plants to be built in hard-to-reach areas (for example, in deep seas, deserts, high altitudes), so it is necessary to enable the successful transfer of that energy to the place of use. The construction of hydropower plants, as today's largest sources of clean energy, is limited by the geographical location of suitable natural resources, and the same applies to less used renewable energy sources such as geothermal, wave or tidal wave energy. In order to meet the demand for electricity in larger areas, it is necessary to interconnect energy systems. To increase the overall efficiency of the energy system, it is desirable to keep energy consumption constant. For example, linking the winter energy consumption of one region with the summer consumption of another region can lead to a reduction in the peak network load. The same effect would occur in networked regions in different time zones. Such an idea of global energy interconnection was first presented by the Chinese State Grid Corporation of China [1].

The concept of global energy interconnection is built on three principles [2]:

1) transmission of energy over long distances, which requires ultra-high voltage technology,

2) distribution of large-scale clean energy, especially renewable energy sources, together with a high level of electrification,

3) smart grid solutions that enable intelligent use of monitoring and control at all voltage levels.

3. Results and discussion – Ultra-high voltage and smart grid

The first studies on the feasibility of ultra-high AC voltage were initiated as early as 1986 [3]. In the period from 1990 to 1995, the first demonstrations of the method of long-distance energy transmission and voltage classes were carried out. China has achieved several results in a study of ultra-high voltage AC transmission by 2006. The key problems related to the construction of the demonstration project of ultra-high voltage were solved and the basic characteristics of ultra-high voltage transmission of alternating current and network were better understood. Preliminary results were obtained for key technologies such as the limit value of the ultrahigh voltage electromagnetic environment, surge level, reactive configuration, insulation coordination and lightning protection. These parameters were the basis of the feasibility study on ultra-high voltage energy transmission and provided a large amount of reliable and accurate data for making the first designs. There are more and more ultra-high voltage AC and DC power transmission projects in the world. China is currently the first country in the world in the number of such projects. The project of developing a system for transmission of ultra-high voltage direct current (± 1100 kV) on the route Zhungdong - Wannan was completed in 2019. In 2020, this network has the highest voltage in the world, the largest transport capacity and the largest energy transmission distance (3324 km) [3]. China has become a pioneer in the development of ultra-high voltage power transmission for direct and alternating current due to large investments in the development of technology and construction of ultra-high voltage network. By 2016, it had contributed to the introduction of 33 national standards and as many as 41 industry standards.

Ultra-high voltage in China

By the end of 2017, China has totally 22 UHV transmission projects in total. 13 lines under operation, developed by State Grid Corporation of China (SGCC) (6 AC and 7 DC). In addition, there are 9 lines (2 AC and 7 DC) under construction (Figure 1). Developing clean energy based on large power grid, SGCC may expect an integration capacity of 220 GW clean energy and become the grid that enjoys the largest wind integration scale and the fastest solar power generation growth.

Fig. 1 - *UHV grid projects in China [4].*

Over 20 ultra-high voltage networks have been built in China by the end of 2019. Five more networks are currently under construction, three for alternating current and two for direct current. This development of power grid construction largely allows the use of large amounts of renewable hydropower from the *Yalong*, *Yangtze* and *Mekong rivers*, wind energy from *Zhundong* and *Jiuquan* cities and solar energy from *Hami* city. The State Grid Corporation of China expects further development of clean energy based on a large electricity grid, whose capacity is planned to expand to 220 GW [4].

Ultra-high voltage in Brazil

The first phase of construction of a project called *Belo Monte* was signed in January 2016 in Brazil. This marked the beginning of the construction of a transmission line for the transport of energy with an ultra-high voltage of ± 800 kV. In the first phase of the project, 2,084 kilometers of transmission

lines, one *Xingu* converter station (capacity 4 GVA) and one *Instanredu* converter station (capacity 3.85 GVA) were built (Figure 2).

The second phase of the project is the construction of a transmission line on the route *Xingu - Rio*, the distance of which should be 2518 km. These two ultra-high voltage lines should be used to transport the energy obtained from the *Belo Monte* hydropower plant. This hydropower plant is the fourth largest in the world with an installed capacity of 11.3 GW and should supply energy to the south of Brazil [4].

Fig. 2 - *Belo Monte ±800 kV UHVDC Transmission Project [5].*

Ultra-high voltage in India

The Indian Power Grid Corporation of India (State Electricity Corporation) is in the implementation phase of the construction of a transmission line for the transport of ultra-high voltage ± 800 kV. The goal is to connect the cities of *Assam* in northeastern India and *Agra* in northern

India. It is 1728 km long, and its transmission capacity is 6 GW. The first phase was completed on August 2015, which connects *Agra* Convertor Station and *Biswanath Chariali* convertor Station, creating a transmission capacity of 1.5 GW. Since 2016, the second convertor station at the transmission side, *Alipurduar*, started to be built, which will operate with three AC terminals that integrate two rectifier stations and one inverter station (Figure 3). When completed, the project may become the first UHV MTDC project in the world, delivering surplus electricity in eight northeastern states to the northern region which is short of power and playing an important role in transmitting potential hydropower in the northeastern region.

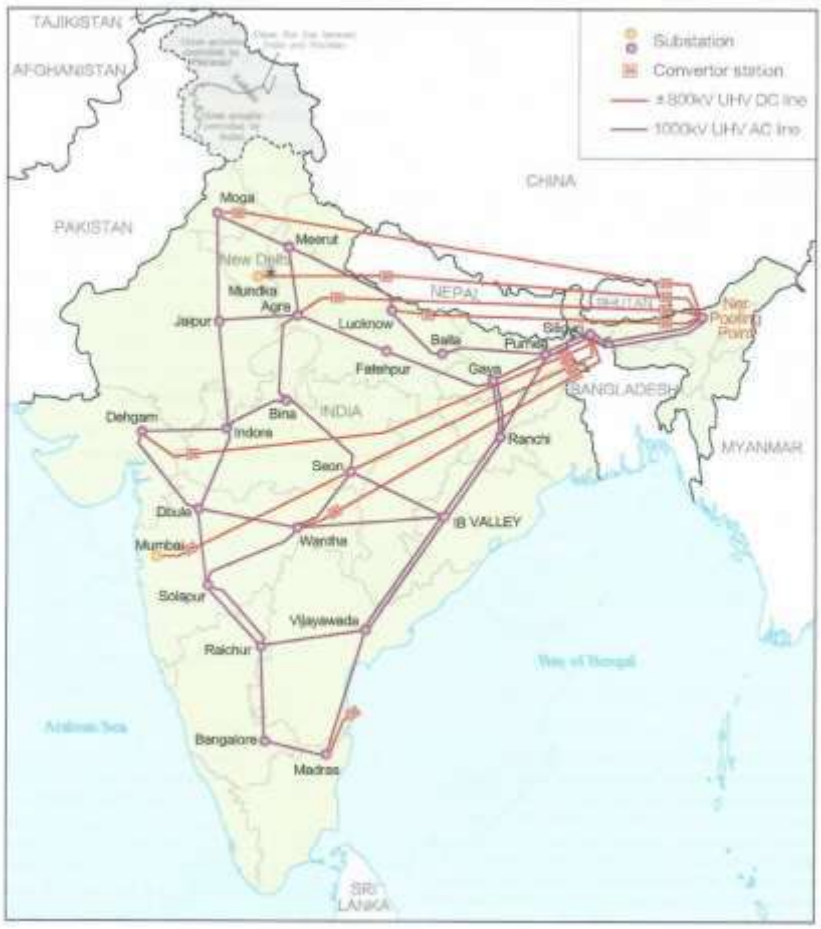

Fig. 3 - *UHV projects in India [4].*

3.1. Clean energy

Renewable energy resources are inexhaustible and have great development potential. The energy revolution with water, wind and solar energy should become a driver of economic and technological development in the world, especially if the goals set by the Paris Agreement on Climate Change are to be achieved. The global installed capacity of renewable energy sources is estimated at 2400 GW. Due to high safety risks and potential environmental pollution by nuclear waste, it is very likely that the share of nuclear energy will decrease in the future. Solar energy has the largest increase in capacity with an annual increase of as much as 30% [4]. Investments in renewable energy sources are currently leading the economic development of the countries that invest in them. This trend is shifting from developed economies in Europe and North America to developing economies such as China and India. Clean energy investment projects are capital intensive and take longer to return to investment. Nevertheless, the concept of clean low-carbon development, good market mechanisms and strong infrastructure in Europe and North America are a strong factor for continued investment.

With the development of technology in the world and the reduction of prices, Asian countries are expected to be leaders in the future development of clean energy. This is seen by the rapid increase in the share of world investment. The cost of generating electricity from solar or wind power plants is declining worldwide due to technological advances. The price of an onshore wind farm decreased by 18% in the first half of 2016. A similar decline can be observed with solar energy, with the largest decline observed for offshore wind farms. The market price of clean energy production compared to conventional energy sources varies considerably in different regions. There is great potential for further reductions in clean energy costs in the near future [6].

3.2. Smart grid

The smart grid includes everything that is used to deliver electricity from the power plant to the consumer (for example, the electricity grid, the transmission line network, substations, transformers). The increasing complexity and power needs of the 21st century must be automated and managed. What makes a smart grid exceptional is its ability to perform two-way communication between the utility and its customers, and its ability to collect data on its own use along transport lines (Figure 4). It consists of new technologies and equipment that work within the electricity grid, and is needed to meet the demands for rapidly changing consumer needs for

electricity. The application of smart grids is an opportunity to move the energy industry into a new era of reliability, availability and efficiency. The main benefits of improving the network are [7]:

- more efficient transmission of electricity,
- faster return of electricity to function after a disturbance,
- reduced operating and management costs of utilities, with lower electricity costs for end consumers,
- peak energy consumption is reduced, which also reduces the price of electricity,
- increased integration of large renewable energy systems,
- improved security.

Fig. 4 - *Concept of Smart Grid [4].*

Power outages can cause a number of failures that can affect banking, communications, traffic and security. This is a special danger in winter when homeowners may be left without heating. The smart grid adds a security factor to the power system and is better prepared to deal with emergencies (storms, earthquakes, and terrorist attacks). It allows automatic redirection in case of equipment failure or interruption thanks to two-way interactive capacity. New technologies help the recovery of electricity continue quickly and strategically after unforeseen situations. For example, it will first direct

electricity to emergency services. Smart grid technology can also be used to address the aging of energy infrastructure that needs to be upgraded or replaced. It is a way to highlight energy efficiency by educating end users to contribute to the preservation of the environment. South Korea's Ministry of Trade, Industry and Energy promoted the idea of an energy-independent island using a smart grid [8]. This idea served as a demonstration of business opportunities in the energy industry. The island of Gaza in the province of South Jeolla has achieved energy independence through the use of renewable energy sources. This includes the operation of four wind farms with a capacity of 100 kW and a solar power plant with a capacity of 314 kW, as well as a storage capacity of 3 MWh. The smart grid limits the supply of electricity depending on the amount of energy consumed in real time. All excess electricity is stored in storage capacity (up to 24 hours) from which it is released for a period of reducing the amount of available energy.

3.3. Results of global energy interconnection planning

One of the main goals of global energy interconnection is to increase the production of electricity from renewable energy sources and to deliver it using ultra-high voltage to the place where it will be used. Such an approach should meet the future growth of global electricity demand and replace part of the energy obtained from fossil fuels. The Chinese State Grid Corporation of China presented its plan for what the global energy interconnection should look like by 2050 [9].

Europe is one of the most important hubs of electricity consumption. The plan is to design an electricity grid to enable the use of wind energy from the Arctic and North Sea, solar energy from southern Europe and northern Africa (Figure 5). It is desirable to combine the activities of hydropower and other energy sources in Europe to balance peak energy demand. Asia is the world's largest consumer of electricity in the world with abundant renewable energy potential. It is planned to build an intercontinental network that would connect the largest places of electricity use and the base of renewable energy sources. The electricity produced from the Arctic and the area around the equator should be able to be received into the electricity grid, distributed as needed using the smart grid and used. The interconnection of the electricity grid in Africa should enable the operation of solar and wind power plants in North Africa with the hydroelectric power plants of Central Africa. The electricity grid in Africa needs to be connected to Europe and West Asia to enable the use of different energy sources and to export electricity to the most needed regions. Better electricity grid connectivity in North America can harness the potential of wind farms in the central and western parts of the continent, solar energy bases from the

southwest region, and hydropower potential in Canada. The obtained electricity can be used in industrial zones in the west and east of the continent. In addition to the above energy sources, electricity obtained from wind farms in the Arctic can be imported. By connecting to Asia's energy network through Alaska, transcontinental relocation of large amounts of energy can be accomplished to make efficient use of renewable energy sources within North America as well as Asia. South America has great potential for the use of renewable energy sources. The interconnection of the electricity network on the continent is planned in order to achieve the connection of energy use between north and south on the west and east coast of the continent, as well as for the transmission of energy from west to east in the central part of the continent.

Fig. 5 - *Overall structure of global energy interconnection [10-12].*

4. Conclusion

The main goal of the Paris Agreement on Climate Change is to reduce carbon dioxide emissions in the atmosphere and prevent the rise of the average global temperature. In order to ensure sufficient amounts of energy to continue economic growth and to gradually reduce the use of fossil fuels, it is necessary to use energy that has a beneficial impact on the environment. Renewable energy sources are one of the possible solutions that can provide sufficient amounts of energy with significantly less negative impact on the environment. Their main drawback is that they are largely limited by time and space. The largest sources of wind and solar energy are often located far from the centers of their demand. Technological advances in the use of renewable energy sources allow power plants to be built in hard-to-reach

areas (for example, in deep seas, deserts, high altitudes). Therefore, it is necessary to enable the successful transfer of this energy to the place of use.

One of the concepts that can overcome these obstacles is the global energy interconnection. The idea was first presented by the Chinese State Grid Corporation of China. Ultra-high voltage, smart grid and clean energy technologies have already been recognized and applied in various regions of the world. Increasing the level of their application and willingness to invest can lead to an increase in the share of energy obtained from renewable sources. This can ensure the further sustainable development of the world economy with the synergy of nature and humanity.

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Review paper

What is a Risk of Increased Traffic in Boka Bay?*

Igor Petrović, Špiro Ivošević, Miroslav Vukičević

Abstract: Boka is undeniably one of the most beautiful destinations in the world. This may be a subjective opinion, however being included in UNESCO's world heritage list may be an objective proof of such a statement. This is recognized by the Government, and nautical tourism has been set as one of the main development strategies for this area. The economic growth, on the other side brings problems that our limited sources can hardly cope with. Increased traffic i.e. number and size of vessels (boats/yachts/ships) that are visiting Boka Bay, enormous fuel quantities burnt by giant engines on mega cruisers, by-products of every day processes such as garbage and sewage cause many side effects that could be hidden. These are all risks that could create catastrophic consequences if not handled properly, and in long term, may turn one of the finest destinations into a place to be avoided.
Navigation is a skill. Years of experience are required to become professional navigator. It is not a sport and it is risky to treat it like that. Risk management concept will be utilized for assessing mentioned risks and for establishing controls that will definitely reduce them.
After short introduction of the concept, priority will be given to analysis of all factors that must be taken into account for successful risk assessment. Special attention will be paid for database that must be established for Boka Bay area. Next step in the process is identification of all hazards related to visits of different types of vessels. Setting the criteria and matrixes that are relevant for this special area is essential before final part of the research focused on risk assessment.

Keywords: Risk assessment, Hazards, Increased traffic, Boka Bay.

1. Introduction

Boka Bay is precious jewel among all other beauties. Apart its enormous cultural and traditional value this diamond has very important economic effect on Montenegrin budget. This has been recognized in the latest

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National Strategy for Substantial Development until 2030 [1]. Large number of seaman compared to its population [2], influential income based on maritime economy, and development of maritime tourism are the benefits that cannot be ignored. Furthermore, same should be developed and brought to its optimum, what is also recognized as priority by Montenegrin government [3].

However, the questions that cannot be avoided and should be emphasized on the top level are: How much are we aware of the risks involved in maritime economy that could endanger our coast? Are we aware of the effect that only one accident could make to our precious jewel? Simply, could Figure 1 lead to Figure 2?

Fig. 1 – *Cruiser "Crown Princess" photographed in close proximity of coast of Prcanj affected by strong wind and anchor dragging [4].*

Fig. 2 – *Cruiser "Costa Concordia" after disaster [5].*

Safety of navigation within Montenegrin coastal waters is implemented throughout many statutory and obligatory acts [6], [7], [8]. It is well established and many parties are contributing towards its improvement. However, without implementing all available techniques and technologies and with increased traffic on the other side, it is very difficult to keep designated path.

Risk Management is very helpful technique in identification of potential risk, and an excellent tool in reducing such a risk. Supported with adequate tools it would create such environment where making decision by appropriate personnel would be easy, quick and risk-based [9].

The aim of this research is to assess the risk of increased traffic in the Boka Bay area. Beside the introduction, the article contains following sections:

- RISK MANAGEMENT TECHNIQUE – this section describes benefits of using Risk Management concept in the specific area of interest, along with the importance of precise database and criteria for successful assessment.
- RISK ASSESSMENT – gives detailed procedure for identification of hazards related to navigation in Boka Bay, and analysis of the risk caused by these hazards.
- DISCUSSION AND CONCLUSION – this part presents the analysis of data gained by the research and summary of the obtained results.

2. Risk Management technique

2.1. Risk management concept

Risk management is not pretty new technique. It has been in use for years. Its essential use started with introduction of ISO Standards. Thus, ISO 9001 (Quality Management System) stipulates that every decision made within an organization must be risk based. What makes this standard more stringent than others is that any process related to decision making must be well recorded and provable. In simple words, an organization must, on request, be able to prove that risk management has been strictly followed. Risk Management is an excellent concept used for improving quality of any process or service rendered.

Even if it is obligatory, and although numerous organizations comply with it, many accidents in everyday life indicate that there is plenty space for improvement [4], [5].

Risk Management is very comprehensive and well-structured concept, consisting of many stages. For the purpose of this article, main focus will be

given on Risk Assessment as just part of this concept. The principle is well explained in many studies [10], therefore it won't be explained in this article.

Risk is often expressed in terms of a combination of the consequences of an event and the associated likelihood of occurrence [11].

Risk assessment may be completed by numerous techniques. This research will be based on risk matrix technique due to its simple practical use in various spheres [12].

2.2. Relevant Risk Management database

Many studies and investigations should be completed in order to make Risk Management 'alive'. Purpose of such studies is to create valid database that will be used for assessing the risk and consequently to set the risk criteria [13].

For the purpose of assessing the risk and thus improving safe navigation in Boka Bay following studies should be performed as a minimum:

1. Study for numbers and interval of visits for all types of vessels.
2. Study of predominant weather in Boka Bay.
3. Study for probability of accident/failure on visiting types of vessels.
4. Possible consequence of accident/failure on visiting types of vessels.

Types of vessels and interval of their visit in Montenegrin Costal waters /Boka Bay

From 2006, Port of Kotor has been recognized and oriented for cruising tourism [14]. Apart from cruising ships, due to its nature and beauty, Boka Bay is well visited nautical-tourism destination. There is an evident tendency of increased number of boats/yachts and cruising vessels, as shown in Table 1 [15], [16].

Table 1 – *Number of foreign boats visiting Montenegrin Coastal waters.*

Year	Number of boats
2014	3,961
2015	4,018
2016	4,384
2017	4,598
2018	4,710
2019	4,775

It is interesting to point out that about 30% of these numbers were boats (yachts) with LOA above 20m, and that most of these visits took part in Boka Bay in summer time (for example in 2019, 2,995 boats have visited Montenegrin coastal waters in period June-August). Taking into account that

number of visitors is also increasing each year, risk of accident/incident will logically be increased.

Regarding cruising ships, the increase of 11.7% has been reported for Port of Kotor in 2019 (compared with 2018), with total 419 visits [17].

Year 2020 was omitted from the study, since the number of visits has drastically decreased, what was expected due to COVID-19 outbreak.

Nevertheless, increasing tendency is obvious, and same pattern is expected in the near future.

Predominant weather condition in Boka Bay

Geographical location and natural protection from strong winds make Boka Bay excellent destination regarding weather conditions. Currents are not affecting the surface navigation, and winds are rarely reaching gale force (28 knots or above).

Even if these parameters give excellent shelter to vessels visiting Boka Bay, the main concern should be given to anchored vessels. As per IACS Unified Requirement A1, Rev 6 [18], to which most Classification Societies refer to, anchor is not designed to hold a ship off fully exposed coasts in rough weather or to stop a ship which is moving or drifting. Anchor is primarily designed to hold a ship in good holding ground, with significant reduction of holding capacity in poor holding ground. In addition, holding capacity is based on an assumed maximum current speed of 2.5 m/s (4.86 kts) and maximum wind speed of 25 m/s (48.6 kts), with no wave. With the wave of 2m maximum significant height, holding capacity is applicable to a maximum current speed of 1.54 m/s (3 kts) and maximum wind speed of 11 m/s (21.4 kts) [18].

This kind of weather is rare in the Bay of Boka, but it still occurs. Therefore, appropriate regulatory act should be enforced, which will consider prohibition of anchoring when the weather prediction reaches above mentioned parameters.

Probability of accident/failure on different types of visiting vessels

Data from many sources must be used in order to calculate and predict probability of accident (or failure leading to accident) on type of vessels that are visiting Boka. However, collecting such data is extensive work, and sometimes uncertain. For example, research made by Maritime Injury Guide Organization states following: 'There has been little consistent and systematic gathering of data to explore cruise ship safety and accidents. Another problem with obtaining accurate safety statistics is the fact that

cruise lines are essentially outsourced. Most ships are incorporated and registered overseas, which means there is little oversight beyond the state under which the ship is operated' [19]. Their statistics shows that:

- Between 2005 and 2018, 448 major cruise ship accidents were reported.
- Between 2005 and 2011, 16 people died in cruise ship accidents.
- Since 2000, around 300 people on cruise ships have fallen overboard. There were 17 overboard incidents in 2017 alone.
- Between 1979 and 2013, 55 cruise vessels sank, with 15 of those occurring between 2010 and 2013.
- From 1972 to 2011, 98 cruise ships ran aground. Between 2005 and 2013, 66 passenger ships reportedly ran aground.

Data for boats/yachts are even more unobtainable, since most of the accidents stay unreported.

Long period of time will be required to create valid database for Boka Bay. Therefore, probability of failure or accident must be calculated based on data from other similar touristic areas. However, accidents that have already occurred in Boka Bay must be taken into account when assessing the risk.

Possible consequences of incident/accident related to visiting vessels' types

First three studies (explained before in section 2.2.) are aimed to determine likelihood i.e. possibility of hazard to happen. To assess the risk it is also required to determine possible consequence if hazard really occurs. Even if this consequence might be minor it should still be considered in the process of risk assessment.

Following consequences (negative effects) may be experienced [13]:

- To people – any accident/incident on board any type of the vessel could cause injury or fatality to humans. This consequence should be categorized based on the scale of injury or fatality.
- To property – collision, allision, failure, force majeure etc. would always cause property damage. It should be formulated upon the value of damage to the property
- To environment – even if very strict rules and regulations aim for zero pollution, it is still taking place. When determining consequence to the environment and its category, the long-term effect must also be considered. The cost of cleaning, bringing environment back to its natural balance, setting new rules etc. must be taken into account. The

impact of increased traffic to very delicate and precious environment should not be based on speculations and rumors, it should be based on facts obtained by concise and detailed studies. These studies should cover all possible pollutions i.e. oil spills, garbage disposal, ballast water treatment, use of inappropriate fuels, discharging sewage and gray water etc.

– To business – major accidents will always affect business, e.g. closure of ports, closure of channel, negative publicity, decreased interest in destination etc.

Setting the criteria

It is worth mentioning that objective of the Risk Management is not to reduce profit by acknowledgment that heightened risk exists. It is there to create safe environment and make such profit achievable. Unfortunately, many organizations are afraid to make realistic Risk Assessment because it may reveal weaknesses of their organization and thus reject potential customers. Since one accident can affect maritime economy for decades, neglecting the risk should be ceased by all possible means.

Another problem, in the use of this concept may be set criteria. This could be the main reason for creating gap between principles set in the context and those used in practice. Most of the organizations adopt ALARP (As Low as Reasonable Practicable) criteria as the main principle in their context [20].

Looking at ALARP principle, it can be noticed that distinctive risk regions are wide and there are no defined limits between each region.

One of the criteria that is more precise, comprehensive and easy to comply with is matrix set by New Zealand Maritime Authority used for Port and Harbour Risk assessment [13]. Frequency and likelihood is well defined by numbers and values, what can easily be referred to. Practical use of such criteria is clear, and assessing the risk is much easier. Another issue, worth mentioning is whether such criteria is statutory? If yes, than making decision is easy and cannot cause any doubt, i.e. if assessed risk reaches statutory defined unacceptable area, such operation/process/service should not be taken until risk is reduced.

Taking above into account, Risk Management may be defined not only as essential tool for risk identification, but excellent aid for setting legislative rules. These rules would assist in protection from potential negligence and intentional misconduct.

3. Risk Assessment

3.1. Hazard identification

First step of Risk Assessment is identification of hazards. Hazard is defined as potential source or situation leading to unintended event (incident/accident). Hazards that are related to navigation in Boka Bay are:

- Unsafe navigation;
- Failure of equipment;
- Bad weather condition;
- Insufficient control of shipboard operation;
- Lack of standards on the ships visiting Boka Bay;
- Lack of regulatory acts controlling navigation in Boka Bay;
- Lack of regulatory acts controlling discharge of sewage/garbage/grey water from ships including ballast waters;
- Lack of acts regulating use of high Sulphur fuels within Boka Bay.

All identified hazards are the common one and each of these consist of many minor hazards. In order to avoid analysis of numerous hazards, more convenient is to analyze unintended events which may occur due to above mentioned hazards. These include, but are not limited to:

- Collision;
- Allision (contact between vessel and fixed object, while collision is contact between two vessels);
- Anchor dragging (with or without consequently collision/allision);
- Grounding;
- Loss of stability;
- Power loss including propulsion loss, engine failure and propeller fault (for cruise vessels only);
- Fire on board;
- Man over board (MOB);
- Injury or fatality;
- Air pollution;
- Sea pollution;
- Mooring breakdown.

3.2. Risk analysis

Risk analysis is the core of the process. Risk is analyzed and evaluated based on data mentioned in section 2.2. Risk analysis may be quantitative or qualitative. Notwithstanding limited budget and time for this research, quantitative risk assessment is preferable. Quantitative risk assessment is very detailed and demanding process, and it is justified only if its use is unquestionable. Many software were developed to assist in quantitative research. One of these is IWRAP MK2 software for assessment of probability of collision and grounding in certain navigational area. Software has been developed by IALA and is even 'free of charge' to its members [21]. Sadly, Montenegro is not an IALA member. The cost of license, adequate training and navigational chart must be anticipated in order to use it within Boka Bay area. Without use of such software quantitative risk assessment cannot be unquestionably certain, but it will, still, give good overview of the risk in the area. It is worth mentioning that software is not giving probability of allision, which in sensitive area like Boka Bay must be considered. Another issue that makes quantitative method difficult to apply is missing data (explained in 2.2).

Following matrixes used for risk assessment in this article are combination of those used by New Zealand's Maritime Authority (and other eminent Port Authority such as UK); ISO; IMO and those based on personal professional experience. Same have been adapted to Boka Bay area and proportional to available budget (Tables 2-5). For example, the consequence is scored as catastrophic for the damage over 6 million € for port Wellington (NZ) and 4.28 million € for Long Beach (USA). Wellington has GDP of about 2 billion € [22], and port of Long Beach about 176 billion € [23], while Montenegro as state had 4.66 billion € in 2019 [24]. Total GDP for Boka Bay area is estimated to maximum 1 billion €. Therefore, categorization of the consequences will be based on values proportional to our budget, i.e. how much impact on our economy could such consequence make.

Table 2 – *Likelihood Matrix for Risk Assessment in Boka Bay.*

Category	Description	Definition
1	Rare	An event occurred once in industry
2	Unlikely	An event occurred several times in industry
3	Possible	An event occurring several times per year in industry or happened in Boka Bay
4	Likely	An event occurring once a year in Boka Bay
5	Frequent	An event occurring several times per year in Boka Bay

Table 3 – *Likelihood Matrix for Risk Assessment in Boka Bay.*

Scale	People	Property	Environment	Business
1	**Insignificant** Slight injury (bruise)	**Insignificant** (€0-5,000)	**Insignificant** Negligible environmental impact. (€0-5,000)	**Insignificant** (€0-5,000)
2	**Minor** Minor injury, Lost work case	**Minor** (€5k-50k)	**Minor** Small spill contained closely around vessel (€5k-50k)	**Minor** Bad local publicity (€5k-50k)
3	**Moderate** Serious injury or disability	**Moderate** (€50k-500k)	**Moderate** Spill, limited to immediate area around vessel (within 500m) (€50k-500k)	**Moderate** Bad widespread publicity, temporary navigation restriction in the Bay (€50k-500k)
4	**Major** Single fatality	**Major** (€500k-2M)	**Major** Pollution spread in wide zone (>500 m radius). Chemical spillage or small gas release, threatening to ecosystem and environmental amenity (€500k-2M)	**Major** Regional bad publicity. Temporary closure of a part of Boka Bay (€500k-2M)
5	**Catastrophic** Multiple fatalities	**Catastrophic** (€2M+)	**Catastrophic** Spill requiring support from international clean up funds. Widespread coast contamination or serious chemical/gas release. Significant threat to environmental amenity. (€2M+)	**Catastrophic** International media publicity. Port closure or navigation seriously disrupted within the Bay for an extended period. (€2M+)

Table 4 – *Risk Matrix for use in Boka Bay Risk Assessment.*

Consequence	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
Likelihood		1	2	3	4	5

Since there are mainly two types of vessels visiting Boka Bay (boats/yachts and cruising ships), and taking into account huge difference in likelihood and consequence of incident involving each type, two separate risk assessment will be carried out.

Table 5 – *Risk assessment for boats/yachts visiting Boka Bay.*

Identified hazard	Likelihood	Consequence	Control	Residual Risk
Collision	3/4	4	COLREG, STCW, Speed limit	12/16
Allision	3	2/3	COLREG, Speed limit	6/9
Anchor dragging	4	1	COLREG, STCW	4
Grounding	3	2	COLREG, STCW, Speed limit	6
Loss of stability	2	2	Register	4
Fire/explosion	4	3	SOLAS	12
MOB	4	2	SOLAS	8
Injury/Fatality	4	4		16
Air pollution	2	2	MARPOL	4
Sea pollution	3	3	MARPOL	9
Mooring breakdown	2	2	Port Control	4

Explanation:

Collision - In last few years, several collision accidents happened in the area and Montenegrin coastal waters (Table 6). In most of these accidents, fatality was present, therefore consequence was categorized as 4.

Allision/Anchor dragging – These incidents are rarely reported since consequence is thought to be under owner's budget, although dragging and allision may affect infrastructure and cause effect on ecosystem. Risk assessment is made on the experience of boat owners and personal practice.

Grounding – three incidents related to grounding were reported in Boka Bay, two in 2021,and one in 2019 [32]. Since there are no many reports for previous period likelihood is categorized as possible. Consequence is usually within the cost of yacht repair (up to 50k), i.e. score 2.

Loss of stability – Even if these incidents happen several times per year around the world, there are no many reported cases in Boka Bay. Likelihood is categorized as 2 and consequence similar to previous hazard (grounding).

Table 6 – *Comparison of collision/allision accidents in the Region and Montenegrin coastal waters.*

Region	Montenegrin coastal waters
• 16.08.2016 Greece, collision between fast and tourist boat, 4 fatalities [25] • 25.04.2017 Croatia, collision between SAR and taxi boat, 5 fatalities [26] • 22.06.2017 Croatia, collision between taxi and fast boat, 1 fatality [26] • 12.07.2017 Croatia, collision between two boats, 1 fatality [26] • 20.07.2017 Croatia, collision between sailing and fast boat, several injuries [27] • 04.08.2018 Italy, collision between fishing and recreational boat, 2 fatalities [28] • 22.08.2018 Croatia, collision between yacht and small passenger boat, injury [29] • 04.09.2018 Croatia, collision between taxi and recreational boat, several injuries [26] • 04.07.2019 Croatia, allision of catamaran and jetty, serious injury [27] • 03.08.2019 Croatia, allision of fast boat with unidentified object, total loss [27] • 10.08.2019 Greece, collision of two boats, 2 fatalities [30] • 02.08.2020 Croatia, collision between fishing and fast boat, injury [27] • 26.11.2020 Croatia, collision of two boats, serious injury [27] • 29.01.2021 Italy, collision between fishing and recreational boat, total loss [31] • 08.07.2021 Croatia, collision between two boats, serious injury [27]	• 01.05.2017 Montenegro, River Bojana, collision between ski-jet and boat, minor injury [32] • 24.07.2018 Montenegro, Ulcinj, collision between recreational and taxi boat, 2 fatalities and 2 injuries [32] • 30.07.2018 Montenegro, Open Sea near Lustica, collision between sailing boat and yacht, 2 fatalities [32] • 11.07.2020 Montenegro, Budva, collision between yacht and boat, 1 fatality, 1 injury [32]

Fire/explosion – Almost once/year there was an incident related to fire or explosion in Boka Bay:

– 22.04.2017 Montenegro, Boka Bay, Solila, fire on catamaran, property damage [32];

– 22.07.2017 Montenegro, Boka Bay, Tivat, fire on boat, property damage [33];

– 13.12.2017 Montenegro, Bar Marina, several boats on fire, property damage [32];

– 05.08.2018 Montenegro, Port of Bar, fire on patrol boat, property damage [34];

- 05.09.2019 Montenegro, Boka Bay, Tivat, fire on motor yacht, total loss [32];
- 26.06.2021 Montenegro, Boka Bay, Tivat, fire on fast boat, property damage [32];
- 14.09.2021 Montenegro, Sveti Stefan, fire on sailing boat, property damage [32].

Therefore likelihood is categorized as 4. The consequences in these incidents were slight to serious injury, but with just small difference in circumstance it could lead to serious injury or total loss including oil spill. Due to potential consequence it will be categorized as 3.

MOB – Almost all incidents with grounding and fire ended up with MOB, defining this incident as likely to happen. However the consequence could be minor injury what is the reason to be scored 2.

Injury/fatality – Risk to injury/fatality rises from many other accidents such as collision, fire, grounding, and MOB. Unsafe navigation and misconduct may also lead to this danger, what is shown through following examples [32]:

- 20.07.2018 Montenegro, Budva, recreational boat accident, 1 severe injury;
- 07.08.2018 Montenegro, Boka Bay, Prcanj, rubber boat hits swimmer, injury;
- 16.06.2019 Montenegro, River Bojana, fast boat hits swimmer, injury;
- 19.08.2019 Montenegro, Open sea near Traste, fast boat hits diver, injury;
- 22.08.2019 Montenegro, Plava Spilja, boat sunk, several person over board, minor injuries;
- 01.09.2019 Montenegro, near Albania border, 2 person rescued after sailing boat sunk;
- 27.07.2021 Montenegro, Becici, ski-jet recreation accident, moderate injury;
- 05.08.2021 Montenegro, Oblatno, contact between towing object and swimmer, severe injury.

Taking into account all of the above, this hazard is classified as likely to happen and possible consequence is unfortunately single or multiple fatality. This is the highest risk among all related to yachts' visits to Boka Bay.

Air pollution – Relatively small engines on boats/yachts and better quality of fuels used on them, make air pollution unlikely to occur with minor consequence.

Sea pollution – Since there were no major accidents reported for the area, risk assessment against this hazard is made based on data and experience from similar regions. Additional explanation is included in conclusion.

Mooring breakdown – Weather conditions in Boka Bay are such that both possibility and consequence for this hazard are low, but still noticeable.

Table 7 – *Risk assessment for cruising ships visiting Boka Bay.*

Identified hazard	Likelihood	Consequence	Control	Residual Risk
Collision	2	4	COLREG, STCW, Speed limit, Company policy	8
Allision	3	3	COLREG, STCW, Speed limit, Company policy	9
Anchor dragging	3	3	COLREG, STCW, Company policy	9
Grounding	2	3	COLREG, STCW, Speed limit, Company policy	6
Loss of stability	2	2	Register, Class, Company policy	4
Power loss	3/4	4	Register, Class, Company policy	12/16
Fire/explosion	3	3	SOLAS, Company policy	9
MOB	3	4	SOLAS, Company policy	12
Injury/Fatality	3/4	4	Company policy	12/16
Air pollution	2	3	MARPOL, Company policy	6
Sea pollution	3	3/4	MARPOL, Company policy	9/12
Mooring breakdown	2	2	Port Control, Company policy	4

Explanation:

Divergent approach has been established for cruise vessels (Table 7). Number of accidents that happened on ships visiting Boka Bay was taken into account instead of number of accidents that happens in Boka Bay area. Apart from data in section 2.2, made available by Medical Injury Guide Organization's own research, there is no transparent database or site where related info could be found and collected. For that purpose, personal research has been made based on scheduled ship visit to Kotor in 2019 and 2021 (planned schedule from 01st Oct till 31st Dec).

Accident database for scheduled vessel has been found on internet [35]. Although database is not official and its content is not approved by relevant authorities, it is justifiable for these purposes. Even if 1.6 million visits to the referred site (in August only) does not give scientific credibility, it clearly indicates that common people rely and trust it. Related to schedule for 2021, records for 19 ships have been found. There were no accident history for 7 ships. Data for these 7 ships must be taken carefully, as 4 ships are new buildings, 2 are 5 years old and 1 with age of 10. Average age of remaining 12 ships is 12.6 years, newest being 2 and oldest 33 years.

Number of accidents for the particular risks occurring on cruising ships scheduled to visit Kotor in 2021 is shown on following diagram (Figure 3).

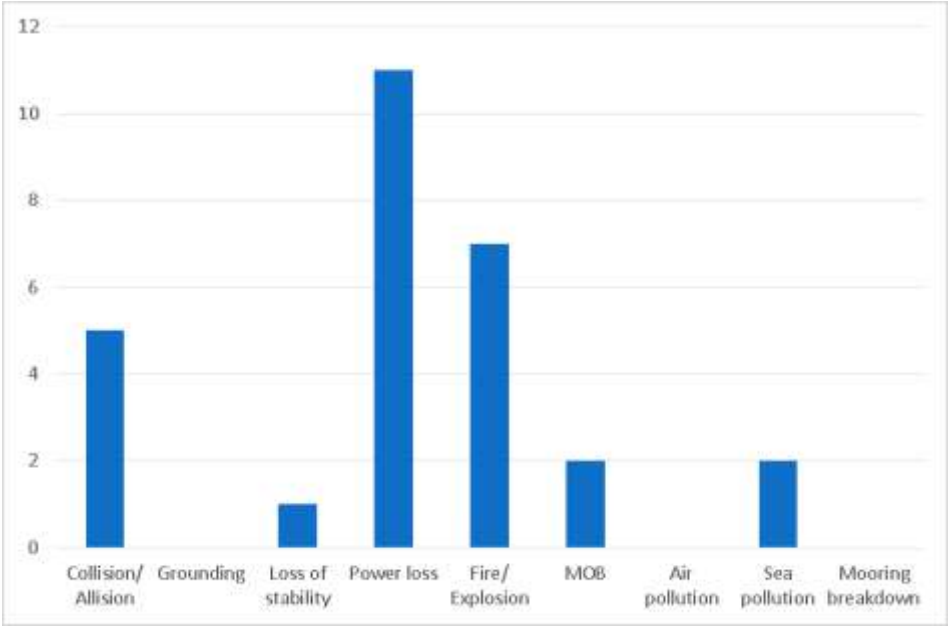

Fig. 3 – *Number of accidents for particular risk on board the vessel scheduled for visit in 2021 [35].*

Note: Anchor dragging is omitted since there is no recorded data. Data for injury/fatality is not shown since it is well above all other accidents, and includes medical cases that are not directly involved with navigation.

Schedule for 2019 should be considered even more, since these vessels were actually visiting Kotor in 2019 for several times. Records for 33 ships have been found. Four ships didn't have accidents (newest has 8 and oldest 30 years). Remaining 29 ships have average 18.7 years (newest 4, oldest 37 years). One of the ships has been scraped, however records are included in research.

Following diagram in Figure 4 shows the number of accidents, for particular risk, occurred on ships that have visited Kotor in 2019.

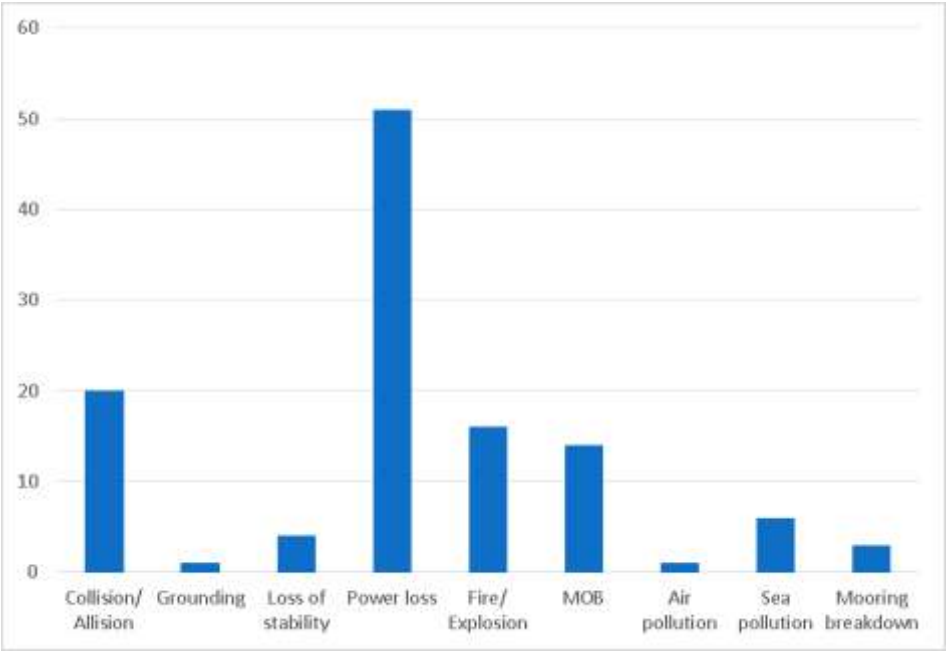

Fig. 4 – *Number of accidents for particular risk on board the vessel visited Boka Bay in 2019 [35].*

Collision – Total 6 collisions (out of 20 incidents related to collision/allision in the fig.4) have been reported for listed vessels both in 2019 and 2021. Therefore, likelihood is categorized as 2. Potential consequence of collision, what was the case in most of these accidents, is large damage and occasionally multiple fatalities. That is the reason why it is scored 4.

Allision – Most of the cases stated in the figures 3 and 4 are allisions. Likelihood is 3, and consequence is serious injury or damage within 500k euros, i.e. 3.

Anchor dragging – Similarly to boats/yachts, these accidents are rarely reported. For example, accident involving cruising ship 'Viking Star' [35] that almost run aground due to anchor dragging cannot be found in above database. Same is with 'Crown Princess', ship from Figure 1. Same is remembered, just because it happened in Boka Bay. Since there were two such accidents in Boka Bay in few years, likelihood is than categorized as 3, consequence is 3. This risk should be well appraised, same as grounding

below, since it could lead to stranding, oil spill etc. what could really cause considerably bigger damage.

Grounding – This accident is one of those that should be assessed with great caution. As stated in above figures, it happened only once among ships visiting Kotor and the consequence was minor. However, everybody is well aware of the accident from Figure 2. One such accident could cause immeasurable damage to Boka Bay. Risk assessment is made on obtained numbers, but as mentioned it should be taken with utmost care. Likelihood is scored 2, consequence as 3.

Loss of stability – Listing is most often case of stability loss within cruising ship business. Possibility to have such incident is unlikely and consequences are either medium injuries or damages up to 50k.

Power loss – This is the accident mostly occurring in research. Power loss itself is not the accident that causes much headache. However, potential losses that derive from power problems are enormous. It could lead to grounding, stranding, stability loss, capsize of the vessel, oil pollution, fire. Therefore both likelihood (with score 3/4) and consequence (with score 4) of such hazard are high, and the risk from it is highest among all others.

Fire/explosion – considering relatively high number of fires, likelihood is scored 3, same as consequence. Most of the accidents have been extinguished by fixed system, or by appropriate reaction, and so the cost of damage was within tolerable limits (score 2). However, due to potential serious injury it is scored as 3.

MOB – Unfortunately, a lot of MOB cases are related to cruise ships. A lot of these accidents are not caused by the lack of standards or controls. Instead, these are usually result of felony or even intention. A lot of these cases were under crime investigation. Since majority of cases ended up with fatality, it is categorized as hazard with major consequence.

Injury/fatality – Taking into account that a lot of hazards end up with serious injuries and fatalities and with such high number of all other mentioned risks which could lead to such result this hazard is also assessed as high risk.

Air pollution – With certain acts regulating air pollution from ships, hazard is unlikely, and consequence may be moderate, especially if hidden (more details in conclusion).

Sea pollution – Number of reported accident (8 in total) might categorize this hazard as unlikely. However, considering the fact that it was repeated on same ship regularly visiting Kotor, makes it more possible to

happen. Claims for declared accidents were remarkable, why this hazard is scored with 3/4.

Mooring breakdown – Mooring breakdown occurred 3 times within all recorded accidents, what was the reason to define it as unlikely risk with minor consequence.

4. Discussion and conclusion

As explained in the article, risk assessment is useful and functional only if criteria is set. Based on professional experience and on many publications dealing with this topic [9], [10], [11], [12], [13], [20], residual risk with score 10 or above is treated as high risk in this research. Thus completed Risk Assessment revealed several hazards with high residual risk. High risk doesn't immediately insinuate that service should be ceased. Economical strategy of Boka Bay reposes on the further development of nautical tourism. As stipulated earlier, our strategy must be based on precise and detailed study, not causing even the slightest doubt in long term. Obtained high risks are pointing out that some of the hazards are not processed adequately. Simply, it could mean that some of the controls to reduce risk are not adequately addressed (as speed limit control, control for strict compliance with COLREG, SOLAS etc.).

Although the risk of pollution (both from yachts and cruising ships) is not within high risk category, it is recommended to carry out further investigation in the future. Montenegrin Government has ratified many conventions and there are numerous acts regulating pollution prevention [33, 34, and 35]. However, legitimate question is whether there is strict control of compliance. For example, responsible person should take fuel sample on 20% of all foreign vessels. Analysis should be completed in accredited laboratory. By following such procedure, it may be practically proved that foreign vessel is complying with measures for air pollution prevention. Another issue that may cause the problem is that taking of samples of sewage/gray water and ballast is justified only if there is doubt that vessel has caused sea pollution. In many sensitive areas, regular taking of samples is custom. Thus, measures to control pollution are made preventive. And finally, penalty policy is the key in successful implementation of the law. Knowing that there are strict rules and witnessing their compliance, navigators will be forced to think twice before making any misconduct.

Further corroboration of above statement could not be completed due to lack of relevant data (as number of fines charged for violation of Port Law i.e. penalty provisions for sea/air pollution; existence of accredited

laboratory for taking fuel sample; number of fuel samples actually taken and existence of beneficial policy for low risk vessels) although official request has been submitted to Ministry of Capital Investment [37-39].

Completed risk assessment may not be perfect and unquestionably reflect the real situation in Boka Bay, but should give good basis for further investigation. With availability of adequate software and data collected over certain period of time, more reliable and precise risk assessment could be made. This research revealed the following:

- There is high risk of collision, fire and injury/fatality on boats/yachts.
- There is high risk of power loss, MOB, and injury/fatality on cruising ships.

Further investigation could be directed towards generation of precise database for the subject area and setting appropriate controls in order to minimize the impact of obtained high risk hazards.

Several high risks call for attention that controls for these areas must be enhanced or established. Navigation in Boka Bay with so many boats, yachts and cruising ships requires special attention by all involved parties. Making risk assessment or just setting the rules is not enough. If the juveniles are allowed to steer the speed boats, ski-jets, if skipper can be any person passing COLREG exam without any practical knowledge, if there are no regulatory acts following best practice around the world (related to ballast water treatment, discharge of water from ships, use of low-sulphur fuels) then our mission will just be a dead letter on the paper. However, it is still not late to protect and preserve our diamond for many future generations.

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Short report

Some Considerations Regarding the Safety of Touristic Vessels Operating in the Albanian Bays*

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Abstract: Ship's stability is one among the foremost important and complicated concept regarding ship and navigation's safety and it's governed by maritime law as well as maritime codes. In Albanian bays, there has been considerable maritime tourism development in recent years, which has consequently brought about an increasing demand for passenger ships offering mainly one day cruises. The ships intended for this type of service are of different typologies: tourist vessels built especially for this destination, but there are many vessels which have changed the destination mainly from fishing vessel to tourist vessel. From the field observations along with contacts with the port authorities and Albanian maritime administration, it is revealed that these ships bare problems related to meeting service and security standards that they offer. Considering existence of such problems and the absence of technical data related to the safety of ships, it is required that geometric and stability calculations are performed with the view meeting the norms of stability. In this paper we will be presenting the causes that lead to ship stability failure and their impact on navigation safety. A case study of the calculation of the ship stability is going to be presented, the causes are going to be analysed and the possible ways of stability failures are going to be assessed. Vessel's intact stability is a fundamental component of seaworthiness so it's in the interest of all owners/operators to be aware of this subject and make sure that their vessel has a satisfactory level of stability in order to ensure its safety as well as that of people on board.

Keywords: Ship stability, Maritime tourism, Passenger ship, Stability booklet.

1. Introduction

The safety of a ship depends on its structure, equipment, shape, disposition and its specific purpose, which varies from one ship to another. The safety of a ship also depends on the nature of the cargo, the

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composition of its crew, working conditions, the education and level of communication between its members, as well as on other related factors. Stability has always been the main safety issue for all marine vessels.

Ships should ensure safe navigation by meeting the stability norms defined by the International Maritime Organization (IMO) and determined by national maritime administrations. The fulfillment of these norms is becoming increasingly important, especially for passenger ships used for tourist excursions.

When a ship is completed by the builders, certain written stability information must be handed over to the shipowner with the ship. The information includes details of the ship's Lightweight, the Lightweight VCG and LCG, and also the positions of the centers of gravity of cargo and bunker spaces. This gives an initial condition from which the displacement and KG for any condition of loading may be calculated.

There are different reasons for a change in the position of center of gravity G. When the vertical center of gravity VCG rises, there will normally be a loss in the ship's stability. G may even rise above the transverse metacenter M to make the ship unstable. The master and mate onboard ship must be aware of changes in a ship that would cause such a rise in G.

In Albania, more and more sea transport is being given priority, mainly in tourist transport ships for tourists on one-day lines. The vessels intended for this type of service are of different typologies: tourist vessels built especially for this destination, but there are many vessels which have changed the destination mainly from fishing vessel to tourist vessel. These ships, in order to adapt to this new tourist trend, have made constructive changes, which in many cases have brought an impact on the stabilizing behavior of the ships. From the analysis of the stability calculations and from the observations on these boats it has been noticed that the center of gravity of them has undergone changes, mainly in its increase VCG.

2. Maritime tourism in Albania

Globally, tourism and travel combined account for nearly ten percent of GDP and brings in an annual review of approximately USD 7.6 trillion, and thus is an important part of the world economy [1]. For Albania, the tourism economy and tourist sectors account for 8.71 of GDP in 2019. People working in the tourism sector also accounted for 22% of the total number of employed individuals in the country.

Over the last decades, the economy of Albania has undergone a major socio-economic transition. Coastal and marine resources, being valuable economic assets, have underpinned this process.

The maritime sector is rapidly increasing in these last years, leading to further economic development and international cooperation. Data from INSTAT shows that in 2017 compared to 2016, the number of passengers travelling by sea increased by 16.9%.

Albania is located in a quite favourable geographical position. Linking the Adriatic and Ionian Seas and the Central Mediterranean Sea, makes Albania an important country for the development of maritime activities [2].

The tourism industry occupies a key place within the economy and is a crucial source for the development of the country. Tourism can immensely contribute to three dimensions of sustainable development: creating jobs, generating trade opportunities to recognize needs and support tourism activities [3].

Tourism in Albania is a major component of the national economy. It is one of the most important and promising sectors considering the natural and cultural resources that this area holds.

In Albania, there is a long coastline with mainly sandy, but also rocky beaches. In this coastline there are a number of hotels, holiday houses, resorts that tell for a significant increase in sea tourism. Almost in all cases we have to do with customized vehicles (formerly fishing boats, small freight vessels, military vessels), however, there are also cases where the subjects are equipped with new vessels aimed for tourist and entertaining purposes. Not only the number of tourists in the last 2-3 years has increased, but also in their geographic distribution has developed with tendency of tourists coming from northern European countries such as Poland, Russia and Scandinavian countries. The presence of this category of tourists has brought about the demand for sea tourism vehicles of a higher category, according to the requirements that this category of tourists has. So we have a request for tourist marine vessels, to which private entities have responded with a rapid increase in the number of these vehicles. Their choices have been to buy such vessels produced some time ago, or to change the destination of their vessels for example, those of fishing in one-day passenger vessels undergoing constructive changes. But in these cases it is required to pay special attention to meeting the standards for the accommodation of passengers as well as for the safety of the ship navigation.

3. Situation in Albania - findings

In Albania, there has been a considerable maritime tourism development in recent years, which has consequently brought about an

increasing demand for the number of passenger ships mainly for one day cruises in short lines (Tables 1 and 2).

Table 1 – *Number of ships and their transport capacity in the bay of Vlora [4].*

Year	2016	2017	2018	2019	2020	2021
Number of vessels	3	4	10	15	14	16
Daily transport capacity	295	342	1198	1350	920	1026
Number of pax	9150	14546	30843	51815	23197	36150

From the field observations, contacts with the port authorities and the Albanian maritime administration it is revealed that these ships have problems related to the fulfillment of the service standards, but also related to the security that they offer. They operate mainly in the bay of Vlora, Saranda and Koman Lake not in very long distances (1-2 hours).

These ships have problems related to periodic and instant technical services, as they are offered in a very limited way in Albania. The only shipyard which can offer service is that of Pashaliman shipyard, which still remains under the jurisdiction of the Ministry of Defense, but also not equipped with all the tools and specialists to fulfill all their requirements for repairment, remodeling of existing ships or construction of new ships.

With these problems and in the absence of technical data related to the safety of ships, it is required to meet the norms of stability and perform geometric and stability calculations of these ships. This emphasizes the necessity of compilation and having the stability book on board of the ship as an operating manual.

4. The importance of ship stability in ship safety

In the last decade, losing the stability of the ship has created significant problems thanks to various ways in which such a situation happenes. This is why attention is needed to be paid to every way separately.

Even though, from a theoretical point of view, such problems were very well known in the past, but it was only recently that further attention was given to preventing and regulating such situations. The ship needs to have a sufficient margin of metacentric height for any loss of stability situation to have a solution as in maintaining the limit level of safety. Even so, practically before starting the voyage, many situations are identified in which the metacentric height is quite accurately known. Moreover, there are cases during which the metacentric height is more accurately determined, but still no reassurance could also be given about the ship's stability for the entire voyage.

During the voyage, the ship should be verified at all times, because sometimes it might be necessary to commence voyage with a higher metacentric height, in order to counteract conditions which arise at later stages.

Four basic elements are considered to be part of the ship's stability system: ship, environment, cargo and operations [5].

The necessary level of safety may, when it comes to ship's stability, be obtained only by considering all elements whichh contribute to the stability system.

The Albanian Maritime Register [6] has set a series of norms that must be respected in relation of safety and for this we have tried to analyze more deeply the requirements and norms required by the IMO provided not only by the Albanian Maritime Register, but also by other European Registers, mainly by the Croatian Maritime Registry [7], to which we have referred in most cases.

For this purpose we have used an extensive bibliography because:

- The ships operating in Albania, are mainly ships produced a long time ago, so they have been in use for many years.
- They have undergone constructive changes, where it is necessary to see in detail the possible constructive damage that may have occurred to the ship, as most such interventions have been made without the intervention of a naval engineer or a group of engineers.
- Most ships have completely changed their destination, mainly from service ships to one-day passenger ships. Thus, the requirements and norms provide other conditions that these ships must meet.
- Almost all of these ships lack technical documentation, even general, constructive and theoretical technical drawings, so in some cases it was necessary to make measurements on the real ship of all dimensions to create a theoretical drawing of the ship and create a frame of semi-widths (ordinates).

Table 2 – *Ship data for tourist transport in Albania in recent years [8].*

Name	Destination	Year of Construction	Place of Building	VCG Lightship	VCG Full Loaded	LOA	B	T
DRAGOBIA, Koman	46 pax	1982	Durres	1.27	1.45	12.90	4.50	1.25
BERISHA 01, Koman	80 pax + 10 cars	N/A	Koman	1.20	1.588	24.60	6.40	0.55
BERISHA 03, Koman	100 pax + 12 cars	N/A	Koman	1.20	1.55	29.80	7.40	0.65
TEUTA	30 pax	1976	Italy	0.88	1.175	12.75	3.70	1.20
Black Pearl	180 pax	2012	Marmaris, Turkey	1.75	2.088	21.35	6.90	1.43
Teuta I	50 pax	1980	Italy	0.82	1.31	13.60	3.80	0.92
SARDA, VauiDejes	40 pax	N/A	N/A	N/A	0.96	14.50	4.00	1.00
JULKA UNIQUE	200 pax	2018	Vlore	2.66	3.12	24.00	9.00	0.98
TINA TOURIST	150 pax	1984	Greece	1.49	1.648	22.50	4.80	1.255
ESPERANZA	80 pax	1990	SCILLA RC, Italy	1.27	1.58	16.60	4.60	1.46
ROZAFA	30 pax + 10 cars	N/A	N/A	0.99	1.7	20.40	7.40	1.33
AQUAMARINE	225 pax	1997	Marmaris, Turkey	1.67	2.09	30.50	8.00	2.10
DELFINI 23	48 pax	1980	Kalymnos, Greece	1.54	1.52	11.90	3.30	0.79
LIBURNA	120 pax	1963	Greece	2.06	2.21	23.75	6.25	2.40
SEASTAR	50 pax	2017	Italy	1.13	1.67	12.00	5.00	0.40
AVVENTURA II	45 pax	1991	Peschici FG, Italy	1.2	1.3	11.96	2.72	0.95
ANNA ST	33 pax	1984	Durres, Alb	1.056	1.30	13.22	3.58	1.26
MOGILA	286 pax	1955/2002	Montenegro	1.69	1.79	25.50	13.70	1.142
PADAJ	20 pax	1989	Bellaria, Italy	0.82	1.02	11.00	2.82	1.00

5. Case study

In many cases the initial purpose the ship was designed for, has changed. The case under consideration has been changed, from a fishing vessel to a passenger/tourist ship. At the request of the owner the ship must embark a maximum number of 180 passengers.

The Ship:	Tourist Ship
Length Overall:	L_{OA} = 23.75 m
Number of passengers + Crew:	180 = [115 (main deck) + 60 (upper deck) + 5 (crew)]

To the case taken in study (look at Figs. 1, 2 below) two upper decks were added. In such cases a considerable vertical displacement of the centre of gravity (G) is observed, therefore a reassessment of stability is required.

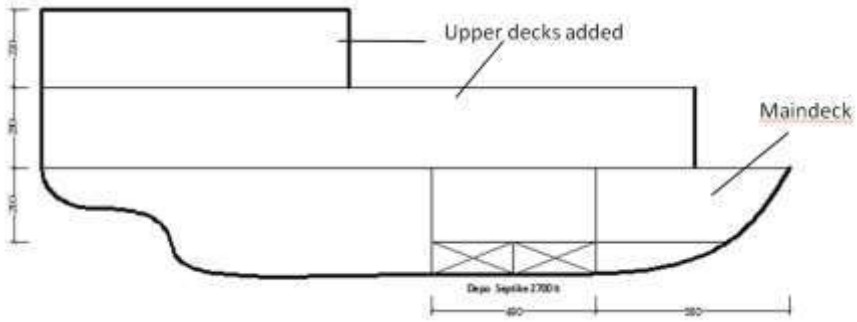

Fig. 1 – *Longitudinal profile of the touristic boat under consideration.*

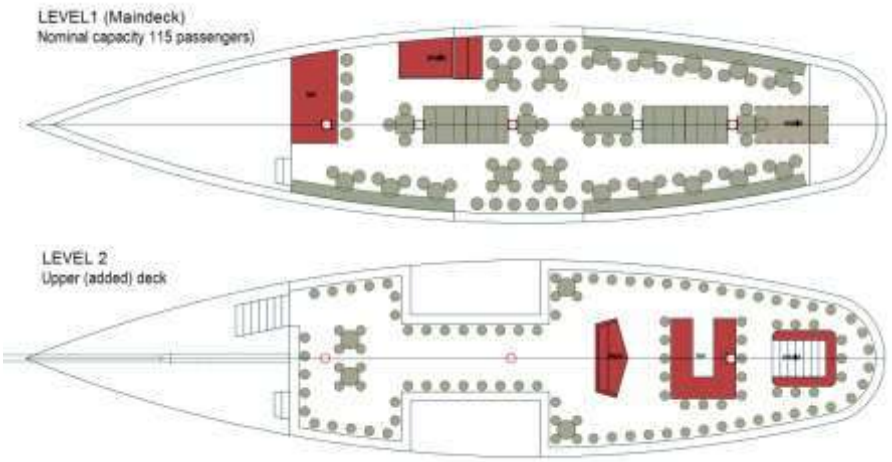

Fig. 2 – *Main and Upper Deck and Passengers Arrangement.*

The significant impact on the outcome of the 3D modelling process of a vessel is the realization of real measurements of the vessel hull that will be modelled [9, 10]. The measurement process is carried out in physical

bulkheads of the vessel, in order to obtain accurate results of the measurement of the semi-breadths of coordinates.

For the tourist boat, taken the data by direct measurement in its physical bulkheads, we have realized the 3D model in MaxSurf software.

Referred to the vessel taken in the study we drafted the Stability Book for the new conditions (Table 3). For the purpose of the assessment, in general, 3 IMO stability criteria (IMO resolution A.267) have not been met [11, 12].

Table 3 –*Verification of general criteria of the vessel in full load departure.*

Code	Criteria	Value	Units	Actual	Status	Margin (%)
	3.1.2.1: Area 30 to 40	1,7189	m.deg	1,6057	Fail	-6,59
	3.1.2.2: Max GZ at 30 or greater	0,200	M	0,197	Fail	-1,50
	3.1.2.3: Angle of maximum GZ	25,0	deg	21,8	Fail	-12,73

5.1. Some recommendation

From the reassessment of the stability of the modified vessel taken into study it was observed a considerable vertical displacement of the centre of gravity (G). This directly affects the stability of the ship therefore the following recommendations are given as possible solutions:

1. The number of passengers required by the ship owner is very large, so it is suggested:
   - To change the loading scheme (Total 130 passengers: Main deck - 130 passengers and the upper deck - 0 passengers);
   - To put a solid/liquid ballast (Put a solid ballast of 4 tons along the length of the keel symmetrically to the longitudinal vertical plane, as well as water and oil deposits must be filled on the vessel departing from the port).
2. The vertical centre of gravity VCG, which is not found in the technical documents of the ship, must be calculated. Alternative methods in calculating VCG, which have emerged and improved in recent years can be used. Some of the alternative methods of calculating VCG of ships are the Graphical method proposed by O.O. Kanifolskyi and M.M. Konotopets in 2016 [13], the Generalized method proposed by R.J. Dunworth in 2013 and improved by R.J. Dunworth and A.C. Smith [14, 15]. Another alternative method, the Polar method was proposed quite recently and refined by K. B. Karolius and D. Vassalos [16, 17, 18].

These alternative methods do not rely on the metacenter. It is observed that these new methods developed have similar results to the classical method. Therefore, these methods may be a good alternative to calculate VCG in the future.

3. During the operation of the ship was seen an uncontrolled movement of passengers, aiming at the upper decks. This is a dangerous situation for stability of the ship, therefore strict measures should be taken to stop and monitor the movement of passengers in this direction.
4. The ship would sail in calm weather conditions and with sea condition up to 2-3 Beaufort scale.

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Review paper

Comparative Analysis of Seafarers' Collective Agreements in the Republic of Croatia and Montenegro*

Tony Vuković

Abstract: Seafarers represent a special category of workers, since their living and working conditions differ in many respects from those of other workers. Therefore, the legal regulation of the employment status of seafarers is particularly important. In the Republic of Croatia and Montenegro, there is no comprehensive legal act regulating the working, social and living conditions of seafarers. Relevant provisions are contained in various legal regulations. Collective agreements are of crucial importance in regulating the employment status of seafarers. In the Republic of Croatia, *the National Collective Agreement for Croatian Seafarers on Board Ships in the International Shipping (2021-2022)* entered into force in 2021. In Montenegro, *the Collective Agreement* for ship crew concluded at the end of 2020 with the employer *Crnogorska plovidba a.d. Kotor* is still in force. In this paper, the author provides an overview of the collective bargaining process and focuses on the comparative analysis of collective agreements.

Keywords: Employment status, Seafarers, Legal acts & collective agreements.

1. Introduction

The employment status of seafarers is very specific and differs significantly from that of land-based workers. The working and employment conditions of seafarers also depend on the ship, the jurisdiction of the ship, the crew, the ship owner, but also on the flag state union that promotes and protects the labour and social rights of maritime workers.[1]

Therefore, the protection of seafarers is crucial to the safety of shipping and, consequently, to the protection of the marine environment, seafarers' health and fundamental human rights. For this reason, *the International*

[1] Andijana Bilić, Vanja Smokvina, Problems and Perspectives of Seafarers' labour agreements in the light of Maritime Labour Convention with special reference to Croatian legislation, Collection of papers-3rd International Scientific Conference on Maritime Law, Contemporaray challenges of navigation, Split 2021, p.17

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Labour Organisation (ILO) adopted *the Maritime Labour Convention (MLC Convention)* in 2006, which is the main international agreement governing the employment status of seafarers.[2]

The paper analyses the employment status of seafarers in the Republic of Croatia and Montenegro and collective agreements in international shipping. The particularly important Dubrovnik Statute of 1272 and the Kotor Statute of the 14th century regulated the shipping of both countries. After World War I and World War II, they were part of the same state and had the same legal system. Although they became independent relatively recently, the favourable Croatian and Montenegrin legal acts have their roots in the regulations of the former Yugoslavia. Therefore, there are many similarities in the current legal systems of both countries.

Today in the Republic of Croatia and Montenegro there is no complete law regulating the working, social and living conditions of seafarers, but such provisions could be found in several laws. Currently, there are about 22,500 seafarers in the Republic of Croatia,[3] who make up 1.5% of the total number of employees and generate more than one billion euros in revenue.[4] According to the *Union of Captains of Montenegro*, there are currently about 6,000 seafarers in Montenegro, whose revenues account for 12% of the total state budget.[5] It can be concluded that seafarers have a great impact on the economy in both countries, so it is extremely important to regulate their employment status. The most important step in regulating the status of seafarers was taken by ratifying *the Maritime Labour Convention (MLC)* and aligning national legislation with its provisions.[6] Ratification of *the Maritime Labour Convention* is crucial as the state ensures that ships have the *seafarers' certificate of employment* and *Declaration of Maritime Labour Compliance.*[7] The Republic of Croatia ratified *the MLC* in February 2013 and Montenegro in February 2015.

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[2] Ibid, p.13

[3] Of the total number of seafarers in the Republic of Croatia, 15500 seafarers work in international shipping and about 7000 in national shipping

[4] official website of the Croatian Seafarers, www.sph.hr (accessed on 18th October 2021)

[5] Official website of *the Union of Seafarers of Montenegro* - www.unijapomoraca.com (accessed on 22nd October 2021)

[6] According to Art.V para 1 of the MLC, each state that has ratified the MLC is obliged to apply and implement laws, regulations, or other measures to meet its obligations under the MLC with respect to ships and seafarers under its jurisdiction.

[7] For more information on certification of seafarers and declaration of maritime labour compliance, see Ranka Petrinović, Trpimir Perkušić, Tony Vuković, Inspection of Seafarers' working Conditions in Accordance with MLC 2006 in Ports of Paris MOU Signatories, Collection of papers – 3rd International Scientific Conference on Maritime Law, Contemporary Challenges of Navigation, Split, 2021, p.190

In the first part of the paper, the author discusses the collective bargaining that precedes the conclusion of collective agreements and the collective agreements themselves. The second part deals with *the National Collective Agreement for Croatian Seafarers on Board Ships in International Shipping (2021-2022)*. The third part analyses *the Collective Agreement with the employer Crnogorska plovidba a.d. Kotor.* Special emphasis is placed on a comparative analysis of the two collective agreements and their impact on improving the working, social and living conditions of seafarers.

2. Collective bargaining and collective agreements in general

2.1. Collective bargaining

Collective bargaining agreements have become an indispensable part of today's labour act and have an important economic, political, social and humanitarian function. A collective bargaining process precedes the conclusion of a collective bargaining agreement. Collective bargaining can be defined as a method of regulating wages, hours, and other terms and conditions of employment through direct negotiations between the union and the employer. The result of the negotiations is usually a written contract that applies to all employees, union members, etc.

According to the new ILO Conventions, collective bargaining is any negotiation between an employer, a group of employers or employers' organisations on the one hand, and workers' organisations on the other. The aim is to establish terms and conditions of employment and/or to regulate relations between employers and workers and/or to regulate relations between employers or their organisations and one or more workers' organisations.

The parties negotiate directly or through joint commissions (negotiating bodies). Bargaining bodies may be at different levels (industry, activity, state) or larger systems in different organisational and associational forms.[8]

The legal obligation of the parties is to negotiate in good faith[9], therefore it is the duty of the union to voluntarily enter into the collective bargaining agreement. The objective is to establish and adopt a collective agreement that improves working conditions and legal status. The persons representing the parties must have a power of attorney. If one of the parties

[8] Marinko Đ. Učur, Collective bargaining and extension of the application of the collective agreement (authorization of the collective agreement), Proceedings of the Faculty of Law, University of Rijeka, vol. 27, no. 1, Rijeka, 2006, p. 548

[9] Labour Act of the Republic of Croatia, Art. 193

is an employers' association or a superior employers' association,[10] the representative must submit a list of employers who are members of the association, on whose behalf he/she negotiates, i.e. concludes a collective agreement.[11]

The subject of the actual negotiations are parts of the collective agreement concerning wages, social benefits, material and other rights of employees, and working conditions. However, the procedural elements of the collective agreement, such as the timing of the conclusion of the collective agreement are no less important.

The goal of collective bargaining is to reach a quality agreement which is often achieved through compromise or by relaxing some of the parties' original demands. The goal of concluding a collective bargaining agreement ensures broad application of the agreement and brings operational and long-term solutions and reliability.[12]

2.2. Collective agreements in general

The collective agreements came into view and filled the gap in the legal system. The conclusion of collective agreements ensured labour peace.

Supply and demand for labour can be better controlled, workers are better protected, and working conditions are improved through cooperation between the social partners.

A collective agreement is a written agreement between a trade union and an employer that contains provisions on the terms and conditions of employment, payment arrangements, working hours, and the rights and obligations of the parties to the agreement.[13] A collective agreement has its own name, subject matter, content and form. The subject matter is the employer, several employers or their associations, a trade union, several trade unions or higher-level employee associations. The content of the collective agreement is divided into two parts: normative and contractual.[14] It can be concluded for a definite or indefinite period of time, but also with an open term. The essential purpose of collective agreements is to enable

[10] For more information on the superior employee association, see Art. 2. Act on representativeness of employers' association and trade union organisations OG No. 93/14, 26/15

[11] Labour Act of the Republic of Croatia, Art. 197

[12] Marinko Đ. Učur, Collective bargaining and extension of the application of the collective agreement (authorization of the collective agreement), Proceedings of the Faculty of Law, University of Rijeka, vol. 27, no. 1, Rijeka, 2006, p. 550

[13] Ivo Rozić, *Collective labour law*, JP NIO Official Gazette of BiH, Sarajevo, 2013, p. 33-34

[14] Tintić, Nikola, *Labour and Social law*, The book first: labour relations (I), Official Gazette, Zagreb, 1969, p. 263

employees and employers to regulate the functioning of labour relations in practice. It also provides the opportunity to choose better working conditions and employment rights than those required by law or contained in the employment agreement. The seafarers' collective agreement establishes the most important aspects of seafarers' employment. It provides the direct legal basis for the protection and realization of the rights, duties and responsibilities of individual employees - seafarers and their shipowners.[15]

According to *Labour Act* (LA)[16] in the Republic of Croatia, a collective agreement regulates the rights and obligations of the parties to the collective agreement. It contains legal provisions that may regulate the content, commencement and termination of the employment relationship, as well as staff council matters.[17]

In Montenegro, the collective agreement regulates the rights, obligations and responsibilities of the parties that have concluded such an agreement. It also regulates their mutual relations and other issues of great importance for employees and employers.[18]

The definitions of collective agreements are similar in both countries, with minor nomotechnical and linguistic ambiguities.

The labour acts of both countries prescribe that collective agreements must be in writing and published.[19] Collective agreements can be concluded for an indefinite or definite period of time.[20] In the Republic of Croatia, a definite term means that the agreement may not be concluded for a period exceeding five years.

3. National Collective Agreement for Croatian Seafarers on Board Ships in the International Shipping Trade (2021-2022)

In the Republic of Croatia, there is no comprehensive legal act regulating the working, social and living conditions of seafarers. Provisions on the labour, social and living rights of Croatian seafarers are contained in several

[15] Mirela Šarac, Andrija Crnković, Legal working status of crew members during the centuries- a comparative overview, Proceedings - 3rd International scientific conference Contemporary challenges of navigation, Split, 2021, p. 326

[16] Labour Act of the Republic of Croatia, OG No. 93/14, 127/17, 98/19

[17] Ibid, Art. 192

[18] *Labour Act of the Repulic of Montenegro,* Official Gazette of Montenegro No. 74/2019 and 8/2021, Art.181

[19] LA Art. 195. and Art. 202, para 1; *Labour Act of Montenegro* Art. 181 para 2 and Art. 186 para 1

[20] LA Art 198; LA of Montenegro Art.187

regulations. The most important are the *Maritime Code,*[21] *National Collective Agreement for Croatian Seafarers on Board Ships in the International Shipping Trade,*[22] *National Collective Agreement for Croatian Seafarers on Passenger Ships and Ferries,*[23] *Ordinance on the Application of the Seafarers' Labour Convention from 2006*[24]*, International Agreements* which were concluded and ratified under the *Constitution of the Republic of Croatia* and *the Labour Act*.

The provisions of the Maritime Code, the National Collective Agreement for Croatian Seafarers on Board Ships in International Shipping and the International Agreements concluded and ratified in accordance with the Constitution of the Republic of Croatia take precedence over the Labour Act.[25]

Collective agreements are characterised by a number of specific provisions concerning the public law nature of seafarers' employment, such as the right to repatriation, food, accommodation, bedding, registration of employment agreement, special health conditions, safety at work, etc. For seafarers, the ship is not only their workplace, but also their home for the duration of their professional activity. *The National Collective Agreement for Croatian Seafarers on Board Ships in International Shipping (hereinafter: The National Collective Agreement)*[26] was concluded on December 30, 2020, entered into force on January 1, 2021 and is valid until December 31, 2022. *The National Collective Agreement* is concluded in writing between two lawful contracting parties: Seafarers' Union of Croatia and representatives of Croatian Shipowners' Association. Seafarers' Union of Croatia is in Rijeka and its main task is to improve and protect the rights, interests and social position of Croatian seafarers.[27] Seafarers' Union of Croatia is a member of the International Transport Workers' Federation (ITF) and must adhere to the minimum standards set out in the ITF Basic Collective Agreement. *Croatian Shipowners' Association Mare Nostrum* was founded on February 5, 1991 on the initiative of 14 shipping companies under the name *Mare*

[21] *Maritime Code,* official gazette No 181/2004, 76/2007, 146/2008, 61/2011, 56/2013, 26/2015, 17/2019

[22] National collective agreement for Croatian seafarers in international navigation, Official Gazette No. 94/2015, 119/2018, 6/2021

[23] National collective agreement for Croatian seafarers on passenger ships and ferries, available on: http://www.nsppbh.hr/cms

[24] Ordinance on the application of the Seafarers' Labour Convention, 2006, Official Gazette No 122/16, 42/19

[25] *Maritime Code*, quote, Art. 125, para 7

[26] The National collective agreement for Croatian seafarers on board ships in the international shipping trade (2021 -2022), Official Gazette, No 6/2021.

[27] *Seafarers' Union of Croatia*, available on: https://sph.hr/ (accessed on 18th October 2021)

Nostrum - Croatian Maritime Shipping Company Ltd Zagreb. Today *Mare Nostrum* unites ten members of the most important Croatian shipping companies.[28]

The Parties have concluded appropriate collective agreements for seafarers in international shipping which consider the specifics of shipowners, ships and seafarers, but also the specifics of the seafarers' union of Croatia and its ITF membership. *The National Collective Agreement* is an independent source of law for Croatian seafarers and seafarers of Croatian nationality with permanent or temporary residence in the Republic of Croatia who work on board ships in international shipping duly registered in either the Croatian or another ship register. *The National Collective Agreement* also applies to seafarers who are nationals of other EU Member States, considering the implementation of Regulation (EC) No. 883/2004 of the European Parliament and of the Council of 29 April 2004 on the coordination of social security systems.[29] It contains 43 articles and consists of *General* and *Special Addendum*. *The General Addendum* is the supplement to the Collective Agreement that is binding on all members of the *Mare Nostrum Association* and all employers. *The Special Addendum* is the suplement to the Collective Agreement that is binding only on the member who signed *Special Addendum* and on the employer.

The National Collective Agreement has essential features of the collective agreement in general, but also contains a number of provisions that are important for seafarers. Article 3 of *the National Collective Agreement* regulates the employment agreement that each seafarer must enter into with his or her employer before boarding the ship. *The Maritime Code* uses the term employment agreement.[30] The seafarers' employment agreement may be concluded for an indefinite or definite period. If it is concluded for a definite period, it may not exceed six months, depending on the requirements of navigation; it may be shortened to five months or extended to seven months.[31] In the event of a conflict between the general provisions and the individual employment agreement, the general provisions shall prevail if they are more favorable to the seafarers. *The National Collective*

[28] The members of the association are the following shipowners: Jadrolinija Rijeka; Adriatic Maritime Service d.d. River; Rapska plovidba d.d. Rab; Atlantska plovidba d.d. Dubrovnik; Tankerska plovidba d.d. Zadar; Jadroplov d.d. Split; Brodospas d.d. Split; Brodosplit-Plovidba Ltd. Split; Alpha Adriatic d.d. Pula (former Uljanik Plovidba d.d. Pula), Croatian Register of Shipping and Golar Viking Management Split as associate members. These shipowners operate 127 ships.

[29] The National Collective Agreement, Art 2, para 2 and 3

[30] More on ship's crew see *Maritime Code,* Art. 125-164

[31] The National Collective Agreement, Art. 3 para 3

Agreement shall apply to all employment agreements, including those concluded prior to its entry into force. The rights and obligations of the seafarer begin from the day of embarkation, i.e. from the day (hour) of the beginning of the voyage, if the ship is outside the territorial waters of the Republic of Croatia.

The provisions of Article 6 of *the National Collective Agreement* shall govern the signing and duration of the employment relationship. As a rule, the day of signing the agreement does not coincide with the beginning of hiring. From the day a seafarer commences his voyage to the ship, he/she is entitled to his *pro rata* wages and daily voyage allowance for the entire duration of the voyage. Disembarkation from the ship means that the seafarer ceases to perform his/her duties. At the same time, it means termination of employment. A seafarer shall be employed for a period not exceeding 9 months in any 12-month period, depending on the operational requirements, voyage routes and type of ship, in accordance with *Special Addendum* (3).[32] An employment agreement may be concluded for one or more trips not exceeding seven months in total, except for trainees, for whom the employment agreement may be concluded for a period of 12 months.[33] The manner of concluding such an agreement is one of the exceptions (when concluding a agreement for a certain period) under *the Labour Act*. [34]

Under *the National Collective Agreement*, there are three ways to terminate employment: upon expiration of the agreement, when the seafarer signs off due to illness or injury after a medical examination, and when the seafarer or the employer terminates employment.

The National Collective Agreement specifies the reasons for termination of employment by the seafarer and the employer.

The seafarer may terminate the agreement with the employer or demand disembarking:

– by notifying the employer in writing one month in advance, in the presence of two witnesses, of his or her termination or disembarkation (this is a termination without notice);

[32] *The National Collective Agreement* in Art. 6 para 5 provides that in case of force majeure and / or circumstances beyond the control of the flag state of the ship or employer such as pandemic, epidemic, war, natural disasters, etc., the period of embarkation of seafarers is extended until it is safe to disembark in accordance with Special Addendum (3), with the consent of the seafarer.

[33] The National Collective Agreement, Art. 3 para 3

[34] Učur, M. (2003). *Seafarers' employment status.* Rijeka: The Faculty of Law.

– if the seafarer's spouse, child, or parent suddenly becomes seriously ill during the voyage;

– if the seafarer was employed for a particular voyage on a particular ship and the voyage conditions have changed significantly in the meantime;

– if the ship is underway in a war zone;

– if the ship has been immobilised for 30 days or more;

– due to the employer's failure to comply with the provisions of *the National Collective Agreement.*

The employer may terminate the agreement with the seafarer:

– by written notice of termination one month in advance in the presence of two witnesses;

– after the complete loss of the ship through storage or sale of the ship;

– due to a serious breach of the seafarer's duty to work;

– in case of the seafarer's inability to perform his/her duties and work professionally and qualitatively (the seafarer should be offered the opportunity to find another job and conclude a new contract).[35]

In addition to the duration and method of termination of the employment relationship, *the National Collective Agreement* regulates other employment relationship issues, such as: working hours, overtime, holiday, rest periods, wages, family allowances, annual leave, watch-keeping, manning, short-term manning, service in warlike operations, effects of manning, termination of employment, repatriation, food, bedding and medical care, and the like.

One of the most important items covered by seafarers' collective agreements is the calculation of wages. According to Article 11, the total wages of each crew member on the foreign voyage may not be calculated lower than the amounts specified in the wage tables of the *General Addendum* (1). For ships less than 6,000 GT and/or 3,000 kW, the wages of each crew member shall be agreed and calculated on the basis of the consolidated minimum wages as set forth in the International Labour Organisation[36], Joint Maritime Commission (JMC) Resolution of November 19 and 20, 2018 and the joint interpretation by the International Shipping Federation (ISF).[37] Each seafarer covered by *the National Collective*

[35] Termination of the contract with the Master is specially regulated.

[36] According to Art. 1 of *The National Collective Agreement* minimum total wage means the total wage in respect of regular working hours, guaranteed overtime work and holiday pay

[37] On wages, see The National Collective Agreement Art. 11

Agreement is entitled to a family allotment in accordance with the provisions of Standard A. 2.2, paragraph 5 of the Maritime Labour Convention.[38]

Among the specifics of seafarers' collective agreements are *items belonging to seafarers* and *repatriation*. The seafarer is considered to have the necessary things in his/her possession from the time of hiring and later when leaving the ship, which often have a significant material value. If a seafarer suffers total or partial loss of or damage to his personal property for any reason not attributable to his own fault, he/she is entitled to compensation from the employer. The seafarer must prove that the property is for his/her personal use, and the maximum amount of compensation is $3,000. *Repatriation* is the right of the seafarer to return to the place specified in the employment agreement (residence, stay, homeport) after signing off. It includes costs borne by the employer and consists of a basic wage and a *per diem*. Repatriation shall be granted to a seafarer at the end of the agreed period of service on board, at the end of employment, in case of total loss or sale of the ship. A seafarer shall also have the right to repatriation if he/she has committed a serious breach of duty or several minor injuries, and if the seafarer himself/herself requests premature termination of the employment agreement. In these cases, the employer is obliged to repatriate the seafarer at his own expense, and he has the possibility to recover the costs of repatriation together with all other expenses incurred from the seafarer's unpaid wages.[39]

Pursuant to Article 27 of *the National Collective Agreement* and in accordance with *MLC*, the employer must provide adequate insurance coverage for the payment of compensation arising from the provisions of the collective agreement.[40]

In addition, most of the seafarers' complaints relate to accommodation, food, lack of recreational facilities, and poor internet connections that prevent them from communicating normally with their family members. Therefore, *the National Collective Agreement* provides for accommodation, recreational facilities, meals and catering services that meet the standards of the ILO Maritime Labour Convention, Rule 3.1 - Accommodation and Recreational Facilities and Rule 3.2 - (Meals and Catering Services).[41]

[38] Refers to the transfer of all or part of the earnings to their families, dependents, or beneficiaries*;* STCW Convention 2006.-quote*; The National Collective Agreement,* Art.11 and 12

[39] Ibid, Art. 20

[40] On the mandatory financial guarantee, see Petrinović Ranka; Lovrić Ivana, *New law on the right of seafarers in case of abandonment and repatriation,* Proceedings of the 1st International Scientific Conference on Maritime Law - ISCLM 2016, p. 276 – 308

[41] The National Collective Agreement, Art. 28.

Nowadays, one of the main obligations of the employer is to enable the seafarer to communicate with his family. He must have access to free telephone calls and the Internet for the entire duration of his/her stay on board, considering the safety of navigation.

A special point, regulated only in the collective agreement for seafarers, is navigation in high-risk areas. The company shall inform the seafarer when the ship is or may be sailing to warlike operations and high-risk areas. The seafarer has the right not to sail into such an area. In this case, the seafarer will be repatriated at the employer's expense with benefits accrued to the date of return to his homeport or port of assignment. Seafarers shall also receive an allowance equal to 100% of their basic wage for the duration of their stay in high-risk areas. The seafarer is entitled to double compensation for disability and death caused by shipping in such areas.[42]

In the event of illness, the seafarer is entitled to sick pay equal to the basic wage up to a maximum of 120 days after returning home.[43] In addition, *the National Collective Agreement* contains provisions in favour of the employer that relate to medical care. The doctor designated by the employer must certify seafarers' sick pay. If the seafarer refuses the examination without a justified cause, sick pay will be retained. If the seafarer suffers an accident resulting in death or a specified degree of disability during the term of his employment agreement, the employer shall pay the amount specified in the *General Addendum* (3) of the employment agreement.[44] The Employer shall not pay the compensation referred to in the *General Addendum* if the seafarer's death was caused by his/her intentional actions or if the death was the result of his/her alcohol and/or drug abuse.[45]

The National Collective Agreement has been concluded for a period of two years. If either party does not terminate it, the collective agreement shall remain in force after the expiration of its term until it is terminated or a new collective agreement is concluded. The parties have also agreed to review and examine the terms of *the National Collective Agreement* at least once a

[42] Ibid., čl. 17.

[43] *The National Collective Agreement* Art. 23 para 1 provides for the possibility that a seafarer will not be entitled to sick pay if the employer proves that the illness is the result of a previous illness or medical condition which the seafarer failed to report during the medical examination to determine the ability to board the ship.

[44] *The National Collective Agreement* Art. 26 para 2 regulates that the Employer shall transport the seafarer's posthumous remains as well as the burial costs at his/her own expense.

[45] The National Collective Agreement Art. 26.

year. In September 2021, it was agreed to collectively negotiate amendments to the provisions on seafarers' rights.[46]

The National Collective Agreement was drafted in Croatian and English. In the event of any incompatibility between the two versions, the Croatian version shall prevail for the interpretation and implementation of its provisions.[47]

4. The collective agreement of Crnogorska plovidba a.d. Kotor

In Montenegro and the Republic of Croatia there is no complete legal act regulating all rights and obligations arising from the seafarers' employment agreement. The provisions on labour, social and life rights of Montenegrin seafarers are contained in several regulations. The most important are the *Labour Act*,[48] *The Branch Collective Agreement for Maritime Transport and Port Transshipment Services,*[49], and two collective agreements of Barska plovidba a.d. and *Crnogorska plovidba a.d. Kotor*. Also, important are the provisions of specific Ordinances such as: *Ordinance on detailed conditions, Methods and procedures for issuing licenses for mediation in the employment of seafarers, Ordinance on safety conditions at the workplace and accommodation of crew members and other persons on board, Ordinance on detailed conditions related to stocks of medicines and medical equipment for the provision of medical assistance on ships.*

Collective agreements for seafarers in Montenegro are characterized by the fact that each employer has concluded its own collective agreement with employee representatives. *The Branch Collective Agreement for Maritime Transport and Port Transshipment Services* between *the Independent Trade Union of Maritime and Transport Workers of Montenegro* and *the Association of Maritime Chamber of Commerce of Montenegro* was concluded on May 25, 2004. *The Independent Trade Union of Maritime Shipping and Transport Workers of Montenegro* is based in Bar and is a member of the International Transport Workers Federation (ITF). By joining the ITF, it has adhered to the minimum standards set out in the ITF Core Collective Agreement. The ITF Collective Agreement for Shipping governs the rights and obligations of

[46] At the time of paper writing, amendments to *the National Collective Agreement* have not been adopted yet.
[47] The National Collective Agreement Art. 42 para 2
[48] Labour Act, gazette of Montenegro No. 74/2019 and 8/2021
[49] Branch collective agreement for maritime transport and port transshipment services, OG of Montenegro No. 40/04 and 41/05

seafarers.[50] Seafarers are all employees working on board ships in international shipping.[51]

The Collective Agreement for Ship's Crew with the Employer *Crnogorska plovidba a.d. Kotor (hereinafter: The Collective Agreement of Crnogorska plovidba)* was concluded on December 25, 2020 and entered into force in January 2021. *The Collective Agreement of Crnogorska plovidba* is a written agreement between the employer *Crnogorska plovidba a.d. Kotor* [52] and the trade union organization of Crnogorska plovidba a.d. Kotor.[53] It applies to all seafarers who have signed it.[54] *The Collective Agreement of Crnogorska plovidba* is a collective agreement with the employer, but it is similar to other collective agreements for seafarers. The agreement contains a number of provisions that are not included in other collective agreements. *The Collective Agreement of Crnogorska plovidba* consists of 34 articles and three annexes.[55]

Pursuant to Article 2, paragraph 2 of the collective agreement of Crnogorska plovidba, a seafarer is any person employed or engaged in work on board in any capacity. All provisions apply to seafarers from the day of their employment on board until their return to their place of residence. Unlike the national collective agreement of the Republic of Croatia, *the Collective Agreement of Crnogorska plovidba* provides an employment agreement only for a certain period of time[56]. This means that according to its provisions, an employment agreement of unlimited period cannot be concluded. One of the most important requirements for concluding an employment agreement is a medical certificate issued by a licensed doctor.[57]

Based on the employment agreement, the seafarer can be hired. Article 4 of *the Collective Agreement of the Crnogorska plovidba* regulates the duration of the employment relationship. The employment agreement is concluded with the officers for five months and with the other crew

[50] Ibid, Art. 4 para 1
[51] Ibid, Art 4. para 1
[52] *Crnogorska plovidba a.d. Kotor* is a joint stock company owned by the Government of Montenegro, i.e. its Ministry of Maritime Affairs and Transport. It operates in the international open maritime market in accordance with the principles and standards of the international open maritime market. The company owns two ocean-going ships, *Kotor* and *21st of May*
[53] Since May 2012, the trade union organization of Crnogorska plovidba a.d. Kotor has entered the register of representative trade unions at the Ministry of Labour and Social Welfare of Montenegro.
[54] The Collective Agreement of Crnogorska plovidba Art. 2
[55] The first Appendix refers to the employment agreement, the second contains a tabular overview of the salaries of employees on board and the third refers to public and other holidays.
[56] The Collective Agreement of Crnogorska plovidba, Art. 3 para 2
[57] Ibid, Art. 3 para 3

members for seven months. It is important to note that the employer may transfer seafarers from one ship to another, shorten or extend the employment agreement by one month, depending on the requirements of shipping. The peculiarity of the *Collective Agreement of Crnogorska plovidba* is the probationary period. The probationary period is the first eight weeks of the first employment. At the end of the probationary period, the employer and the seafarer have possibility to terminate the employment agreement.[58] Article 6 of *the Collective Agreement of Crnogorska plovidba* regulates two reasons for termination of the employment contract: the first reason is the expiration of the employment agreement; the second reason is the illness or injury of the seafarer. Moreover, the reasons for which the employer and the seafarer have the right to terminate the established employment agreement are exhaustively listed.

The employer may terminate the agreement with the seafarer:

- by giving 30 days' written notice to the seafarer with a notice period of 30 days;
- due to unreasonable conduct of the seafarer;
- in case of loss or sale of the ship;
- in case of scrapping of the ship for a period exceeding one month.

The seafarer may terminate the agreement:

- by written notice to the employer with a notice period of 30 days;
- if the ship sails in a war zone/high risk area;
- if the ship is detained for a period of 30 days or more due to deficiencies specified in ILO Conventions.

As previously pointed out, *the Collective Agreement of Crnogorska plovidba* is similar to other collective agreements relating to seafarers. It regulates working hours, guaranteed overtime, holidays, rest periods, wages, family allotments, annual rest, watch-keeping, composition and number of crew members, navigation in war operations areas, things owned by crew members, repatriation, medical attention, food, bedding and accommodation. The wage of a crew member is stipulated and calculated by Article 11 of *the Collective Agreement of Crnogorska plovidba*. The wage is paid in amounts determined in Addendum No. 2, which is an integral part of the Collective Agreement. The seafarer shall be entitled to repatriation including basic wage, the daily travelling allotment *(per diem)* from the date he/she commences his/her trip until the return to his place of residence. The

[58] Ibid, Art.5

deadline for calculating the salary is 30 days, and it is calculated in euros. Also, seafarer shall be allowed an allotment note payable at monthly intervals as advance payment of 100% of his basic wage.[59]

Seafarers spend almost all their time on board, so it is natural for them to have certain things in their possession. If a seafarer suffers loss or damage to his/her personal effects for a reason not his/her fault, he/she is entitled to compensation from his employer up to a maximum of $3,000.[60] In order to live a normal life on board, it is essential to provide adequate food, accomodation and recreation facilities for crew members. Therefore, the employer has committed through the *Collective Agreement* to provide seafarers with quality food, adequate accommodations, bedding, and rooms for rest and recreation. It is essential to ensure regular communication between the seafarers and their family via the Internet.[61]

Repatriation under the provisions of *the Collective Agreement of Crnogorska plovidba* shall be made in such a manner as to meet all reasonable requirements for the comfort of seafarers. A seafarer has the right to repatriation in the following cases: upon expiry of the employment agreement for a certain period of time, in case of illness or injury, loss or sale of the ship.[62] A seafarer also has the right to repatriation if he/she has committed a serious breach of duty or if he/she has been proven to seriously violate one of the obligations under the employment agreement. In such cases, the employer is obliged to repatriate the seafarer at his/her own expense, and he/she has the option to bear the costs of repatriation.

As far as navigating in war zones is concerned, *the Collective Agreement of Crnogorska plovidba* regulates this issue similarly to *the National Collective Agreement of the Republic of Croatia*. Seafarers must be informed that the ship may enter a high-risk area. In this case, each seafarer has the right not to enter this area. In this case, the seafarer will be returned at the expense of the employer.[63] According to *the Collective Agreement of Crnogorska plovidba*, the war and warlike operations and the high-risk areas are areas published in the ITF report, while according to *the National Collective Agreement* of the *Republic of Croatia*, these areas are announced by the Joint War Committee.[64]

[59] Ibid, Art.12
[60] Ibid, Art.17
[61] Ibid, Art.26 and 29
[62] Ibid, Art.18
[63] Ibid, Art.16
[64] The Joint War Committee (JWC) consists of insurance representatives from the Lloyd's and IUA markets. It usually meets quarterly to update and distribute areas where owners are required to notify

In the event of illness of the seafarer, the same rules apply as in the *National Collective Agreement of the Republic of Croatia*. The seafarer is entitled to sickness benefit for part of his/her full salary until the day of repatriation. He/she is entitled to sick pay for a maximum of 130 days after repatriation.[65] Sick pay is evidenced by a medical certificate, which must be certified by a doctor appointed by the employer.[66] For seafarers with a certain degree of disability, the employer shall pay the compensation specified in the table in Article 22 of the *Collective Agreement of Crnogorska plovidba*. The doctor designated by the employer determines the degree of disability. If the seafarer does not agree with the opinion of the employer's doctor, the seafarer, the employer and the trade union shall appoint an independent doctor. The cases in which the employer is not required to pay the compensation for the seafarer's disability are also listed in the table in Article 22.

The employer shall not pay compensation if the seafarer's death was caused by his intentional acts or if the death was due to alcohol and/or drug abuse. *The Collective Agreement of Crnogorska plovidba* also regulates the commission of a criminal act by the seafarer during employment. Article 25 of *the Collective Agreement* of *Crnogorska plovidba* precisely defines the rights and obligations of the master of the ship when the seafarer commits a criminal offense.

The only significant difference from the *National Collective Agreement* is the duration of the collective agreement. *The Collective Agreement of Crnogorska plovidba* is concluded for an indefinite period, while the *Collective Agreement of the Republic of Croatia* is valid for two years. The provisions of *the Collective Agreement* of *Crnogorska plovidba* shall remain in force until the parties adopt a new collective agreement. [67] Finally, it should be noted that *the National Collective Agreement* was also drafted in English, while *the Collective Agreement of Crnogorska plovidba* is drafted only in Montenegrin.

insurers of travel. The Joint War Committee last inspected the areas in April 2021, and in its circular of 29 April 2021 detailed the areas with the assumed increased war risk.

[65] The Collective Agreement of Crnogorska plovidba, Art. 19

[66] Ibid, Art. 20

[67] Ibid, Art. 34

5. Conclusion

Maritime science has been a driving force throughout the world for centuries and is considered one of the most important economic activities. Ships, seafarers and shipping companies play the most important role in the successful management of maritime affairs. Compared to other workers who perform their jobs in land-based economic activities, seafarers have a special employment status that is closely regulated. The greatest success in regulating the employment status of seafarers was achieved with the *Maritime Labour Convention* (MLC), which entered into force in 2006. The Republic of Croatia and Montenegro have ratified the Maritime Labour Convention and aligned their national legislation with its provisions. Both countries have taken a major step forward in ensuring the two most important tasks in the maritime sector, namely the protection of seafarers and the safety of shipping.

In addition to the Maritime Labour Convention, seafarers' collective agreements are a major source of rights governing the employment status of seafarers. In this paper, the author analyses the collective agreements for seafarers in the Republic of Croatia and Montenegro who work aboard ships in international shipping. Seafarers are an important category of workers in both countries, as their income has a significant impact on the state budget and the economy in general. In the Republic of Croatia, *the National Collective Agreement for Croatian Seafarers on Ships in International Shipping (2021-2022)* is in force, while in Montenegro, *the Collective Agreement for Ship's Crew with the Employer Crnogorska plovidba a.d. Kotor* is in force.

The National Collective Agreement for Croatian Seafarers on Ships in International Shipping (2021-2022) is a continuation of the successful and continuous social dialogue between the Croatian Shipowners' Association *Mare Nostrum and the Seafarers' Union,* which results in new national collective agreements for Croatian seafarers in international shipping almost every two years. In Montenegro, on the other hand, the practise is reversed in the adoption and duration of collective agreements for seafarers. Therefore, *the National Collective Agreement for Croatian Seafarers on Ships in International Shipping (2021-2022)* regulates in more detail a number of relations that are very important for seafarers, such as wages, food, accommodation, communication of seafarers with their families, ship safety committee, etc.

The parties in *the National Collective Agreement for Croatian Seafarers on Ships in International Shipping (2021-2022)* are *the Croatian Shipowners' Association Mare Nostrum* and *the Seafarers' Association of Croatia.* They

entered into the agreement in good faith to promote harmonious relations between employers and seafarers. The collective agreement regulates issues such as hiring, length of employment, wages, sick pay, meals, accommodation, bedding, insurance, service in high-risk areas, repatriation, etc.

The author also points out that both countries have worked out in detail the nature of seafarers' employment agreements and the termination of employment. The collective agreements differ in terms of their duration. For example, *the Collective Agreement of the Republic of Croatia* can be concluded for a definite or indefinite period, while the *Collective Agreement of Montenegro* can only be concluded for a definite period. The collective agreements in both countries regulate their issues in accordance with the provisions of the MLC and the ITF Basic Collective Agreement.

It is important to note that the provisions of these collective agreements guarantee minimum seafarers' rights. When concluding an individual employment agreement, the provisions will favour the seafarers by applying the principle *in favorem labaratores*.

From the analysis carried out, it can be concluded that in both countries the collective bargaining of the contracting parties, especially the trade unions, leads to the conclusion of collective agreements that significantly improve the employment status of seafarers. Improvement of working conditions is a guarantee of fair and humane relations on board, which is important for the safety of shipping and protection of the marine environment.

The Republic of Croatia and Montenegro should make additional efforts, in particular by adopting positive measures that would enable better training of seafarers, facilitate their mobility and generally improve the image of maritime activity. The goal would be seafarers who, through systematic education and good training, would continue the long and successful tradition of good and well-trained seafarers in international shipping.

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Review paper

Impact of the COVID–19 on Container Ships Efficiency

Renato Ivče, Leon Tomić, Astrid Zekić, Darijo Mišković

Abstract: Coronavirus (COVID-19) has significantly slowed down the global economy, affecting global shipping and impacting all shipping sectors. COVID-19 slowdowns disrupt port operations and cause delays in planned schedules at major ports around the world. Around of 2,4 million TEUs (10 % of the Container fleet at the end of 2021) was waiting globally due to port´s congestion. Ship operators are facing increasing problems from biofouling, which occurs during idle periods. The considerable extent of hard fouling appears to be due to increasing idle time; COVID-19 shows the extent of unnecessarily increasing fuel consumption, emissions and speed losses due to increased hydrodynamic drag. Most antifouling paints are toxic and extremely harmful to the environment, and increasing idle time causes additional amounts of leached biocides in the port area. Ship operators are increasingly demanding antifouling paints that are suitable for specific ship routes as well as for the different activities of the ships. This paper focuses on the possibility of reviewing the impact of the COVID-19 crisis on the efficiency of container shipping. The authors emphasis the need for the use of a new environmentally friendly technology against biofouling, as container ship lay times increase significantly in the COVID-19 pandemic.

Keywords: COVID-19, Container shipping, Ship operators, Idle period, Antifouling coatings.

1. Introduction

The coronavirus (COVID-19) has significantly slacken not only the Chinese but also the global economy, affecting global shipping and impacting all shipping sectors. A noticeable fell in global real GDP by 3.6 %, the volume of global trade by 5.3 %, and foreign direct investment (FDI) by 42 % were recorded in 2020, in year which was declared the beginning of the COVID pandemic [1]. The ongoing coronavirus crisis escalated to unprecedented levels in Europe in March 2020, with severe health, human and economic impacts.

COVID-19 slowdowns in southern China are disrupting port operations and causing delays in planned schedules. This is causing massive delays at

major Chinese ports and driving up the cost of shipping. According to analysts and representatives of the shipping industry, waiting times at berths have increased considerably. For example, waiting times for container ships at the Yantian International Container Terminal in Shenzhen have increased from an average of 0.5 days to 16 days [2].

Some regions of the world recovered from the pandemic in the last quarter of 2021, leading to a buying boom that caused a critical shortage of empty containers. This led to massive delays in shipping goods from China to all destinations, especially Europe and the US [3].

Container shipping slowed down considerably and container ships stayed longer at anchorages and ports. First it was COVID-19 slowdowns and a critical shortage of empty containers due to the pandemic. Then there was a massive blockage of the Suez Canal [4]. Ship operators faced increasing problems from biofouling that occurs during idle periods. More than 40 % of vessels were suffering from over 10 % hard fouling coverage on the underwater part of the hull even before the fleets were idled due to COVID-19 as per conducted [5]. The level of hard fouling could be responsible for at least 110 million tonnes of excess carbon emissions and an additional $ 6 billion a year in fuel costs for the global merchant fleet as per data taken from conducted study from 2011 [6]. Given the data on the increase in unused ships in 2021, it is reasonable to assume that the extent of fouling has increased significantly across the shipping industry. The significant extent of hard fouling appears to be due to the increase in idle time in the pandemic COVID-19. Hard fouling of underwater part of the ship has great impact on the unnecessary rise in fuel consumption, emissions and speed losses due to increased hydrodynamic drag.

The aim of this paper is to identify the possibility of reviewing the impact of the COVID-19 crisis on the efficiency of container shipping. The paper examines the impact of a pandemic on container ship lay times and the increasing problems caused by biofouling that occur during this time. Most antifouling paints are toxic and extremely harmful to the environment. Therefore, the authors emphasis the need to use a new environmentally friendly technology against biofouling to improve the efficiency of container shipping. In Section 2 is presented impact of the COVID-19 on the global economic, maritime trade and container shipping, while Section 3 analyzes the impact of the COVID-19 on port operations. Sections 4 and 5 describe the biofouling underwater part of ships due to ships idle and its consequences.

2. Impact of the COVID-19 on the Container Shipping

In today's economy, maritime trade plays an irreplaceable role, which is expressed in the amount of goods transported by sea - about 11 billion tonnes in recent years, which accounts for about 80 % of the global trade in goods [7]. Global trade in containers has grown by about 55 % in the last ten years, on average by about 5 % per year [8]. In the period under consideration, container trade accounted for 17 % of global maritime trade [9].

The coronavirus crisis has reached unprecedented proportions in Europe and has serious health, population and economic implications. The ongoing global outbreak of COVID-19 has affected shipping worldwide and it has had a significant impact on all types of shipping.

The global economic slowdown has had a negative impact on maritime trade flows in the first two quarters of 2020. Despite the economic slowdown caused by COVID-19, overall global trade held up relatively well in the last quarter of 2020 [10]. The positive trends from the last quarter of 2020 grew stronger in early 2021 and the value of global trade in goods and services grew by about 4 % quarter-over-quarter and by about 10 % year-over-year. Importantly, global trade in Q1 2021 was above pre-crisis levels, with an increase of about 3 per cent compared to Q1 2019. The recovery in trade in Q1 2021 was driven by the strong export performance of East Asian economies [10]. World trade in goods 2021 remained strong and trade in services finally returned to its pre-COVID-19 levels. According to a report issued by the World Trade Organization world trade in goods 2022 will be expanded for a 3.5 % [11]. In the 2021 the Global Shipping Container Market size was approximately 13,856.42 million USD. In the 2022, an increase of 2.7 % is expected [12]. The expected improvement in the supply chain did not happen during 2022, which is evident from the sailing schedules published by Container Carriers [13]. During 2022, pressure on the maritime transport market has been continued due to port congestion and strong global demand in the consumer goods sector. It is assumed that freight rates will not fall to pre-COVID levels [14].

Analyses of the impact of COVID-19 on the development of maritime transport can be carried out using ship calls at EU ports. The data is based on information on ship calls provided by Member States to Safe Sea Net for the years 2019, 2020 and 2021 [15].

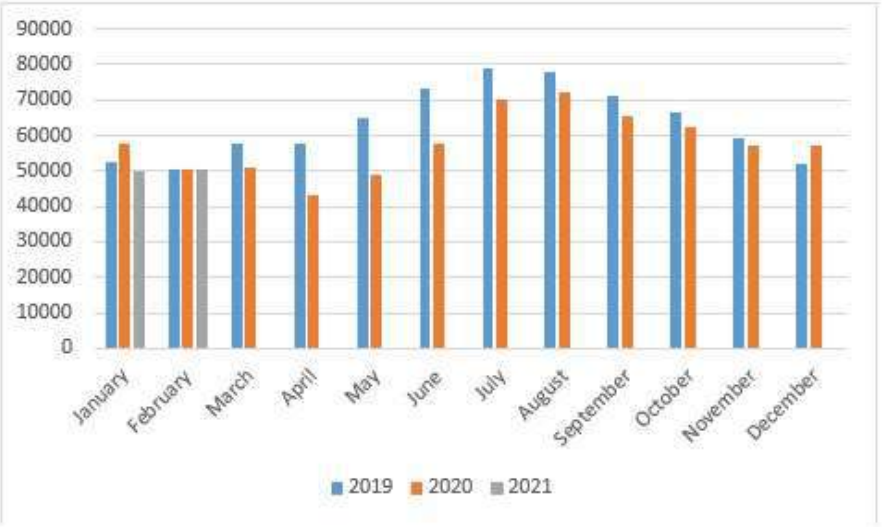

Fig. 1 – *Ships calls at EU ports in 2019, 2020, 2021 [15]*

The graph on Figure 1 shows the number of ship calls per month in 2019, 2020 and 2021. It was decided to use 2019 as a reference because it was the last year without COVID-19 in Europe. The trend of ship calls was negative and reflected in the maritime trade flows, especially in the second quarters of 2020. The positive trend was observed in the last quarter of 2020 and continues in the first quarter of 2021.

Cruise ships and passenger ships are the ship types where the greatest decrease in shipping traffic were observed [15]. During the same period (Figure 2), container ships were found to have experienced a 9 % decrease in shipping traffic.

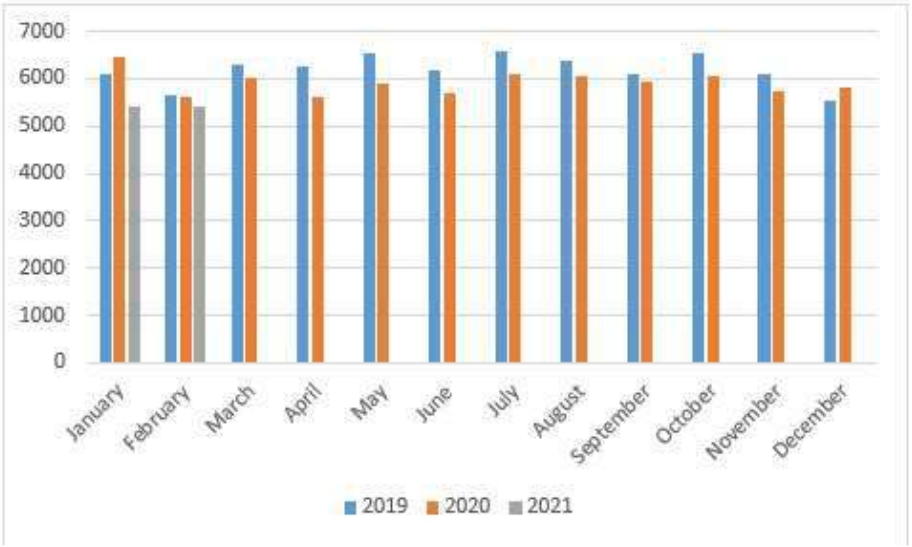

Fig. 2 –*Ship calls by container ships in EU ports (2019, 2020 and 2021) [15]*

The highest decreasing of container ship calls was happened in second quarter 2020. Container traffic was increased in last quarter booming global demand for COVID-19 related products. In the first quarter container traffic doesn't reach expected vessel traffic due to congestion of main China's, EU and USA ports.

3. Port's Congestion due to pandemic COVID-19

Container ships were waiting in ports from Shenzhen to Los Angeles. The stoppage of ships was caused by storms, pandemics and a shortage of empty containers. A large number of container ships were waiting to be docked in ports around the world. At the beginning of 2021 port congestion was worsened by 14 % compared to the September same year [16]. Ships were arriving at the ports without interruption, which means there were no signs of improvement. An analysis carried out shows that a total of 427 container ships, with a capacity of 2,914,445 TEU, were on the roads of the world's ports.

The nearly 100 ships were waiting on the port area to dock at the container ports of Hong Kong and Shenzhen container ports indicate on problems whose disruption of global supply chains had led to shortages of goods in the US and Europe [17]. The container port in Long Beach, California, is one of the most congested container ports in the US. At the

beginning of 2021 there were 67 ships waiting off Long Beach. The longest waiting vessel was idling for 22 days.

Asian ports were also affected by the pandemic COVID-19. A total of 74 ships anchored or drifted outside Ningbo/Zhoushan (306,538 TEU) [16]. An additional problem was a major shortage of container boxes in the export ports. Returning empty containers to be refilled with industrial goods also takes much longer than before the pandemic. The number of ships waiting at the ports were continue to increase, as many ships were still on their way to these places. For this reason, congestion was continuing for some time. It can be concluded that the problems in the considered period were arisen due to increased demand, closure of terminals, shortage of port workers, truck drivers, shortage of available empty containers and finally shortage of available container ships.

The ships also had to wait a long time in the European seaports. Even when ships do not have to wait for days at sea, there can be massive disruptions - as in the port of Rotterdam in the Netherlands, where a shortage of truck drivers or congested inland waterways slowed down the onward transport of cargo [17]. Figure 3 shows the ships that are idle in the world's major ports. Los Angeles is the least efficient major port as can be seen on Figure 3. Ships in the port area of LA were idle for an average of 6.5 days. Ships in Port Kelang and Tanjung Pelepas were the least idle, averaging 1.5 days [18].

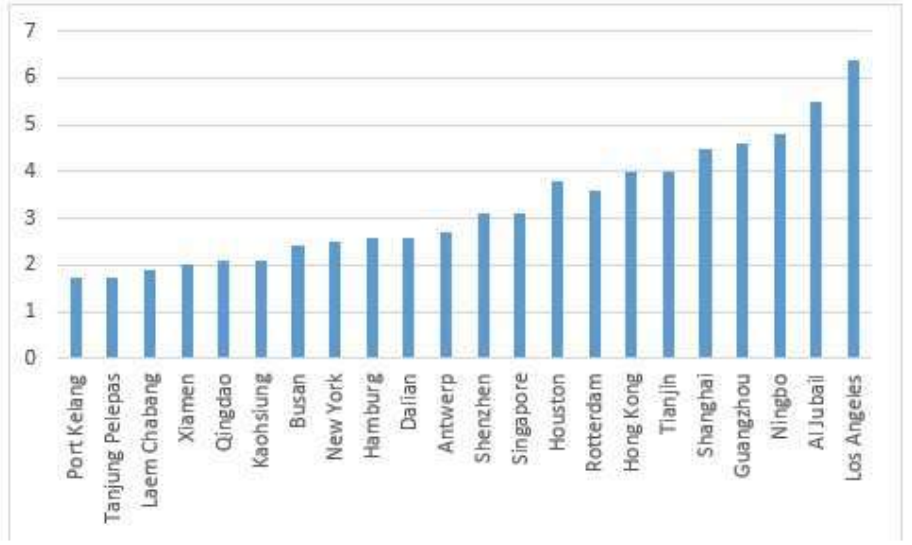

Fig. 3 – *Number of day ships remain in or near major world ports [19]*

The idle capacity of container ships reached a record high of 3 million TEU by the end of 2021. And it was the "worst capacity crisis the industry has ever seen," according to [20].

4. Biofouling Impact on Shipping Industry

Biofouling is one of the problems that has plagued the shipping industry from the beginning. A biofouled ship consumes more fuel to maintain the same speed through the water. This leads to higher fuel consumption. A heavy fouled ship's hull also has a significant impact on maintenance costs, resulting in higher vessel operating costs. Due to the current situation, which has a strong impact on ships idle, biofouling risk increases and hull cleaning is likely to be required more frequently. The fouling risk can vary depending on the location. This means that, if possible, a lower risk location can be chosen.

Underwater hull cleaning can also remove layers of antifouling paint, which shortens the life of the paint and increases maintenance costs. Hull cleaning is not cheap, each cleaning can cost between $ 15,000 and $ 45,000 depending on the size of the vessel [20].

The negative impact of biofouling on the hydrodynamic performance of the hull has significant financial and environmental consequences for the shipping industry. According to [21], approximately 9 % of total ship fuel consumption is due to the effects of biofouling. Based on this assumption, a container ship with a length of 400 m will theoretically consume about 250 tonnes of heavy fuel oil per day if the hull is clean. The same ship will consume another 22.5 tonnes per day if it is fouled. This would equate to an additional operating cost of about $ 11,000, assuming a heavy oil price of $ 500 per tonne. Assuming that liner container ships spend 85 % of the time in transit each year (310 days), this would represent an additional expenditure of $ 3,410,000.

Research in the field of underwater protection of ship hulls has shown that ships idling for 14 days or more are highly exposed to the risk of barnacle growth. The risk and also the extent of biofouling increases in warm waters, especially when water temperatures exceed 25 degrees. This type of fouling can have a significant impact on the performance of the vessel.

Most antifouling paints protect the underwater hulls between 14 and 21 days at idle. Premium grade antifouling paints guarantee up to 30 days of no-use protection, and few offer more than 30 days of no-use guarantee. However, in difficult market conditions, such as during the current COVID-19 pandemic, it has been demonstrated in conducted research that it is not uncommon for a vessel to be idle for longer than 30 days and in some cases

even longer than 45 days. Long idle periods are a challenge for foul-release and biocidal coatings. For these types of coatings, the idling guarantee is 14-21 days in most cases [20].

The shipping industry is essential to the global economy, but it is also a major contributor to global air pollution. Around 80 % of the world's goods are transported by ships, and compared to other modes of transport, shipping is the most energy-efficient way to move large amounts of cargo [10].

In general, two main methods are used to determine emissions from the shipping industry: a bottom-up and a top-down method. The top-down method determines total emissions without considering the characteristics of individual ships. This method is based on data on the total amount of marine fuel sold and the specific fuel emission factor [22]. The bottom-up method is based on pollution data from a single ship at a specific location. This method takes into consideration all the ship particulars important for air pollution and ship condition data.

Emissions estimation from fossil fuel combustion in navigation was provided by the Intergovernmental Panel on Climate Change (IPCC) Guidelines. According to [8] basic equation is:

$$Emissions = \Sigma\ (Fuel\ Consumed\ ab * Emission\ Factor\ ab) \quad (1)$$

Where:

a - fuel type (diesel, gasoline, LPG, heavy oil, etc.),

b - water-borne navigation type (i.e. ship or boat, and possibly engine type).

Biofouling has the greatest impact on a vessel's performance in navigation so it will be discussed below. The propulsion system of most ships consists of one or two main engines (rarely more) and two or more auxiliary engines connected to a generator. The emissions for a ship in navigation with steaming speed for the aforementioned machinery are expressed as follows [22]:

$$Em(steam) = \frac{D}{V(steam)} * (P_{ME} * L_{ME} * EF_{Steam} + P_{Ax} * L_{Ax} * EF_{Ax} \quad (2)$$

Where:

P_{ME} - main engine power (kW),

P_{Ax} - power (kW) of auxiliary engines driving the generators,

v - ship's average speed (steaming or manoeuvring (km/h),

D - distance passed with steaming speed (km),

L_{ME} - main engine load factor (%),

L_{Ax} - the load factor of auxiliary engines driving the generators during steaming (%),

EF_{Steam} - main engine emission factor in steaming (g/kWh),

EF_{Ax} - emission factor of engines driving the generators in steaming (g/kWh).

The load factor of the engine plays an important role in the emissions of a ship. The load factor can be defined as the percentage of the current load in relation to the maximum power of the main and auxiliary engines. Normally, ships sail with a load factor of the main engine between 75 % and 90 % [22]. Research by the IMO has shown that 9 % of the total fuel consumption of ships is due to the effects of biofouling. To achieve the same speed, a fouled ship increases the load factor of the main engine. As can be seen from expression 2, the load factor has a direct effect on emissions. Fouling has no influence on the load factor of the auxiliary engines.

The air quality in the port area and the surrounding area may deteriorate due to air pollution from idle vessels. This type of pollution is directly related to the number of ships at anchor and the power of their auxiliary engines. The load factor of the auxiliary engines depends on the type of vessel and the activity, assuming that the auxiliary engines are always in operation. The emissions for an anchored vessel are expressed as follows:

$$Em\ (anchoring)\ = tm_{anchoring} * (P_{Ax}\ * L_{Ax} * EF_{Ax}\ ) \quad (3)$$

Where:

P_{Ax} - power (kW) of auxiliary engines driving the generators,

L_{Ax} - the load factor of auxiliary engines driving the generators for anchored ship (%),

EF_{Ax} - emission factor of engines driving the generators for anchored ship (g/kWh).

It can be assumed that the ship at anchor has a lower demand for electricity than when steaming or manoeuvring. The load factors of auxiliary engines for anchored vessels are approximately the same as for moored vessels. The values for the load factor depend on the type of ship and range from 17 % for a container ship to 80 % for a passenger ship [23].

5. Anti-fouling Coating Impact on Marine Environment and Alternative Methods for Environmentally-save Fouling Control

Fouling is the growth and settlement of various biological species on underwater surfaces such as ship hulls, piers and other underwater

structures. It starts with the settlement of microscopic animal larvae or weeds. These form an adhesive surface to which larger organisms can later attach. In seawater, these include barnacles, algae, mussels and hydroids [24]. When an artificial structure is placed in seawater, fouling very soon occurs and plant and animal species begin to cause serious technical and economic problems [25].

The International Maritime Organization (IMO) uses the term 'antifouling system', which is defined as 'a coating, paint, surface treatment, surface or device that is used on a ship to control or prevent the attachment of unwanted organisms' [26]. During the Second World War, copper-based synthetic paints became the most popular. In the late 1950s, a coating containing tributyltin (TBT) came into use. While this seems ideal, environmental studies provided evidence that organotin compounds from TBT coatings remain in the water and sediments, killing marine life and potentially entering the food chain. For this reason, tin-based antifouling paints were banned worldwide by the International Maritime Organization (IMO). In 2003, the International Convention on the Control of Harmful Anti-Fouling Systems on Ships entered into force. The Convention stipulates that all ships shall not apply or reapply organotin compounds in antifouling systems.

After the use of TBT compounds was banned, various methods were tested to find an effective substitute. Currently, the development of commercial AF coatings is generally based on following main types:

– non-biocide coatings,

– gradual biocide release coatings, and

– non-biocide-release based AF coatings.

Biocidal antifouling coatings generally contain slow-release toxic substances. Biocide-based AF coatings work on the same principle as TBT-based systems, but contain a different type of toxic component. The most common biocidal antifouling coatings are copper and zinc-based compounds [27]. Currently, there are three main biocidal antifouling technologies:

– Controlled Depletion Polymer soluble coatings (CDP),

– Self-polishing Copolymer (SPC),

– coatings with contact release of biocides.

CDP technology works by allowing water to penetrate the paint film, while dissolved rosin and biocides seep into the sea. The self-polishing copolymers react with the seawater, resulting in thinner leached coatings with excellent biocide release control. The reaction continues with the film becoming thinner as it is polished with seawater.

Non-biocide release-based AF coatings generally can be divided into two main types according to their mechanism of action: 'detachment of biofouling' and 'prevention of attachment' of biofouling. The 'prevention of attachment' strategy aims to prevent settlement, while the 'detachment of biofoulants' aims to reduce the adhesion force as much as possible to efficiently remove the settled organisms [28].

Silicone compounds are biocide-free coatings. When applied to the surface of the hull, they form a smooth and slippery surface that reduces surface energy, thus deterring organisms from initially attaching. Their disadvantages are resistance to physical wear and mechanical contact, higher price and the reasonable speed required for the coating to be effective. A novel alternative that shows competitive results for similar tasks is ceramic enamel coatings, which have excellent chemical and abrasion resistance. This type of antifouling coating minimises the adhesion of biofilms to the surface.

Some innovative techniques that may be used in the future to prevent biofouling are antifouling systems inspired by floating seeds and special molecules of bacteria.

The availability of more data on the risks of biofouling and the effectiveness of coatings could lead to a method for including the choice of coating in the calculations for the new measures. In the review of the two systems planned for 2026, there is a possibility that antifouling measures will become a factor to be included in the regulations.

The data on the ship's performance is regularly analyzed by Shipowners. If the underwater part of hull is fouled, it will be cleaned in dry dock or by the drivers using special equipment. The condition of the hull can be monitored regularly by divers.

Ship operators require antifouling systems that not only protect against all types of fouling, but are also suitable for specific trade routes and different ship activities (steaming, anchoring and mooring). Ships that are laid up for any reason are naturally at higher risk of fouling by marine organisms. Modern antifouling systems should ensure that the vessel is protected whether it is in constant operation or at rest for extended periods.

Researchers have made progress in this field. It needs to be found a suitable model for risk prediction of fouling of the ship's hull. Also environmentally friendly marine antifouling systems suitable for protect against all types of fouling specific trade routes and different ship activities should be developed.

6. Conclusion

The COVID-19 pandemic has had a major impact on global shipping markets, having a ripple effect on global shipping. The ongoing coronavirus crisis has serious health, human and economic implications. It has had a major negative impact on global supply chains and international trade. According to analysts and stakeholders in the shipping industry, idle times have increased significantly. In addition, 2021 saw massive delays in shipping goods from China in all directions, especially to Europe and the US, as the buying boom led to a critical shortage of empty containers.

Container ships were staying longer at anchor and in ports, and container shipping was slowed significantly due to COVID-19 and the critical shortage of empty containers. Ship operators were faced with increasing idle time in the considered period, leading to a significant increase in pollution across the shipping industry.

Maritime trade plays an important role in the global economy, transporting around 11 billion tonnes in recent years. Global container trade has seen annual growth of around 5 % over the last decade.

The spreading coronavirus is having a serious impact on health, people and the economy, and it is affecting global shipping. Economic cycles have had a direct impact on demand in maritime trade. Maritime trade flows were negative globally in the first two quarters of 2020 due to the economic downturn. In the 2021, global trade recovered and returned to its pre-crisis levels. In the 2022 it will be expanded for 3,5 %. The negative trend in maritime trade was reflected in a lower number of ship calls, especially in the second quarters of 2020. A positive trend was observed in the last quarter of 2020 and during 2021, which is continuing in 2022 (an increase of 2.7 % is expected).

Container ships were waiting in ports from Shenzhen to Los Angeles due to storms, pandemics and lack of empty containers. A total of 427 container ships, equivalent to a capacity of 2,914,445 TEUs, are currently lying idle in ports around the world, according to an analysis conducted by Vessels Value. Due to port´s congestion around 2,4 million TEUs was waiting globally at the end of 2021. The situation where ships are idle increases the risk of biofouling and hull cleaning is likely to be required more frequently. A heavily fouled hull has a significant impact on maintenance costs and engine consumption, resulting in higher operating costs for the ship and significant financial and environmental implications for the shipping industry. More fuel burnt due to fouling also leads to higher air pollution.

Hull fouling protection is the protection of the hull from fouling by the application of a protective coating or other antifouling protection system.

Antifouling systems can generally be divided into antifouling systems containing biocides that seep through the paint and create a toxic environment, and systems that create a surface that marine organisms cannot attach to when vessels are in motion.

Most antifouling paints are toxic and extremely harmful to the environment. Research in the paint industry is trying to find antifouling ingredients for their paints that will leave both the ships and the marine ecosystem unharmed. Some innovative techniques that may be used in the future to prevent biofouling are antifouling systems inspired by nature, but more research is needed to use them effectively on a ship's hull.

Ship owners and operators need to take the next step in prevention when considering the antifouling components of the paints on offer and potential downtime. The paints offered should meet the requirements and protect their vessel from hard fouling during unforeseen long downtimes.

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Review paper

Legal Sources Regulating the Crew Change During the COVID-19 Pandemic*

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Abstract: During 2020 and 2021, numerous seafarers had to stay on board their ships long after their employment agreements expired due to a worldwide pandemic caused by COVID-19. In some cases, seafarers were forced to stay on board for more than a year after their employment contracts expired. Seafarers' employers found it impossible to arrange for a crew to embark and disembark from a ship. Furthermore, the seafarers who stayed home for a longer period of time due to a lack of possibility to embark, were deprived of exercising their fundamental right: the right to work. For this kind of situation, the crew change became a burning problem of the maritime industry, so it was necessary to bring legal sources that would regulate the problem.

The aim of this paper is to analyze the content of legal sources adopted during 2020 and 2021 at the international and national level, the purpose of which is to regulate the undisturbed embarking and disembarking of the ship crew in the circumstances of COVID-19 pandemic. These sources are: UN resolution on International Cooperation to Address Challenges Faced by Seafarers as a Result of the COVID-19 Pandemic to Support Global Supply Chains, IMO's industry recommended framework of protocols for ensuring safe ship crew changes and travel, The Neptune Declaration on Seafarer Wellbeing and Crew Change, European Union Guidelines on protection of health, repatriation and travel arrangements for seafarers and other persons on board and the Measures of the Ministry of the Sea of the Republic of Croatia for seafarers who have not been able to renew all the documents required for service on ships.

After analyzing the content of mentioned legal sources, the key directives for the undisturbed ship crew changes during the COVID-19 pandemic are highlighted within this paper's conclusion.

Keywords: Crew Change, COVID-19 Pandemic, Legal Sources Regulating the Crew Change, IMO's Industry Recommended Framework for Safe Ship Crew Changes.

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1. Introduction

Each month about 150,000 seafarers need to be changed over to and from the ships they operate to ensure compliance with international maritime regulations for ensuring safety, crew health and welfare, and the prevention of fatigue [1, 23]. But, during 2020 and 2021 we saw how many seafarers were forced to stay on board their ships long after their employment agreements expired, due to the COVID-19 pandemic. Although seafarers' employment agreements have expired, it was impossible for the seafarers' employers to organise crew change (crew embarking and disembarking the ship) which gave seafarers no option but to stay on board and created conditions for them to languish for months on ended in situations that could amount to forced labour [22, 23]. On the other hand, due to the new situation in the world, the seafarers who stayed home for a longer period of time were prevented from boarding ships and this infringed their fundamental right – the right to work. Also, seafarers were not allowed to make brief "visits to the shore" in ports where they happened to be, for example during the loading or unloading of cargo [2]. Although seafarers were understanding at the beginning of the pandemic, it soon became clear that seafarers must be allowed crew changes urgently. The global supply chain is maintained by seafarers who are the most valuable part of the shipping industry [1, 24]. The shipping industry accounts for 90% of global commerce [3, 22, 31] or, at the European Union (EU) level, 75% of the goods imported to the EU or exported from of the EU is transported by sea [4, 10]. In addition to the economic aspect of the importance of the shipping industry and the seafarers' work, it is important to note that long stay of seafarers on board, which in some cases exceeds the term of a seafarer's employment several times, is unacceptable and goes against the fundamental rights of seafarers set out in the Maritime Labour Convention (MLC) from 2006 [5] and other conventions in the field of labour law [6, 23]. Also, the inability to be relieved and repatriated can affect the safety of a ship and the maritime environment as prescribed by the international convention on the safety of navigation and protection of the maritime environment [2, 23]. Definitely, the pandemic situation surely affected the shipping industry and world trade and it was necessary to find a way to help seafarers go home after the expiry of their employment agreements or join a ship and start working.

Due to the new situation, it was necessary to make changes to the law and govern the organisation of crew changes by legal regulations. Therefore, the aim of this paper is to analyse the content of legal sources enacted during 2020 and 2021 at an international level, the purpose of which is to regulate the unhindered crew change. We shall also review the content of the national law source enacted in the Republic of Croatia regarding the same subject as

the example of the national regulation of crew changes in the pandemic circumstances. The international legal sources the content of which will be analysed are: the United Nations (UN) resolution on International Cooperation to Address Challenges Faced by Seafarers as a Result of the COVID-19 Pandemic to Support Global Supply Chains [7], IMO's industry recommended framework of protocols for ensuring safe ship crew changes and travel during the coronavirus (COVID-19) pandemic [8], The Neptune Declaration on Seafarer Wellbeing and Crew Change [9], and European Union Guidelines on protection of health, repatriation and travel arrangements for seafarers, passengers and other persons on board ships [10]. The national legal source the content of which will be analysed is: The Measures of the Ministry of the Sea, Transport and Infrastructure of the Republic of Croatia for seafarers who have not been able to renew all the documents required for service on ships, serve as example of national regulation [11]. In the final part of the paper, we will summarise and highlight the most important provisions from the aforementioned legal sources.

Using research methods of analysis, synthesis and comparison we will try to answer do these legal sources manage to improve crew change during the COVID-19 pandemic.

2. Inability to Organise Crew Changes: Breach of the Provisions on the Term of Seafarers' Employment Agreements

Inability to organise crew changes automatically brings up the issue of the breaching of the provisions on the term of seafarers' employment agreements. Due to the pandemic, seafarers were unable to leave their ships and return to their place of residence, leading to constituted a breach of the provision from the employment agreement setting out the term of their contractual relationship with the employer.

The term of an employment agreement which a seafarer concludes with an employer depends on the branch of the shipping industry. For example, in the offshore industry, seafarers' employment agreements mostly last for two to three months, whereas in the rest of the shipping industry (for example, carriage of goods at sea), employment agreements are usually concluded for a period of four to six months [12]. This is usual standard of duration of seafarers' employment agreements, but, there are also, more or less, some different contracts with longer or shorter duration. Terms of seafarers' employment agreements mostly differ due to the characteristics of navigation in certain branches of the shipping industry and on the level of complexity and responsibility of seafarers in performing their duties [15]. The shipping industry recognised these factors during normal navigation,

however, in the pandemic situation new challenges needed to be answered regarding the term of employment agreements [12].

International sources from the field of seafarers' labour relations define the term of employment agreements and regulate all other fundamental rights of seafarers (for example, the right to decent living and work conditions aboard ships). According to the Maritime Labour Convention (MLO), which represents the consolidation and modernization of the standards defined in existing conventions and recommendations previously within the work of the International Labour Organization (ILO) [13, 23], maximum term of a seafarer's employment agreement aboard a ship must be less than eleven months [5]. After the expiry of the agreement, the seafarer is entitled to repatriation at the expense of the shipowner. Also, if a seafarer's employment agreement expires before the expiry of eleven months, the seafarer has the right to request repatriation. Repatriation is the seafarer's right if the seafarer's employment agreement was terminated by the shipowner, and even when it was terminated by the seafarer due to justified cause, for example exhaustion, fatigue, etc. Also, according to the MLO, in the event of a breach of the provisions of the MLO (such as the imposition of signing a new employment agreement), a seafarer is entitled to file a complaint aboard the ship [5]. The seafarer's complaint must be resolved by the flag country of the ship, and it must be resolved efficiently, fairly, and as soon as possible [14, 26].

Although at the beginning of the pandemic, flag countries asked seafarers to extend the terms of their employment agreements to maintain the flow of global commerce, as early as in June 2020, the standpoint of the International Transport Workers' Federation (ITF) was that the extension of the employment agreement was "not an acceptable option" because many seafarers already worked longer than envisaged by the agreement [12, 23].

To mobilize action towards addressing this problem, several international organizations (first of all UN and IMO), maritime industry (shipowners, ship operators and charterers as well) and labour organizations approached the relevant authorities and issued guidance documents to facilitate crew changes and repatriation of seafarers while, at the same time, taking steps to minimize the risk of contagion of the coronavirus disease. Based on industry analysis, the numbers of seafarers requiring repatriation after finishing their contracts had declined - from a high of around 400,000 in September 2020 - to around 200,000 as of March 2021 [24]. However, until the measures and guidelines have been adopted, many seafarers witnessed numerous examples of inability to organise relief and the absence of repatriations, as shown by the following examples.

3. Examples of Inability to Organise Crew Changes During the COVID-19 Pandemic

According to the statement issued by the IMO in June 2020, as many as 70,000 crew members on cruise ships worldwide waited for crew changes. Thousands of seafarers have had to stay on board cruise ships, as they have not been allowed to disembark in ports for repatriation to their home countries. Many of these seafarers have not been paid [28]. This clearly illustrates the scope of the problem of the inability to change crews during the pandemic. However, in addition to the cruising industry, consequences of the pandemic were also felt by other branches of transport industry and the consequences of the inability to organise crew changes were felt by many seafarers and ship operators.

One of the examples is the experience of the crew of MV Zagreb of the Croatian company Atlantska plovidba d.d. Dubrovnik, who requested to leave the ship after more than a year spent on board. In this case the intervention of Croatian Seafarers Union was required. At the end, the crew was allowed to disembark in port of Singapore. Also, several solutions were offered so that the crew could leave the ship as soon as possible, including disembarking on the Philippines [12, 26].

Also, urgent requests for repatriation were made on Johar Shipping's ship Coral C, sailing under the Romanian flag, after it arrived in the Port of Ploče, Croatia, to load cargo. For some members of the crew, employment agreements expired long ago and, in addition to this, several different problems were also discovered on the ship itself. Finally, after ITF intervened, part of the crew left the ship, repatriation was arranged, and other discovered deficiencies were remedied [12].

Relief of the crew on MV Obrovac belonging to Croatian company Tankerska plovidba d.d. Zadar in the Port of Singapore was carried out only in the third "attempt" because port authorities refused to allow the relief of the crew on board the ship which entered the port for bunkering, i.e. it did not have scheduled cargo loading and unloading. Only after repeated insistence of the shipowners, relief and repatriation were carried out. The shipowner incurred significant additional costs due to two refusals to allow the crew to embark and disembark. Of course, because of this the shipowner had a high costs.

After arriving at the Croatian port of Gruž, Croatia, the cruiser Marella Disco stayed at the port for nine full months. In addition to the problem of unhindered disembarking of the crew on the territory of the Republic of Croatia, there was also a crisis that lasted for several months due to the

absence of repatriation, which almost led to a crew strike. However, the relief for the crew was finally organised in the port of Reunion [12].

These are only a few examples of the experiences of seafarers and ship operators in organising crew changes during the pandemic. When the crew change is finally organised, the most important thing is to follow the procedure list prescribed by the port countries, with which all participants in the shipping industry must be familiar. Therefore, in this paper we also need to discuss some fundamental terms defined by the procedure lists of the port countries.

4. Procedure Lists for Seafarers When Embarking and Disembarking a Ship

In order to reduce the number of absences of repatriation during the pandemic, countries/port countries, each on its own, compiled a list of procedures for seafarers when embarking and disembarking a ship. There is no unified list of procedures for seafarers in different port countries. The list will also surely change depending on the measures adopted by individual countries. What different procedure lists of different port countries have in common is the mandatory COVID-19 test. A PCR test is mostly used due to its reliability, and the costs of such tests are paid by a seafarer's employer. Test results and other information on the voyage must also be visible in the so-called 'Fit for Travel' certificate. Also, certain countries require a 'Stay Home Notice', i.e. quarantine (self-isolation) for seafarers before embarking or disembarking a ship, which as a rule lasts for fourteen days (in some countries ten days). Some countries require all of the above, including quarantine (self-isolation), upon arrival at the port country or after coming on board. Different countries truly have different requirements regarding this issue [12].

Maritime agents are of great help to seafarers when searching for information on procedure lists for embarkation and disembarkation of ships. Maritime agencies provide help in different ways, so that's how an interactive world map showing ports in the world is available on the website of Wilhelmsen, one of the largest maritime agents in the world. After selecting a country, seafarers have access to information on the rules and restrictions in effect in a certain country. The map is updated twice a day, so that the information is always up to date [16]. Similar information is also provided by the companies such as Inchcape [17] and Gac [18] which are the subject of business shipping, logistics and marine services.

The procedure lists of port countries must be adhered to, but in addition to them, changes to the law were also necessary at other levels, primarily at an international level.

5. International Legal Sources Enacted to Facilitate Crew Change

At the start of the pandemic, the main problem was that governments around the world have suspended international flights, closed borders, ports and airports and imposed travel restrictions on foreign nationals. These restrictions have directly impacted the capacity of seafarers to travel to and from ships. Therefore, it was crucial to enact legal sources to regulate crew changes.

As at 10 June 2020, only 30% of governments worldwide were allowing crew changes to take place. This situation is unsustainable, both for the safety and well-being of seafarers and the safe operation of maritime trade [28].

Several important international legal sources have been enacted to facilitate of crew change and repatriation. These are primarily the UN resolution on international cooperation to address challenges faced by seafarers as a result of the COVID-19 pandemic to support global supply chains (A/RES/75/17) [7], IMO's industry recommended framework of protocols for ensuring safe ship crew changes and travel during the coronavirus (COVID-19) [8], the Neptune Declaration on Seafarer Wellbeing and Crew Change [9] and European Union Guidelines on protection of health, repatriation and travel arrangements for seafarers, passengers and other persons on board ships [10].

From the national legal sources, we primarily refer to those which are significant for Croatian seafarers, and in this part we will cover the measures of the Ministry of the Sea, Transport and Infrastructure of the Republic of Croatia for seafarers who couldn't renew all the documents required for service on ships [11] which the Ministry enacted "at the height" of the pandemic in 2020.

We shall highlight important provisions of the aforementioned legal sources below.

5.1. Resolution on International cooperation to address challenges faced by seafarers as a result of the COVID-19 pandemic to support global supply chains (A/RES/75/17)

In December 2020, the UN General Assembly unanimously adopted a resolution on International cooperation to address challenges faced by

seafarers as a result of the COVID-19 pandemic to support global supply chains (A/RES/75/17) [7].

Co-sponsored by 71 countries, the resolution among others calls upon the UN system, under the leadership of the Secretary-General, to work with all relevant actors in order to mobilize a coordinated global response to the pandemic and its adverse social, economic and financial impact on all societies (paragraph 2) and urges member states to designate seafarers and other marine personnel as key workers (paragraph 3) [7]. Shipping industry, relying on the world's 1.9 million seafarers, has played a vital role in the global response to COVID-19 pandemic, continuing to deliver food, medical supplies, fuel and other essential goods and helping to keep global supply chains and flows of commerce running [27] accordingly governments and industry should ensure that seafarers are designated as key workers.

The resolution encourages governments and other stakeholders to implement the IMO protocols titled Industry recommended framework of protocols for ensuring safe ship crew changes and travel during the coronavirus (COVID-19) pandemic (paragraph 4) [7].

Also, the resolution calls upon governments to promptly implement relevant measures to facilitate maritime crew changes, including by enabling their embarkment and disembarkment, expediting travel and repatriation efforts, and ensuring access to medical care (paragraph 5) [7].

Countries with responsibilities as flag States should ensure that seafarers on ships that fly their flags are covered by adequate measures for the protection of their health and have access to prompt and adequate medical care whilst working on board, including access to vaccination and that seafarers on ships that fly their flags are provided with occupational health protection and live, work and train on board ship in a safe and hygienic environment [23].

The resolution also calls upon international organizations and other relevant stakeholders, including relevant workers and employer's organizations, to support Governments, upon their request, in the design and implementation of their responses and policies aimed at ensuring the integrity and increasing the resilience of global supply chains, decent working and living conditions and human rights of seafarers (paragraph 6) [7].

States and other relevant stakeholders should, in consultations and meetings on seafarer issues at the International Labour Organization and the International Maritime Organization, keep the relevant legal framework under review, and ensure that international obligations are respected and implemented [27].

5.2. IMO's industry recommended framework of protocols for ensuring safe ship crew changes and travel during the coronavirus (COVID-19) pandemic

Since the beginning of the pandemic, numerous governments and seafarers' and shipowners' organizations have turned to the International Labour Office (ILO) for guidance on how best to address the complexities of the current crisis in light of the provisions of the Maritime Labour Convention, 2006. ILO responds to such requests by referring, among other things, when relevant, the recommendations published by the International Maritime Organization (IMO) [23].

The first IMO's industry recommended framework of protocols for ensuring safe ship crew changes and travel during the coronavirus (COVID-19) pandemic was adopted in November 2020. Namely, the Maritime Safety Committee (MSC), at its 102nd session (from 4 to 11 November 2020), inter alia, recognized the importance of the framework of protocols for ensuring safe ship crew changes and travel during the coronavirus pandemic. These recommended framework contains protocols for joining a ship and protocols for leaving a ship and repatriation, including the need for compliance and strict adherence with COVID-19 testing and quarantine requirements, and measures to prevent infection on board ships [19].

According to the protocols for joining a ship in IMO's industry recommended framework from November 2020, the objective of these protocols is to facilitate safe travel of seafarers to join ships for the purpose of conducting crew changes, and to ensure that effective measures are applied to manage and control the risk of seafarers becoming infected with the coronavirus (COVID-19), or infecting other persons, prior to leaving their place of ordinary residence and while travelling via aircraft (and other modes of transport) to join ships in a seaport in another country. Also, the objective of protocols for leaving a ship and repatriation is to facilitate safe travel of seafarers in order to be repatriated, and to ensure that effective measures are applied to manage and control the risk of seafarers becoming infected with the coronavirus (COVID-19), or infecting other persons, throughout the process of travelling via aircraft (and other transport modes) to their place of ordinary residence in another country [19].

Protocols from November 2020 have been revised in April 2021 to take account of issues relevant to the global rollout of vaccines and the critical part they will play in facilitating ships' crew changes and the efficient movement of world trade. Once again governments have committed to minimizing disruptions to trade and global supply chains, and have identified the need to prioritize keeping logistics networks open and

functioning efficiently. Member states was invited to consider the protocols and advise shipowners, operators and managers of ships entitled to fly their flag, as appropriate, as well as shipboard personnel employed or engaged on such ships to act accordingly. Also, intergovernmental organizations and non-governmental organizations in consultative status with the IMO are also invited to consider the protocols, and other guidance, and advise their membership accordingly [8].

Framework of protocols contains protocols for joining a ship from a seafarer's place of ordinary residence in one country via aircraft to join a ship in a seaport in another country and protocols for leaving a ship and repatriation from a ship in a seaport in one country via aircraft to a seafarer's place of ordinary residence in another country. As in the previous protocols from November 2020 and in these from April 2021 the objective of protocols for joining a ship is to facilitate safe travel of seafarers to join ships for the purpose of conducting crew changes, and to ensure that effective measures are applied to manage and control the risk of seafarers becoming infected with the coronavirus (COVID-19), or infecting other persons, prior to leaving their place of ordinary residence and while travelling via aircraft (and other modes of transport) to join ships in a seaport in another country (provisions from 1 to 6). The objective of protocols for leaving a ship and repatriation is to facilitate safe travel of seafarers in order to be repatriated, and to ensure that effective measures are applied to manage and control the risk of seafarers becoming infected with the coronavirus (COVID-19), or infecting other persons, throughout the process of travelling via aircraft (and other transport modes) to their place of ordinary residence in another country (provisions from 7 to 12) [8]. Taking into account differences in national requirements, a straightforward system is proposed for the evaluation of risks and the communication of the control measures to be put in place, by mutual agreement, to reduce the risk of infection [28].

Recently the Maritime Safety Committee (MSC), at its 104th session, from 4 to 8 October 2021, approved a draft IMO Assembly resolution consolidating issues related to crew change, access to medical care, key worker designation and seafarers' prioritization for COVID-19 vaccination, with a view to adoption at the 32nd session of the IMO Assembly which is planned for December 2021 [20]. Therefore, it is necessary to continue to monitor the development of the adoption of IMO protocols in this area.

5.3. The Neptune Declaration on Seafarer Wellbeing and Crew Change

Analysis of international legal sources enacted to facilitate crew change we continue with the analysis of the Neptune Declaration on Seafarer Wellbeing and Crew Change.

The declaration was developed by the Maritime Industry Crew Change Taskforce created as an outcome of the Global Maritime Forum's 2020 Virtual High-Level Meeting [22].

In January 2021, more than 600 companies and organizations signed the Neptune Declaration, recognizing their shared responsibility to resolve the crew change crisis. The signatories to The Neptune Declaration on Seafarer Wellbeing and Crew Change, recognize that it is necessary to share responsibility to ensure that the current crew change crisis is resolved as soon as possible and to use the learnings from the crisis as an opportunity to build a more resilient maritime supply chain [9, 22, 23].

According to the Neptune Declaration, the most effective way of addressing the crew change challenge and building a more resilient maritime logistics chain, is by working together across the value chain with industry stakeholders, organizations and with governments to implement solutions that work in practice. Therefore, according to the Neptune Declaration, it is necessary to take action to resolve the crew change crisis, based on individual position and role in the value chain, thereby ensuring the rights and wellbeing of the seafarers supporting global supply chains. So, to make tangible improvements, according to the Neptune Declaration, the following actions should be implemented: seafarers need to be recognised as key workers and given priority access to COVID-19 vaccines, gold standard health protocols based on existing best practice need to be established and implemented, collaboration between ship operators and charterers needs to be increased to facilitate crew changes and to ensure air connectivity between key maritime hubs for seafarers [9].

Namely, the Neptune Declaration states that the Seafarers should be recognized as key workers by all governments in line with the UN General Assembly resolution adopted on December 2020 [7] and the transition of seafarers across borders should be facilitated based on internationally agreed, high-quality health protocols. Governments and other stakeholders should work together with the maritime industry to ensure that seafarers, irrespective of their nationality, get priority access to COVID-19 vaccines alongside other key workers and health care professionals in recognition of their critical role in global supply chains and trade [9]. The aim is to ensure that seafarers are medically fit and have access to medical care, with mechanisms to prevent and respond to pandemic-related emergencies at sea, and that ships and port facilities meet international sanitary requirements. In particular, seafarers should be recognized as key workers and vaccinated as a matter of priority [27].

The Neptune Declaration advocates the establishment and implementation of gold standard health protocols based on existing best

practice. According to the Neptune Declaration, the maritime industry and governments should implement the IMO recommended framework of protocols for ensuring safe ship crew changes and travel during the coronavirus (COVID-19) pandemic [8] which has been recognized by the IMO earlier [9].

It is stated that facilitating crew changes based on high-quality health protocols is a shared responsibility which will create benefits for all by minimizing the risk of COVID-19 spread on vessels, minimizing the risk of disruptions to global supply chains, while contributing to maritime safety and the wellbeing of seafarers. Shipowners and charterers should share relevant information transparently and collaborate to ensure that necessary crew changes can be carried out with the least impact possible in terms of cost and delays. In this connection, the owner should provide the charterer with as much notice as possible on intended crew changes, while the charterer should make all reasonable efforts to accommodate crew changes including when the vessel has to make a reasonable deviation. No charter contracts should contain clauses preventing necessary crew changes from being carried out, as the aggregate effect of such clauses could be a serious obstacle to the safe operation of maritime trade and the protection of the wellbeing and rights of seafarers. By implementing high-quality health protocols, shipowners can reduce the risk of trade disruption due to COVID-19, which also creates benefits to charterer [9]. These provisions are implemented in a tool developed by the UN Human Rights Office, the UN Global Compact, and the UN Working Group on Business and Human Rights which have issued a statement calling upon companies to act under the UNGPs. This call has been echoed by the International Labour Organization (ILO) and IMO intended to help businesses uphold their responsibility to respect human rights in the maritime sector during the COVID-19 related crew change crisis through urgent measures. The tool is a response to the ongoing crisis concerning crew changes [22].

The critical issues that have affected the international shipping sector during the pandemic include also border closures to airlines, quarantine requirements and restrictions on personnel crossing borders in some countries [28].

According to the Neptune Declaration, in the part on the need to ensure air connectivity between key maritime hubs for seafarers it is stated that the aviation industry should work together with the maritime industry to ensure that airlift capacity is established between major crew changing hubs and seafaring nations. Also, the aviation and maritime industries as well as governments should work together to establish a universally accepted and harmonized framework of standards for the validation of trusted health data

for seafarers to facilitate border crossing and ensure the long-term resilience of air connectivity [9].

5.4. European Union guidelines on protection of health, repatriation and travel arrangements for seafarers, passengers and other persons on board ships

The European Union (EU) contributed in facilitating crew changes and repatriation of seafarers adopting Guidelines on protection of health, repatriation and travel arrangements for seafarers, passengers and other persons on board ships. These Guidelines state that EU member states should facilitate the transit of EU citizens and third-country nationals who are EU residents for their return home. Workers in essential functions, regardless of their nationality, should be able to transit and travel to ensure continued professional activity. This includes, inter alia, and seafarers [10].

The Guidelines contain a summary, general guidance and provisions under the heading: repatriation of persons on board cruise ships and all other vessels, changeovers of crews, designated ports for crew changes, sanitary recommendations and ship supplies, recommendation for additional COVID-19 updated reporting by ships approaching EU ports.

According to the provisions of the EU guidelines under the title changeovers of crews and designated ports for crew changes from the guidelines, as essential staff, seafarers should be exempt from travel restrictions when they are in transit to the port where they take up their duties [21]. Member States should, in coordination among themselves, designate several ports in the Union for fast-track crew changes. The ports should be geographically dispersed to cover the EU and should be connected to operational airports and rail stations. EU member states should envisage the possibility of dedicated or regular flight and rail operations to ensure the transport connections for crew changes, allowing for swift travel and repatriations of seafarers [10].

In the context of EU it is important to points out the European Community Shipowners' Associations (ECSA). ECSA emphasizes that its main priority is the welfare of crew and passengers and the guidelines certainly serve as the basis for the changes that need to happen on the ground. Their members work closely with the national authorities, to see that the procedure set out in the guidelines are carried out, and they will certainly relay their feedback to the European level. On its side, ECSA will continue to cooperate with the EU institutions to make sure that there is a coordinated approach by all member states with regard to the implementation of the Commission's guideline [30].

According to the EU guidelines, these designated ports should have nearby accommodation where seafarers could wait for arrival of the ship they should board or for their flight, train or ship if it does not leave on the same day. This accommodation should have adequate facilities to allow them to shelter in place. This should enable undergoing 14 days of quarantine before embarking and after disembarking if the EU member state in question requires this and if testing is not available. Also, the ports should have accessible and adequate medical services available to seafarers when they embark, disembark and during their quarantine periods [10].

These provisions in the EU guidelines end with a provision that emphasizes that the practice of designating ports where crew changes can take place safely and unhindered can then be shared with third countries to be implemented worldwide. So, due to the international nature of the shipping sector, the difficulties relating to crew changes are not just limited to operations in the EU [10].

International Chamber of Shipping (ICS) and International Transport Workers' Federation (ITF) called on all Governments to identify ports in their countries, and appropriate airports nearby, from where crew changes can be resumed as soon as possible, and to inform IMO and the International Civil Aviation Organization accordingly. They also called on Governments, in the event of medical emergencies, to provide visiting seafarers with access to emergency medical treatment ashore and, if necessary, to facilitate emergency repatriation [31].

6. National legal sources enacted to facilitate crew change

Croatia is mostly labour-supplying State, less is known as flag State and Croatian ports are not usually "home ports" for international ships, where, in addition to other actions, crew would be changed [25].

Delays in joining crews and in repatriation may result in seafarers not getting their minimum sea time requirements and consequent expiration of professional certification [22]. That's why in June 2020, the Ministry of the Sea, Transport and Infrastructure of the Republic of Croatia decided to enact measures for seafarers who couldn't renew all documents for service on ships and thus approve general extension of the validity of the seafarers' personal documents in order to enable them to work in accordance with the law. Those measures were established in line with all recommendations of the International Maritime Organization on implementing pragmatic approach that do not jeopardize safety of navigation and taking into account that such measures do not substantially affect the competence of the seafarer [29].

The extension of the validity of the seafarers' documents beyond their expiration date pertains to certificates of competence and certificates of proficiency which expired by 18 June 2020, and which were given a general extension of validity of three months. The extension also pertains to medical certificates. With these measures, the Ministry allowed the seafarers to work without having valid medical certificates provided that this period does not exceed three months and that the seafarer holds an expired medical certificate from the last date [11, 25]. Since lockdown measures imposed by countries around the world resulted with inability to organize crew change in many countries and despite the UN General Assembly Resolution adopted in December 2020 recognizing seafarers as key workers in order to facilitate safe and unhindered movement for embarkation and disembarkation, there are still a number of seafarers holding Croatian certificates and documents that are embarked on board vessel with no possibility to organize crew change and their repatriation and whose certificates and documents are due to expire. Seafarers holding certificates and documents issued by the Republic of Croatia who are embarked or will be embarked on board vessel with valid certificates and documents that will expire upon the expiration of regularly concluded seafarers' employment agreement (SEA) and with inability to organize crew change and repatriation, such certificates and documents shall remain valid until disembarkation and repatriation of seafarer concerned at the latest [29].

Also, with regard to the extension of seafaring service after the expiry of the seafarer's employment agreement and the inability to organise repatriation of seafarers, shipowners may extend the validity of the seafarer's employment contract for a maximum of three additional months if the seafarer agrees to such extension and if this is in line with the applicable collective bargaining agreement [11].

In this case, it is necessary to conclude an annex to the seafarer's employment agreement under the same terms as the underlying contract [11, 23].

Also, with regard to the seaman's book, the embarkation permission and seafarer's identification documents, the Ministry decided that the seaman's books, the permission to embark and the seafarer's identification documents which expired before 18 June 2020, will be granted a general validity extension of up to three months [11, 23].

These measures succeeded in somewhat alleviating the seafarers' problems regarding their repatriation, but even after the measures have been enacted there have been individual and group problems in organising crew change and repatriation.

7. Conclusion

During the COVID-19 pandemic we witnessed cases of a lack of organisation in crew changes on ships. Prolonged stay of the crew on board a ship implies a breach of the provisions on the term of employment agreements, and it goes against a series of international sources regulating employment, safety at sea, environmental protection, etc. Due to the closure of borders all over the world, changes had to be made to the law to emphasise the importance and significance of seafarers and their place as key workers in the organisation of world trade. Simply put, without seafarers, there is no trade, industry, or income. Unfortunately, in the period in which the issue of crew change organisation was not regulated, we witnessed numerous instances of crew being kept aboard ships long after their employment agreements expired. After the crew changes are finally organised, they need to be organised with adherence to the series of measures set out by procedure lists prescribed by port countries. It is necessary to constantly keep track of the procedure lists for seafarers when embarking and disembarking ships because they are subject to frequent changes. However, the most important step in regulating crew changes was the enactment of several international legal sources. These legal sources were adopted during 2020 and 2021. As the most important international legal sources we highlighted are the UN resolution on International Cooperation to Address Challenges Faced by Seafarers as a Result of the COVID-19 Pandemic to Support Global Supply Chains, IMO's industry recommended framework of protocols for ensuring safe ship crew changes and travel during the coronavirus (COVID-19) pandemic, The Neptune Declaration on Seafarer Wellbeing and Crew Change, and European Union Guidelines on protection of health, repatriation and travel arrangements for seafarers, passengers and other persons on board ships. These several important legal sources have taken an important step in the organization of crew change and they all highlight seafarers as key workers or workers in essential functions.

By analysing these legal sources, as most important provisions we highlight those pertaining to calls upon governments (supported by international organizations) to promptly implement relevant measures, protocols and polices to facilitate maritime crew changes and repatriation from UN resolution and provisions of protocols for joining a ship and protocols for leaving a ship and repatriation, from the IMO's industry recommended framework of protocols. To make tangible improvements in crew change, according to the Neptune Declaration and IMO's industry recommended framework of protocols - seafarers need to be given priority access to COVID-19 vaccines. European Union Guidelines emphasize the

importance of designation several ports in the Union for fast-track crew changes with nearby accommodation that have adequate facilities to enable undergoing 14 days of quarantine before embarking and after disembarking. The Neptune Declaration emphasize that collaboration between ship operators and charterers needs to be increased to facilitate crew changes and to ensure air connectivity between key maritime hubs for seafarers. All of these legal sources involve establishment and implementation of high medical care standards for seafarers when they embark, disembark and during their quarantine periods.

As an example of a national legal source in regulating the crew change issues, we highlighted the Measures of the Ministry of the Sea, Transport and Infrastructure of the Republic of Croatia for seafarers who have not been able to renew all the documents required for service on ships serve as examples of national regulations. The aim of same measures is to regulate the period of validity of a seafarer's certificates which expired while the seafarers who were not able to disembark the ship due to the pandemic were aboard ships. These measures were significant for seafarers of labour-supplying state as Croatia.

All of these legal sources, international and national, play an important role in regulating crew change during a pandemic. So, regardless of the situation with the COVID 19 pandemic, it is important not to allow "the return" of the problems of organising crew changes. We can only move forward and adapt legal sources to issues encountered in practice. Crew changes of seafarers are important and we cannot disregard legal regulation in this issue.

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[1] G. Eason, B. Noble, and I. N. Sneddon, "On certain integrals of Lipschitz-Hankel type involving products of Bessel functions," Phil. Trans. Roy. Soc. London, vol. A247, pp. 529–551, April 1955.

[2] J. Clerk Maxwell, A Treatise on Electricity and Magnetism, 3rd ed., vol. 2. Oxford: Clarendon, 1892, pp. 68–73.

[3] I. S. Jacobs and C. P. Bean, "Fine particles, thin films and exchange anisotropy," in Magnetism, vol. III, G. T. Rado and H. Suhl, Eds. New York: Academic, 1963, pp. 271–350.

[4] K. Elissa, "Title of paper if known," unpublished.

[5] R. Nicole, "Title of paper with only first word capitalized," J. Name Stand. Abbrev., in press.

[6] Y. Yorozu, M. Hirano, K. Oka, and Y. Tagawa, "Electron spectroscopy studies on magneto-optical media and plastic substrate interface," IEEE Transl. J. Magn. Japan, vol. 2, pp. 740–

741, August 1987 [Digests 9th Annual Conf. Magnetics Japan, p. 301, 1982].
[7] M. Young, The Technical Writer's Handbook. Mill Valley, CA: University Science, 1989.

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