

Port developments and marine democracy in Latin America

Jeremy Anbleyth-Evans

Geography and Environment, University of Aberdeen, Universidad De Los Lagos, Arica, Chile

ARTICLE INFO

Keywords:
Ports
Economy
Growth
Ecological
Democracy

ABSTRACT

Under the quest for continual blue growth, port developments in Latin America continue to grow, in ecological footprint and socio-economic impact. This article reviews a series of ports in Chile, Panama, and Colombia, which share a constellation of impacts, social struggles for blue justice similarly lacking marine democracy. It reviews how these different groups of fishers, NGOs and citizen scientists are coming together to challenge these issues and look for a new system of environmental impact assessment and participatory rights. Considering mixed benthic and wetland habitat in San Antonio and coral reef and mangrove complexes in Panama and Colombia, it shows how local stakeholders may have relevant, significant long-term baselines of knowledge. At the same time, ports and their consultants are systemically given effective decision monopolies over EIAs, during their own projects. Using semi structured interviews and participatory GIS it shows how across Latin America, the same issues with ports repeat, and that a joint international agreement for marine democracy may be relevant.

1. Introduction

Like in many parts of the world, port developments in Latin America are exploding in scale, growth, and socio-ecological impacts [16,36,40,42]. States and corporations race to build the biggest new terminals, as ships increase in size, and infrastructural automation. Ecological impacts increase as channel deepening, increased reclamation, dredging, and dumping accelerate [3]. Ecological impacts see reduced species richness and biodiversity altering benthic community structure [5,8]. Simultaneously, anthropogenic pressures have seen Caribbean coral reefs decrease from an average of 50% to 10% in just four decades [21].

From new mega-ports in Malaysia, [18]; India, [23], Hainan, China [30]; this article considers some of the biggest port expansions, impacts and governmental regimes and their impacts in Latin America. It focuses on San Antonio in Chile, Cartagena in Colombia, and the expansion of the Panama Canal in Colon, examining the impacts on coral reefs and other benthic ecosystems [7]. It charts the lack of community participation in marine democracy in the decisions supporting relentless growth [17]. It also aims to assess the extent participatory rights exist, and the extent the systems need to change to allow for alternative valuations of the ecosystems being destroyed (Sys et al., 2008).

While offshore dumping and dredging might seem low impact from those far away, for the coastal communities affected, the influence can be greater than the simple dispersal of sediment. Shiva [39] argued that localization of decision making, must be made closest to where the

impact is most felt. Relevant is the concept of inclusive development, which Araos and Ther (2017) highlighted contributes the relational element, and the development of appropriate institutions.

Considering the various challenges of port developments, this article reviews how and where ports create blue environmental injustice (Agyeman et al., 2003 [2], 2020, Anbleyth-Evans et al. [4] and Bennett et al., 2020). Responding to the blue justice literature (Jentoft and Cheunpagdee, 2022) and its increasing plethora of examples, it assesses how their systems of participation in marine democracy, allow them to campaign for their local ecological health. Different to marine citizenship, which emphasises the individual citizen's responsibility [28], a functional marine democracy is composed of social networks, where feedback with governance, civic society, and industries continue. It evaluates how these civic organisations, NGOs, and forums, as well as small scale fishers, have been able to integrate their local ecological knowledge (LEK) of impacts. In a way that successfully influences the decision making. Marine Democracy is the rich interaction of NGO specialists, communities, and scientist's knowledge, engaging society in ocean dialogue, which can lead to the collective co-production of new knowledge and ocean literacy [22]. The participation of LEK is here defined as those observations generated by those non-scientists interacting continually with local ecosystems such as fishers, extended here to urban citizens, who can be aware of important environmental details missed by scientists, and those in power over ecological decision making [2]. These ecological changes can inform Environmental Impact

E-mail address: j.ableythevans@gmail.com.

<https://doi.org/10.1016/j.marpol.2023.105767>

Received 27 August 2021; Received in revised form 9 December 2022; Accepted 11 July 2023

Available online 7 September 2023

0308-597X/Crown Copyright © 2023 Published by Elsevier Ltd.

This is an open access article under the CC BY-NC-ND license

(<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Assessments (EIAs). In the way that ecosystems are observed before the impact, and after. This can successfully move collaboration forward, improving human health (White, 2020) and simultaneous ecological health [35] or socio-ecological health, through knowledge transformation into action (Anbleyth-Evans, 2020).

This article examines the extent the economic and environmental ministries in Chile, Panama and Colombia, have the resources or an adequate understanding, to realise this approach. Beyond LEK, marine democracy is the interaction of civil society pressurising state institutions, that successfully moves towards collaboration for an improved marine environment (Anbleyth-Evans, 2020).

2. Methods

2.1. Case studies

We present three case studies to explain how different communities, can better participate in decision-making and identify anthropogenic contamination through their LEK. This includes small scale fishers, community leaders, divers and other environmental activists. The case-study approach permits the comparison of several instances of a particular phenomenon, to help explain it (Hardwick, 2009). These cases focus on the use of marine LEK to examine three different community contestations of contamination in Chile, Panama and Colombia. These are based on interviews and focus groups, conducted from 2020 to 2021.

2.2. Semi-structured Interviewing

Semi-structured interviews were key to understanding the experiences of those excluded from participation and the extent that community LEK could enhance ecological health [27]. This chapter builds on research indicating that marine governance currently positions LEK as less important, being anecdotal, that is it is not scientifically valid [2], Sampling using a snowballing interview technique led to twenty semi-structured interviews in each of the areas of San Antonio, Chile, Colon, Panama, and Cartagena, Colombia. Twenty semi-structured interviews from each case site were deemed sufficient to capture those interested community stakeholders not typically validated institutionally. Interview data was analysed through an inductive approach to thematic analysis, supported by NVivo 10 (Clarke and Braun, 2013). The themes used during interviews to develop questions were: (A) Access to decision-making and participation, (B) Impact and pollution of the port in the marine environment, (C) Scarcity and abundance, (D) Seabed characteristics, (E) Seabed habitats and biodiversity, and (F) Perception of blue justice. The identities of the interviewees were kept confidential; references in the text identify them by their local community and the order in which they were interviewed.

2.3. Participatory GIS /Focus group

Participatory mapping / GIS took place during the focus groups to understand how marine LEK could contribute to marine governance. Participatory GIS operates as a tool that can provide first order justice (Kooiman et al., 2005). Focus group discussions occur with an informal group with a specific theme, with open feedback, such as used in Participatory Rural Assessment in fisheries (Fitriana and Stacey, 2012; Chambers, 1994). Groups were divided into two and asked to draw the ecological impacts of dumping on a local map. Coloured pens were given out with a key of different habitat types and features for groups to identify and annotate (Zambra-Alvarez et al., 2016). It was important to encourage the quieter members to take part, so that more prominent members did not dominate. Mapping with the group was the most accessible way to elicit LEK in the first instance. Afterwards the maps were codified using the open-source Geographic Information System program QGIS, supported by Bing open maps (QGIS Development Team,

2018). In the different cities, different stakeholders including NGOs and local fishers explained where they identified impacts to natural shellfish banks, coral reefs, and fish breeding and spawning areas.

3. Case studies

3.1. San Antonio Mega-port expansion in Chile

San Antonio is the largest port in Chile, situated to the west of the capital Santiago in the Valparaíso region. It first began expanding in size beyond the historically biggest port Valparaíso, in 1990. It currently has 31 ha, 800 m of dock, and a depth of 15 m, supporting the entry of Panamax sized vessels. At least 8000 people work in the port with a monthly average of 159 million (Twenty-foot Equivalent Units) of freight container movement [37]. However, the current project has met significant resistance from different parts of the community. They plan to 1. dredge up the seabed in front of the port, creating significant benthic impacts, 2. Construct and dig in 3000 piles, to support the structure of the two new terminals reclaiming 1024.7 ha. 3. remove the beach, cover it in concrete, and stop public accessing it. Alongside this, they 4. plan to fill in two lagoons and associated wetlands, which recently received legal protection [38].

As well as these impacts, 5. the construction of a breakwater will stop the current flow of the river, which will change its river mouth. The community activists report that this will stop the unique form of low impact, artisanal Chinchorro style fishing, for the Lisa species *Mugil Cephalus* that has continued for millennia Fig. 1.

Additionally, more than 3000 observations of citizen science were submitted. These consider different endangered species in the wetlands, lagoons, and shore, while 20,000 people signed a petition against the development. Organisations include the Union of small-scale Fishers of Boca de Maipo, fishers of San Antonio Cove, Cosmos Foundation, The Network of Chilean Bird and Wildlife Observers, and Environmental Movement Ojos de Mar Nge Lafken, and the NGO Life.

Objections also followed from government institutions, including The Health and Environment Ministry of Valparaíso, National Forestry Corporation, the Valparaíso Agricultural and Livestock Service and the Municipality of Santo Domingo. A small-scale fisher activist summarised their thoughts on the current legal status of the port as a public good:

The Port is for private use, which is different to public good. In reality it is a private good, for the port it's a centre for mass consumption. What they are provoking is a war to see who can eliminate the other (San Antonio, 1).

The environmental NGOs such as Cosmos Foundation, summarised that the mouth of the Maipo including the wetlands and the lagoons and intertidal area, are home and place of passage for hundreds of species of birds. They explained that while there has been monitoring of the bird species in the site over time, the new project proposal ignores this impact and the data, they ruled the impacts insignificant. A focus group with the small-scale fishers of Boca de Maipo led to participatory GIS mapping, as can be seen in Fig. 2 below:

Differently to the NGOs focus on the wetlands and the lagoons, the small-scale fishers focused on marine ecological impacts. Starting with 1. the loss of the muddy, sandy and boulder benthic ecosystems in the red rectangle seen in Fig. 2 above. 2. Because of the new sea wall and wharf construction in the south of the rectangle, the river plume and its subsequent flow of river sediments and water will create ecological change. 3. Where fishers predicted the new channel of the river flume. 4. Current habitat areas of species such as merluza, *Merluccius australis* and its feeding ground in green. Corvina *Cilus gilberti* breeding area which will be impacted upon by the new wharf expansion into the sea. They also identified that the loss of the wetlands, lagoons and river ecosystem would see species loss, including the river Lisa species, which would disappear under the current plans Fig. 3.



Fig. 1. showing the location of the port of San Antonio in Chile from bing maps base (Created by author).

3.2. Puerto Colon, Panama

Similarly, at the port of Colon, on the north end of the Panama Canal the new Port terminal has been controversial socio-ecologically, specifically around the Isla Margarita. A previously healthy coral reef directly in front of the Panama Canal breakwater, is being gradually destroyed by dredging disposal. The disturbance from the expansion of the port, on the land and in the sea and the breakwaters continues. While acknowledged by a network of NGOs, including CIAM, Global Coral Reef Alliance and Universities such as the Smithsonian Tropical Research Institution, to be of national importance, its location close to the entrance of the canal has made it vulnerable. Nevertheless, the Environmental impact assessments (EIA) undertaken by the government body, the Directorate of Evaluation and Environmental Regulation (DIEORA) only considered previously dredged areas inside the breakwater. They ignored the importance of the coral reefs near the coast where construction was developing, also in the vicinity of the dredge disposal site, identified in Fig. 4 below in red. The associated internationally endangered species on CITES red lists are less than 100 m away, connected through an open channel to the dredging and landfill zones [15].

While this reef is close to the land-based Isla Galeta Protected Area on the north side, which offers some potential protection, the privatisation of the Isla Margarita area, meant that construction impacts on land and the coast were unregulated. This is highlighted with black hashed lines in Fig. 4 above, including the mangroves that were cut down, and soil and debris washed into the sea, smothering the corals. The lack of enforcement came through the lack of capacity of the

Maritime authority, Authority of Aquatic Resources (ARAP) and the Coasts and Seas Division of the Ministry of the Environment to evaluate and enforce these impacts.

A local fishermen explained the perspective from the fishing community, la Playita.

Yeah it's a travesty man. We've seen the fish disappear over the last 3 years increasing activity from the port. You don't see Bobo fish anymore, or the hammerhead sharks. Used to be able to fish for about 200 kg a year, now it's more like 40 kg.

A representative from the centre for Environmental Impact Assessments (CIAM) explained that they had won a case at the supreme court to enforce the recognition of the coral reefs, but it was thought that bribery had been at play, as DIERORA had ignored the decision. They had not made any attempt to stop the impacts on the reefs from the dumping and the landward side construction and erosion of mangroves.

Nearby, in Minas Bay, there is a new centre for natural gas storage controlled by Chevron, which they want to expand. They have plans to develop further infrastructure around the coast, in Rago island. Additionally, they want gas port infrastructure on Remo Island, Piena Island, Guapa Island and Palma Island where there are more coral reefs.

Current legislation lacks consideration of habitats and species, as well as biodiversity. But there are now hopes that a new law put through the constitutional court in 2019, will establish integral protection of ecosystems including coral reefs, mangroves, and wetlands Fig. 5.

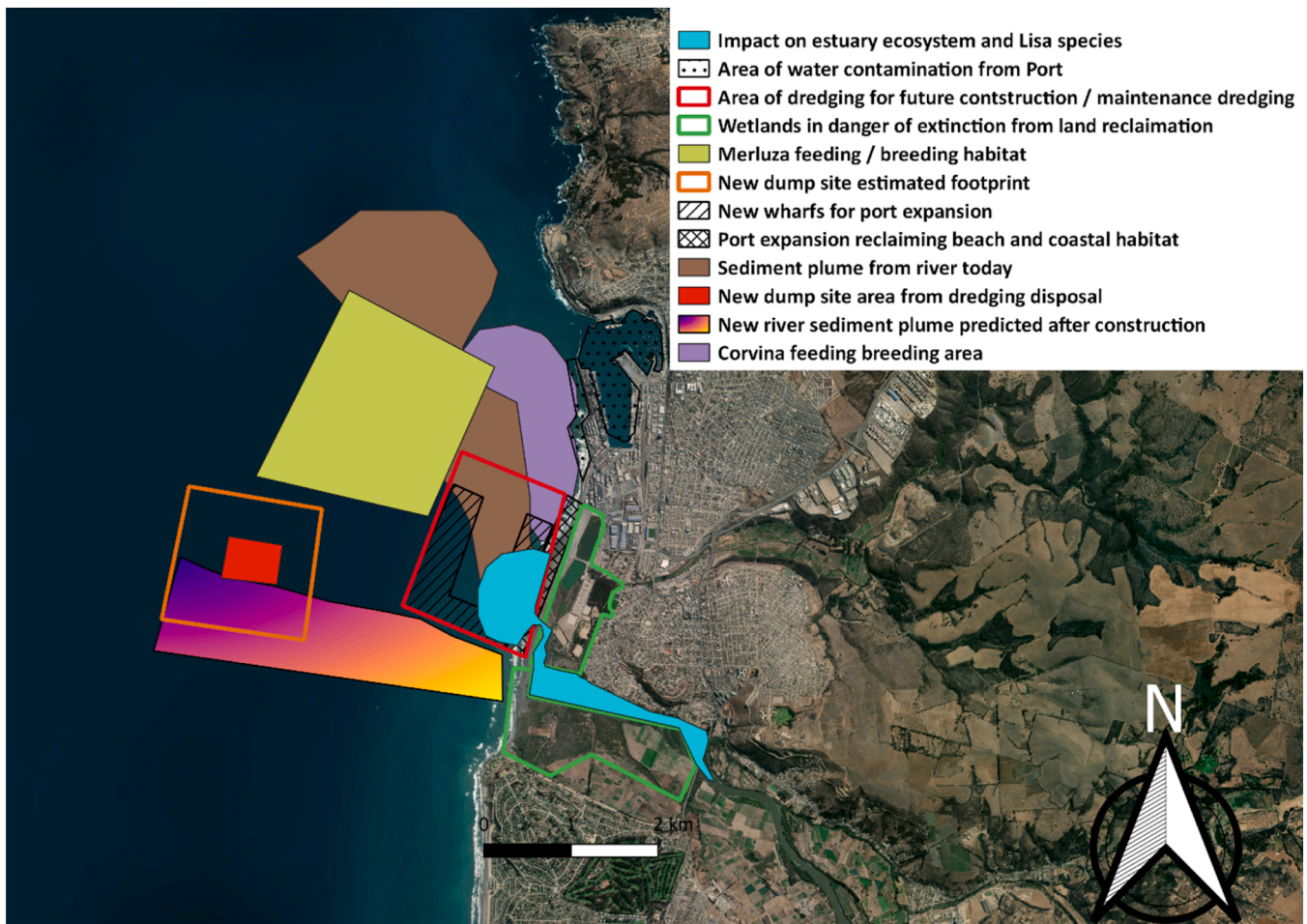


Fig. 2. showing the different impacts of the proposed port expansion of San Antonio. 1. The physical footprint of the land reclamation in the sea – red rectangle. 2. The current sediment plume from the river, supporting benthic ecosystems (in brown). 3. The estimated new flume, when the mouth is built upon, changing benthic ecosystems in (fluorescent pink / yellow). 4. Current fish species and habitats identified to be impacted upon by fishers (in green and purple) 5. New dump site from dredging / disposal and impact (in orange). 6. The physical footprint on the urban wetlands, green rectangle.

3.3. Cartagena, Colombia

In Colombia, near to the port of Cartagena, local divers and researchers recently discovered a new paradoxical coral reef [25]. It is paradoxical, in that high coral biodiversity continues, despite the poor water quality resulting from the urban discharges of the Canal del Dique and Magdalena River (Hope Spots, 2021). The improbable continuation of the Varadero reef, is now imperilled by the new proposed dredging and disposal for the port approach channel. Simultaneous, cumulative deterioration of water conditions with the increased activities of the port expansion threaten life. As can be seen in Fig. 6 below, the Varadero Reef is located on the northern limit of the Corals of Rosario and San Bernardo National Natural Park, between Tierra Bomba and Barú. It is located approximately 6 kilometres east of the main mouth of the 118 km Canal del Dique, dug out to connect the Bay of Cartagena with the Magdalena River. This contributes, according to the ‘Basic Cartagena research project’, 2000 tons of sediment per day into the bay (Pizarro et al., 2014).

The new dredging proposal is proposed to have a width of 300 m and a depth of 14–15 m. This channel would pass directly through the Varadero reef, destroying all in the canal path, as well as indirectly impacting approximately twice the surface area. Currently, various social movements and NGOs, led by Ecomare, Salvemos Varadero, Ecostono, Cardique, Corales de Paz, and Mission Blue are attempting to get legal designation for the reefs. Recently in April 2018, the Varadero Reef was also designated as a Hope Spot by the NGO [29]. The Hope Spot

designation is often given to areas that require protection, but they can also be for existing Marine Protected Areas where more action is needed. They were also successful in gaining a national declaration by the Ministry of Environment and Sustainable Development and the President, who said that the area would be a new protected area for the people of Cartagena, Colombia, and mankind. However, there is still no legal protection.

One of the biggest challenges to protect Varadero, is that the dredging for the port is supported by investment by the Ministry of the Economy, through a public-private initiative. This means that one arm of the government stands to profit from the port expansion project, legally described in Colombia as a national necessity. Indeed, the current system sits in favour of development, by letting the company create the boundaries of the Environment Impact Assessment, analysed further in the discussion.

Another problem is that this reef ecosystem is outside the national inventory of coral reefs, that is, the official Atlas of Coral Reef Areas of Colombia, published by the Institute for Marine and Coastal Research, José Benito Vives de Andrés in the year 2000 (Invermar, 2000). Currently they are waiting for Invermar and the Ministry of Environment and Sustainable Development, to update the edition to officially recognise the reefs existence. This is the only way to get official governmental recognition. Considering this, the Reef Check Cartagena programme in 2019, invited over 100 citizens and expert divers to gather information on the health status of the reef. An activist from Corals of Peace explained that:



Fig. 3. the location of Puerto Colon in Panama developed from Bing Maps base layer.

The citizen science allowed us to actively involve society in collecting information on coral health, continual monitoring and increasing the collective level of understanding in the community.

The citizen science supported broader communication of the challenges, outreach, and education strategy, increasing interest in monitoring, and preserving the reefs across the Cartagena community. Furthermore, interconnections with the local fisher community were established, who explained the importance of the reef in maintaining the fish populations essential for their livelihoods. This was underlined in the interviews of the documentary *Saving Atlantis* [33].

4. Discussion

The discussion follows with a section for each case study, discussing EIA legislation in the respective country, allowing for comparison between them. Firstly, it discusses the context of citizen participation in the evaluation of impacts, followed by significant or insignificant impacts, and cumulative and in combination impacts. Additionally, how citizens do or don't participate in ecological impact evaluation, significance, and baseline assessment aspects of EIAs, an important part of the evolution of marine democracy. This is discussed in 5.4. in the context of justice. The different value systems of the stakeholders are also discussed in 5.5., which are important for understanding how the different types of citizens values interact with governance in marine democracy.

4.1. San Antonio SEIA and EIA legislation in Chile

4.1.1. Marine democracy - citizen participation in the evaluation of impacts

With the size of the impacts of the San Antonio extension, it is not surprising that The Chilean Service of Environmental Impact Assessment (SEIA)' evaluation, has been critiqued by the community and wider civic society, and for other projects. Firstly, in its lack of capacity for reconsideration of new information. That is, once the project has been submitted for consideration, there is no mechanism to submit new evidence. Where stakeholders such as those mentioned above, want to explain the potential environmental impacts, they lack a mechanism. Other key criticisms include the definition of what a significant impact is. In the first instance, the following significant impacts were identified by various stakeholders, (but were ruled insignificant): 1. the loss of the muddy, sandy and boulder benthic ecosystems in the red rectangle (all described above in Fig. 2). 2. The new sea wall and wharf construction in the south of the rectangle, changing the river plume and the subsequent flow of river sediments and water. 3. The change of the channel and river flume. 4. Loss of fish species habitats such as merluza *Merluccius australis* corvina *Cilus gilberti* breeding and feeding areas by the new wharf expansion. They also identified that the loss of the wetlands, lagoons and river ecosystem would be bad for biodiversity, including the river lisa species, which would disappear under the current plans. These impacts were ruled insignificant, whilst drastically changing many types of ecosystems, landscapes, and livelihoods. Further solutions such as small ports, or decentralising shipping around the country, had no space for consideration in the process.



Fig. 4. Participatory mapping showing where the impacted corals are in red, and the area inside the breakwater that was dredged in green outline. The area of the coral was also impacted from the landward side during construction, area in hashed black. Also of note is the rectangle disposal site in the north in brown where dumping continues.

4.2. Significant or insignificant impacts

Perception of citizens, such as their LEK of ecological change, are important in contrast to the information presented by private consultants. They represent an equally valid environmental reality of the local area. Although they may be subjectively place protective, in contrast, the business may be more interested in influencing the decision maker to go ahead quickly with the project. Different types of stakeholders' everyday experience, such as fishing / harvesting activities, leisure and diving, to artistic inspiration, merit having a place at the table of the determination of significance. For example, place-based connection, that is the bond of a community with the sea and land, can enhance their valuation of the importance of biodiversity, and its conservation (Hausmann et al., 2020). Additionally, artisanal economic activity including harvesting fish, will be affected by this mega project in a serious way. Despite this, it has been reframed by the paid consultants carrying out the EIA to be insignificant. This is relevant since the only impacts that are considered "significant" are those that force the company to take measures to mitigate or compensate for these damages. But it is the same company carrying out the creation of the EIA who carried out the study, which is somewhat contradictory. For example, in the context of the Rio Maipo wetland, while the report considers that there will be impacts, they will not be significant. The EIA identifies 69 impacts, but only 13 of them are considered significant, and none of them refer to the areas identified above, such as protected wetland, as explained by the Cosmos Foundation. Also, the idea that the creation of

an artificial lagoon will recreate at least the same level of biodiversity as the currently existing Lagoons of Llolleo, is a stretch even of corporate imagination.

Further, there is no consideration of the cumulative and in combination impacts. Cumulatively, how these changes will occur over time, and in combination, and how they will feed into each other. For example, the footprint of the port on the seabed, and its interaction with the change of the river flow. How this will interact with marine ecosystems, or on the wetlands, or how this would interact in combination with the loss of the lagoon habitats and other possible synergies with neighbouring areas such as Santa Domingo, and other parts of the Maipo basin and the coastal area from El Yali to Cartagena, with its different marine processes, zoologies and geomorphologies, remains unknown.

4.3. Lack of baseline evaluation and other essential information

As indicated by the community activists, NGOs and fishers, the EIA of the "Puerto Exterior de San Antonio" project, omits significant information regarding the ecological baseline of the project. Such as the identification and evaluation of environmental impacts, mitigation or compensation measures and their respective monitoring plans. For example, considering the mouth of the Maipo river, there is a coastal upwelling area that makes the San Antonio Bay an important biodiversity hotspot, alongside the influence of the freshwater sediments from the Maipo River. By not considering the dynamics of the Maipo river plume, the impact will influence currents and hydrodynamic processes



Fig. 5. location of the Varadero reef near to Cartagena port in Colombia from Bing maps base layer.

up to the Las Cruces Marine Protected Area. Furthermore, stakeholders identified that the EIA did not assess the impact on marine fauna, lacking consideration of the disturbance of construction and reclamation, the impacts of increasing underwater noise, as well as light pollution. All these impact elements need full description and analysis after a real baseline is completed, to see if the corresponding compensation, mitigation, or repair measures are appropriate.

4.4. Puerto de Colón and EIAs with DIEORA in Panama

4.4.1. Marine democracy - citizen participation in the evaluation of impacts

While fishers, civil society groups and interest groups including the NGO Coral Reef Alliance and the Smithsonian university, registered objections to the project, there was no mechanism to register objections and different forms of evidence to be recognised in a formal way by DIEORA. Similarly, the EIA report is presented to them via the private consultants, who have a special register. In Panama, article 1 of the EIA law (1998), stipulates that the EIA is a duty of the state to promote a sustainable development and support a reparation of any environmental damages (DIEORA, 2017). Nevertheless, the detailed ecological baseline of the coral reefs in the vicinity of the area, presented by the Coral Reef Alliance among others was ignored by the decision makers, despite the constitutional court ruling it illegal.

4.5. Significant or insignificant impacts

While the EIA provided a complete analysis of the biodiversity present inside the breakwater area as seen in Fig. 4 above, the zone outside

of the breakwater, also significantly impacted, as well as in Punta Galeta and Nombre de Dios was ignored. Importantly, how the construction and operation might affect the fragile coral reefs and mangroves from the landward side was also obfuscated. Thus, while these important habitats and species, became protected under law in 2019, that they were not finally conserved is perhaps surprising, given the supreme court decision to stop the project. However, stakeholders explained that bribery influenced the decision makers in DIEORA.

4.6. Lack of baseline evaluation and other essential information

Given the global value of these endangered habitats and species, it was surprising that the ecological baseline of the coral reefs by the Coral Reef Alliance was ignored. Additionally, there was a lack of transparency when trying to communicate with the owners of the Panama Colon Container Port, who ignored any request for information. Even more surprisingly, while the Supreme Court of Justice decided to stop the project, after a lawsuit from the Centre of Environmental Impact Assessment, DIEORA let the project continue. Investigations in 2018 evoked a lack of communication between the different government agencies DIEORA, and the environment agency. This failure saw the ecological costs absorbed by the environment, while the profits went to the businesses registered in Panama City. At the same time, the negative socio-economic externalities impacted the people locally in Colon. It appears that the Panamanian centralized system of governing continues without both local decision makers, or stakeholders involved in marine urban planning [31].

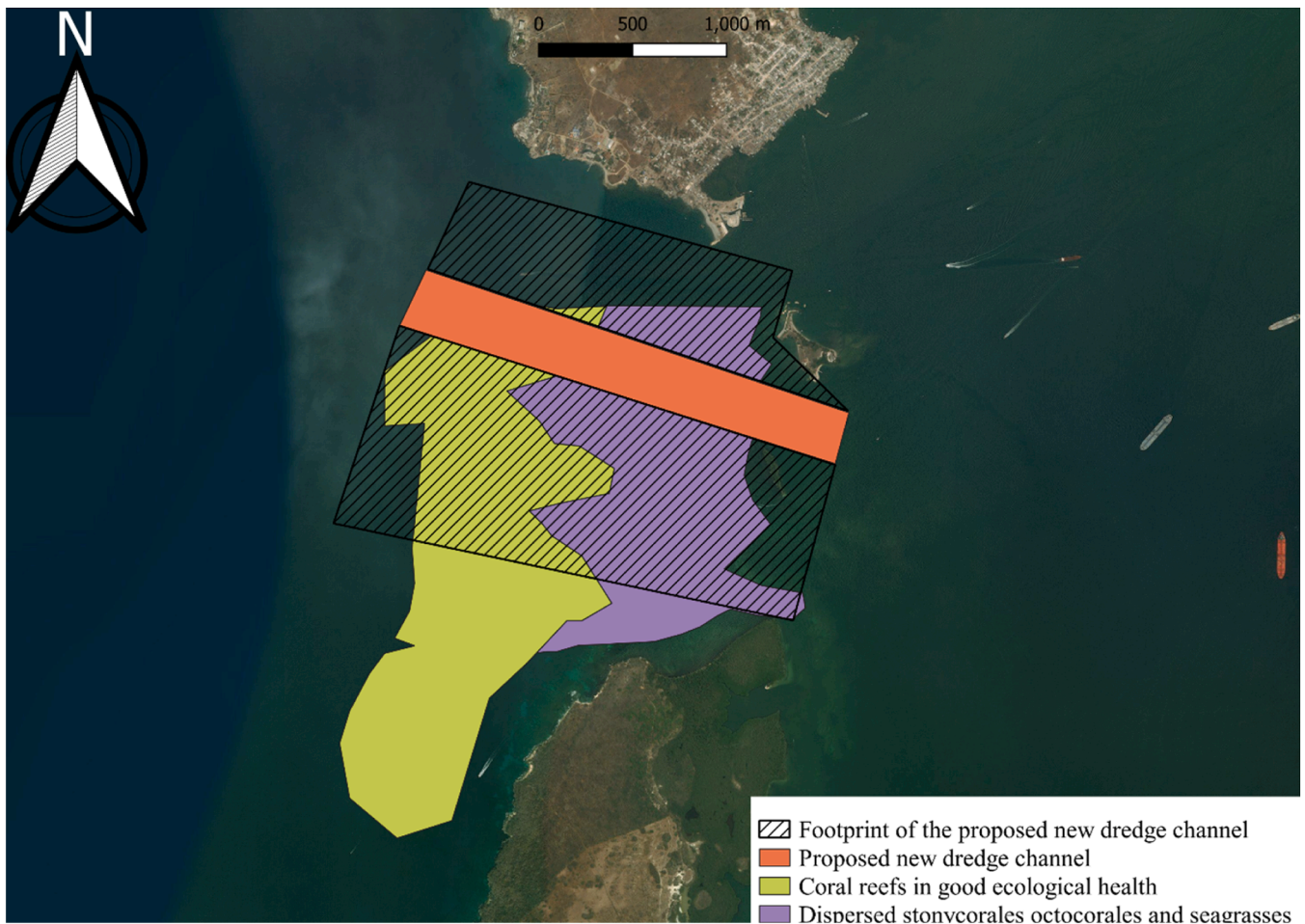


Fig. 6. from participatory GIS showing where the coral reefs are and the proposed new dredge channel of Cartagena port, and its footprint.

4.7. Cartagena EIA

4.7.1. Marine democracy - citizen participation in the evaluation of impacts

Like the other case studies, the Cartagena situation is an environmental disaster in the making, because of the lack of participation in the EIA process. Whether the port will be given permission to dredge through the newly discovered coral reef, first depends on recognition of its existence. Problematically, the national inventory of coral reefs was last updated in 2000 [20]. Currently the National Agency of Environmental Licenses (Autoridad Nacional de Licencias Ambientales) are waiting for Invemar to update it, alongside the Department of Coastal Marine Aquatic resources (Asuntos Marinos Costeros y Recursos Acuáticos) in the Ministry of Environment and Sustainable Development. Then the protection level can be upgraded.

A second problem is that although stakeholders would be expected to have their say on the EIA, only private bodies involved in the application can have real influence. Thus, the port developer, and the consultants they hire, are essentially responsible for the EIA decision of their own project. The same organizations that want to carry out the project, such as the port effectively oversee the EIA. Thus, there is bias over the environmental impacts, and a similar lack of participation common in the other cases.

The EIA further mentions a compensation package for the fishing communities, including new fishing boats and gear, to be overseen by the national Authority of Aquiculture and Fishing (AUNAP). However, for the 2000 estimated fishers in the 5 communities of the Cartagena Association, such a gift package may be less than useful, given the fish and the habitats would be annihilated.

4.8. Significant or insignificant impacts

The consultants, while deeming the impacts insignificant, recommended a plan to relocate the newly discovered coral reefs. However, this is problematic, as there is no scientific evidence that these coral reefs can be moved safely without destroying them. This was emphasised in the external review of the EIA by the different stakeholders. The Dutch consultancy, Netherlands Commission for Environmental Assessment (NCEA) emphasised this in the review of the EIA for the government. This report also underlined that the licencing body, and the Department of Coastal Marine Aquatic resources, also had serious concerns.

4.9. Lack of baseline and other key information

Civil society stakeholders identified that there is an inconsistency in the description of the percentage of existing coral cover in the EIA. This is despite the swathe of scientific publications since (Lopez et al., 2015), posing questions on the reliability of the scientific information presented by the consultant, and their bias. The spatial extent of these endangered habitats is critical to the issue of coral reef damage and compensation. Similar criticisms were launched describing the presentation of the extent of the mangrove forests in the Canal del Dique, that would be destroyed by the project.

Stakeholders also identified that the proposed methodology to remove and transplant coral reefs was not clear. Both in terms of their handling, transport and reattachment and success rate. For example, they showed a lack of realism in the idea of relocating corals larger than

2 m (e.g., *Montastraea faveolata*). Another issue is the selection and the destination area of the corals. A similar criticism was made in relation to the proposed relocation of the mangroves and seagrasses, that would be impacted. Furthermore, the fact that these bodies had no idea that these coral reefs existed before, shows a substantial lack of baseline information in general.

4.10. Port EIAs common characteristics for improved legislation and justice

The three case studies in the three countries all show that the processes of EIA evaluation, exclude citizen participation, locally, scientifically, and politically. This means port developments across Latin America, needs updating legislatively, to include these participatory rights. It shows it is a widely occurring issue, with questions of epistemic, distributional, and intersectional justice. To develop Marine Democracy is about realising epistemic justice, or the right for the stakeholder’s way of knowing to be considered valid, and have it included in EIAs or planning and decisions [12]. It is about realising distributive justice, where fair distribution of environmental costs and benefits develop, without asymmetry in the distribution of those who bare the impact, such as environmentally destructive port developments on certain groups [19]. In this article, we have worked towards realising intersectional environmental justice, where not only the most powerful actors and their influences in the cause of the injustice are identified, but how the systems and processes of power function at different scales, between different groups and geographies, both human and non-human. Malin, Ryder (\$year\$) [26].

In the context of updating legislation for participatory rights across countries, it is generalisable that private consultants’ knowledge, representing port / commercial interests, is privileged above all others. Systemically, this limits capacity for reconsideration of new information. That is, once the project has been submitted for consideration, there is no mechanism to submit new evidence, from other parties. This means that the main body of evidence being created in this assessment, is not a neutral scientific party, but someone working for the port to get the permission, as quickly as possible.

In terms of the second part, significant or insignificant impacts, it was commonly found that the different flavours of stakeholders’ everyday experience, from fishing, to leisure and diving, to artistic inspiration are not at the table of the determination of significance. Only the consultant’s perspective on significance is deemed valid. This is important, as only impacts that are considered "significant" are those that force the company to take measures to mitigate or compensate for ecological harm. Cumulatively, how these changes would occur over time, for example, the footprint of the port on the seabed, or the interaction with the loss of the current river flow, would interact on marine ecosystems in Chile, or the coral ecosystems and mangroves in Panama and Colombia. Clear legislative update is needed, so the long-term expertise of local stakeholders in marine consents and planning is included. Thus, their potentially long-term experiences with marine ecosystems, can be incorporated in generating baselines, including where co-production with NGOs and researchers is most effective. Ultimately, their capacity for holistic thinking across socio-ecological dimensions, can be included across Latin America.

Table 1
of other port EIAs in other Latin American countries and evidence for participation.

Country	LEK Participation in EIA	Case study	Reference
Brazil	No	Santos	Roos, Neto [34]
Argentina	No	Puerto Rosales	Gomez et al., [13]
Peru	No	Puerto Chancay	Alferez Murias [1]. https://dialogochino.net/en/infrastructure/43228-perus-chancay-mega-port-shakes-village-to-core/
Ecuador	No	Puerto Guayaquil	Lituma Vera [24].
Mexico	No	Puerto Veracruz	Gómez-Barrero et al., [14]

Across the ports different ecological baselines, substantial information concerning the effects of the construction and evaluation of environmental impacts, was left out. Additionally, mitigation or compensation measures, and their respective monitoring plans were forgotten across the case study baselines. These case studies show that ports and their consultants are essentially writing their own EIAs for their own projects. A literature review showed this also occurs in Ecuador, Peru, Argentina, Honduras, Mexico Brazil in Latin America, as shown in Table 1 below.

The lack of participation in port EIA assessments around Latin America identified in Table 1 evidences that an international agreement between Mercosur countries, to have adequate environmental protection and assessments, would be beneficial. Like the more detailed case studies in Chile, Panama, and Colombia, all the other EIAs lacked evidence for mechanisms of consideration of new information. Such as from stakeholders which is an issue of epistemic and distributional justice. Further, this relates to the debate over who decides whether the project’s impacts on the environment should be deemed significant or insignificant. If the existing legislation protecting habitats and species is not robust, then these projects can build on even the most endangered species, such as coral reefs. If it is in the economic interests of the decision maker, such as DIEROA in Panama, or the Ports owned by the States of Chile and Colombia, then they can rule the impact insignificant, and go ahead and profit. There is a power hierarchy with economic ministries dominant over environmental ministries. This relates to the different value systems of the stakeholders interacting in marine democracy, considering long term global to local impacts, as described in Table 2 below.

4.11. Different value systems of stakeholders and marine democracy

Table 2 shows the different value systems of the different stakeholders, and how values relate to marine democracy. It shows that the port consultants in comparison to the environmentally and locally focused stakeholders, focus on profit for the port. Their values influence the way they frame their evidence, around the level of impacts. They differently delegitimise the impacts, as the profits from port expansion are more important to them. The NGOs and environmental organisations, for example Cosmos Foundation, Coral Reef Alliance and Salvamos Varadero, were all locally focused on preserving ecosystems and biodiversity, both at the local level and international level, in contrast to the consultants. The fisher groups participated by lobbying against the project’s impacts on marine ecosystems, through attempts at dialogue with the ports and collaborating with the researchers. This shows a range of values is important in marine democracy, as if it were only profit focused, the perspective valuing local ecosystems would be left out.

Different values may be emerging among the ‘Eco Ports’ network through the European Sea Ports Organization, whose mission is to “raise awareness on environmental protection through cooperation and sharing of knowledge between ports and improve environmental management” [10]: 1), such as using self-diagnostic tools to identify ecological risks. the development of green ports is emerging in some blue economy narratives, such as with the Environmental Performance in Ports measure, which mainly focuses on bringing down carbon

Table 2
of different value systems across the ports.

Stakeholders	Values	Type of evidence	State
San Antonio Port consultant	Profit focused, concentrating on increasing size exponentially	Evidence production focused on reframing narrative demonstrating the lack of potential impacts	Chile
Fishers of the Bocas del Maipo	Valuation of local ecological place and the relationship to livelihood	Local ecological knowledge of fish species changing over time	Chile
Cosmos Foundation	Ecological valuation focused on bird species biodiversity and their habitats	Scientific research approach quantitative but including citizen scientists	Chile
Port of Colon consultant	Profit focused, concentrating on increasing size exponentially	Evidence focused on demonstrating the lack of potential impacts	Panama
Coral Reef Alliance	Biodiversity of coral reefs and their preservation across the world, and the interconnections to other systems	Scientific ecological evidence	Panama and international
Fishers of La Playita	Place based protection focused for the benefit of fisheries	Local ecological knowledge of impacts	Panama
Port of Cartagena consultant	Profit focused, concentrating on increasing size exponentially	Evidence focused on demonstrating the lack of potential impacts	Colombia
Salvamos Varadero	Locally focused on corals and biodiversity	Scientific and social science evidence	Colombia
Fisher Caleta de Cartagena	Place based protection focused for the benefit of fisheries	Local ecological knowledge of the impacts on the corals	Colombia

emissions, and making logistics more energy efficient. Nevertheless, continuing without participatory processes, or habitat creation or restoration as objectives ([9,41]). Examples in the UK included where the Port of London expansion had to develop ecological compensation, creating habitat elsewhere at Wallsea Island. However, the unique example where marine democracy pressure changed the decision to stop dredging was from against the Port of Falmouth proposal. In a similar vein to coral reefs, maerl coralline algae was recognised as a species important to conserve, and not transplantable, nor possible to recreate elsewhere like saltmarsh from dredged muds. It was also protected being in the Fal Special Area of Conservation [32]. The concept of eco-engineering of blue-green infrastructure for enhancing biodiversity on artificial marine structures is also increasingly being discussed [11]. Port and coastal defence artificial structures including breakwaters, groynes, seawalls, can be redesigned to be attractive to marine life, such as reproducing rocky reef characteristics.

There is potential for this to evolve in Chile in the future, where the draft new Chilean constitution states in section 145- article 4 that: “The law shall establish their spatial planning and integrated management, through differentiated, autonomous, and decentralised treatment, as appropriate, on the basis of territorial equity and justice”. Convencion Constitucional [6]. However, while the referendum voted against this version of the constitution, further debate may lead to an updated version.

4.12. Developing decentralised district planning, fisheries, and conservation authorities

In light of incorporating this range of values, observations and perspectives, a new structure for these environmental institutions, based on

the case study results, are introduced below in Fig. 7. Through locally led, (District, or municipal / parish) Planning, fisheries and conservation authorities, the lack of local oversight over the permissions and planning of projects can be changed. Power can flow from the local coastal communities, whether villages or urban municipals.

The local municipal scale is more conducive to marine democracy, as the inclusion of actors’ perspectives by institutions is more possible. Democratic potential is higher at the level of power where people live and have face to face interaction with each other and their environment. Where ecosystems are part of the community. Thus, Fig. 7 shows how, at the municipal level, these proposed District Planning, Fisheries and Conservation Organisations can move towards marine democracy, uniting EIA, fisheries, and conservation laws and assessments. These can facilitate the co-production of participatory marine plans, involving a broad range of stakeholders, including tourism interests, conservation organisations, aquaculture fisheries, ports, and energy. Local marine plans can be continually updated by their ongoing observations, from which decisions would be supported. Marine democracy can develop through the participation of LEK, but not just of fishers; marine democracy is the interaction of civil society pressurising state institutions to consider impacts of ecological change over time considering the past for the future. Further work, can show whether these questions of epistemic, distributional, and intersectional justice, are found in similar port and other coastal development projects around the world.

5. Conclusion

To develop marine democracy across Latin America, means that EIAs must include a system where parity of participation of diverse knowledge claims in decision making and evidence production occurs, whilst uniting EIAs with conservation, and fisheries laws. Port developers and their EIA consultants must not be the only groups responsible for EIAs on their own projects. That means that to develop epistemic, distributive, and intersectional justice, the right for different ways of knowing needs

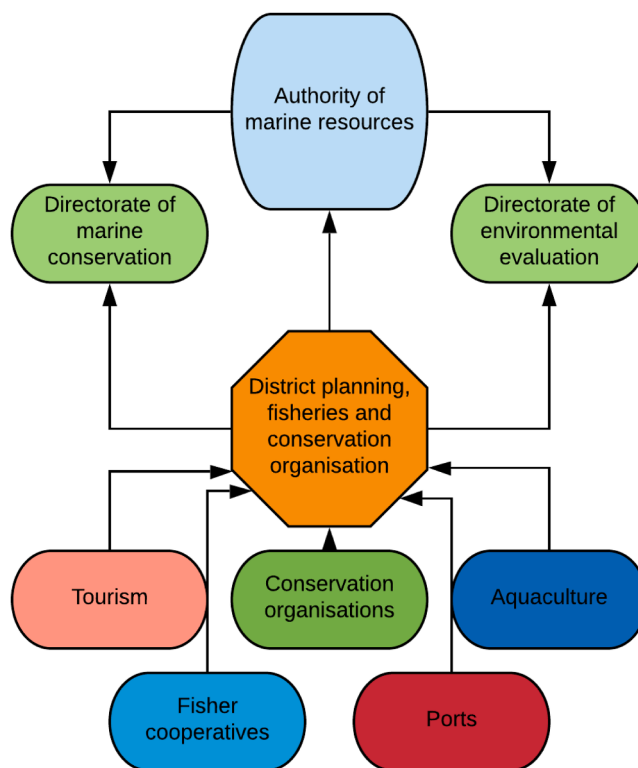


Fig. 7. showing how marine democracy could be realised through District Planning, Fisheries and Conservation Authorities.

to be legitimised. Including the observations of non-scientists working in nature such as fisher LEK and other coastal stakeholders, means participatory conservation planning. This will be supported by decentralised District Planning, Fisheries and Conservation Authorities working face to face on the coast. This means creating participatory rights for the epistemic justice of new social movements, interest groups, individuals, and organisations and other working with and having interest in the long-term socio-ecological health of the sea. Moving beyond simplistically understood, gross domestic growth in the ocean economy, future marine democracy can mend the ecological rift with industries and support the re-growth of ecosystems whilst simultaneously increasing their value through enhanced biophilic relations.

CRedit authorship contribution statement

Conceptualization, Methodology, Software Data curation, Writing – original draft preparation. Visualization, Investigation. Supervision.: Software, Validation, Writing – reviewing and editing – all Jeremy Anbleyth-Evans.

Data availability

Data will be made available on request.

References

- Alferez Murias, J.D.C. (2020). Panorama y reflexión sobre la inversión china en infraestructura en el Perú: Análisis desde las relaciones internacionales y la política exterior peruana. *Colecciones Maestría en Diplomacia y Relaciones Internacionales* URI (<http://repositorio.adp.edu.pe/handle/ADP/161>) (As accessed, 01.07.21).
- J. Anbleyth-Evans, Aggregate dredging impacts in Southeast England: improving ecological health by integrating fisher local ecological knowledge with scientific research, *Mar. Pollut. Bull.* 135 (2018) 129–138, <https://doi.org/10.1016/j.marpolbul.2018.06.051>.
- J. Anbleyth-Evans, S.N. Lacy, C. Aguirre-Muñoz, J. Tredinnick-Rowe, Port dumping and participation in England: developing an ecosystem approach through local ecological knowledge, *Ocean Coast. Manag.* 192 (2020) 105–195.
- J. Anbleyth-Evans, M. Prieto, A. García Cegarra, J. Barton, S. Muslow, Toxic violence in marine sacrificial zones: developing blue justice through marine democracy in Chile, *Environ. Plan. C: Polit. Space* May 2022 (2022), <https://doi.org/10.1177/23996544221084193>.
- S.G. Bolam, P.S.O. McIlwaine, C. García, Application of biological traits to further our understanding of the impacts of dredged material disposal on benthic assemblages, *Mar. Pollut. Bull.* 105 (2016) 180–192, <https://doi.org/10.1016/j.marpolbul.2016.02.031>.
- Convención Constitucional (2022). Propuesta Constitucional de la República de Chile (<https://www.chileconvencion.cl/>) (As accessed, 03.09.22).
- R. Cunning, R.N. Silverstein, B.B. Barnes, A.C. Baker, Extensive coral mortality and critical habitat loss following dredging and their association with remotely sensed sediment plumes, *Mar. Pollut. Bull.* 145 (2019) 185–199.
- V.N. De Jonge, H.M. Schuttelaars, J.E.E. van Beusekom, S.A. Talke, H.E. de Swart, The influence of channel deepening on estuarine turbidity levels and dynamics, as exemplified by the Ems estuary, *Estuar. Coast Shelf Sci.* 139 (2014) 46–59, <https://doi.org/10.1016/j.ecss.2013.12.030>.
- A. Di Vaio, L. Varriale, Management Innovation for Environmental Sustainability in Seaports: Managerial Accounting Instruments and Training for Competitive Green Ports beyond the Regulations, *Sustainability* 10 (3) (2018) 1–35.
- EcoPorts (2021). Environmental Report. (<https://www.ecoport.com/publication/s/environmental-report-2021>) (As accessed, 23.09.22).
- A.J. Evans, L.B. Firth, S.J. Hawkins, A.E. Hall, J.E. Ironside, R.C. Thompson, P. J. Moore, From ocean sprawl to blue-green infrastructure—A UK perspective on an issue of global significance, *Environ. Sci. Policy* 91 (2019) 60–69.
- Fricker, M. (2007). *Epistemic Injustice*. Oxford: Oxford University Press.
- E.A. Gomez, D.G. Cuadrado, G.A. Federici, Environmental impact assessment in a harbour area, Argentina, *Thalass., Int. J. Mar. Sci.* 21 (2) (2005) 31–38.
- Gómez-Barrero, A.E., Liaño-Carrera, F., Ramírez-Macías, J.I., & Guzmán-Ricardo, C.R. (2018). Nuevo puerto de Veracruz: los sistemas de gestión ambiental como herramienta para el control y seguimiento de los aspectos ambientales en la construcción de megaproyectos de infraestructura. Nuevo puerto de Veracruz: los sistemas de gestión ambiental como herramienta para el control y seguimiento de los aspectos ambientales en la construcción de megaproyectos de infraestructura, Cádiz: del floreciente s. XVIII al Port of the future del s. XXI 629–637.
- T. Goreau-Arango, Isla Margarita Preliminary Coral Reef Health Baseline Assessment Prior to Dredging (Rep), Global Coral Reef Alliance., Cambridge, MA, 2018, pp. 1–15.
- H.M. Guzman, R. Cipriani, J.B. Jackson, Historical decline in coral reef growth after the Panama Canal. *AMBIO: a, J. Hum. Environ.* 37 (5) (2008) 342–346.
- M. Hadjimichael, A call for a blue degrowth: unravelling the European Union's fisheries and maritime policies, *Mar. Policy* 94 (2018) 158–164.
- M. Hanapiah, S.Z. Zulkifli, M. Mustafa, F. Mohamat-Yusuff, A. Ismail, Isolation, characterization, and identification of potential Diuron-degrading bacteria from surface sediments of Port Klang, Malaysia, *Mar. Pollut. Bull.* 127 (2018) 453–457.
- A. Honneth, Recognition or redistribution? Changing perspectives on the moral order of society, *Theory, Cult., Soc.* 18 (2–3) (2001) 43–55.
- INVMAR (2000). General, C., Tinoco, J. A. G., Gómez-López, D. I., Coordinadora de Línea, O. D. I., Portada, F., Lopsant, L. P., & Capítulos, C. Instituto de Investigaciones Marinas y Costeras José Benito Vives De Andreis INVMAR Vinculado al Ministerio de Ambiente, Vivienda y Desarrollo Territorial Cerro Punta Betín, Santa Marta, DTCH Teléfonos (+ 57)(+ 5) 4214413/4214775 Ext. 251, 125 Fax (5) 4312975 AA 1016.
- J.B.C. Jackson, M.K. Donovan, K.L. Cramer, V.V. Lam, Status and trends of Caribbean coral reefs. *Global Coral Reef Monitoring, Netw., IUCN, Gland, Switz.* (2014) 1970–2012.
- R. Kelly, K. Evans, K. Alexander, S. Bettiol, S. Corney, C. Cullen-Knox, G.T. Pecl, Connecting to the oceans: supporting ocean literacy and public engagement, *Rev. Fish. Biol. Fish.* (2021) 1–21.
- K. Kohli, M. Menon, The Tactics of Persuasion: Environmental negotiations over a corporate coal project in coastal India, *Energy Policy* 99 (2016) 270–276.
- Lituma Vera, V.H. (2015). Estudio de impacto ambiental (EIA) y plan de manejo de un terminal de parqueo de camiones pesados y servicios, en terrenos del puerto marítimo de Guayaquil (Master's thesis, Universidad de Guayaquil: Facultad de Arquitectura y Urbanismo). (<http://repositorio.ug.edu.ec/handle/redug/8644>) (As accessed, 01.07.21).
- M. López-Victoria, M. Rodríguez-Moreno, F.A. Zapata, A paradoxical reef from Varadero, Cartagena Bay, Colombia, *Coral Reefs* 34 (1) (2015), 231–231.
- S.A. Malin, S.S. Ryder, Developing deeply intersectional environmental justice scholarship, *Environ. Sociol.* 4 (2018) 1.
- M.J. McIntosh, J.M. Morse, Situating and constructing diversity in semi-structured interviews, *Glob. Qual. Nurs. Res.* 2 (2015), 2333393615597674.
- E. McKinley, S. Fletcher, Improving marine environmental health through marine citizenship: a call for debate, *Mar. Pol.* 36 (2012) 839–843, <https://doi.org/10.1016/j.marpol.2011.11.001>.
- Mission Blue (2021). (<https://mission-blue.org/hope-spots/>).
- Z. Ou, G. Ma, Marginalisation of the Dan fishing community and relocation of Sanya fishing port, Hainan Island, China, *Isl. Stud. J.* 12 (2) (2017).
- Peña Silva, L., Royer, S. (2018). FINAL REPORT PROYECTO DE PANAMA COLON.
- E.V. Sheehan, D. Bridger, M.J. Attrill, The ecosystem service value of living versus dead biogenic reef, *Estuar., Coast. Shelf Sci.* 154 (2015) 248–254.
- Smith, J. and Baker, D. (2018). director. Saving Atlantis. (<https://Films.oregon.state.edu/Saing-Atlantis>). (As accessed, 02.12.22).
- E.C. Roos, F.J.K. Neto, Tools for evaluating environmental performance at Brazilian public ports: Analysis and proposal, *Mar. Pollut. Bull.* vol. 1 (115) (2016) 211–216.
- S.J. Pittman, L.D. Rodwell, R.J. Shellock, M. Williams, M.J. Attrill, J. Bedford, S. E. Rees, Marine parks for coastal cities: A concept for enhanced community well-being, prosperity and sustainable city living, *Mar. Policy* 103 (2019) 160–171.
- V. Pizarro, S.C. Rodríguez, M. López-Victoria, F.A. Zapata, S. Zea, C.T. Galindo-Martínez, M. Medina, Unraveling the structure and composition of Varadero Reef, an improbable and imperiled coral reef in the Colombian Caribbean, *PeerJ* 5 (2017), e4119.
- Puerto San Antonio (2021). Port container transfers total more than 159 in April (<https://www.puertosanantonio.com/puerto-san-antonio-transfirio-mas-de-159-mil-teu-en-abril>) (As accessed, 08.06.21).
- SEIA (2020) Evaluation of Impacts Puerto San Antonio (https://seia.sea.gob.cl/archivos/2020/04/30/4.0_Evaluacion_de_Impactos.pdf?fbclid=IwAR3j5r9biaezxT1SwGnWov6wJ6rFjWK5zpZ9GmYeJdyU7Km6Qpp3EEERuc) (As accessed, 09.12.21).
- Shiva, V. (2005). *Earth democracy: Justice, sustainability and peace*. Zed Books.
- D. Suman, Panama revisited: Evolution of coastal management policy, *Ocean Coast. Manag.* 45 (2–3) (2002) 91–120.
- A. Vega-Muñoz, G. Salazar-Sepulveda, J.F. Espinosa-Cristia, J. Sanhueza-Vergara, How to measure environmental performance in ports, *Sustainability* 13 (7) (2021) 4035.
- G. Wilmseier, J. Monios, G. Pérez-Salas, Port system evolution—the case of Latin America and the Caribbean, *J. Transp. Geogr.* 39 (2014) 208–221.