

Towards a sustainable economic governance in the East Sea

Nguyen Tac An^{1,*}, Venugopalan Ittekkot²

¹*Vietnam Marine Science & Technology Association, Hanoi, Vietnam*

²*Leibniz Centre for Tropical Marine Research, Bremen, Germany*

*E-mail: nguyentacan@gmail.com

Received: 29 September 2020; Accepted: 19 December 2020

©2020 Vietnam Academy of Science and Technology (VAST)

Abstract

The East Sea and its resources play a crucial role in Vietnam's 2030 and vision to 2045 development agenda. This new “marine economy” model brings with its enormous opportunities, but also challenges that need to be address for its effective implementation especially under the complex geopolitical situation in the East Sea. Based on information from the last three decades, this paper describes the status and potential of marine economic sectors in Vietnam and suggests steps to maximize benefits and towards a sustainable development. It outlines options for responding to the challenges at national, regional and international levels. They include: (i) Coordination of coastal and marine economic sectors, integrated ecosystem - based management practices, and a broad consensus among Vietnamese public, (ii) Mutually beneficial cooperation for the development of marine economic sectors and programs among ASEAN countries, and finally, (iii) Compliance with international law and conventions. Such an approach will contribute to a harmonious and sustainable use of the East Sea for the benefit of the people in ASEAN nations, and of the world at large.

Keywords: East Sea, marine economy, sovereignty, governance, sustainable development, integrated management, ecological security, international cooperation, harmonious development.

INTRODUCTION

Humans are currently going through a period of development characterized by the growing impact of climate change, an apparent weakening of globalization of economies, and the fast - paced societal changes driven by the Fourth Industrial Revolution (FIR). At the same time, the continuing challenge of supporting and sustaining the lives of an increasing global population and the search for new sources of raw material and energy result in competition among nations with the potential for conflicts. The process of “globalization” and the transition to “industrial economy 4.0” have however, also enabled progress in science and technology providing tools to explore new realms and resources, and to apply innovative solutions to confront the prevailing and emerging challenges. It is in this overall context that our renewed interest in the Ocean, and the recognition of its strategic role for development, particularly by the developing countries, is to be seen. There is now global consensus for the argument, considering “The 21st century is the century of the ocean”, the future economy is the “ocean economy” [1].

Vietnam is responding to these challenges by modifying its growth model and restructuring the economy, including what is called “marine economy”, towards sustainable development, adapting to climate change, and linking growth with social equity, poverty reduction and environmental protection using monitoring and evaluation indicators that include: Human development index (HDI), environmental sustainability index (ESI), efficiency of investment capital (ICOR). During the last two decades, the country has taken major steps and policy decisions towards a national development strategy based on the ocean [2], and more recently, as a contribution to achieving sustainable development goals in UN Development Agenda 2030 [3]. These steps and decisions usher in a new phase of Vietnam’s development by “reaching out to the great sea, connecting mainland to the ocean in the pursuit of prosperity”. Obviously for Vietnam, the ocean-based development is tantamount to the development of the East Sea to maximize benefits from its resource potential.

The East Sea is characterized by more than 20 typical tropical marine ecosystems rich in diverse resources of critical functional and strategic values for economic, social and environmental development [4–8]. Based on its geostrategic and economic advantages, Vietnam is transforming and developing a marine economy in the East Sea [9] integrating and improving policies, institutions and laws in management to enable harmonious development, according to its long-term development principle: “Lessons and experiences from the world and drawing on the resources, wisdom and national identity of Vietnam”.

For the implementation of a harmonious East Sea-based development strategy however, Vietnam like many of its counterparts in the developing world, faces many challenges in as varied fields as science and technology, education, public policy, security, and regional, and international cooperation and diplomacy [10]. At home, it requires consensus on policies on economic and social development involving all segments of society. This paper addresses these challenges by presenting the status of ocean-based economic development, “marine economy” during the last three decades (1990–2020) based on perceptions, development trends, opportunities and best practices extracted from domestic and international publications [11–24] using appropriate methods¹ [25–34]. The focus is on the development of marine economy in Vietnam, the basis of which is the East Sea.

PERCEPTIONS OF MARINE ECONOMY²

¹ Review method, Systematic and integrated approach, Access to history, Multi-sector and inter-regional approach, Access to objective laws, Practical approach, Traditional approach.

² Economy is a concept that refers to all the daily and long-term activities of human society based on the laws, rules and standards of conduct, and overall settlement of relationships in the production process and social reproduction, in order to improve people’s living conditions. Economics is related to “rice, clothes, money”. The content of the research focuses on the most effective way to allocate scarce resources for different selected goals. Usually resources are divided into three categories: Capital,

Due to Ocean's rich resource reserves, diverse ecological functions and services as well as abundant "renewable" energy, it has a preeminent role in the "ecologicalization" of the economy, a modern marine economy [35–37]. The marine economy in the past has been a continental economy (agricultural economy) extending to the sea and ocean. The scientific theoretical background of the "continental economy" also formed the basis for developing strategies and policies for ocean exploitation and use. In essence, traditional marine economy includes all economic activities taking place at sea (in the narrow sense: pure sea economy) and land-based economic activities related to marine exploitation (according to broad meaning) [38–43]. This is an economy based on the resources of sea, ocean, island and coastal area but according to the "continent" thinking; the "agricultural" thinking has changed a little [44].

Although there is still no agreed definition [45, 46], today all modern economists [47] say: "Marine economy is general industrial, interdisciplinary activities that take place at sea, receive output products from the sea, and provide inputs to the sea that are technologies, science - engineering, services, management policy, development, according to dialectical relationships". Marine economy has the following basic characteristics: Science and technology, financial potential, maritime security, diplomacy, and especially new perceptions and thinking. It brings many benefits [22, 23, 34, 37]: political, economic, social and national security [33, 35, 48, 49]. It

labor and resources. That is, based on the available but "limited" space and resources, human society must find ways to answer three questions: "What to produce? How to produce? And to produce for Whom?" [23]. The history of development shows that economies are always moving to improve, from natural economies with dispersed energy structures, to industrial economies with artificial energy sources and currently, it is gradually shifting to a modern ecological economy, with an integrated and renewable energy structure based on highly developed intelligence, capable of overcoming (the "existences"), "weaknesses", "shortcomings" of the previous economies [42, 44].

is estimated that there are 15 main sectors^{3,4} [1, 22, 23, 47] with a value added (GVA)⁵ of about 1.5 trillion USD equivalent to 2.5% of the total world GVA in 2010 [23, 47]. Generally, marine economy has an annual turnover of about 1–3 trillion USD, accounting for about 2–15% of the total world economic value [22, 47]. The total value of ecological functions and services (climate, water, soil, nutrition,...) from marine ecosystems is estimated at about 21 trillion USD/year [1, 22, 37].

Depending on their potential, many countries focus on developing specific sectors of marine economy such as "information" economy⁶, renewable energy from wind, waves and tides; deep-sea mineral exploitation; marine biology and biotechnology; develop environment-friendly maritime transport including ship building; sustainable fisheries and aquaculture ensuring food safety criteria.

³ The sectoral scope of the ocean economy varies considerably by country. The number of categories chosen can range from 6, as in the case of the United States, to 33 in the case of Japan. Some industries may be excluded from the ocean economy in one country but not in another. Moreover, there are significant differences among countries in the delineation of the classifications and categories used. Internationally agreed definitions and statistical terminology for ocean-based activities do not yet exist [45].

⁴ Such as: Capture fisheries; Marine aquaculture; Seafood processing; Shipbuilding; Offshore oil and gas (shallow water); Maritime safety and surveillance; Marine manufacturing and construction; Marine biotechnology; Maritime and coastal tourism; High-tech marine products and services; Marine business services; Marine R&D and Education; Dredging; Renewable energy; Undersea cables (not including national defense economy).

⁵ Gross Value Added (GVA) is a measure of the increase in the value of an economy due to the production of goods and services,... GVA plus taxes (minus subsidies) on products equal to gross domestic product (GDP).

⁶ With the advent and rapid expansion of information and communication technology (ICT) in the second half of the 20th century, the notion of the "information economy" became a household name [47].

Successful development of the marine economy sectors however is strongly dependent on advances in science and technology [47] and national capabilities in their application. Furthermore, it is subject to several global scale problems such as unsustainable fisheries; global climate changes and ocean acidification; pollution and waste [5, 14, 50]; loss of habitat, loss of biodiversity, alien species as well as governance problems associated with ocean's large three-dimensional space, which accounts for two-thirds of the earth's area. More importantly, their resolution requires efforts beyond national policies and jurisdiction, adding a new dimension to marine economic development.

ROLE OF EAST SEA IN VIETNAM'S ECONOMY

The marine economy in the East Sea contributes directly to the Vietnamese economy, including traditional activities, such as exploitation and processing of oil, gas and minerals; seafood extraction, farming and processing; marine tourism and island economy; marine defence/maritime security/defence industry; activities associated with the development of coastal urban areas in special economic zones, industrial parks and export processing zones [13, 17, 23]. Economic value of marine and coastal areas of Vietnam, developing relatively rapidly in the past 20 years (1995–2017), increased to 2–3 times to that of the value of marine and coastal economy of Vietnam in 2008. It is estimated that in 2000 it represented about USD 52–53 billion USD, accounting for 47–48% of the country's GDP [23, 28, 51]. In about 15 years, in 2016–2017, it increased to about 175–196 billion USD and accounted for 78–88% of the GDP (2016–2017) [51, 52]. Among the marine economic sectors, the contribution of the sea-based economic sectors accounts for 98%, mainly oil and gas exploitation, seafood extraction, maritime transport and seaport services, and marine tourism [23, 52]. In developing a number of marine economic sectors in the East Sea, Vietnam attaches great importance to international cooperation, for example: (1) Cooperation with Russia in oil

and gas exploitation, mainly joint ventures with foreign countries and exporting 100% of products; (2) Seafood sector with a large export turnover, about 9 billion USD (in 2018); (3) Tourism industry, especially marine tourism. In 2019, the Vietnam Tourism industry welcomed more than 18 million international visitors (an increase of 16.2% compared to 2018), served 85 million domestic tourists, with a total revenue of about 33 billion USD. As a result, Vietnam is considered as one of the 10 countries with the fastest growth in tourism worldwide⁷; (4) The major ports - the gateway to trade with foreign countries. According to Vietnamese economists, shipping industry, including the seaport system, is the driving force for economic development in the region. The Vietnamese port cluster has the advantage of being close to one of the largest sea routes in the world, in local raw materials, with abundant labor. The expansion of ports in this region also facilitates the development of tourism and other related services. However, due to poor management and spatial development planning, Vietnam's seaport economy is facing difficulties related to infrastructure, linkages - logistics, and the uncompetitive way of operation. The quota of goods through the port per capita is extremely low compared to other countries in the region [19]. Economists estimate that every year, local maritime service business units lose up to USD 6–8 billion in revenue from logistics to foreign partners⁸ [19]. In addition, the impact of marine

⁷ The tourism economy has been occupying an important position in the development strategy of each country. For Vietnam, the benefits of the tourism industry are huge, not only in terms of contribution to GDP, job creation, poverty reduction, but also a way to connect - exchange culture, promoting the image of the country and people of Vietnam (Doan Thi Trang - Finance magazine, August, 2019).

⁸ In Vietnam, logistics is both invested by the Vietnamese state and invested by foreign companies, and due to poor management, foreign companies earn more than \$ 6–8 billion in profits annually compared to Vietnam, so economists [19] believe that the goods located in Vietnam's logistics business have lost 6–8 billion USD to foreign hands.

economic development on the ecological and social environment is also a critical issue that needs attention.

Experts' opinion based on surveys, interviews and use of Gutman model [53] ranked their initial perceptions of the importance, role and impact of several marine economic sectors in the development process is given in table 1. Information on table 1 shows, that most experts do not appreciate the economic sectors of mining, construction materials and shipbuilding.

ECONOMIC VALUE OF EAST SEA RESOURCES⁹

The economic evaluation of marine and island resources aims to assess and quantify monetary and non-monetary values of natural systems in relation to the political, economic and social systems [51–55]. However, here is an urgent need in policy making and planning for development, conservation and protection towards sustainable development of coastal areas, seas and islands. Economic assessment of natural resources has been carried out since the 50s of the twentieth century, with Gordon's (1954) and of world ocean ecosystem values by Costanza et al., [56]. Up to now, the methods of assessing the economic value of natural resources and environment in Vietnam have only focused on traditional groups, such as market prices, travel costs, and services and not taken into account their functional value and

⁹ In terms of academics, the environment ensures the quality of life, while the resources are the values of the environment useful for social development and prosperity. The types of resources that have been, are and will be exploited, used to create "goods", "wealth" and meet the diverse "needs" of people, of society are often called "resources" for the maintenance of social existence and prosperity. Much of the value of resources is usually measured with the dimension of "currency", acting as the "source of capital" of the country. This is the classic perception, common, often mentioned in the process of development management: resources are all that can sustain the existence and development of human society in the past and present and the future [52–54].

ecological services. It should be noted that the functional value of natural and social systems is several times higher than their natural value [55, 57, 58]. The results of initial evaluations of the East Sea resources are given in table 2.

It is difficult to determine the "objectivity" of the resource values in table 2. According UNEP and other reports [54, 58], they are probably only 50% of the total value. Because of the enormous diversity of activities exploiting natural ecosystem resources the actual values have not been inventoried and evaluated.

Detailed overview, analysis and evaluation of economic resource economic values, shows:

For coral reef ecosystems, economic values are dependent on the geographical location and the prevailing socio-economic characteristics in their distribution area. Globally, the economic value of coral reefs is estimated at an average value of about 1,000–6,000 USD/ha/year [57, 58]. The value obtained from tourism per 1 ha of coral reef ranges from 7 to 1,110 USD/ha/year. Southeast Asia has a coral reef area of about 10,000,000 ha (accounting for 35% of the world's coral reefs), with the highest diversity in the world, about 450 species in Philippines coral reefs. In Indonesia, tourism is a major coral use industry, estimated to be worth US \$ 0.01 million/ha. Vietnam has a total coral area estimated at 111,200 ha, with 350 species of coral [57–59]. The results of calculation of economic cost were performed for 28 seagrass beds with an area of 50 ha or more with a total area of 8,660 ha, worth a total of about 35 million USD, an average of about 4,000 USD/ha [59]. On the basis of the results of the assessment of the economic value of seagrass beds in Thuy Trieu lagoon (Khanh Hoa province), although not taking into account all kinds of products, is of about 9,900 USD/ha/year (Nguyen Xuan Hoa (2003), according to [59]). Random assessment and quantification have shown the conservation value of Tam Giang - Cau Hai lagoon system (TG-CH), Thua Thien-Hue province to be more than 253,000 USD/year.

The indirect use value of seagrass beds in Tam Giang - Cau Hai lagoon as seeding and

spawning grounds is estimated at 325,633 USD and the environmental treatment value is over 407,000 USD (Tran Huu Tuan (2002), according to [59]). Using a market-based

approach, estimating the direct use values of wetland products in Ca Mau province was 345 US\$/ha/year (Do Nam Thang, Jeff Benett (2005), according to [59]).

Table 1. Information matrix on the economic role, social efficiency and adverse environmental impacts of some marine economic sectors according to the expert poll (on a scale of 100, processed according to the Gutman model) [53]

Marine economics and revenue (billion USD)	Role economy (A)	Efficiency society (B)	Adverse Effect on Environment (C)	Total G = A + B - C	Sort priority level selected
Seaport 1.2 billion USD [53]	89	85	20	154	2
Seaport 1.2 billion USD [53]	82	67	36	113	5
Ship building 0.195 billion [53]	15	12	40	-13	11
Oil and gas (64% of marine GDP) ¹⁰ 6 billion	90	95	30	155	1
Tourism & relaxation 22.6 billion [53]	65	70	17	118	4
Marine fish and seafood 3 billion [53]	85	75	10	150	3
Aquaculture	70	75	40	105	6
Processing seafood	70	45	45	70	7
Waste treatment	17	8	5	20	9
Reclamation	15	20	8	27	8
Mining and building materials	10	15	35	-10	10

Table 2. Resource value assessment of marine ecosystems in Vietnam and the East Sea [55, 58]

Ecosystems	Total value of goods (USD/ha) (1)	Total service value (USD/ha) (2)	Total value (USD/ha) (1+2)	Total surveyed area (ha) (3)	Total economic value (USD/ha/year) (1+2) × (3)
Mangroves	453.95 (1,584.97)* (28.64%)**	Not yet confirmed concentration	453.95 (2872.25)* (15.88%)**	156,608 (1,809,136)* (8.66%)**	71,092,201 (5,196,296,711)* (1.4%)**
Sea grasses	582,36 (712.38)* (82.0%)**	1,678.77 (469.21)* (357%)**	2,261.13 (1,181.59) (191%)	8,940 (73,769)* (12%)**	20,214,502 (87,164,402)* (23%)**
Coral reefs	Not yet confirmed concentration	964.17 (1,408.97)* (68%)**	964.17 (1,542.56)* (63%)**	110,000 (750,307)* (15%)**	106,058,248 (1,157,393,756)* (9.1%)**
Wetlands	1,442.05 (167.00)* (863%)**	1,227.94 (128.15)* (958%)**	2,670.00 (295.15)* (904%)**	392,416 (4,201,145)* (9.3%)**	1,047,749,247 (1,239,956,427)* (84%)**

Notes: Seven countries surrounding the East Sea participated in the evaluation project: Cambodia, China, Indonesia, Malaysia, the Philippines, Thailand and Vietnam; *:Total economic value of goods (1) and services (2) of the 7 participating countries; **: The ratio % of Vietnam’s coastal economic value to the average value of the 7 countries.

¹⁰ Total oil and gas exploitation output in 2018 reached 23.98 million tons of oil, exceeding 5.0% of the year plan. Nitrogen fertilizer production was estimated at 1.63 million tons, exceeding 5.7% of the year plan. Total revenue was estimated at 626.8 trillion VND, exceeding 96 trillion VND, equivalent to 18.1% of the year plan, up 25.9% compared to 2017. State budget payment is estimated at 121.3 trillion VND, exceeding 47.5 trillion VND, exceeding 64.3% of the year plan, up 24.3% compared to 2017 (according to Vietnam Energy, January 14, 2019).

Coastal areas of Vietnam are places of dynamic economic development and high population density¹¹ and growth rate. Along the coast there are 12 major cities, hundreds of fishing berths and about 238,600 industrial production facilities and establishments [17, 23, 52]. Tourism, service sector and urbanization are on the rise. Up to now, 15 major fishing grounds have been identified. Along the coast, there are more than 37,000 hectares of wetland areas of all kinds capable of cultivating salt-brackish water aquatic products, especially farming specialties such as shrimp, crab, seaweed [23, 27]. In the larger sea area of Vietnam, 2.78 million square kilometers, up to 500,000 square kilometers are located in oil and gas prospective zones [23, 52]. The oil and gas reserves off the coast of South Vietnam can account for 25% of the bottom oil reserves of the East Sea [23, 52]. In addition to oil and gas, Vietnam's seabed also has many precious minerals such as tin, titanium, zircon, quartz, aluminum, iron, manganese, copper, nickel and other rare earths [60]. Along the coast there are more than 100 seaports, 48 pools, bays and over 114 estuaries and creeks empty into the sea [23, 61]. Along the Vietnamese coast, there are more than 6 out of 7 world natural and cultural heritages recognized by UNESCO located in coastal provinces (Quang Ninh, Quang Nam, Thua Thien-Hue, Quang Binh) [62]. 125 beaches and with marine recreational tourism accounting for more than 70% and attracting more than 80% of foreign tourists provide favorable conditions for further development [2, 47].

CHALLENGES OF SUSTAINABLE GOVERNANCE OF EAST SEA

The overall goal of the governance of the East Sea should be to maximize economic, environmental, social, cultural benefits and

¹¹ The value of residence and settlement is convenient for life, on average 1 km² there are 35–40 people, but now overloaded, the urban population nationwide is about 33 million people, the urbanization rate reaches 37% (23.7% in 1999) with an average urban density of 1,888 people/km², much higher than the world standard [23].

conservation¹² for the riparian nations while maintaining the overall security and stability of the regions [12, 23].

Vietnam's East Sea development governance strategy uses an economic growth model focused on productivity growth based on both public and private capital and on innovation and fostering development drivers through broad-based institutional and market reforms¹³. Its primary task is to design integrated, harmonized institutional processes to overcome sector-based governance and the division of power between levels of government in neighboring region bordering on land - sea - island [63, 64]. An effective tool here is a coordinated mechanism that connects coastal and marine economic sectors, different levels of government, stakeholders and the public into the regulatory process [4, 8, 12, 17]. This should focus especially on enhancing the value of using the East Sea by improving transport infrastructure - transportation; development of energy and social and cultural fields, and should go hand in hand with the use of science and technology in the conservation, restoration, regeneration and development of renewable resources as well as in climate change adaptation and environmental protection.

Investment solutions to develop a sustainable economy, protect the environment and marine ecosystems, islands, archipelago are

¹² The results of the analysis of costs, benefits and economic significance of the action program to protect 30% of the land and sea area in the world, according to the 2020–2030 plan (currently only 15% of land and 7% of sea is protected). Investment costs are at least US\$ 140 billion per year (currently only 24 billion). Economic output will increase from 64 billion US\$ to 454 billion US\$ per year by 2030 (rate of return on investment is 5/1). In addition, protection of forests and mangroves could prevent economic losses from climate change amounting to US \$ 534 billion per year by 2050 (Conservation International, July 10, 2020).

¹³ General opinions and comments of World Bank experts at the launching ceremony of the report "Dynamic Vietnam creates the foundation for a high-income economy" held on May 27, 2020 in Hanoi.

important and should be given priority consideration. However, they alone cannot achieve the sustainable development of the East Sea [33, 48]. This requires strategies that are also consistent with social and cultural norms, and in compliance with international laws and conventions. This requires the participation of the ASEAN community in the formulation and implementation of development governance.

Undeterred access to and the exploitation of East Sea resources are prerequisites for achieving the development goals (strategic vision) of Vietnam [2] and the broader Southeast Asia region and the ASEAN countries. Vietnam understands the dynamic nature of the marine environment and the prevailing high transboundary connectivity in the distribution of resources and its role in sustaining ecosystems [65]. It also recognizes the conflict potential; a profound historical lesson over more than 1000 years of existence and development in Vietnam has been that economic development and sovereignty protection are two sides of the same problem, related, closely linked requiring patient, long-term work [2, 66–68]. There is the need for orderly management and sustainable use of sea and island spaces to ensure energy and ecological security, environmental protection and conservation of heritage and biodiversity, and last but not least, maritime security [23, 48, 63]. This is especially critical to strengthen peace and stability in the region in the current complex and somewhat tense and uncertain geopolitical context.

Informed management methods, which comply with international conventions and treaties, international law in the exploitation of sea, islands and deep-sea areas in the East Sea and the adjacent coastal areas, need however a strong scientific foundation based on regional, cooperative, multidisciplinary investigations (the strategic direction is the implementation of management, prevention, adaptation, and mitigation programs). Vietnam has many potentialities and advantages in terms of geostrategic, geopolitical and marine economy, “so it is very urgent not just to have a military strategy but also it is very urgent to increase the awareness of the domestic and the broader

international community to “understand and deeply understand” the issues at stake in the East Sea”¹⁴. Vietnam must actively pursue its interests both regionally through ASEAN, and internationally through UN Fora striving towards resolving any potential disputes on the basis of UNCLOS [69].

In the immediate future, Vietnam could initiate actions to promote greater ASEAN international cooperation in maritime science and technology to stimulate innovation and enhance sustainable development of the marine economy [9, 35, 47]. Specifically, ASEAN countries could support each other in the field of education, exchange information and advice on national and regional policies; provide assistance in the development and implementation regional marine programs and for the implementation of international agreements related to the protection and conservation of oceans and seas. Some of these actions related to policy, research and management include:

Strengthening the implementation of policies for development of maritime clusters in ASEAN.

Establishing the East Sea - ASEAN information network to exchange views and experience in the establishment of Centers of Excellence for education, and research, incubators for innovation and other renewal bases in the field of transdisciplinary maritime technology and to improve technology news sharing among ASEAN countries at different levels of development.

Enhancing integrated ecosystem-based coastal and marine management, in particular this will involve greater use in integrated management, to establish information systems, exchange knowledge, experiences and best practices in ASEAN.

- Stepping up efforts to assess economic efficiency of ASEAN public investment in marine research and observation.

¹⁴ Dang Minh Thu, 1998. Sovereignty over the two archipelagos of Hoang Sa and Truong Sa. Paper read at the Summer Workshop “The issue of disputes in the South China Sea”, New York City, August 15–16, 1998. 62 p.

Especially for the development of marine economy, countries and regions might also need a new breed of ocean professionals who are sensitive to the trans-boundary nature and conflict potential of the involved issues, who can advise on building consensus in policy making at national, regional and global levels based on international conventions and treaties [70–73]. There is an overall need to strengthen capacity building towards a modern vision of the marine sector. This includes the capability to assess emerging, and potential future changes of industries in the Sea, and to further develop ASEAN’s current scientific capabilities to advance marine economic development in the region and beyond.

CONCLUSIONS

Ocean plays a critical role in Vietnam’s development agenda 2030 and vision to 2045. In response to the challenges of 21st century, Vietnam is modifying its growth model to include an East Sea-based economic development or “marine economy”. Lessons learned in other parts of the world on marine economy, and assessments of the status of East Sea resources show their enormous potential to bring benefits to the people. The implementation of the marine economic development strategy however brings many challenges at national and international levels. Addressing them at a national level requires a certain degree of preparedness that will contribute to enhancing the value of East Sea resources by improving energy and transport infrastructure, development of social and cultural fields, as well as promote their sustainable use and management with adequate consideration for climate change adaptation and environmental protection. Another challenge under the current tense and complicated geopolitical situation is ensuring undeterred access to East Sea resources, which form the backbone of Vietnam’s development agenda. Given Vietnam’s many geostrategic, geopolitical and marine economic potentialities and advantages, it can create awareness for the preeminent role and relevance of East Sea for its marine economic development agenda, and its importance in achieving UN’s Sustainable

Development Goals (SDGs). It can do so regionally through ASEAN, and internationally through the UN Fora. The aim should be to strengthen the governance of sustainable economic development of the East Sea based on science and technology, international law and conventions as well as regional and international cooperation.

REFERENCES

- [1] IOC, IMO, FAO, UNDP, 2011. A blueprint for ocean and coastal sustainability. *UNESCO, Paris*.
- [2] Resolutions no. 09-NQ/TW dated Feb. 9, 2007 on “Vietnam’s maritime strategy to 2020” and Resolution no. 36 NQ/TW, dated Oct. 22, 2018, on “Sustainable development strategy of the Vietnam’s sea economy to 2030, with a vision to 2045”.
- [3] Decision No. 622/QĐ-TTg dated May 10, 2017 on “National action plan to implement the 2030 agenda for sustainable development”, and Resolution 26/NQ-CP dated Mar. 05, 2020 on “Marine economic development plan”, with major orientations and groups of tasks - specific implementation solutions.
- [4] Nguyen Tac An, G. Lindsey, 1999. Indicator system for coastal management of Vietnam. *Journal of Scientific Activities*, 7, 105–108. (in Vietnamese).
- [5] Nguyen Tac An, V. Ittekkot, 2005. Emerging problems of coastal environment of VietNam. *Proceeding of USA - Vietnam workshop on Water pollution prevention technologies. Hanoi, Nov. 15–18, 2005*, pp. 295–301.
- [6] Vu Huu San, 2007. Geography of the East Sea with Hoang Sa - Truong Sa. *Young Publishing House*.
- [7] Bojo, J., 2011. Vietnam development report 2011: natural resources management (No. 66634, pp. 1–163). *The World Bank*. URL: <http://documents.worldbank.org/>.
- [8] Nguyen Tac An, 2010. Intergovernmental Oceanographic Program with the Development of Vietnam in the East Sea. *Journal of Scientific Activities*, pp. 57–58. (in Vietnamese).

- [9] Nguyen Tac An, 2012. Development of “Blue-Green economy” in Vietnam: Issues and Prospects. *Vietnam- Korea forum, Ho Chi Minh city, 22/2/2012*.
- [10] Zahuranec, B. J., Ittekkot, V., Montgomery, E., (Eds.), 2014. Science and technology diplomacy in developing countries. *NAM S&T Centre, Daya Publishing House (a division of Astral International Pvt. Ltd.), New Delhi, India*.
- [11] Nguyen Tac An, 2000. 70 years of mobilizing ocean science and technology forces to participate in the development of coastal areas, islands and East Sea.
- [12] Nguyen Tac An, 2012. National committee of intergovernmental oceanographic program (IOC VN) for the development and stability of Vietnam in the East sea. *Proceedings of UNESCO Vietnam National Committee “35 years of operation and development, 1977–2012”*, pp. 75– 81.
- [13] Nguyen Tan Trinh, 1996. Fishery resources of Vietnam. *Fisheries Department*, 614 p.
- [14] Nguyen Tac An, 2004. Immediate economic ecological problems of Vietnam’s coastal waters. *Vietnam Sea Magazine*, 10, 6–9.
- [15] Nguyen Tac An, V. Ittekkot, Vo Duy Son, Phan Minh Thu, Nguyen Huu Huan, 2000. Tracing sediment transport and bed regime in Nha Trang bay. *Collection of Marine Research Works - Special issue on the occasion of 70th establishment anniversary of the institute of oceanography. Science and Technique Publishing House*, 10, 63–69.
- [16] Nguyen Tac An, V. Ittekkot, 2001. Causes and consequences of the degradation of the resources and environment in the typical coastal ecosystems of Vietnam. *Proceedings of DAAD/BMBF-ZMT meeting, Purwokerto, Indonesia, Mar. 26–30*.
- [17] Bui Tat Thang, 2007. On Vietnam’s strategy for marine economic development. *Economy and Forecast Review*, No. 7.
- [18] World Ocean Council, 2010. URL: <http://www.oceancouncil.org/site/faq.php> 20.
- [19] Ngo Luc Tai, 2012. Vietnam’s marine economy on the way of development and integration. *Ho Chi Minh city General Publishing House*.
- [20] Nguyen Anh Tuan, 2013. World economic development trends to 2030 and issues posed to Vietnam’s international integration. *Magazine of International Research*, 9/2013.
- [21] WWF, 2015. Reviving the Ocean Economy, 23/4/2015.
- [22] WOA, 2016. World Ocean Assessment I, United Nations, 1752 p.
- [23] Nguyen Tac An, Phan Minh Thu, Nguyen Thanh Van, Tong Phuoc Hoang Son, 2017. Economic governance and development in the East sea. *Publishing House for Science and Technology, Hanoi*, 260 p. (in Vietnamese).
- [24] FAO, 2020. The State of world fisheries and aquaculture. URL: <http://www.fao.org>.
- [25] Kimball, L. A., 2001. International Ocean Governance: Using International Law and Organizations to Manage Marine Resources Sustainably. *IUCN-The World Conservation Union*, 123 p.
- [26] Nguyen Tac An, Venu Ittekkot, 2006. Ecological basis of coastal zone management in Viet Nam. *Presentation on International Meeting of ACEMON. Coastal Marine Ecosystems and Their Management, Phuket, Thailand, Sep. 25–28, 2006*, 12 p.
- [27] Nguyen Tac An, 2007. The status and policies on exploitation and protection of marine biological resources in Vietnam. *Proceedings of the 11th International Symposium on the Efficient Application and Preservation of Marine Biological Resources, Nha Trang, Nov. 1–2, 2007*, pp. 1–13.
- [28] Nguyen Tac An, 2007. Think about some of the main directions in sustainable marine economic development management. *Proceedings “Sustainable Management and Development of Da*

- Nang Marine Economy*”, *Workshop, Da Nang*, pp. 25–26.
- [29] Nguyen Tac An, 2007. Building the park “Knowledge of the East Sea” to create attractive and competitive sightseeing products in economic and cultural development in the city Danang. *Workshop proceedings “Sustainable Management and Development of Danang Marine Economy”*, pp. 6–13.
- [30] Nguyen Tac An, Huynh Phuoc, 2007. The project “Solutions for sustainable management and development of some important marine economic sectors in Da Nang city”. *The 3rd East Sea Conference*, 12 p.
- [31] Nguyen Ngoc Truong, 2011. The East Sea chess game under a geostrategic perspective. *SGTT 12/8/2011*.
- [32] Townsend-Gault, I., 2011. Contribution of seminars on the East Sea - The importance of a functional approach. *East Sea Studies*, 17/3/2011.
- [33] Nguyen Chu Hoi, 2016. Environmental Security and Peace in the East Sea. *Information - Communication Publishing House*.
- [34] Waldron, A., Adams, V., Allan, J., Arnell, A., Asner, G., Atkinson, S., Baccini, A., Baillie, J., Balmford, A., Beau, J. A., Brander, L., Brondizio, E., Bruner, A., Burgess, N., Burkart, K., Butchart, S., Button, R., Carrasco, R., Cheung, W., ... Zhang, Y., 2020. Protecting 30% of the planet for nature: costs, benefits and economic implications. *Campaign for Nature*. <http://pure.iiasa.ac.at/id/eprint/16560/>.
- [35] Suvorov, A. V., 1999. Marine ecogonomics: the ecology and economics of marine natural resources management. *Elsevier*.
- [36] Fausold, C. J., and Lilieholm, R. J., 1999. The economic value of open space: A review and synthesis. *Environmental Management*, 23(3), 307–320.
- [37] Simcock, A., 2017. World Ocean Assessment. *Cambridge University Press*.
- [38] Nguyen Tac An, Nguyen Van Luc, 1992. Marine shrimp farming technology and environmental management. *Science and Technics Publishing House*, 44 p. (in Vietnamese).
- [39] Nguyen Tac An, Truong Sy Ky, Ngo Van Toan, 1994. Fish cage culture techniques. *Agriculturale Publishing House*, 55 p. (in Vietnamese).
- [40] Nguyen Tac An et al., 2003. Sustainable shrimp farming: A tool for managers and planners. *Book from project “A sustainable environment for shrimp farming in the Mekong Delta, Vietnam”*. *Nha Trang*.
- [41] Nguyen Tac An et al., 2003. Economic management of shrimp farms. *Book from project “A sustainable environment for shrimp farming in the Mekong Delta, Vietnam”*. *Nha Trang*.
- [42] Nguyen Tac An, 2007. Some main orientations on sustainable marine economic development management. *Proceedings “Vision of marine economy and development of Vietnam’s fisheries”*, *Hanoi, 12/2007*, pp. 65–72.
- [43] Nguyen Xuan Thu and Bui Tat Thang, 2012. Vietnam’s marine economic development - Current status and prospects. URL: <http://dangcongsan.vn/cpv/Modules/News/NewsDetail.aspx?>
- [44] Tran Dinh Thien, 2016. Regarding Vietnam’s marine economic strategy. URL: <http://www.vasi.gov.vn>. (in Vietnamese).
- [45] Park, D., Seo, K., Kildow, D., and Judith, T., 2014. Rebuilding the classification system of the ocean economy. *Journal of Ocean and Coastal Economics*, 2014(1), 4. <https://doi.org/10.15351/2373-8456.1001>.
- [46] Hoang Thanh Nga, 2018. Marine Economics - Concept and Classification Approaches in the World and Vietnam. *Science & Technology Development Magazine: Specialized in economics - law and management*, 2(1), 49–58.
- [47] Organisation for Economic Co-Operation and Development (OECD), 2017. The Ocean Economy in 2030. *IWA Publishing*.
- [48] Nguyen Tac An, Tran Cong Huan, Pavlov, D. S, Nhezdoli, V. K., 2008. Integrated Approach to management of

- tropical marine ecosystems towards eco-security in Vietnam. *Proc. of Environment and Human Health-Ecoforum, Saint-Petersburg, Russia, July 1–4, 2008*, pp. 409–410.
- [49] Du Van Toan, 2013. Features “Power of the sea” in the world and proposed to Vietnam. *Journal of International Research*, 94.
- [50] Nguyen Hong Thao, 2003. Marine environmental pollution in Vietnam, law, practice. *Statistical Publishing House, Hanoi*, 270 p. (in Vietnamese).
- [51] Ngoc Hien, 2008. Vietnam’s marine economy: current situations and challenges. URL: <http://www.vnmedia.vn/newsdetail.asp?NewsId=157527&CatId=26>.
- [52] VASI, 2018. State of Oceans and Coasts, brief Vietnam. *The East Asian seas congress, Iloilo, Philippines, Nov. 27–30, 2018*.
- [53] Nguyen Tac An, 2007. Sustainable management solutions for some important marine economic sectors in Da Nang city. *Project summary report, IOC VN, City People’s Committee. Da Nang*, 98 p.
- [54] UNEP, 2007. Procedure for Determination of National and Regional Economic Values for Ecotone Goods and Services, and Total Economic Values of Coastal Habitats in the context of the UNEP/GEF Project Entitled: “Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand”. South China Sea Knowledge Document No. 3. UNEP/GEF/SCS/Inf.
- [55] UNEP-WCMC, 2011. Marine and coastal ecosystem services: Valuation methods and their application (Tinch, R., Mathieu, L., (eds.)). *UNEP-WCMC Biodiversity Series*, No. 33, 46.
- [56] Costanza, R., d’Arge, R., de Groot, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O’Neill, R. V., Paruelo, J., Raskin, R. G., Sutton, P., and Belt, M. V. D., 1997. The value of the world’s ecosystem services and natural capital. *Nature*, 387(6630), 253–260. <https://doi.org/10.1038/387253a0>.
- [57] Vo Si Tuan, Nguyen Huy Yet, Nguyen Van Long, 2005. Ecosystem of Vietnam’s marine coral reefs. *Science and Technics Publishing House, Ho Chi Minh city branch*, 212 p.
- [58] Tuan, V. S., and Pernetta, J., 2010. The UNEP/GEF South China Sea Project: lessons learnt in regional cooperation. *Ocean & Coastal Management*, 53(9), 589–596. <https://doi.org/10.1016/j.ocecoaman.2010.06.011>.
- [59] Lan, T. D., 2013. Quantitative approach to sustainability assessment of the use of coastal ecosystems. *Vietnam Journal of Marine Science and Technology*, 13(2), 178–185.
- [60] Nguyen Tac An, 2020. Regarding the exploitation of deep sea resources in the East Sea. *Science and Technology of Vietnam*. URL: <http://vjst.vn/vn/tintuc/3047/khai-thac-tai-nguyen-bien-sau.aspx>.
- [61] Tra Duc Thanh, 2008. The bays along the coast of Vietnam and potential uses. *Publishing House for Science and Technology*.
- [62] Tran Duc Thanh, 2012. Vietnam’s sea and islands - position resources and typical geological and ecological wonders. *Publishing House for Science and Technology*.
- [63] An, N. T., and Shadrin, N. V., 2008. Integrated coastal zone management in Vietnam: first steps, goals, framework. *Marine Ecological J.*, 7(3), 87–96.
- [64] Ton That Nguyen Thiem, 2016. Humanities and economics: Love and money in business administration. *Youth Publishing House*.
- [65] Danks, F.; Fletcher, R.; McOwen, C.; Scrimgeour, R.; Martin, J.; Thornton, H.; Tittensor, D., and Dunn, D., 2018. Marine connectivity across jurisdictional boundaries: An introduction. *Cambridge (UK): UN Environment World Conservation Monitoring Centre*, 32 p.
- [66] Tran Vinh Du, 2011. East Sea: Economics and Conflict. tuanvietnam.net, date 28/6/2011.

- [67] Le Hong Hiep, 2011. Vietnam's Tyranny of Geography. URL: <http://vietnamnet.vn/> & <https://thediplomat.com>.
- [68] Nguyen Van Kim (Ed.), 2011. Vietnamese people to the sea. *World Publishing House*. URL: <https://openknowledge.worldbank.org/handle/10986/4389>.
- [69] Nguyen Hong Thao, 2020. United Nations Convention on the Law of the Sea UNCLOS and 25 years of implementation in Vietnam. *East Sea Studies*.
- [70] Ittekkot, V., 2017. Enhancing national capacities for sustainable development: the case of oceans, seas and developing countries. In: *S&T Diplomacy and Sustainable Development in the Developing Countries* (Miremadi, T; Arabzai, A. H.; Relia, S. (Eds.)), NAM S&T Centre, Daya Publishing House (a division of Astral International Pvt. Ltd.), New Delhi, India. pp. 107–113.
- [71] Nguyen Duy Nien, 2002. Ho Chi Minh's Diplomacy. *National Political Publishing House, Hanoi*. pp. 139–162.
- [72] Nguyen Tac An, 2011. To boost cooperation and enhance IOC consultative capacity and support for investigation and research in the East Sea. *Proceeding of Workshop "International Cooperation in Investigation and Research of Marine Natural Resource and Environment"*, Hanoi, 15–17 Sept. 2011.
- [73] Nguyễn Tac An, Tran Cong Huan, 2012. Strengthening cooperation and exploiting the international community's ability to advise and support knowledge and technology to improve efficiency in investigation, research, and training of human resources for the development and protection of the East Sea. *Proceedings of Scientific Conference "Cooperation in the East Sea: History and Prospects"*, Da Nang, 12–14 Dec. 2012.