

SUSTAINABLE DEVELOPMENT GOALS IN THE DREDGING INDUSTRY TO BUFFER MANGROVE FORESTS ECOSYSTEMS

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ABSTRACT

Sustainable goals and aims are emerging as a measuring tool to quantify sustainability achievements by various industries and organisations. The dredging industry of Malaysia is not exceptional, dredging activities at coastlines areas are frequent with ports and harbours infrastructure facilities, maintenance and development, and navigational purpose. Dredging can create an enormous impact on mangrove forest's ecosystems and potential damages to marine biodiversity breeding grounds. Conservation issues and challenges to protect mangrove forests are being highlighted however, problems related to dredging activities impact and potential harm lack insights information. The dredging industry's sustainable goals and aims to protect coastal biodiversity and habitats lack research information. Several articles have proposed various standard and specific protection measures on ecological topographies. Solutions to protect from coastal dredging's activities impact remained unclear. The paper stresses the importance of continuous efforts to highlight keys drivers of sustainable goals and sustainability aims of the mangrove forest ecosystems values and benefits to nature and human's well-being. Research initiatives and industrial collaborations are critical to achieving the government's commitment to enhance the sustainable development of forest biodiversity. Sustainable development's obligation also relies on industries, organisations, academia, and the public to preserve nature and human's well-being. A concerted effort to elevate social, environmental, and economic factors to enhance effective sustainable development goals and sustainability indicators enable to buffer the mangrove forests ecosystem. The paper reviews the literature to explore coastal dredging activities impact on mangrove forests ecosystems and to potential sustainable development goals (SDG) and sustainability indicators to gain insight and narratives for future research interests and research initiatives. The article used web resources to support discussions of mainstream literature to provide supporting points on the objectives in the interest of preserving nature and human well-being. This paper adopted a qualitative content analysis approach to pursue the content of communications.

Keywords: Sustainability, sustainable goals, sustainability indicators, mangrove forest, dredging.

INTRODUCTION

Mangrove forests ecosystems are known for their variety of values and benefits to nature and socio-economics. Mangrove forests are considered a productive ecosystem that can provide valuable ecological and socio-economic benefits to Malaysia as well as the coastal communities. In Southeast Asia, Malaysia is recognised as one of the 12 popularly known nations in the world for its mega-diversity (Forest Department of Peninsular Malaysia). Several researchers specialising in the area of marine biodiversity studies have emphasised the values and benefits of the mangrove forests ecosystems and their ability to guard and protect coastlines from damaging winds, waves, and floods. Various policies to protect the mangrove forests ecosystems were implemented, however, the need for policy decision-makers to evaluate and recognise the benefits of the mangrove forest ecosystems benefits to nature and human's well-being rather than converging on monetary profits. The monetary profits should balance the mangrove forests ecosystems values and benefits above financial aids. Effective sustainable goals and aims are critical for the survival of this biodiversity in the future. A well-developed sustainability policy is critical for the future generation, even the implementation is challenging. The paper contributes to the efforts made by the Maritime Institute of Malaysia on coastal marine biodiversity sustainability measures and the Forest Department of Peninsular Malaysia (FDRM) on biological diversity, forest management, and forest biodiversity. The paper stressed the coastal dredging activities potential impact on mangrove forests ecosystems, and the United Nations Sustainable Development Goals (SDG) implementation is significant for the dredging industry to buffer the mangrove forests ecosystems survival in the future.

Malaysia contributes 12 percent of the mangrove area in Southeast Asia, the mangrove area in Malaysia is around 17 percent followed by Sabah 57 percent and Sarawak 26 percent. A recent study by Bakti et al. (2020) highlighted the nation's mangrove forests ecosystems services for human well-being such as fish and non-fish products, timber and non-timber products, medical plants, and dyes. However, the situation is at a critical stage of extinction. The nation's policy decision-makers attention is needed to preserve the nation's marine biodiversity and habitats which are offers ecosystems for economic benefits and growth. The policy decision-makers and maritime stakeholder has a hefty responsibility to protect and conserve the mangrove forests ecosystems extinct in size and areas. The authors' concern is the policy decision-makers perspective over the mangrove forests ecosystems values habitually ignored due to financial benefits and market forces influence. The study by Hemati et al. (2014), also prompted, the nation's mangrove forest factors is in critical condition and considerations from policy decision-makers to intervene to save from extinct in the future is sensible. The authors also highlighted those coastal dredging construction activities has serious implications to the survival of coastal biodiversity breeding ground and habitats, and as well harm the nature and human's well-being. Over the years the development in aquaculture, agriculture, deforestation, and urban land use activities has enormously impacted the coastal marine biodiversity and habitats extinct. The nation's economic growth has also increased the ship's transshipments, ports developments, infrastructure developments, and rural population. This has tremendously contributed

to the coastal ecological topographies. The development and changes in socio-economic have also made the mangrove forests growth extinct. Defacement to coastal marine ecosystems may also create enormous damage to coastal marine protection and increase flooding on adjacent lands (IADC, 2020). Zarina (2016), stressed the mangrove's thickets benefits which can improve water quality by filtering contaminants, trapping residues from land, and reduce coastal corrosion. This is important and informative to realise the mangrove forest's ecosystems natural abilities and benefits it can bring to preserve nature and human's well-being. Damage to the mangrove forest's breeding ground is a loss of marine biodiversity along with economic values and benefits which are pressing issues and ongoing discussion within the maritime and forestry policy decision-makers.

The oceans and seas are the main carbon dioxide sink and, despite the importance, it also affects human activities (Sahabat Alam Malaysia, 2020). Port areas are a multi-user environment with significant natural buffer zones. Any major capital dredging project requires the relocation of enormous quantities of dredged materials that may cause multi-user conflicts, socio-economic effects, and concerns for environmental protection (Rajoo, 2007). Norpadzlihatun and Nikolaos (2014) raised the navigational dredging and material extraction issues, stating the dredging activities are closely related to several ecological factors. Dredging at ports areas also has potential effects on surrounding areas such as turbid plumes, sediments, the release of contaminants, and bathymetric changes (PIANC, 2010). Amir (2018) stated urban development needs land, and it has driven offshore lands covered by water with additional land which is excavated from the sea. These affect the mangrove forests ecosystems either immediately or over a long period and it could be temporary and permanent damage. Thus, coastal areas with mangrove forests ecosystems must be kept unsoiled and frequent maintenance is critical to the coastal marine biodiversity sustainability aims. Even though the mangrove forests ecosystems are undeniably vulnerable to coastal dredging activities. Preservation is a top priority and vital to the mangrove forests ecosystems existence for the future generation.

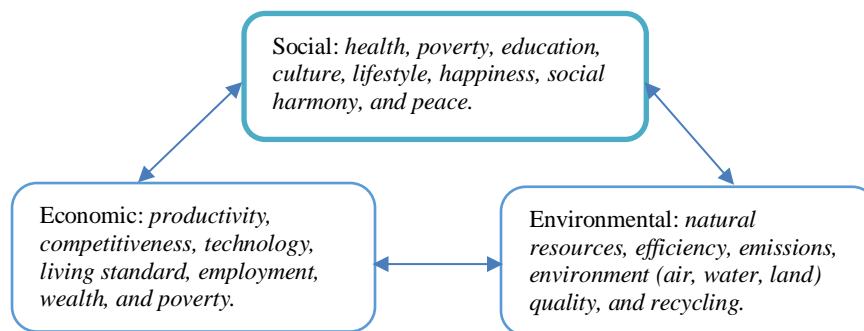
Coastal dredging activities in Malaysia is often considered as a colossal activity for the development of new projects, developing waterways, and regular waterways maintenance to maintain the current facilities and support existing hydrologic features (Fauziah et al., 2019). Dredging activities are navigational dredging and excavating large amounts of sea sand or transporting a considerable amount of sea sands to land to develop infrastructure projects, increase industrial land, deepening navigational channels which can bring constructive to social and economic benefits but damages to a coastal environment specifically the coastal marine biodiversity. According to the International Association of Dredging Companies (IADC), a global organisation for dredging contractors, dredging role is to maintain the land and coastal infrastructure projects e.g. infrastructure and port development, flood protection measures, reclamations, subtraction of deposits, sediments from the bottom of the rivers and harbours. Coastal dredging activities involve navigational maintenance or improve navigation channels deepness for safety passageway of containers vessels and cargo ships, and to maintain the nation's ports and docking zones competitive to influence the benefits of the cargo and competitions. Although dredging is necessary to eradicate deposits and sediments flowing through the rivers from urban and industrial areas, it may frequently contaminate and pollute nearby and surrounding coastal areas. Capital dredging and maintenance dredging may lead to loosening the soil and its substance can contaminate the water and harmful bacteria may create degradation. Shifts in current patterns, accompanying sand removal which have sediments and nutrient loads and introduce pollutants to waterways (National Oceanic and Atmospheric Administration, 2021), may create potential damages to natural mangrove forest's ecosystems. Coastal dredging activities are important for Malaysia ports economic growth, to enable ports to continue generating jobs, allowing for the efficient transportation of goods on a global scale, to boost the nation's economic growth in maritime sectors, and support maritime industries and organisations to achieve sustainable competitive advantage. Concerted efforts and initiatives for well-develop strategies are essential to prevent harm and damages to coastal mangrove forests ecosystems growth.

Frequent dredging activities at the ports, navigational dredging, maintenance dredging, capital dredging, coastal land reclamation, coastal development projects, deepening ports and harbours projects have an enormous impact on the mangrove forests ecosystems. According to Sahabat Alam Malaysia (2020) report, sand mining and reclamations activities can increase significant effects on seabed flora and fauna. Coastal dredging activities can affect the fisher's communities and access to coastal and marine resources, dispossesses marine resources, spaces fishers and coastal communities. Extraction from the sea bottom zone can have an enormous impact on habitats and organisms which eventually affect the composition of biodiversity. Thus, it is practical that dredging activities lead to a decline in infauna biomass and sift in species composition. Coastal dredging projects have the potential to contaminate marine biodiversity and they are highly vulnerable to mangrove forests ecosystems and may damage and decline the marine biodiversity, decline natural swamplands, and the extinction of animals and plants surroundings. These changes may replace various natural habitats and affect the structure of intertidal communities in terms of their sustainability behaviours, which has been a point of discussion (Kate, 2016). Intensification and expansion of human activities into previously inaccessible locations and climate change add concerns to biodiversity conservation and sustainability (Cheryl and Nurul, 2018). The coastal areas also attract migratory species, marine plants, marine animals and the dredging pollutions can have serious inferences. The coastal dredging areas endure serious biological and chemical paraphernalia. According to Norsyihan (2020), coastal reclamation has an extensive impact on marine habitats because of the burial of original biodiversity. Kate (2016), cited the suspended sediments from dredged and deposited sand increase and changes in hydrodynamics patterns and may affect biodiversity. The changes may result during the construction process or completed structure and may affect the vicinity of the projects. A concerted long-term plan to ensure the sustainability measures are adapted continuously and the status of realisation that sustainable development is possible and the best way forward is lacking.

Global dredging industries often stress the implementation of sustainable goals in dredging. It is fundamental to today's global dredging industries sustainability aims to protect the planet, people, and profit growth. The core principles of sustainability are social, environmental, and economic factors. Dredging industries have stated to value sustainability approach by informing social, environmental, and economic development. Dredging Today (2018), define sustainability as to achieve through infrastructure developments and investing resources to support the social, environmental, and economic service that will benefit

the current and future generation. Rosen and Kishawy (2012) cited, sustainability aims is the ability to endure and has potential results from the human perspective. Sustainability contains alleviating disorderly connection among the human and nature, and the accountability to use natural resources and waste disposals This is a challenging and pressing issue to mangrove forests ecosystems conservation as it involves anthropological systems and nature's systems, two different worlds. However, research efforts and initiatives are important to analyse dredging sustainability indicators that best fit between the two systems that can create values and benefits to humans and protect coastal marine biodiversity and habitats. The authors highlighted several common characteristics: relevance to reveal obligatory information around a system or process, consider the upfront information, understood by experts and non-experts, reliability and provides trustworthy information, and assessment to current data. The sustainability domains of social, environmental, economic factors are critical to the mangrove forests ecosystems challenges conservation. Rosen and Kishawy (2021) specified the objective of the sustainable goal, to identify the link amid the social, environmental, and economic priorities, indicators problems, and changes in the community. Although the sustainability indicators reflect the relations between the three aspects of sustainability, the indicators and corresponding metrics are essential for an integrated systems approach to address challenges of sustainability (Joseph et al., 2012). The paper adopted Rosen and Kishawy (2012) sustainability approach (Figure 1) to stress the sustainable goals inter-relationships features and the adaption of the sustainability indicators.

Figure 1: Sustainability interrelations between social, environmental and economic factors



The global sustainability indicator framework was developed by the Inter-Agency and Expert Group on SDG Indicators (IAEG-SDGs) and agreed to, as a practical starting point at the United Nations Statistical Commission held in March 2016. The Commission report included the global indicator framework, which was then noted by the United Nations Economic and Social Council (ECOSOC) at its 70th session in June 2016 (UN Environment Management Group). ECOSOC is responsible to promote higher standards of living, full employment, economic, social, health problems, facilitating international cultural and educational cooperation, and encouraging universal respect for human rights and fundamental freedoms. This includes the dredging industries sustainability aims and indicators, which increasingly recognise the importance of sustainable dredging practices (IADC). Hak et al. (2007) research indicate the sustainability indicators able to provide information on any aspect of the interplay between environment and socio-economic. Boulanger (2008), sustainability indicators aim to inform the public about policy-making as part of the process of sustainability governance. Giovannucci and Potts (2007), building the strategic indicator set to deal with few sample questions. Victoria et al. (2015), sustainable activity is based on an in-depth understanding of how dredging affects the marine environment and the positive and negative effects of dredging on the marine environment (reviews by Erftemeijer et al., 2012; Tillin et al., 2011; Erftemeijer and Lewis, 2006; Hitchcock and Bell, 2004; Thrush and Dayton, 2002; Newel et al., 1998) Sustainability indicators in dredging industry can have an enormous influence in conserving the mangrove forests ecosystems. Thus, sustainability indicators are considered an effective measuring tool to assessing sustainability indicators and to improve and identify sustainability aims status to move forward.

The United Nations conference on sustainable development in Brazil in 2012 expressed the commitment from nations to address conservation and sustainable use, including deciding on the development of an international instrument under UNCLOS. Marine biodiversity is being of critical importance, as marine areas are trans-boundary and interconnected and threats to the marine environment and biodiversity are looming. Climate change and an increase in transshipments at the major ports can create an ecological impact. Sustainable goals are vital to govern impact to the social, environmental, and economic development and to aid sustainability goals. Sustainability goals represent a significant milestone towards sustainability indicators and continuous advancements within the dredging industries. Greenport (2020) has proposed global dredging industries to increase and strengthen the implementation and revitalise the partnership for greater sustainable development to minimise the impact on society and the environment and maximise economic benefits. The paper adopted Greenport (2020) dredging industries sustainability measures known as the global sustainability indicator framework. Each set of indicators is used to assess the progress in dredging projects. The sustainable goals and sustainability indicators for construction and navigation infrastructure support are SDG 2 Zero Hunger, SDG 7 Affordable and Clean Energy; SDG 8 Decent Work and Economic Growth; SDG 9 Industry, Innovation and Infrastructure; SDG 10 Reduced Inequality; SDG 11 Sustainable Cities and Communities; SDG 12 Responsible Consumption and Production; SDG 13 Climate Action; SDG 15 Life on Land; and SDG 16 Peace and Justice Strong Institutions. The goals and indicators on coastal protection, infrastructure, flood risk and management support are focusing on socio-economic and natural resources: SDG 1 No Poverty; SDG 3 Good Health and Well-being; SDG 7 Affordable and Clean Energy; SDG 10 Reduced Inequality; SDG 12 Responsible Consumption and Production; and SDG 14 Life Below Water. The social, environmental and economic factors stress the importance to adopt sustainable goals set by the global dredging industries, prioritising the natural well-being of the human.

According to Greenport (2020), a business information provider on environmental and corporate responsibility on marine ports, shipping, transport and logistics, it is most imaginable for dredging industries to immerse sustainable goals in dredging planning and implementation activities. Over the years dredging projects have embraced different thinking, looking beyond isolated dredging activities towards a wider context. A 'smart dredging' concept projected by the global dredging industries can be devoted to protecting the natural mangrove forest's ecosystems may assist to protect the natural mangrove forest's ecosystems. SMART is a well-established tool used to plan and achieve goals, a tool that aligns objectives with goals. A SMART dredging approach in projects may simplify specific sustainability objectives are precisely strong to changing interpretations and understood by all involved in dredging projects; measurable sustainability objectives is the future state in measurable terms and possible to verify achieved and quantified objectives; achievable sustainability objectives are to influence sustainability behaviours; realistic sustainability objectives need ambitious, aims, to reflect the level of achievement and to be meaningful; and time sustainability objectives are to provide timely information and to connect effective measures for potential results. Therefore, a smart approach may transform the dredging industries into an eco-friendly activity that enable to buffer of the natural mangrove forest's ecosystems. A smart approach may add value to dredging firms, engineers, consultants to hypothesise sustainability aims and protect nature and human well-being.

Considering the global dredging industries sustainable goals and sustainability indicators may assist policy decision-makers to renew sustainability aims and set the global dredging industries sustainable goals as a benchmark to improve conservation methods to protect the mangrove forests ecosystems and coastal marine habitats. Mangrove forests sustainability need to be viewed as a top priority in the government coastal marine biodiversity preservation aims for future generation's well-being, it cannot be overlooked. New research may assist in the efforts and initiatives to protect coastal habitats. The negative impact on the mangrove forests ecosystems requires a strong commitment from Marine Department Malaysia, Department of Environment, Department of Irrigation and Drainage, the Department of Fisheries Malaysia, port administrators, dredging companies, environmental consultants, maritime institutions, professional organisations, researchers, academia, and the public. The paper aims to assess the sustainability indicators and increase the protection insights and confines on mangrove forest ecosystems protection strategies. Sustainability indicator is defined as a measurable tool to perceive social (health, safety, educational funding, learning, training, and practice); environmental (pollution conditions, water pollution, waste and recycling, and land uses); and economic (stakeholders, productivity, economy, and government) factors and impact. Sustainability assessment may provide valuable information and required actions in the interest to protect the mangrove forests ecosystems, dredging industry eco-friendly approach, and coastal sustainability policies.

The Malaysian government has various policies to protect the coastal marine biodiversity from urban developments, air and water pollutions, land use and as well restoration and mitigation plans to avoid or minimised damages to coastal habitats. Maintenance dredging and capital dredging projects can have a potential negative impact on mangrove forests ecosystems. The need to analyse sustainability measures to assure dredging projects enable to buffer natural mangrove forest ecosystems and to prevent the spread of contaminants to the water body is essential. Policies may need to be reviewed to re-enforce the commitments made by the Malaysian government to the united nations global sustainability laws. There is a need to increase research efforts and initiatives and industries collaboration from all levels of inclusiveness to protect the coastal marine habitats. Thus, cultivating awareness of the sustainable goals and sustainability indicators in the dredging industries is definitely a step forward towards the mangrove forests ecosystems and strategy. Without a strategic approach to dredging industry's sustainability measures, the best options to facilitate sustainable goals are detrimental to the mangrove forest's ecosystems.

MATERIALS AND METHODS

A sustainability assessment could provide a logical sequence and effective feedbacks. The aim is to gain insights and limitations from sustainability problems and issues which are important to the mangrove forests ecosystem growth. It is important at an early stage before any project is designed or even before a commitment is made to proceed with a development (Bray, 2020). Carefully driven sustainable goals and sustainability indicators may assist policy decision-makers and dredging industries to adjust or change sustainability aims. Singh et al. (2009) state that anticipating and assessing can provide early warning and feedbacks to prevent adverse results, backing decision-making, formulate strategy, and create development goals. The paper adopted an interpretivism philosophy by Easter-Smith et al. (2002). The interpretivism philosophy believes that reality is subjective to the people or situation concerned. A content analysis method was used to pursue the research aim, to reflect the content of communications, and to find out the logical basis of the research aim (Kirsty and Graeme, 2018). The significance of the study is to identify the circumstances and to identify new research which may be beyond the experiences (Bandulahewa, 2015). Dredging industry's experts, consultants, engineers, and contractors' feedback and help were attained to ascertain the research objectives.

RESULT AND DISCUSSION

Table 1 illustrates the sustainability indicator assessment's perspectives whether supported or non-supported. Certain perspectives warrant attention for new analyses, strategies, policies, and research for better understanding and added value to foster greater benefit to nature and human's well-being in the future.

Table 1: Sustainability indicator assessment

Dimension	Criteria	Perspective
Social	Health	Supported
	Safety	Supported
	Educational Funding	Not Supported
	Knowledge-Based Training	Not Supported
Environmental	Pollution Conditions	Supported
	Water Pollution	Supported
	Wastes and Recycling	Not Supported
	Land uses	Not Supported
Economic	Stakeholders	Supported
	Productivity	Supported
	Economy	Not Supported
	Government	Supported

Social

Table 1 shows the four criteria significant in social factors and their sustainability aims and achievement. The safety and health indicators are supported, while education funding and knowledge-based training are not supported. Enhancement in social factors needs federal and state government's adjacent to tackle socio-economic issues and challenges. Policy decision-makers may create prevalent sustainable development goals and effective governance for dredging firms to protect the future survival of the mangrove forest ecosystems from socio-economic growth. Thus, Greenport (2020) states, the global dredging industries projected the health issues is central to SDG 3 to ensure healthy lives and promote well-being for all ages, supported by 13 targets that cover a wide spectrum of the World Health Organisation's (WHO) work. All the other 16 goals are related to health or their achievement contribute to health. Focus on Organisational Safety and Health Administration (OSHA) attributes can contribute to achieving the 2030 agenda for sustainable development, especially to achieve SDG 3 to ensure healthy lives and promote well-being for all ages. SDG 8 promotes inclusive and sustainable economic growth and employment, while SDG 4 is the educational goal to ensure inclusive and fair quality education and promote lifelong learning opportunities for all ages. The learning, training and practice include sessions focusing on strengthening the capacity and promoting partnerships for the sustainable development goals, knowledge and skills achievement, and networking and sharing experiences and peer collaboration. The assessment shows that the support of the public and private sector is critical to the profound knowledge of nature and human well-being. Learning and training may expand coastal sustainability aims in coastal dredging projects. Educational funding and knowledge-based training are critical to future talents development. The awareness of coastal marine biodiversity knowledge through education and professional training certification may increase the ability to identify coastal marine risk factors and mitigation solutions. The dredging industry is technically intensive based and requires specialised skills and management competencies. Learning and training may help to increase the knowledge and skills on coastal marine conservation measures, Historically, dredging was considered as more art than science (John, 1996), however, technological advancement has increased the realisation to use more formal approaches to training that practical experience is desirable. Dredging projects have become bigger and dredging equipment is costly and ignorance are too big to be any longer acceptable to dredging projects. Technology and the competition of the commercial world have ensured the demand. To have a healthy, flourishing world dredging industry is in the interest of everyone. Potential clients, their advisers and contractors must know the possibilities which dredging can offer. There are clear signs that the willingness transfer and exchange of knowledge is flourishing in dredging industries and continues to expand. if education and training succeed, there must be a demand for knowledge and a willingness to take part in the changing environment's learning and training methods and processes.

Environmental

Table 2 shows the four criteria significant in environmental factors and their sustainability aims and achievement. The pollution conditions and water pollution are supported, while the wastes and recycling and land uses are not supported. Improvement in environmental factors needs federal and state government's adjacent to tackle environmental issues and challenges seriously. Policy decision-makers may create prevalent sustainable development goals and effective environmental governance for dredging firms to protect the mangrove forest ecosystems breeding growth. Thus, Greenport (2020) stated, the global dredging industries projected air, water, and soil pollution are an important threat to human development. SDG 3.9 seeks to reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination by 2030. Subsequently, SDG 6.3 is to improve water quality by reducing pollution, eliminating dumping and minimising the release of hazardous chemicals and materials, halving the proportion of untreated waste water, and increasing recycling and safe reuse globally by 2030. Thus, SDG 1 aims for No Poverty. 1% of the global urban population make their living from recovering recyclable materials from waste (SDG 8). These informal waste champions provide a valuable and often no-cost service, and it is

important that we recognise their role in urban sanitation and resource efficiency (SDG 10). Sustainable land management is a knowledge-based procedure that aims at integrating the management of land, water, biodiversity, and other environmental resources to meet human needs while sustaining ecosystem services and livelihoods. The need to review dredging wastes and recycling may have their benefits to the dredging industry and coastal marine biodiversity conservation plans. According to Lei et al. (2018), researchers have developed value-added and time effective measures to transport contaminated sediments into construction fill materials. The study has indicated technical and economic feasibility's values and benefits. The analysis showed contaminated sediment hindered hydrates formation and adversely influenced the properties of sediment-based products. Mixture designs with dry-mix/press method to improve the precipitation reactions to densify the porous structure to enhance performance and conformed to the requirements of partition blocks and paving blocks. The leaching concentrations of potentially toxic elements and organic contaminants from the dredged sediment substantially reduced by stabilisation and solidification satisfied the leachability acceptance criteria for its on-site reuse. Assessment on cost and benefits showed the production of all three studied sediment-based products was potentially profitable. The recycling of sediment into paving blocks showed the highest profit. An innovative solution that effectively mitigates the burden of dredged sediment disposal and sustainably produces green construction materials. Land uses relate to land reclamation for developments. Huabo et al. (2016) gave an example of a land uses issue quoting China's rapid urbanisation. Land prices were soaring and the solution was to look at the ocean, coastal cities in China for building airports and factories on reclaimed land. However, sea-land reclamation activities have brought about serious environmental effects. Their research combines qualitative and quantitative information on reclamation activities in China highlighting the major environmental effects: ecosystem damage and geological disasters, and the deterioration of marine environmental quality resulting from polluted air, water, soil, and sediment. The realised and potential environmental damages are substantial. A resultant policy recommendation by local Chinese governments to limit land reclamation and to strengthen environmental assessment systems especially in fragile coastal regions containing important oceanic resources such as mangroves and protected wildlife. The study also serves as a reference for the better management of land reclamation in densely populated coastal regions of the world.

Economic

Table 2 shows the four criteria significant in economic factors and their sustainability aims and achievement. The economic indicator is important for wealth creation and growth. The assessment shows that stakeholders, productivity, and government are supported, while the economy is not supported. Economic indicator plays an important role on the dredging industry economic growth and there are possibilities to overlook protection and conservation measures on coastal marine diversity and habitats. Dredging industries contains production and distribution and extensive conventional method of interrelated economic production and consumption activities that determine how scarce resources and waste are allocated. Development in economic factors needs federal and state government's adjacent to tackle economic issues and challenges continuously. Policy decision-makers may create prevalent sustainable development goals and effective economic governance for dredging firms to protect the mangrove forest ecosystems economic benefits and values. Thus, Greenport (2020) stated, the global dredging industries projected a well-managed stakeholder engagement process that helps project stakeholders to work together to increase comfort and quality of life while decreasing negative environmental effects and increasing the economic sustainability of the project. SDG 2.3 and 2.4 targets (agriculture, in particular subsistence agriculture) and SDG 8.2 target (total factor productivity), thus recognising that greater productivity is essential to combat hunger, advance decent work and boost economic growth. All the SDGs aim to encourage sustained economic growth by achieving higher levels of productivity and through technological innovation. The goal is to achieve full and productive employment, and decent work, for all women and men by 2030. The government plays an important role and even critical role on sustainable goals and aims future and can provide vehicles for informed decision-making, investment, and maintain the checks and balances to promote sustainable economic strategies. James et al. (2015) explained the economic indicator's importance and asserting the industry's cost, production and consumption of goods and services. The sustainability goals and aims are significant to the social domain that emphasises and observes material expressions that are associated with the production and resources. The economic consequences can arise from practices and measures involving values, culture, technological advancement, society, organisations, political structure, legal systems, geography, natural resources which may need further studies to expand the sustainability aims. The economic indicator factors can be considered as societal needs whereby well-developed practices and efforts by all levels of inclusiveness is critical.

CONCLUSIONS

The paper provides a comprehensive overview of sustainable goals and aims applicable to the dredging industry. Sustainable goals and aims were reviewed and sustainability indicators were identified for an effective sustainability management approach to buffer the mangrove forests ecosystems. Mangrove forests conservation plans need immediate attention and seriousness from all stakeholder's cooperation and industrial collaboration to find suitable solutions to prevent the mangrove forests ecosystems extinct in the future. Marine biodiversity has enormous value and benefits to marine economic growth. The study's evaluation shows some sustainability indicators need further attention and to foster new research interests, designing knowledge-based training, and biodiversity educational programmes. The advancement in information technology, the fourth industrial revolution (IR4.0), and digitalisation initiatives to improve productivity growth and plans for expansion in the services and agriculture sector need well-developed sustainable goals. The perceptions on marine biodiversity and habitats conservation from researches, industries, and organisations may particularly interest the policies decision-makers, related government agencies, Marine Department of Malaysia, Forest Department of Peninsular Malaysia, Department of Fisheries Malaysia, Department of Environment, Department of Irrigation and Drainage, port authorities, port administrators, dredging firms, environmental consultants, maritime institutions, maritime industries, maritime organisations, engineering consultants, construction firms, and contractors involved in planning and designing dredging activities, maritime infrastructure, fluvial projects, and the public. The paper may be useful to identify relevant industries sustainable development goals (SDG) as key drivers to influence the

sustainability measures on mangrove forest ecosystems. The aim is to prevent harm and damages and to increase preservation consciousness. There are other research areas of sustainable goals worthy to explore along to assess and capture opportunities that can benefit the marine biodiversity existence in the future.

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