Ocean economy and regional development of Maluku Province, Indonesia

[1]Amin N. Renur, [2]Achmad Fahrudin, [1,3]Tridoyo Kusumastanto, [4]Dadang Solihin

[1] Tropical Ocean Economics, Department of Resource and Environmental Economics, Faculty of Economics and Management, IPB University, Bogor, Indonesia; [2] Department of Aquatic Reources Management, Faculty of Fisheries and Marine Science, IPB University, Bogor, Indonesia; [3] Center for Coastal and Ocean Resources Studies, IPB University, Bogor, Indonesia; [4] Darma Persada University, Jakarta, Indonesia. Corresponding author: A. N. Renur, aminnasrunrenur@gmail.com

Abstract. Ocean economy activities in Maluku Province as largest archipelago in Indonesia not only directly affect the industries in the sector but also influence other sectors through inter-sectoral linkages. The purpose of this study is to analyze ocean economy contribution to Maluku's regional development, potential sectors and disadvantaged sectors in Maluku Province. This paper uses an input–output (IO) methodology to examine the linkages of the ocean economy in Maluku Province regional economic development. The analysis showed the fisheries sector (code 14); marine infrastructure sector (code 44) and the marine services sector (code 63) were the leading sectors in Maluku Province. In addition to the leading sectors this research shows that there are potential sectors that can be developed, namely: energy and mineral resources sectors (codes 15 and 20), marine industry sector (codes 26, 32, 34 and 42), sea transportation sector (code 52), marine tourism sector (codes 53, 54 and 65) and marine service sector (codes 43 and 61) as potential sectors that have bacward linkage. While the potential sector that has a forward linkage is the energy and mineral resources sector (code 22) and marine service sector (code 46). The study also found that in Maluku Province some of them fell into the category of disadvantaged sectors, they were energy and mineral resources sector (codes 16, 17, 19, 21); marine industry sector (codes 24, 25, 35, 41); sea transportation sector (code 52); and marine tourism sector (code 53).
Key Words: ocean economy, input-output model, small island, regional development.

Introduction. During 2004-2016 the economic growth rate of Maluku Province appeared fluctuating from 4.43% in 2004, rising quite high to 7.81% in 2012 and falling again to 6.48% in 2016. From the data on the economic growth of Maluku Province, it can be seen that the economic growth of Maluku Province continues to experience growth but tends to fluctuate. The contribution given to each economic sector in the regional Gross Regional Domestic Product (GRDP) value still shows a striking imbalance in several sectors, especially the marine-based sector, as a geographical consequence of small islands in nature and having land-based sectors. According to Krugman (1998), the unique geographic features of small islands have their own advantages or disadvantages. Economically and politically, it is very logical if the maritime sector is used as a foundation in economic development and growth center (Kusumastanto 2003; Kusumaatmaja 2005).

Study of Central Statistics Agency (2017) and Matitaputty (2012) show that the sectors in the maritime sector which comprised ocean economy activities have not become the leading sectors in Maluku Province. This shows that there is still an imbalance in the process of economic activity that occurs. This inequality can be interpreted that the leading sectors of a region will always grow, but the sectors which are potential and backward sectors do not experience significant development. This study

aims to find out the portrait of economic landscape, especially the linkages between the economic sectors in the marine sector in Maluku Province, Indonesia.

Information on an industry's linkages with the rest of the economy helps us to better understanding the structure of an economy and how it changes over time, which in turn is important in formulating industrial policies (Rasmussen 1956; Chenery & Watanabe 1958; Hirschman 1958). In other words, the economic importance of the economic industry in Maluku Province depends upon the relationship of ocean economy to the rest of the economy. Using the analysis of the Maluku Province Input Output Table in 2013, we analyzed ocean economy contribution to Maluku's regional development, by classifying into leading sectors, potential sectors and disadvantaged sectors in Maluku Province.

Material and Method

Description of the study site. The study was conducted from June 2017 to February 2018 in Ambon City, a central capital of Maluku Province, Indonesia (Figure 1).
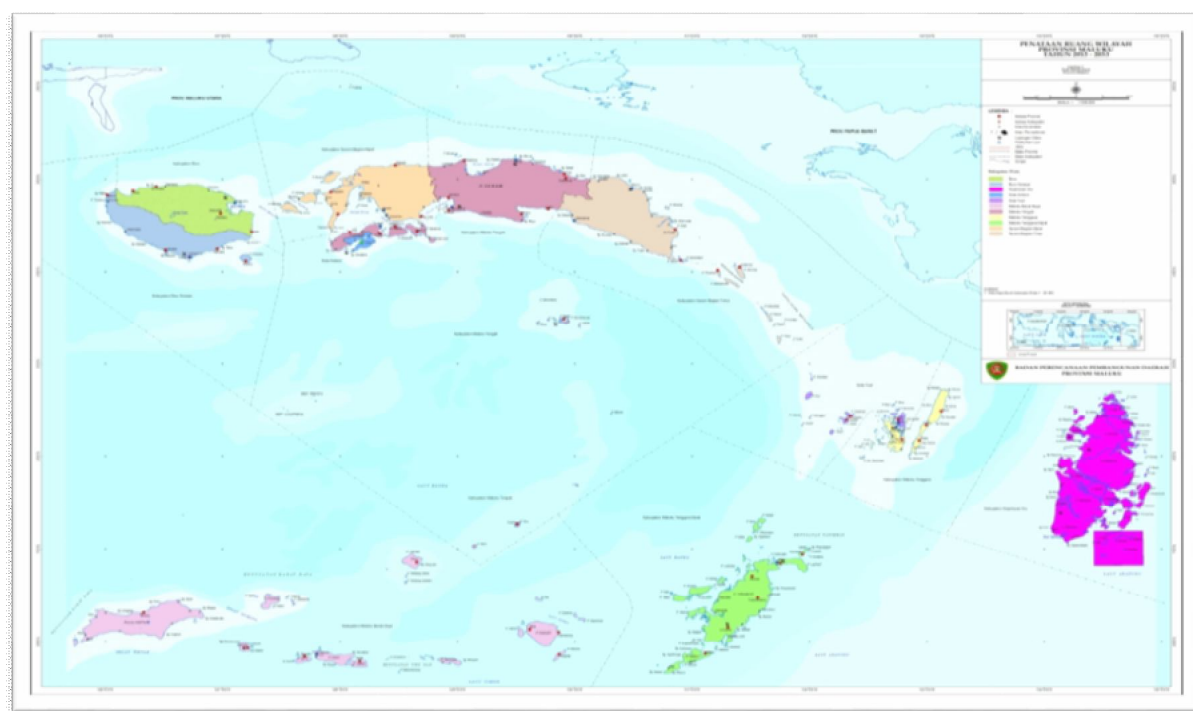

Figure 1. Map of Maluku Province, Indonesia (Source: Nations online 2018).

Overall, Maluku Province has an area of 712,479.69 Km2. Most of its territory is an area of 658,331.52 Km2 (92.4%), while the area is only around 54,158 Km2 (7.6%). Maluku Province is an area with a number of large and small islands 1,340 islands with a coastline length of 11,000 Km. Location of Maluku Province lies between $2^030'$-9^0 south latitude and 124^0-136^0 east longitude. Since the enactment of the Law of the Republic of Indonesia No. 32 of 2008, administratively Maluku Province consists of 9 (nine) regencies and 2 (two) cities with 118 district and the number of village/subdistrict as many as 1,231 consists of 1,198 villages and 33 urban villages/subdistrict (Central Statistics Agency 2017a).

The boundary of Maluku Province consists of 4 (four) borders are The Northern of Maluku Province is bordered to Seram sea, The Southern is Indonesia ocean and Arafura sea, The eastern is Irian Island/ Papua Province and western is Sulawesi Island. The 11 (eleven) Regencies in Maluku Province with land area ranging from the largest to the smallest is Maluku South West Regency with an area of 72,426.91 km², Maluku South East Regency 52,99.19 km², Ambon Municipality 35,944.62 km², Maluku Tengah Regency 11,595 , 57 km², Buru Regency 7,595.58 Km², Seram Barat Regency 6,948.40

km², Kepulauan Aru Regency 6,426.77 km², Seram Bagian Timur Regency 5,779.12 km², Buru Selatan Regency 5,060.00 km², Maluku Tenggara Regency 4,178, 66 and Tual Municipality 254,39 km². The population of Maluku in in 2017 amounted to 1.744.654 people. The Municipality of Ambon is the region with the largest population of 444,797 people or 25.49 % of the total population of Maluku in 2017, the second largest population is in Central Maluku Regency amounted to 371,479 people or 21.29 %, then Seram Bagian Barat Regency 170,494 people or 9.77 % and the regency with the smallest population of Buru Selatan Regency is 61,330 people or only 3.52 % of the total Maluku population (Yushantarti & Rezky 2019).

Category Agriculture, Forestry and Fisheries still has a dominant share in the structure of the economy of Maluku province is 23,87 percent, followed by the category of Administration. Government, Defence and Compulsory Social Security amounted to 22,43 percent; the business field and Retail Trade, Repair Cars and Motorcycles at 13,18 percent and Construction business sector amounted to 7,58 percent. The economy of Maluku in 2016 has increased the growth rate if compared to 2015. The economic growth rate of Maluku in 2016 reached 5,76 percent, while in 2015 it was 5,48 percent. The highest economic level in the category of Financial Services and Insurance amounted to 9,22 percent. GDRP (Gross Domestic Regional Product) per capita of Maluku Province increased from 20,36 million rupiah in 2015 to 21,6 million rupiah in 2016 (Central Statistics Agency 2017b).

Secondary data analysis. Secondary data analysis method was used for input-output analysis. Input Output Models have been widely used to investigate the linkages among production sectors in an economy. It is common to use of the Input Output Table in ocean economic sectors and measuring its impact to the national economy. For instance, Nurkholis et al (2016) investigates the role of the marine sector into Indonesian economy, Lee & Yoo (2014) analyze the role of the capture fisheries and aqua culture sectors in Korea while Morrissey & O'Donoghue (2013) investigate the role of the marine sector in the Irish economy.

There are two types of connection: (i) backward linkages which is a reference to the raw material and calculated according to the column, and (ii) forward linkages which is a reference to the sale of finished goods and is calculated according to the line (Nurkholis et al (2016). While backward linkages mirror the strength by which the production of one sector depends on inter-sectoral inputs, forward linkages show how other sectors of the economy draw on the outputs of one particular sector (Miller & Blair 2009).

Inter-sectoral linkages, comprising backward and forward linkages, reflect the interconnectedness between the sectors of an economy, with mutual interdependencies between the sectors being decisive for the extent to which the growth in one sector contributes to the growth of other sectors as well as overall growth. Backward linkages create additional demand for the output of upstream sectors which, in turn, induces an increased upstream investment and an increased level of capacity utilization, as well as a possible upstream technological upgrading. The overall effect on the economy depends on the kind of sectors to which a sector is backwardly linked (Tregenna 2008).

In his theory of inter-industrial linkage analysis, Hirschman (1958) especially emphasizes the role of backward linkages for growth stimuli. He further argues that forward linkages cannot exist in a pure form since they are a result of the demand that emanates from existing backward linkages. Thus, the existence of demand is a condition for forward linkages. Accordingly, Hirschman states that forward linkages can be considered a powerful reinforcement of backward linkages. This consideration leads to the differentiation between industries that *induce* economic development via backward linkages and industries that *enable* economic development via forward linkages (Hirschman 1958).

In order to have a reliable comparison of sectoral linkages and to calculate the relative strength of the total linkages, backward and forward linkages are normalized according to Rasmussen (1956). According to Hirschman (1958), sectors with both high backward and high forward linkages can be classified as key sectors of the economy. In

normalized form, this comprises sectors with both backward and forward linkages greater than one (Miller & Blair 2009).

Input-Output Data 2013 with 65 sectors were obtained from Agency for Regional Development of Maluku Province and Central Statistic Agency Maluku Province (2013) which aggregated into 27 sectors. This 27 sectors combined into 7 sectors of ocean economy sector were defined by Kusumastanto (2003) as a ocean sector including the fisheries sector, marine tourism, marine mining, maritime industry, sea transportation, marine infrastructure, and marine services. This merger was carried out because these sectors were closely related and to facilitate the implementation of the policy was relatively easy to understand.

Results. Table 1 shows that the sector that has both a high IDP and IDK or as a leading sector is fisheries sector (code 14) with an IDP value of 1.0224 and IDK of 1,2016, the next sector is marine infrastructure sector (code 44) with an IDP value of 1.1128 and IDK of 1.2091. The third sector is the marine services sector (code 63) with an IDP value of 1.1184 and IDK of 1.3141.

Table 1

Degree of Sensitivity Index and Dispersion Power Index of Ocean Economic Sector Table IO 2013

Sector	IO code	Degree of Sensitivity Index (IDK)	Dispersion Power Index (IDP)	Category
Fisheries	14	1.2016	1.0224	Leading
Energy and mineral resources	15	0.9038	1.0306	Potential
	16	0.8701	0.8701	Disadvantage
	17	0.8701	0.8701	Disadvantage
	19	0.8701	0.8701	Disadvantage
	20	0.9918	1.0099	Potential
	21	0.8701	0.8701	Disadvantage
	22	1.0950	0.9676	Potential
Marine industry	24	0.8701	0.8701	Disadvantage
	25	0.8701	0.8701	Disadvantage
	26	0.9798	1.3109	Potential
	32	0.8709	1.0153	Potential
	34	0.8820	1.1423	Potential
	35	0.8701	0.8701	Disadvantage
	41	0.8920	0.9633	Disadvantage
	42	0.8702	1.0587	Potential
Marine infrastructure	44	1.2091	1.1128	Leading
Sea transportation	49	0.9013	0.9284	Disadvantage
	50	0.8912	0.9998	Disadvantage
	52	0.8770	1.0037	Potential
Maritime tourism	53	0.8784	1.0903	Potential
	54	0.8772	1.0797	Potential
	65	0.9981	1.0073	Potential
Marine service	43	0.9171	1.0467	Potential
	46	1.0812	0.9649	Potential
	61	0.9472	1.0163	Potential
	63	1.3141	1.1184	Leading

In addition to the base sector there are also potential sectors, namely sectors that have a high IDK or IDP or more than 1. Sectors that have high IDK are: energy and mineral resources sector (code 22) and marine services sector (code 46). These sectors have a high potential to encourage increased output in other sectors in the downstream sector. If there is an increase in the final demand in the sector, the overall sector output in Maluku through the linkage process will increase as well. While sectors with high IDPs are: energy and mineral resources sector (codes 15 and 20), maritime industry sector

(codes 26, 32, 34 and 42), sea transportation sector (code 52), maritime tourism sector (code 53, 54 and 65); then the marine services sector (codes 43 and 61).

Besides the leading sectors and potential sectors there are also sectors that still have low IDKs or IDPs or are categorized as disadvantage sectors. These sectors are: energy and mineral resources sector (codes 16, 17, 19 and 21), marine industry sector (codes 24, 25, 35 and 41), and the sea transportation sector (codes 49 and 50).

Discussion. The development of the region's economy, especially islands-based regions, is a challenge for developing small islands economic growth, the economic sectors have a relatively high level of linkages. In addition, based on the results of the previous analysis, it can be seen that there are still gaps in the contribution of the sectors in the maritime sector which actually have the potential to drive economic growth in Maluku, especially based on the potential of ocean economy.

Fisheries sector (code 14), marine infrastructure sector (code 44) and marine services sector (code 63) as leading sectors are able to encourage the growth of upstream industry and its downstream industry so that it can drive the regional economy optimally in Maluku Province. In the national context Nurkholis et al (2016) suggested that fisheries, marine industry, marine infrastructure and marine services are key sectors that are very potential to be developed. This is in accordance with Hirschman (1958) policy by developing selected productive sectors in more detail is built through industries which in fact have interrelated relations between one sector and another sector, both related forward linkages and backward linkages.

Energy and mineral resources sector (code 22) and marine services sector (code 46) are potential sectors that have high potential to encourage increased output in other sectors in the downstream sector (IDK > 1). It means that those act on the supply side while the economic sectors act on the demand side of the sub-sector's product markets. While energy and mineral resources sector (codes 15 and 20), the marine industry sector (codes 26, 32, 34 and 42), the sea transportation sector (code 52), the maritime tourism sector (codes 53, 54 and 65) and the marine services sector (codes 43 and 61) are potential sectors that can be relied upon in driving the growth of the upstream sector and cannot be relied upon to encourage the growth of the downstream sector (IDP > 0). This condition reflects that the role of these sectors is decreasing in producing output if there is a final demand from all economic sectors.

Energy and mineral resources sector (codes 16, 17, 19, 21); marine industry sector (codes 24, 25, 35, 41); sea transportation sector (code 52); and maritime tourism sector (code 53) are sectors included in the category of disadvantage sectors. Whereas according to Diposaptono (2017), the Maluku Sea saving of oil and gas reserves is in accordance with what was stated by the Ministry of Energy and Mineral Resources, the potential for oil and gas in Indonesia reached 87.22 billion barrels and 594.43 trillion cubic feet (TCF). The oil and gas potential is in 60 basins. Of that amount, 70 percent of them are in the coastal and marine areas. Therefore, they should be managed and developed appropriately, so that sustainable economic development can be achieved for the sake of the people's prosperity.

Conclusions. This paper estimates ocean economic sector in Maluku Province economy by calculating the relative strength of the total linkages, backward and forward linkages. Each sector generally exerts two-way impacts on all industries, and therefore on the entire economy. The study found that fisheries sector (code 14), marine infrastructure sector (code 44) and marine services sector (code 63) are sectors with both high backward and high forward linkages. This shows that these sectors are industrial sectors that have an important role in the distribution of raw materials in the input market as well as the biggest contributor in the formation of output markets. These priority sectors are further classified as key sectors of the economy. Sectors with relative backward linkages (IDP > 1) or potential sectors are the energy and mineral resources sector (codes 15 and 20), maritime industry sector (codes 26, 32, 34 and 42), sea transportation sector (code 52), maritime tourism sector (codes 53, 54 and 65) and marine services sector (codes 43 and 61). In terms of net linkages, these sectors have

larger total backward dependence on all industries than the total backward dependence of all industries on these sectors. Sectors with relative forward linkages greater (IDK > 1) than the corresponding economy-wide average of the forward linkages of all sectors are energy and mineral sector (code 22) and marine services sector (code 46). In case of net linkages, forward-oriented sectors have larger total forward dependence on all industries than the total forward dependence of all industries on these sectors. Weak linkages sectors, are energy and mineral resources sector (codes 16, 17, 19, 21); marine industry sector (code 24, 25, 35, 41); sea transportation sector (code 52); and the maritime tourism sector (code 53) are included in disadvantage sector. These are not strongly connected to other industries both along their input demand and output supply chains, and thus have both relative backward and forward linkages less than 1 (where the value of one indicates the economy-wide average value of both relative linkages). In case of net linkages, weak sectors have lower total backward and forward dependence on all industries than the total backward and forward dependence of all industries on these sectors.

References

Central Statistics Agency Maluku, 2017a [Commodity sector analysis of Maluku Province 2015]. Maluku BPS. Ambon. [in Indonesian]
Central Statistics Agency Maluku 2017b [Maluku Province in figures 2017]. Maluku BPS. Ambon. ISSN : 0215.4471 Publication Number: 81560.1703 Catalog: 1102001.81. [in Indonesian]
Chenery H. B., Watanabe T., 1958 International comparisons of the structure of production. Econometrica 26(4):487-521.
Diposaptono S., 2017 [World maritime development in marine spatial planning perspectives]. National Library, Jakarta. [in Indonesian]
Hirschman A. O., 1958 The strategy of economic development. New Haven and London: Yale University Press, 217 pp.
Kusumaatmaja S., 2005 [Maritime vision of Indonesia: what's the problem]. Posted by Gohan sck@na.its.ac.id. Published in Maritim Indonesia, Jakarta. [in Indonesian]
Kusumastanto T., 2003 Ocean policy dalam membangun negeri bahari di era otonomi daerah. PT. Gramedia Pustaka Utama, Jakarta, 160 pp. [in Indonesian]
Krugman P., 1998 What's new about economic geography? Oxford Review of Economic Policy 14(2):7-17.
Lee M. K., Yoo S. H., 2014 The role of the capture fisheries and aqua culture sectors in the Korean national economy: an input-output analysis. Marine Policy 44:448-456.
Maluku Provincial Goverment, 2014 [The medium term development plan (RPJMD) 2014-2019 Maluku]. Bappeda Maluku. [in Indonesian]
Matitaputty I. T., 2012 [Development of production centers area in improving archipelago region economy in the Province of Maluku]. Dissertation, Postgraduate School of Bogor Agricultural University, Bogor. [in Indonesian]
Miller R. E., Blair P. D., 2009 Input-output analysis: foundation and extensions. Prentice-Hall, Inc, Englewood Cliffs, New Jersey, 750 pp.
Morrissey K., O'Donoghue C., 2013 The role of the marine sector in the Irish national economy: an input-output analysis. Marine Policy 37:230-238.
Nurkholis, Nuryadin D., Syaifudin N., Handika R., Setyobudi R. H., Udjianto D. W., 2016 The economic of marine sector in Indonesia. 2nd International Symposium on Aquatic Products Processing and Health And Exhibition, ISAPPROSH 2015. Aquatic Procedia 7:181-186.
Rasmussen P. N., 1956 Studies in intersectorial relations. Amsterdam: North-Holland; Einar Harcks: København.
Regional Development Planning Board of Maluku Province, 2014 [Local government medium term strategic plan of Maluku Province]. [in Indonesian]

Regional Development Planning Board of Maluku Province, Central Statistics Agency Maluku, 2013 Input-output table Maluku Province 2013]. Publication Number: 81550.1505. Published by: Badan Pusat Statistik Provinsi Maluku. [in Indonesian]

Tregenna F., 2008 Sectoral engines of growth in South Africa: an analysis of services and manufacturing. Research Paper/UNU-WIDER, No. 2008.98, 40 pp.

Yushantarti A., Rezky Y., 2019 Geothermal resources at Maluku Islands, Eastern Indonesia. Proceedings World Geothermal Congress 2020 Reykjavik, Iceland, April 26-May 2, 2020, pp. 1-9.

Authors:
Amin Nasrun Renur, Tropical Ocean Economics, Department of Resource and Environmental Economics, Faculty of Economics and Management, Jl. Kamper Wing 10, Level 4, Kampus IPB Dramaga 16680 Bogor, Indonesia, e-mail: aminnasrunrenur@gmail.com
Achmad Fahrudin, Department of Aquatic Reources Management, Faculty of Fisheries and Marine Science, Jl. Rasamala, Kampus IPB Dramaga 16680 Bogor, Indonesia, e-mail: fahrudina@pkslipb.or.id
Tridoyo Kusumastanto, Center for Coastal and Ocean Resources Studies, IPB University, Jl. Raya Pajajaran No. 1, Bogor 16127, West Java, Indonesia, e-mail: prof.tridoyo@gmail.com
Dadang Solihin, Darma Persada University, Jalan Taman Malaka Selatan Pondok Kelapa Jakarta Timur DKI Jakarta, Indonesia 13450, e-mail: dadangsol@gmail.com