Timor-Leste population on internal migration, in the analysis of direction, flow, pathways, boundaries, and international procedures

Sri Endang Purwatiningsih^{1,*}, Sukamdi Sukamdi², and Sri Rum Giyarsih³

¹Population Studies, Post Graduate School, Universitas Gadjah Mada, Indonesia.

²Migration and Population Development, Post Graduate School, Universitas Gadjah Mada, Indonesia.

³Geography and Population Development, Post Graduate Post Graduate School, Universitas Gadjah Mada, Indonesia.

Abstract. This study aims to analyze and evaluate internal migration in the population of the country of Timor-Leste based on Ravenstain's theory (1885) and Lee (1966) on types of internal migration with respect push to pull and factors and defining the flow, direction, path and boundaries of internal migration in municipal in the country of Timor-Leste. This study uses a quantitative approach, using the concept of lifetime migration and inter-municipal displacement. The analysis of cross tabulation between the place of birth and the place of registration at the time of the CPH-TL2015 has resulted internal migration of population of Timor-Leste first type. This research uses CSpro, and Excel, and GIS analysis tools with the amount of population internal migration is the percentage of migration rates. The results of this study have produced first type internal migration of Timor-Leste, specific forms of internal migration such as residents who have carried out lifetime migration internal with direction and flow through international boundaries and procedures. The geographic position each municipality and special for municipality of Oecusse as an enclave is particularly important and significantly new type of internal migration.

Keywords: Economic Composite Index (EcCI), Environment Composite Index (EnCI), Life-time migration, Social Composite Index (SCI), Timor-Leste Sustainable Development Index (TL-SDI).

1 Introduction

As an expert on migration Ravenstien (1885), [1], suggested that the pattern of population migration was influenced by the driving force of the area of origin, barrier factors and attraction of the destination area in the migration process to reach the destination [1–3]. In 1958 Petersen [4] and UNDESA (1970) proposed the theory and type of migration based on the spatial boundaries of a country, thus forming a type of internal and international migration [4–6]. Other migration experts Tinkler and McAuliffe have stated that the concept of geographic location which states that each region naturally has a unique location with specifications in terms of coordinate systems, space and time [7, 8]. The geographic position of Timor-Leste already has a land border line with the territory of the Republic of Indonesia Nusa Tenggara Timur Province along 228 km, and a sea line border of 706 km with the country of Indonesia in the Savu Sea and the Banda Sea and with Australia in the Timor Sea [9–11]. The background and journey of the history of the colonization of the Portuguese government on the island of Timor centuries ago has formed a geographic location and borders of the country of Timor-Leste that have a characteristic that does not occur in many countries in

the world, known as the enclave area that forms the municipality of Oecusse [12–14].

Several previous studies of internal migration carried out by residents in a country related to the emphasis on geographical position or location: among them to analyze the experience of depopulation of mountain populations in the territory of the country of Tibet because young people go migrating out for educational reasons [15]. Research on internal migration carried out by residents in a country is related to the emphasis on the geographical position or enclave area as “metageography” development, to analyze workers and owners of gold mining land in the country of Papua New Guinea [16]. Research on internal migration carried out by residents in a country is related to the emphasis of migration of people from one particular ethnicity from one region to another adjacent to the Soviet Union with different types of migration types: immobility, intra-urban mobility, sub-urbanization, and long-distance migration [17]. Other research from China has shown evidence that residents who have carried out internal migration have given a new understanding of social mobility from lower class toward power class middles that are obtained precisely after spatial mobility as a new urban are actually very vulnerable [18]. Spatially and based on national borders, population migration can be classified as follows: internal

* Corresponding author: endangvong@gmail.com

migration and international migration [19]. Temporarily, population migration can be classified as follows: permanent migration (including life-time migration) and non-permanent migration (including seasonal migration and commuter shuttle migration [19]. The theory, classification of migration and the uniqueness concept of an area above are not really appropriate to classify and describe the type of migration that has occurred in the population of Timor-Leste, so the results of this study can encourage renewal and authenticity in population migration in the country of Timor-Leste.

This study aims to find and ensure the truth that the geography of the country of Timor-Leste can produce specific and renewable types of internal migration, namely internal migration flows through international channels, borders, and procedures. This study aims to analyze, evaluate, and define the flow, direction, path, and limits of internal migration in the population of Timor-Leste. Based on Petersen, Ravenstein's, and Lee theory about geographical position, the full and push factors that population migration by defining the flow, direction, path, and limits of internal migration within the territory of the country of Timor-Leste. This research has produced novelty in the five pattern of population migration in the country of Timor-Leste as stated in the dissertation [20]. The significance of this study has defined the types of lifetime internal migration based on the position of municipal areas: both out-migration and in-migration with crossing international boundaries, routes and procedures in the pattern, direction and flow of population migration including the Oecusse enclave area. The research has encouraged and to produce a new type of internal migration based on the geographic position of the state of Timor-Leste and all forms of push, full, and barriers factors to the internal migration process of the population of Timor-Leste. This research is based on the results of the 2015 Timor-Leste population and housing census, covering thirteen (13) municipalities, sixty-five (65) post administrative, and all population that living on Timor-Leste country [20].

2 Internal and international migration

2.1 The geographical position of country and type of migration

The geographic enclave area has been defined as a land area or part of a country's territory that is isolated by the plains and / or oceans from other countries [21]. This enclave area also occurs in some countries such as the St. Pierre and Miquelon islands belonging to the French state bordering and surrounded by Canadian waters [22], Monaco and Vatican city, Nauru island [23]. The characteristic of the enclave area in Timor-Leste is the municipality of Oecusse. The Oecusse municipal enclave region is also geographically part of the land area of the territory of Timor-Leste which is isolated in land and sea areas of the Indonesian state, especially in East Nusa Tenggara Province, but the territory, population and government system are constitutionally

under the Democratic Republic of Timor-Leste [24]. Hayward and Gomes as another expert was classified the geographical position of Oecusse as an exclave area. The characteristic of exclave area including: accidental consequences of drawing straight line borders across complex topographies and/or coastlines, a result of fragmented spheres of colonial influence that involved small pockets of land being administratively attached to nearby colonies, a result of the break-up of areas of large nations at particular stages [25–27].

The UNDESA Institute has defined this internal migration as referring to the migration of people from one administrative area to another administrative area in a country which is carried out by the population at certain time intervals and involves changes in residence status [5, 28, 29]. Internal migration, direct measurement using comparison by place of birth and place of resident currently base on census or vital statistics data [5, 30]. The concept of internal migration encompasses voluntary movement of people, both moving to settle and to stay temporarily, from rural to urban areas or vice versa from urban to rural areas, from rural to rural areas, and from urban areas one goes to another urban, migration can be classified by political boundary (internal or international) [3, 31, 32]. Research on internal migration in the spatial context of the region, by setting measurements based on differences in places of birth and places registered when the population census is carried out in the territory of a country is a concept of lifetime migration. Lifetime migration that has been carried out by residents either individually or in groups, both on the scale of internal migration and international migration. International migration by residents from home countries, through international borders to other countries [33–36].

The development of internal migration in the past few years in some countries has been the movement of population not only to occur internally within their country but also beyond other countries bordering their countries. Internal migration by crossing international boundaries is caused by the history of the past century of the country itself, for example this country is a state or country with the same family. Such internal migration has occurred in the population of Fulani countries in West Africa, Sotho in South Africa, and ethnic Hungarians who have crossed the Slovak and Romanian countries centuries ago in the unity of European countries [3].

2.2 Procedure of internal and international migration.

Internal migration in the country of Timor-Leste especially in internal migration through international channels, boundaries and procedures has the same procedure as international migration. The entrances and exits for the internal migration path with international procedures for the country of Timor-Leste have been regulated in a cooperation agreement between the State of Timor-Leste (UNTAET) and Indonesia on June 11, 2003. This agreement has regulated: land boundaries, maritime boundaries, Oecusse enclave boundaries, cross-border doors, cross-border regulations with

traditional destinations and events, residents of border areas, regulations for border markets, cross-border regulations and services for entering or leaving the country, duties and responsibilities of agencies issuing travel documents (issuing officer), duties and responsibilities of border quarantine institutions, visit deadlines, prohibited matters and confiscation of prohibited goods, and repatriation between citizens of Timor-Leste and Indonesia [37, 38]. Regulations and agreements between the countries of Indonesia and Timor-Leste on the journey of internal migration by crossing the international border route in 2003 have been strengthened and updated with regulations that adjust the needs of international travel and migration in the context of ASEAN countries, for example by using passports and visa payments, and periods of visit for 14 days [39, 40]. The latest regulations governing the internal migration of Timor-Leste's population have been regulated in the law on migration and refugees (*Lei No:11/2017 de 24 Maio: Lei de Migracao e Asilo*) [41].

2.3 Push, full, and barrier factors on internal migration

The situation in developing countries in general, internal migration is a picture of the impact of differences between regions on the social and economic dimensions of the population [42]. Ravenstein's and Lee theory of the influence of push and pull factors and barrier factors in migrating has been measured by using individual analysis units for research at the micro level [1, 2] and by prioritizing neo- classical theories about urban rural migration and social systems in society for macro-level research [42–44]. The push factor is in the area of origin forming the flow of population migration towards the destination [45], the push factor is the area left by immigrants to the destination of migration [46], [47].

The push factors is the beginning of the migration process in the area of origin, so that in the context of rural to urban migration, the urban area is a collection of residents who are driven from their original rural area [48], [49]. The push factor can be measured based on the number of people leaving from the area of origin, with the same logic the push factor can be measured from the number of migrants entering the destination area [46], [47]. In some African countries, the push factor of the population to carry out internal migration on a rural urban scale is due to the agricultural sector which provides better benefits, limited facilities and basic services for a better life [50]. In other developing countries the factors driving internal migration include: characteristics of poor villages, high levels of unemployment, inadequate housing, difficulty in obtaining health facilities and services, difficulty in obtaining public transportation facilities and services which is a picture of high economic and environmental pressures [45, 46]. The push factors that need to be considered are the excess labor force, the low level of income that causes high poverty in rural areas and encourages the population to migrate internally in the same municipality or different municipalities but still in the same country. However, not all poor people can

migrate, because differences in income levels and education levels can also be a motivating factor for migrants leaving their home areas to get better jobs and incomes [51]. An area with better socio-cultural factors, further education, enjoy urban life, economic factors that are more profitable and provide opportunities to get higher incomes, and better environmental factors in the destination area are factors that attract migrants to carry out internal migration to the area [2, 52]

2.4 Flow and direction of internal migration

The flow and direction of internal migration can be calculated using the direct calculation method for residents who carry out a lifetime of migration (direct life time migration) and produce several values such as: the number or percentage of people who do not migrate, migrant stock, migrants, migrants exit, migration patterns and flows, gross migration and net migration in absolute terms and percentages [5, 34]. Internal migration of the population is important to take into account the flow and direction of migration, because the flow and direction of migration of the population can map the positive impact of welfare and changes in the level of life of its inhabitants in a particular area or even the negative impact of migration itself [3]. This direct measurement method uses a multiregional model by displaying internal migration flows from origin cities and destination cities [5, 33, 53, 54], also applied to research in the context of Timor-Leste country.

Internal migration in a country includes several concepts and measurements such as: stock migration, in-migrants, out-migrants, gross migration, and net migration in absolute value and or percentage. Migrant stock is the amount (percentage) of all residents coming out of the origin area or the number (percentage) of all residents entering the destination area. Stock migration or gross migration (gross migration) will reflect the balance of migration in a regional aggregate, this is indicated by the amount of migrant population entering the destination area equal to the number of migrants leaving the area of origin [5, 55]. In-migrants in the event of internal migration are residents who migrate come, enter, and settle within a certain period of time and are registered at the census of their migration destination in a certain period of time. Out-migrants are residents who migrate out of their original area to other areas of their migration destination and remain for a certain period of time [56]. In the context of this life time migration, incoming migrants are identified by residents with differences in the area of birth and domicile at the time of the population census [5, 33]. The population of incoming migrants is counted as a factor in increasing the number of residents in the migration destination area and vice versa. Net migration is the value resulting from the difference between the number (percentage) of incoming migrants and the number (percentage) of outgoing migrants. With a net value of this migration will produce patterns of flow magnitude and direction of migration based on the origin and destination areas of migration. Internal migration in the concept of population balance for an area, then the sum (aggregate) of in-migrants must be the same as out-migrants, thus

the net value of migration under observation of internal migration will be zero [5, 57, 58].

3 Data and method

This study using quantitative approach and covers the territory and population of Timor-Leste in 13 municipalities, 65 post administrative. Throughout the region, the total population is 1 179 654 inhabitants: 598 921 men and 580 733 women. Internal migration that has occurred to the population of Timor-Leste based on the results of the 2015 population census has a gross internal migration value of Timor-Leste's population reaching 9.40 % of the total population or 110 898 people have performed life time migration with a composition of 56 680 male migrants and 54 218 female migrant.

In this research has used descriptive quantitative method with the regional model of internal migration direction and flow analysis tools are using CS-Pro 6 and Excel programs, direct measures methods and UN Institute standard guidelines like contained in the Manual VI Methods of Measuring Internal Migration [5, 58]. The Census and Survey Processing System (CSPRO) is a public domain software package that has been created by the US Census Bureau. The CS pro program has been used in the Timor-Leste population and housing census since 2004 to 2015 by the National Directorate of Statistics Timor-Leste and researchers to enter, edit, tabulate, and disseminate census and survey data. The internal migration direction and flow patterns are calculated using the cross-tabulation method for residents based on birthplaces and place of residence that registered at the CPH 2015 on municipal level administrative areas. Furthermore, the cross-tabulation can result in the value of the stock of migrant, gross, and net migration, in-migrant rate, and out-migrant rate analysis of life-time migration in the regional model [59–61]. In this study, the measurement of the magnitude of the push and pull of migration is to look at the migration rate (present) of people who migrate from the origin to the destination by using the following Formula:

Formula for in-migration rate:

$$\text{Net MR Oe} = \text{IMR Oe} - \text{OMR Oe} \quad (1)$$

IMR Oe = In-migration rate of Oecusse.

ΣIMOe = Total population from twelve municipalities that was lifetime in migrants and living in Oecusse.

ΣMTL = Total population of Timor-Leste that was living like lifetime migrant.

Formula for out-migration rate:

$$\text{OMR Oe} = (\Sigma \text{OM Oe} / \Sigma \text{MTL}) * 100 \quad (2)$$

OMR Oe = Out-migration rate of Oecusse.

ΣOMOe = Total population from Oecusse that

was out and living like lifetime migrant in twelve municipalities

ΣMTL = Total population of Timor-Leste that was living like lifetime migrant

Formula for net migration rate:

$$\text{Net MR Oe} = \text{IMR Oe} - \text{OMR Oe} \quad (3)$$

Net MR Oe = Net migration rate of Oecusse IMR

Oe = In-migration rate of Oecusse.

OMR Oe = Out-migration rate of Oecusse

If an area or region will have a negative net migration value, this means that the region has experienced a loss or lack of population due to the population of migrants leaving more than the migrants entering the area, and vice versa. Migration flows and patterns depicted from the net value of this migration will be better if it is displayed in the territorial map, however it is not recommended in areas with too many aggregates [5, 34, 62].

4 Result and discussion

The following Table 1 shows cross-tabulation between the place of birth and place of the resident during CPH 2015, and the pattern of internal migration first type. Internal migration first type in Timor-Leste is the lifetime internal migration of the population carried out by going through international channels, borders, and procedures covering thirteen (13) municipalities in the Timor-Leste country. This study has found the pattern of internal migration with the specification through international channels, borders and procedures, and approach by distance and intensity of internal volume of migration from small areas to the main area. This research has strengthened Ravenstein's, Lee and Petersen theory as happened in previous studies in eighteen Latin American countries and the Caribbean islands and developing countries in general [63] and Kazakhstan country [42].

In this research results are obtained that there are three biggest municipalities as origin areas included: Baucau (15.35 %), Bobonaro (12.60 %) and Viqueque (11.56 %) from total number of out-migrants. As origin area, municipalities of Baucau, Bobonaro and Viqueque was pushed the number of migrants out of their municipality, with flows international routes, borders, and procedures from the origin area 39.5 % from total stock of migrants to another destination area. An interesting finding from the results of this study is the measurement of the flow and direction of internal migration in municipality of Baucau which have lost 11.7 % of their population because they have carried out internal migration. 88.3% live and settle in Dili. Meanwhile Viqueque and Manatuto municipalities that are geographically bordered directly with the municipality of Baucau have received residents from Baucau by 3.2 % and 2.1 %. The municipality of Bobonaro which have lost 10.71 % of their population

because they have carried out internal migration. 76.2 % live and settle in Dili. Meanwhile Covalima and Liquica municipalities that are geographically bordered directly with the municipality of Baucau have received residents from Baucau by 11.1 % and 4.0 %. The municipality of Viqueque which have lost 10.25 % of their population because they have carried out internal migration. 81.6 % live and settle in Dili. Meanwhile Baucau and Manatuto municipalities that are geographically bordered directly with the municipality of Baucau have received residents from Baucau by 10.9 % and 2.5 %.

This research has proven that the internal migration of residents from the municipalities of Baucau, Bobonaro and Viqueque has reinforced the theories of Ravenstein and Lee, because the three municipalities have so much pushed the population out of internal migration, directly affected by geographical location, the closest distance and direct border with the municipalities. Population migration with this first pattern has an impact on the complex scope of

demography including life cycle, dependence on migration paths, wealth dynamics, change and expansion of borders as the results of previous studies by Caviglia (2013) [64] on internal migration of Amazon border populations in Brazil and Latin America. This research has reinforced Lee's theory that municipalities of Viqueque and Lautem as origin areas, and municipalities of Manatuto as a barrier or buffer before reaching to the municipality of Dili as main of the destination areas. The municipality of Bobonaro as origin areas, and municipalities of Liquica as a barrier or buffer before reaching to the municipality of Dili as main of the destination areas. The results of this research have shown that the push factor of the population migrating out of the municipalities of Baucau, Bobonaro, and Viqueque as migrants' origins, each with its currently have different magnitude like previous research [54].

Table 1. Cross tabulation between place of birth and place of resident, and migration rate CPH 2015

Enumeration Area Place of resident (destination area)	Place of birth (origin area)														
	Timor-Leste	Aileu	Ainaro	Baucau	Bobonaro	Covalima	Dili	Ermera	Lautem	Liquica	Manatuto	Manufahi	Oecussi	Viqueque	OTHER COUNTRY
Timor-Leste	1,179,654	51,046	71,173	135,337	108,494	67,391	193,666	133,954	72,030	73,470	49,740	56,025	71,400	87,232	8,696
Aileu	48,759	45,111	712	80	127	101	1,473	535	32	78	138	163	57	83	69
Ainaro	62,988	115	61,631	47	152	125	235	85	22	21	17	424	10	25	79
Baucau	122,709	107	122	118,319	123	99	1,034	129	444	114	203	60	206	1,402	347
Bobonaro	97,153	82	88	91	94,520	203	572	706	40	143	26	54	55	54	539
Covalima	65,240	60	250	82	1,548	61,989	368	80	32	41	38	87	55	47	563
Dili	275,664	4,859	7,029	15,032	10,644	4,510	186,323	8,597	7,233	3,979	4,618	3,919	3,324	10,466	5,131
Ermera	125,302	237	229	97	401	48	485	122,975	33	387	47	42	74	55	192
Lautem	65,148	31	33	347	43	22	425	47	63,870	22	39	17	23	85	144
Liquica	71,709	125	117	161	558	89	871	499	85	68,482	70	88	183	77	324
Manatuto	46,588	139	96	355	92	44	621	105	54	67	44,244	183	70	324	194
Manufahi	53,685	119	805	101	171	91	541	96	60	51	211	50,929	43	135	332
Oecussi	88,745	39	23	86	64	39	294	59	35	39	41	17	67,258	70	681
Viqueque	75,964	42	38	539	51	31	424	41	110	46	48	42	42	74,409	101
Non migrant	1,060,060	45,111	61,631	118,319	94,520	61,989	186,323	122,975	63,870	68,482	44,244	50,929	67,258	74,409	na
In-migrant	110,898	3,579	1,278	4,043	2,094	2,688	84,210	2,135	1,134	2,903	2,150	2,424	806	1,454	na
Out-migrant	110,898	5,935	9,542	17,018	13,974	5,402	7,343	10,979	8,160	4,988	5,496	5,096	4,142	12,823	na
Net-migrant	-	-2,356	-8,264	-12,975	-11,880	-2,714	76,867	-8,844	-7,026	-2,085	-3,346	-2,672	-3,336	-11,369	na
In-migration rate	100	3.23	1.15	3.65	1.89	2.42	75.93	1.93	1.02	2.62	1.94	2.19	0.73	1.31	na
Out-migration rate	100	5.35	8.60	15.35	12.60	4.87	6.62	9.90	7.36	4.50	4.96	4.60	3.73	11.56	na
Net-migrant rate	-	-2.12	-7.45	-11.70	-10.71	-2.45	69.31	-7.97	-6.34	-1.88	-3.02	-2.41	-3.01	-10.25	na

Table 2. The three municipalities as origin areas for internal migration first type.

	Origin area	Total	Aileu	Ainaro	Baucau	Bobonaro	Covalima		Dili	Ermera	Lautem	Liquica	Manatuto	Manufahi	Oecussi	Viqueque
Baucau	Total	17,018	80	47	-	91	82		15,032	97	347	161	355	101	86	539
	Out-migration Rate	100	0.5	0.3	-	0.5	0.5		88.3	0.6	2.0	0.9	2.1	0.6	0.5	3.2
Bobonaro	Total	13,974	127	152	123	-	1,548		10,644	401	43	558	92	171	64	51
	Out-migration Rate	100	0.9	1.1	0.9	-	11.1		76.2	2.9	0.3	4.0	0.7	1.2	0.5	0.4
Viqueque	Total	12,823	83	25	1,402	54	47		10,466	55	85	77	324	135	70	-
	Out-migration Rate	100	0.6	0.2	10.9	0.4	0.4		81.6	0.4	0.7	0.6	2.5	1.1	0.5	-

Table 3. The three municipalities as destination areas for internal migration first type.

Destination area		Total	Aileu	Ainaro	Baucau	Bobonaro	Covalima	Dili	Ermera	Lautem	Liquica	Manatuto	Manufahi	Oecussi	Viqueque
Dili	Total	84,210	4,859	7,029	15,032	10,644	4,510	-	8,597	7,233	3,979	4,618	3,919	3,324	10,466
	In-migration Rate	100	5.8	8.3	17.9	12.6	5.4	-	10.2	8.6	4.7	5.5	4.7	3.9	12.4
Baucau	Total	4,043	107	122	-	123	99	1,034	129	444	114	203	60	206	1,402
	In-migration Rate	100	2.6	3.0	-	3.0	2.4	25.6	3.2	11.0	2.8	5.0	1.5	5.1	34.7
Aileu	Total	3,579	-	712	80	127	101	1,473	535	32	78	138	163	57	83
	In-migration Rate	100	-	19.9	2.2	3.5	2.8	41.2	14.9	0.9	2.2	3.9	4.6	1.6	2.3

This study can also produce a population policy as well as manage the spatial planning of the municipal area of Dili by reducing the amount of migration flow from the municipalities of Baucau, Bobonaro, and Viqueque to improving social facilities, education,

health, economy and road infrastructure and bridges as a means of transportation and mobility.

Geographically as destination area the city of Dili has experienced overpopulation due to internal migration even net migration rate reaching 69.3 % such

as previous research by Tyner's (2013) [65]. The Municipality of Dili has experienced population growth (surplus of population) due to spatial migration patterns from rural to urban areas, its population growth is caused by high migration rate values [66]. The municipal of Dili is an area with urban characteristics, ease of transportation and accessibility to the city as full factor for migrants entrance to this municipality, and then this resulted was reinforced the theory of "entrance to the city" by Skeldon, (2017) [35]. Dili is a destination city for internal migration from the municipalities of Baucau (17.9 %), Bobonaro (12.6 %) and Viqueque (12.4 %). As an internal destination for the migration of the municipality of Baucau has received the largest migrants from the municipalities of Viqueque (34.7 %), Dili (25.6 %) and Lautem (11.0 %). Meanwhile in the municipality of Aileu, having received several migrants from Dili (41.16 %), Ainaro (19.89 %), and Ermera (14.95 %), the results of this analysis can be seen in Table 3. The patterns of internal migration it has also happened to the municipalities of Dili, Baucau and Aileu.

Other results in this first type of internal migration study have strengthened Ravenstatein and Lee's theory [1, 2] that migrants who enter and live in the municipalities of Dili, Baucau and Aileu are migrants who come from municipalities that are near or directly adjacent to the municipality. The value of the in-migration rate in these three municipalities is an expression of the magnitude of attraction that exists in these three municipalities as the results of Raymer's (2017) previous research [33, 54]. The result of this study can also produce a population policy with the need for example to manage the spatial planning of the municipal area of Dili by reducing the amount of migration flow from the municipalities of Baucau, Bobonaro and Viqueque area by improving social facilities, education, health, economy and road infrastructure and bridges as a means of transportation and mobility.

In the first type of internal migration has shown that residents municipality of the Oecusse municipality who carried out internal migration through international routes, borders and procedures from the total migrant stock out from Oecusse around 4.142 people (6.2% from total of Oecusse population). The total population of Oecusse who have carried out this first type of internal migration (4,142 people) is 80.3% with the destination area of migrating in Dili City, 5% in Baucau and 4.4% in Liquica. Likewise, the Oecusse municipal, which is the destination of migration from twelve other

municipalities, has received 806 in- migrant residents from Dili, 36.5 %, 10.7 % from Baucau and 8.7 % from Viqueque (Table 4). Overall, the results of this study have proven that the municipality of Oecusse has lost or is a population shortage of 43.8 % and all these residents are heading to the municipal of Dili. The pattern out of internal migration through international routes, borders, and procedures (or first type internal migration of Timor-Leste) from the Oecusse municipal.

Geographically it has placed the municipal position of Bobonaro as the entrance area by land, and the Liquica region as a buffer zone before migrants from Oecusse enter the municipal Dili as the main destination. The amount of in-migration rate and out-migration rate illustrates the strength of attraction for migrants to the destination of migration, or the driving force from the area of origin to exit towards various municipalities in the destination of migration. The value of the in-migration rate or out migration rate has identified the internal migration process of the current pattern and direction of internal migration of the population in Timor-Leste through international borders, routes, and procedures. The first type of internal migration of Timor-Leste has reinforced the theory of migration from previous researchers another developing countries [1, 2, 46, 49, 58, 67–69].

Residents of the municipalities of Dili, Baucau and Oecusse are municipalities that pattern the direction of a lifetime of internal migration flows through international routes, borders, and procedures due to easy access to land, sea, and air transportation. Migration of residents by means of transportation by ships and aircraft does not have to use a passport as required in international cross- border procedures, this is because passengers or migrants can travel directly and do not have to transit at the point of national boundary.

Meanwhile migrants who carry out internal migration across land borders and travel by bus must continue to use passports and transit for registration at the immigration office for immigration, customs purposes, and visa payments as stipulated in the agreement between the government of the Republic of Indonesia and Timor-Leste [37, 38]. Transit and passport registration for exiting residents the territory of Timor-Leste is carried out at the immigration office at several border gates as contained in the 2003 declaration of agreement between the governments of Indonesia and Timor-Leste. Seventh of the entrances on the land border from the territory of Timor-Leste to Indonesia are as follows:

Table 4. The Oecusse municipality as destination and origin areas for internal migration first type.

Internal migration with prosedure and cross international border	Total	Aileu	Ainaro	Baucau	Bobonaro	Covalima	Dili	Ermera	Lautem	Liquica	Manatuto	Manufahi	Viqueque	Origine of Oecussi
In-migrant to Oecussi	806	39	23	86	64	39	294	59	35	39	41	17	70	67,258
Out-migrant form Oecussi	4,142	57	10	206	55	55	3,324	74	23	183	70	43	42	67,258
Net-migrant	-3,336	-18	13	-120	9	-16	-3,030	-15	12	-144	-29	-26	28	-
In-migration rate	100.0	4.8	2.9	10.7	7.9	4.8	36.5	7.3	4.3	4.8	5.1	2.1	8.7	
Out-migration rate	100.0	1.4	0.2	5.0	1.3	1.3	80.3	1.8	0.6	4.4	1.7	1.0	1.0	
Net-migrant rate	0.0	3.5	2.6	5.7	6.6	3.5	-43.8	5.5	3.8	0.4	3.4	1.1	7.7	

1. Batu Gede (Bobonaro, Timor-Leste) - Motaain (Atambua, Indonesia)
2. Salele (Suai, Timor-Leste) – Metamauk (Atambua, Indonesia)
3. Turiskain (Bobonaro, Timor-Leste) – Haekesak (Atambua, Indonesia)
4. Memo (Bobonaro, Timor-Leste) – Builalo

(Atambua, Indonesia)

5. Wini (Oecusse, Timor-Leste) – Haumusu (Kefamemanu, Indonesia)

6. Citrana (Oecusse, Timor-Leste) – Oipoli (Kupang, Indonesia)

7. Belulik Leten (Suai, Timor-Leste) – Laktutus (Atambua, Indonesia)

Fig. 1: Direction, flow pattern of the first type internal migration of Timor-Leste.

5 Conclusion

The results of this study have found the novelty of the first type of migration for the country of Timor-Leste as, is a unique type of internal migration, unlike the type of internal migration as prescribed by [5, 34, 35, 70, 71] so far, this is because of the specific geographical position of the Oecusse municipal area as an enclave or exclave area for the country of Timor-Leste, namely internal migration carried out by its inhabitants through International channels, borders and procedures.

In accordance with the objectives of this study it has been proven and strengthened the theory of Ravenstein and Lee that identified three municipalities Baucau, Bobonaro, and Viqueque that act as origin areas that have been very large pushing out the population to carry out this first type of internal migration. This study has identified that there are three municipalities such as Dili, Baucau, and Aileu that act as exceptionally large destinations that have received residents from various municipalities to carry out this first type of internal migration.

The pattern of the lifetime internal migration of the population with direction, flow, boundaries and international procedures (the first type of internal migration in Timor-Leste country) from the municipality of Oecusse to Dili is two point twenty times greater than the migration of the population from Dili to Oecusse. Meanwhile the pattern of life-time internal migration of the population with direction, flow, boundaries and international procedures (the first type of internal migration in Timor-Leste country) from the municipality of Oecusse to Ainaro is only 0.08 times greater than the migration of the population from Ainaro to Oecusse. This condition is related to the characteristics of the more urban Dili municipality, which has various economic, social and transportation facilities that are easily accessible. This condition is related to Dili's key urban characteristics, which have various economic, social and transportation facilities that are easily accessible.

Abbreviation

CHP-TL 2015: Census Household and Population Timor-Leste 2015. CS-pro: The Census and Survey

Processing System. GIS: Geography Information System. IOM: The International Organization for Migration. UNDESA: United Nation Department of Economic and Social Affairs.

Declaration

Author contributions: All authors conducted fieldwork and contributed text segments to the manuscript. The final version of the manuscript was developed interactively, with all authors actively involved.

Competing interest: The authors declare that we have not complying and no conflict of interest

Availability of data and material: The data of CPH-2015 that supporting in the conclusion of this article. Any questionnaires regarding this data may be direct to corresponding author.

Consent to publication in the IEEE Xplore Digital Library or E3S Web of Conferences.

The author would like to grateful for supervisor Pak Kamdi and Ibu Rum, and to the ICST-UGM2020 for their many helpful, receipts, comment, and suggestion to this article. We would like to acknowledge to Marcos, Rose, Nina, two anonymous reviewers and the editors for their critical comments on earlier versions of this manuscript. We special thank also for financial support from Sustainable Development Research Program by Matenek Kmanek Foundation (grant number 26042017).

References

1. E. Ravenstein, J. Stat. Soc. London, **48**, 2: 167–235 (1885).
2. E.S. Lee, Demography, **3**, 1: 47–57 (1966).
3. IOM, *Internal Migration and Development: A Global Perspective*, NO:19., 19. Geneva, Switzerland: International Organization for Migration, (2005).
4. W. Petersen, Am. Sociological Rev., **23**,3:256–266 (1958).
5. UNDESA, *Manual VI Methods of Measuring Internal Migration, Population*. New York: United Nations, (1970).
6. J. Birchall, *Gender, Age and Migration: An Extended Briefing*, Bridge Dev. Institute of Development Studies 2016, (2016).
7. K.J. Tinkler, R. Geogr. Soc. with Inst. Br. Geogr., **1**,3:27–30 (1969).
8. V. Mence, A. Parrinder, Environmentally Related International Migration: Policy challenges, In: *A Long Way to Go*, May 2018, K. Koser, M. McCauliffe, (Eds). ANU Press. (2017), 2017, p. 129–131.
9. Worldwide Mapping LLC, *East Timor (Timor Leste)*. 2013 LAND INFO worldwide Mapping LLC, p. 1–2, (2013).
10. National Statistics Directorate and United Nations Fund for Population Agency, TIMOR-LESTE Census of Population and Housing 2004. *Atlas*. Dili Timor-Leste: National Statistics Directorate, (2006).
11. D.L. Philips, Social and Economic Conditions in East Timor, Columbia U. Oslo, Norway: Fafo Institute of Applied Social Science, Oslo Norway, (1999).
12. W.B. Sowash, Far East. Q., **7**,3:226–235 (1948).
13. D.E. Weatherbee, Asian Surv., **6**,12:683–695 (1966).
14. Center for Excellence in Disaster Management & Humanitarian Assistance, *Timor-Leste Disaster Management Reference Handbook*, 2016th ed. Dili Timor-Leste: Center for Excellence in Disaster Management & Humanitarian Assistance, (2016).
15. G. Childs, S. Craig, C.M. Beall, B. Basnyat, Mt. Res. Dev., **34**,2:85–94 (2014).
16. N. a. Bainton, *Migrants, Labourers and Landowners at the Lihir Gold Mine, Papua New Guinea*, in Large-scale Mines and Local-level Politics, no. October, C. FILER and P.-Y. LE MEUR, Eds. ANU Press. (2017), 2017.
17. K. Magi, K. Leetmaa, T. Tammaru, M. Van Ham, Demogr. Res., **34**,1:1161–1192 (2016).
18. Y. Song, Migr. Dev. China, **16**,3:121–147 (2016).
19. M. Leach, J. Scambary, M. Clarke, S. Feeny, H. Wallace, *Attitudes to National Identity Among Tertiary Students in Melanesia and Timor Leste : A Comparative Analysis*, Australian National University. 1–24, (2012).
20. S.E. Purwatiningsih, *Internal Migrasi Penduduk dan Pembangunan Berkelanjutan di Negara Timor-Leste*, Universitas Gadjah Mada, (2020).
21. International Crisis Group, *Timor- Leste: Oecusse and the Indonesian Border*, Asia Brief., 104, May, 1–20, (2010).
22. J.I. Charney, Am. J. Law, **88**,2:227–256 (1984).
23. J. Crawford, Int. Comp. Law Q., **38**,2:277–298 (1989).
24. Government of Timor-Leste, Constitution of the Democratic Republic of Timor-Leste. Dili Timor-Leste: *The Constituent Assembly of Timor-Leste*, 2002.
25. P. Hayward, Small States Territ., **2**,2: 183–194 (2019).
26. S.M. Gomes et al., BMC Genomics, **16**,1:1–20 (2015).
27. UN Volunteers, *General Information of Oecusse*, Oecusse Timor-Leste, (2017).
28. UNDESA, *Principles and Recommendations for Population and Housing Censuses - Revision 3*, Edition 3., 3, March. New York: UN Statistics, (2008).
29. M. Bell, E. Charles, Popul. Dev. Rev., **41**,1:33–58 (2015).
30. B.R.K. Sinha, Foldr. Ert., **3**:403–414 (2005).
31. M. Kupiszewski, H. Durham, P. Rees, Eur. J. Popul., **14**,3:265–290 (1998).

32. World Economic Forum, *Migration and Its Impact on Cities*, 10. World Economic Forum, (2017).
33. A. Rogers, J. Raymer, J. Popul. Res., **22**,1:1–19 (2005).
34. United Nations, *Principles and Recommendations for Population and Housing Censuses*, Revision 3., 3, March. New York: UNDESA 2017, (2008).
35. R. Skeldon, *International Migration, Internal Migration, Mobility and Urbanization: Towards More Integrated Approaches*, September, 1–11 (2017).
36. R. Chen, P. Xu, F. Li, P. Song, Adv. Publ., 1–10, 2017.
37. Government of RDTL and RI, *Arrangement Between the Government of The Republic Indonesia and The Government of The Democratic Republic of Timor-Leste on Traditional Border Crossings And Regulated Markets*. Republic Indonesia and Republic Democratic of Timor- Leste, p. 1–16 (2003).
38. M. Anggitta, J. Penelit. Polit., **11**,1:21–38 (2014). [in Bahasa Indonesia].
39. ASEAN Secretariat, *ASEAN Framework Agreement on Visa Exemption*. agreement.asean.org/media/download/20160831072909.pdf, (2016), p. 7.
40. ASEAN Secretariat, *2006 ASEAN FRAMEWORK AGREEMENT ON VISA EXEMPTION*, July. Kuala Lumpur, Malaysia, (2006), 6–9.
41. Parlamento Nacional RDTL, *Lei no 11/2017 Lei de Migracao e Asilo*. Timor-Leste, (2017), 1–79.
42. R.E. Msigwa, J.E. Mbongo, J. Econ. Sustain. Dev., **4**,9:28–36 (2013).
43. A. Wickramasinghe, W. Wimalaratana, A J. Soc. Sci., **1**,5:13–32 (2016).
44. H. de Haas, Int. Migr. Rev., **44**,1:227–264 (2010).
45. J. Michalek, N. Zarnekow, Soc. Indic. Res., **105**,1:1–37 (2012).
46. G. Dorigo, W. Tobler, Res. Gate, 1–99, (1976).
47. I.B.M. Astawa, J. Ilm. Ilmu Sos., **2**, 1: 10–20 (2016). [in Bahasa Indonesia].
48. B. Arkadie, R. Mallon, Poverty, Location, and Internal Migration, In: *Viet Nam, A Transition Tiger?*, May 2018, ANU Press (2004), 2004, 239–251.
49. M. Lerch, Demography, **51**, 4, 1527–1550, 2014.
50. P. B. Cobbinah, M. O. Erdiaw-Kwasie, and P. Amoateng, “Africa’s Urbanisation: Implications for Sustainable Development,” *Cities*, **47**, 62–72, 2015.
51. ILO, *Labour Migration Policy and Management : Training Modules*. Bangkok Thailand: ILO Subregional for East Asia, (2005).
52. B.U. Eze, Int. J. Res. Environ. Stud., **3**, 109–119, 2016.
53. UNDESA, *Principles and Recommendations for Population and Housing Censuses - Revision 3*, Edition 3., 3, March. New York: UN Statistics, (2008).
54. J. Raymer, *Measuring flows of international migration*, IZA World Labor, April, 1–10, (2017).
55. IOM, *Labour Migration and Human Development Annual Review 2012*, Migration. Geneva, Switzerland: IOM, (2012).
56. OECD, *Trends in International Migration*, (2001).
57. A. Bernard, M. Bell, E. Charles- Edwards, Popul. Dev. Rev., **40**,2:213–239 (2014).
58. W.B. Morgan. R. Geogr. Soc., **9**,1:67–68 (1977).
59. E. Aguila, R A. Alisher, R. Basurto- davila, B K. Krishna, K. Sarah, H.J. Shatz, *Ties That Bind, Issues That Divide*, in United States and Mexico, May 2018, RAND Corporation. (2012), 2012, 1–13.
60. C. Drake, Trans. Inst. Br. Geogr., **6**:471–490 (1981).
61. J. Wihbey, Cityscape, **19**,2:21–30 (2017).
62. C. Ginsburg et al., Demogr. Res., **34**,1:845–884 (2016).
63. M. Bell, E. Charles-edwards, P. Ueffing, J. Stillwell, M. Kupiszewski, D. Kupiszewska, Popul. Dev. Rev., **41**,1:33–58 (2015).
64. J.L. Caviglia-Harris, E.O. Sills, K. Mullan, Popul. Environ., **34**,3:338–369 (2013).
65. J.A. Tyner, Prog. Hum. Geogr., **37**,5:701–711 (2013).
66. S. Mecartney, J. Connell, Urban Melanesia: The Challenges of Managing Land, Modernity and Tradition, In: *Kastom, property and ideology*, May 2018, S. McDonnell, M. G. Allen, C. Filer, (Eds.) ANU Press. (2017).
67. C. Ginsburg et al., South. African J. Demogr., **17**,1:133 (2016).
68. A.K. Cheung, W.J.J. Yeung, Demogr. Res., **32**,1:1209–1238 (2015).
69. P. Deshingkar, Inst. Dev. Stud., 1–19, (2015).
70. UNDESA, *Handbook on Population and Housing Census Editing*, Revision Statistics Division UNDESA, (2010).
71. IOM and UNDESA, *Migration and Human Mobility*, May. p. 15, (2012).