

Republic of El Salvador

Autonomous Executive Port Commission

Republic of El Salvador
Survey on Port Activation Plan
in La Union Port

Final Report
Summary

February 2022

Japan International Cooperation Agency (JICA)

The Overseas Coastal Area Development Institute of Japan

Nippon Koei Co., LTD.

ECOH Corporation

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Comision Ejecutiva Portuaria Autonoma**

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Abbreviations

ABRE	Area Under Special Regime
AMP	Autoridad Marítima Portuaria (El Salvador)
APM	Autoridad Marítima de Panamá
BCR	Banco de Costa Rica
BOR	Berth Occupancy Ratio
CA	Central America
CADEXCO	Cámara de Exportadores de Costa Rica (Costa Rican Chamber of Exporters)
CCT	Colon Container Terminal
CEPA	Comision Ejecutiva Portuaria Autonoma
CIQ	Customs, Immigration and, Quarantine
CLIA	Cruise Lines International Association
CND	Comisión Nacional de Desarrollo
COCATRAM	The Central American Maritime Transport Commission
COEXPORT	La Corporación de Exportadores de El Salvador
CONAMYPE	National Commission of Micro and Small Companies
CPN	Commission Portuaria Nacional (Guatemala)
DGA	General Directorate of Customs
DGMA	Dirección General de Asuntos Marítimos (Guatemala)
DGME	General Directorate of Migration and Foreign Nationals
DGMM	General Directorate of the Merchant Marine (Honduras)
DIGESTYC	La Dirección General de Estadística y Censos
DUCA	Central American Customs Declaration System
DWT	Dead Weight
ECFCC	Estrategia Centroamericana de Facilitación del Comercio y Compatitividad con énfasis en la Gestión Coordinada de Fronteras (Central American Strategy for Trade Facilitation and Compativity with emphasis on Coordinated Border Management)
ECLAC	Economic Commission for Latin America and the Caribbean
EMPORNAC	Empresa Portuaria Nacional Santo Tomas de Castilla
ENP	Empresa Nacional Portuaria (Honduras)
EPN	Empresa Portuaria Nacional (Nicaragua)
EPQ	Empresa Portuaria Quetzal (Guatemala)
EU	European Union
FEU	Forty Equivalent Unit (2 TEU)
FTA	Free Trade Agreement
FTZ	Free Trade Zone
GDP	Gross Domestic Product
GDP/c	Gross Domestic Product per capita
GT	Gross Tonnage
ICTSI	International Container Terminal Services, Inc. (Philippines)
IDB	Inter-American Development Bank
IMF	International Monetary Fund
INCOP	Instituto Costarricense de Puertos del Pacífico (Costa Rica)
INSEP	Secretaria de Infraestructura y Servicios Públicos (Honduras)
JAPDEVA	Junta de Administracion Portaria y de Desarrollo Economica de la Vertiente Atiantica (Costa Rica)
JICA	Japan International Cooperation Agency
LNG	Liquefied Natural Gas
LOA	Length Overall
LPG	Liquefied Petroleum Gas
MAG	Ministry of Agriculture and Livestock
MCT	Moín Container Terminal (Costa Rica)
MDO	Marine Diesel Oil
MERCOSUR	Mercado Común del Sur (The Southern Common Market)
MINEC	Ministerio de Economía de El Salvador
MIT	Manzanillo International Terminal (Panama)
MOP	Ministerio de Obras Públicas, Transporte, Vivienda y Desarrollo Urbano (El Salvador)

MOPT	Ministerio de Obras Públicas y Transportes (Costa Rica)
MTI	Ministerio de Transporte e Infraestructura (Nicaragua)
NA	North America
NAFTA	North American Free Trade Agreement
OD	Origin and Destination
OPC	Operadora Portuaria Centroamericana
PCC	Panama Port Company
PIANC	World Association for Waterborne Transport Infrastructure (former Permanent International Association of Navigation Congresses)
PLU	La Union port (Puerto La Union)
PNC	Border Security Division and the Anti-Narcotics Division of the National Civil Police
PNLOG	National Cargo Logistics Plan (Plan Nacional de Logística de Cargas)
PNODT	Plan Nacional de Ordenamiento y Desarrollo Territorial (El Salvador)
PQD	Five-Year Development Plan
PROESA	(Organismo Promotor de Exportaciones e Inversiones de El Salvador (Export and Investment Promotion Agency of El Salvador)
RICAM	Mesoamerican International Highway Network
ROA	Return on Assets
ROE	Return on Equity
SA	South America
SAAM	Sudamericana Agencias Aereas y Maritimas S.A
SIECA	Secretaría de Integración Económica Centroamericana
SITC-OIRSA	International Quarantine Treatment Service
SPC	Sociedad Portuaria de Caldera
SPGC	Sociedad Portuaria Granelera de Caldera
SSS	Short Sea Shipping
TEU	Twenty Equivalent Unit
TMCD	Transporte Marítimo de Corta Distancia (Short Distance Maritime Transportation)
TSHD	Trailer Suction Hopper Dredgers
UNDP	United Nations Development Programme
US	United States
VLSFO	Very Low Sulphur Fuel Oil
ZEE	El Salvador Special Economic Zone Law

Chapter 1 Analysis on Current Situation

1.1 Socio-economic Situation

1.1.1 Socio-economic Overview of Central American Countries

- Population in the six Central American countries (Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Panama) ranges from 4 to 17 million while the total population of the six countries is around 50 million (2019) and Real GDP is around 215 billion dollars (2019; 199 billion dollars in 2020). Efforts aimed at overall development through regional economic integration have been promoted in recent years. As part of this, customs integration is underway, and the elimination of intra-regional tariffs has generally been achieved. Various processes such as standardization are progressing, and these economic integration measures are improving the business environment of the Central American market. The Central American region is located on the corridor connecting North and South America, with access to both the Pacific and Atlantic economies, and access to the large markets of NAFTA, MERCOSUR, and the EU. A long-standing issue has been how to promote development that best takes advantage of the region's strategic location.
- Of the six Central American countries, Panama, whose income from the Panama Canal accounts for 70% of its GDP, and Costa Rica, which has succeeded in realizing effective public administration and security and attracting foreign capital, have GDP per capita exceeding \$ 10,000. Per capita GDP of the remaining four countries which lack effective administration and security remains at the level of \$ 2,000 to \$ 4,000. The latter four countries are also characterized by the fact that overseas remittances from US immigrants are at a high level of 10-20% of GDP. Since the time of Spanish rule and the time of interference from major US companies, Central American countries have become a monoculture economy of commercial crops such as bananas and coffee, and the economic structure is susceptible to external influences such as price fluctuations.

Table 1-1 Summary of the Central American economy (2019)

	Population ('000.)	GDP (mil. US\$)	GDP/capita (US\$/person/Year)	Overseas remittance (mil. US\$)	Ratio to GDP	Major industries
Guatemala	17,581	55,875	3,178	10,656	13.8%	Coffee, Sugar, Banana
El Salvador	6,454	23,106	3,580	5,661	21.0%	Sugar, Textile
Honduras	9,746	21,875	2,244	5,401	21.5%	Coffee, Banana, Palm oil
Nicaragua	6,546	11,636	1,778	1,686	13.4%	Textile, Lead wire, beef
Costa Rica	5,048	51,661	10,235	553	0.9%	Semiconductor, Pineapple, Medical equipment
Panama	4,246	50,542	11,902	581	0.9%	Banana, Fish meal, Shrimp
Total	49,621	214,695	4,327	24,539		

Source: ECLAC – CEPALSTAT, GDP at constant prices in dollars, at 2010 prices

1.1.2 Socio-economic Overview of El Salvador

- El Salvador is the smallest and most densely populated country in Central America with a land area of 20.72 km² and a population of about 6.5 million (2020). It is a country with scarce

natural resources and vulnerable to natural disasters such as earthquakes and hurricanes. From 1979 to the early 1990s, a violent civil war continued and the security situation deteriorated, but after the peace agreement in 1992, consistent economic policies focusing on macroeconomic stability have been successfully implemented.

4. After the end of the civil war in 1992, the economy maintained positive growth despite being hit by two major earthquakes and natural disasters such as hurricanes. Interest rates fell due to the dollarization of the domestic economy in 2001, and inflation also stabilized. In recent years, GDP growth has been improving, but remains at the lowest level in Central America. Overseas remittances by about 2.5 million El Salvadorans in the United States and other countries amounted to about \$ 5.66 billion (2019), which is supporting the economy.
5. El Salvador's economy boasts the third largest per capita GDP among the six Central American countries, and the El Salvador's real GDP growth in 2019 was 2.64%. The average growth rate over the last 25 years has been 2.1% and has risen to 2.4% over the last five years (2015 ~ 2019); but which is the lowest level among the six countries. Nominal GDP per capita is \$ 4,168 (2019). The main growth engines are (1) manufacturing industry, (2) commerce, restaurant, hotel industry, (3) service industry, (4) transportation, telecommunications, (5) real estate, and business service industry. The main industries are light industry (sewing industry for export), agriculture (coffee, sugar, etc.). Tourism is an important industry, accounting for 6% of GDP, but there is a lack of infrastructure such as hotels.

1.1.3 Eastern Region of El Salvador

6. The population of the eastern region accounts for around 20% of the country's total, increased slightly from 2010 to 2018 by 0.8% on average (which is slightly above the national average 0.5%). Growth rates by city are as follows: Morazán (1.7%), San Miguel (1.0%), Usulután (0.5%) and La Unión (0%). According to the statistics bureau DIGESTYC, the population of the four eastern cities will increase by 1.0% to 1.2% from 2019 to 2025, and then increase by 0.6% to 0.8% in each department until 2035.



Source: DATOS ECONOMICOS TOTAL PAIS Y CENTROAMERICA solicitud JICA

Figure 1-1 Population by Department

7. Regarding the economic indicators, since GRDP (GDP by department/prefecture) is not used in El Salvador, it is difficult to grasp the economic indicators of each region / department, but a comparison was made based on the materials received from the Ministry of Economy (MINEC).

8. Looking at the figures for 2018 compared to 2010, the number of expatriates has hardly increased (Usulután figures for 2017 are a little doubtful). On the other hand, the number of workers and residents engaged in economic activities has increased significantly, while the number of unemployed has been relatively stable. However, the number of recipients of overseas remittances is constantly increasing, and the amount received is also increasing. It can be seen that household consumption is increasing along with this. From this, it can be understood that the poverty rate in the eastern region is decreasing.

Table 1-2 Trends of Economic Indicators of El Salvador

Total of 4 departments	Average annual rate	Increase rate compared to 2010
Overseas residents	6.3%	1.3%
Economically active population	2.2%	19.1%
Working population	2.4%	20.6%
Number of unemployed	1.2%	0.4%
Number of overseas remittance recipients	1.0%	7.6%
Monthly amount of overseas remittance (\$/household)	3.3%	27.8%
Monthly consumption (\$/household)	1.3%	9.9%

Source: JICA Survey Team

1.2 Trade Overview

1.2.1 Trade Trends in Central America

9. Exports in Central America amounted to \$ 85.9 billion in 2019, showing a slight increase. Imports were valued at \$ 101.8 billion in 2019, a slight decrease from 2018, but a slight increase compared to recent years. There is a large excess of imports in total, and it is the overseas remittance from US immigrants that makes up for this. North America (including Mexico) accounts for 40% of the total imports and exports, and Central America accounts for 20%. Regarding exports, exports to Central America and North America account for 37% and 33%, respectively, followed by Europe at 14%. Regarding imports, imports from North America account for 44%, followed by Asia at 21% and Central America at 18%. Over the years, the dependence on North America has declined, and the proportion within Central America has been on the rise. Furthermore, the volume of trade with Asia is increasing, and the trade ratio with China in particular has risen to about 5% for both imports and exports.
10. Regarding export items, bananas and coffee, which have traditionally been the main products, are exported in large volumes to North America and the EU, while Asia receives a large volume of sugar exports.

1.2.2 Trade Trends in El Salvador

11. El Salvadoran trade statistics show a large excess of imports, and the proportion of import cargo is large. There was a significant trade deficit of \$6.1 billion in 2019 (\$5.9 billion in exports and \$12 billion in imports; In 2018, \$5.9 billion in exports and \$11.8 billion in imports, which results in a \$5.9 billion trade deficit).

1.2.3 Export Policy

12. The five-year development plan (PQD) has not been updated since the inauguration of the

Bukele administration in June 2019, and the economic take-off plan scheduled to be formulated in January 2020 has not yet been announced. In the explanation of the Cuscatlan plan, President Bukele's election promise, and the outline of the economic take-off plan by the Ministry of Economy, the manufacturing and agricultural industries shall be highly valued added, the current concentration on specific industries shall be decentralized, and customs rationalization, tourism, e-commerce shall be promoted.

1.3 Industrial Situation

1.3.1 Industrial Location

13. The breakdown of GDP in El Salvador is as follows: primary industry accounts for 12%, secondary industry for 23.3% and tertiary industry for 63.5%. However, the agriculture and fisheries industry which employs 18% of the working population (and this figure rises to 40% in rural areas), is considered to be more important than other industries.

1.3.2 Potential Industry to Utilize La Union Port

14. The IDB's La Union Market Study Report (2018) lists the industrial fields as potential users for La Union Port, and includes surveys on the following four industrial fields.
- Textile industry
 - Agricultural industry
 - Food processing industry
 - Gas storage and distribution

1.3.3 Free Zone

15. El Salvador is trying to foster the export industry by attracting foreign investment and is actively improving the business environment by developing and attracting free zones (FTZ). In the World Bank's Ease of Doing Business 2020, El Salvador ranks 7th among Latin American countries (91st overall). In attracting foreign investment, in order to treat domestic and foreign investors fairly, El Salvador is also developing laws such as Investment Law (Foreign Investment Law), Free Zone Law, International Services Law, Tourism Law, etc. The Free Zone Law stipulates the target industries, tax exemptions and periods, etc.
16. There are 17 free zones nationwide, but they are concentrated in 6 of the 14 departments (San Salvador, Santa Ana, La Libertad, La Paz, La Unión, Usulután).

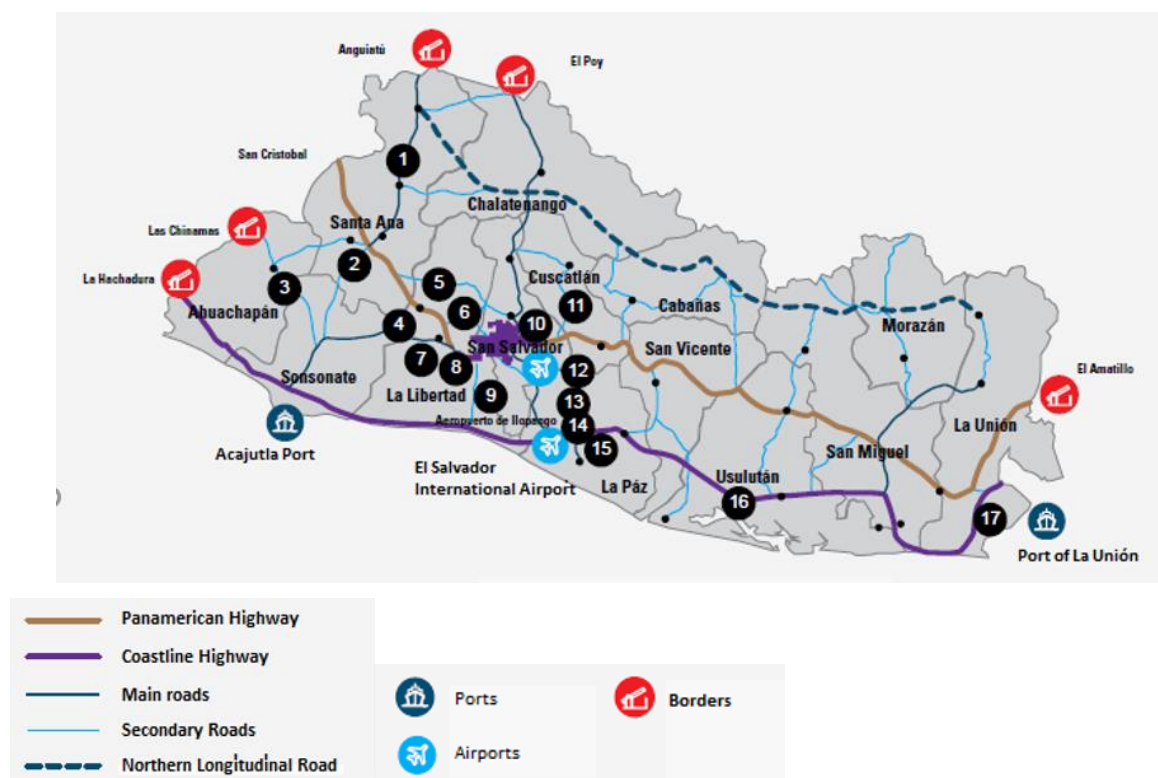


Figure 1-2 Free Zones in El Salvador

① Santa Ana FZ	② Las Mercedes FZ	③ Free Zone 10	④ EXPORTSALVA FZ
⑤ PIPIL Free Zone	⑥ SAM-LI FZ	⑦ American Park FZ	⑧ Santa Tecla FZ
⑨ San José FZ	⑩ San Marcos FZ	⑪ San Bartolo FZ	⑫ Santo Tomás FZ
⑬ International FZ	⑭ Miramar FZ	⑮ El Pedregal FZ	
⑯ Concordia Industrial Park FZ		⑰ Calvo FZ	

Source : PROESA, PNLOG El Salvador 2018-2032

1.3.4 Major Companies in the Eastern Region of El Salvador

17. Major industrial companies located in the eastern region of El Salvador are shown in the Main Report.

1.4 Trend of Cargo Movement Centering on Central America

18. The trade volume (tons) data of each country in the world are available in the database prepared by “IHS Markit”. OD (Origin-Destination) and commodity centering on Central America region are analyzed by processing this huge database.

1.4.1 Inter-regional Trade

19. Major destinations of export cargoes are North America and Europe with the share of around 70%. Vegetable products including fruits are dominant in the export sea trade from the Central America region.



Source: IHS Markit Data (2020)

Figure 1-3 Sea Trade Volume from Central America (Export; All Cargo)

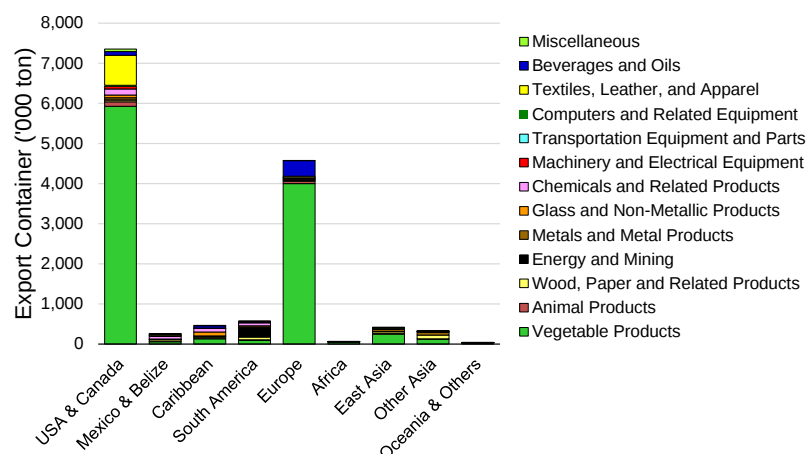
20. Major origins of import cargoes are North America and South America with a share of around 77%, while Europe has a small share compared to exports. East Asia has a share of 13%. In terms of commodity, Energy and Mining is dominant in the import sea trade to Central America region.



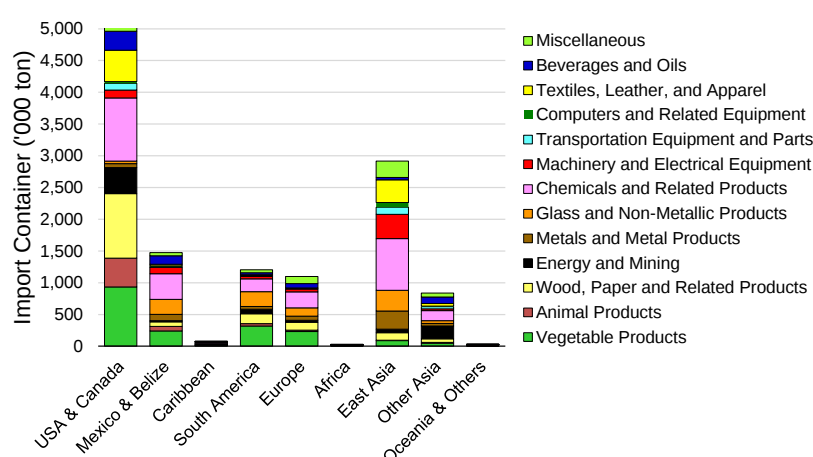
Source: IHS Markit Data (2020)

Figure 1-4 Sea Trade Volume to Central America (Import; All Cargo)

21. The graphs below show the container sea trade to/from Central America. While various commodities including chemical products, wood and paper products are imported, vegetable products including fruits is the main export. Import container volume amounts to 14.1 million tons (accounting for 17% of the total import sea cargo volume), and export container volume amounts to 12.1 million tons (46% of the total export sea cargo).
22. Major export destinations are North America and Europe. Regarding import origin, North America has the dominant share followed by East Asia, South America and Europe.



Source: IHS Markit Data (2020)



Source: IHS Markit Data (2020)

Figure 1-5 Container Trade to/from Central America by Commodity (Upper: Export; Lower: Import)

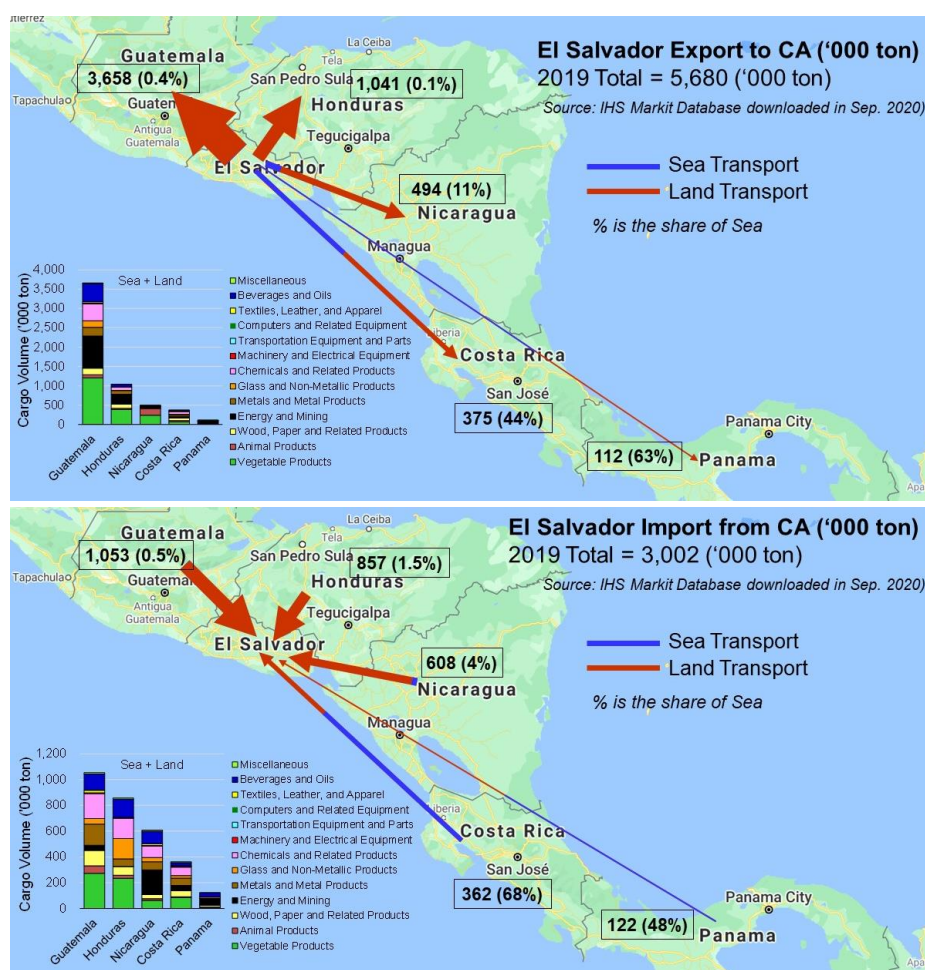
1.4.2 Trade in Central America Region (Intra-regional Cargo)

Cargo to/from Guatemala

23. El Salvador and Honduras are the major countries for export from Guatemala and cargo mainly transported by land. Costa Rica follows them and account for a large share of sea transport. As for import cargo, El Salvador has the dominant share followed by Honduras, Nicaragua and Costa Rica.

Cargo to/from El Salvador

24. Guatemala is a major trade partner for exports from El Salvador and cargo mainly transported by land. Costa Rica and Panama are minor trade partners in terms of cargo volume but account for a large share of sea transport. As for import cargo, Guatemala is also dominant followed by Honduras, Nicaragua and Costa Rica.



Source: IHS Markit Data (2020)

Figure 1-6 Trade Volume within CA (to/from El Salvador)

Cargo to/from Honduras

25. Guatemala and El Salvador are major trade partners for exports from Honduras. Nicaragua, Costa Rica and Panama are minor trade partners in terms of cargo volume. As for import cargo, Guatemala and El Salvador also hold dominant shares.

Cargo to/from Nicaragua

26. Costa Rica, Guatemala and El Salvador are major trade partners for exports from Nicaragua. As for import cargo, Costa Rica has the dominant share and accounts for a large share of sea transport.

Cargo to/from Costa Rica

27. Regarding exports from Costa Rica, Nicaragua is the most significant trade partner followed by Guatemala. Major transport mode of export/import to/from Guatemala is sea transport, while imports from Panama are mostly transported by land.

Cargo to/from Panama

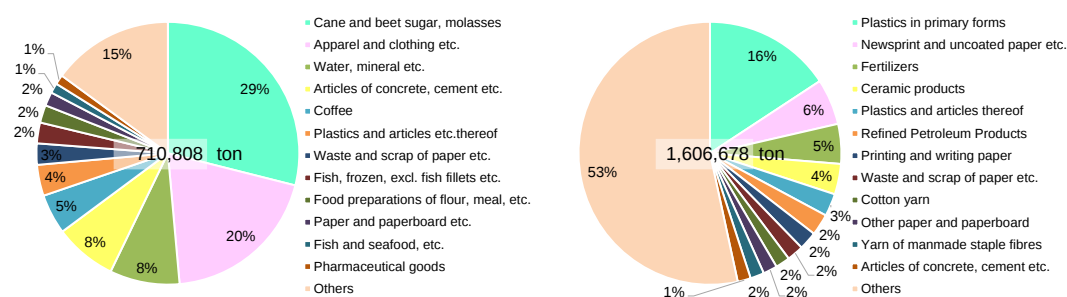
28. Regarding exports from Panama, Costa Rica is the most significant trade partner with land transport. Imports volume from other Central American countries is very small and mainly from Guatemala and Costa Rica.

1.4.3 Container Movement Centering on El Salvador and Honduras

29. Here, inter-regional container movement centering on El Salvador and Honduras is described in more detail.

El Salvador

30. Major export commodities of container cargoes from El Salvador are Sugar and Apparel & Clothing which account for around 50% of total export container cargoes. In terms of import, various commodities are observed, Plastics in Primary Forms is one of the more significant commodities, accounting for 16% of the total.



Source: IHS Markit Data (2020)

Figure 1-7 Commodity of Container (El Salvador; Upper: Export, Lower: Import)

31. North America has the dominant share (81%) in export container from El Salvador, while exports to East Asia account for 12% of the total. In terms of import container to El Salvador, East Asia has a large share (34%) as shown below:



Figure 1-8 Export Container from El Salvador to NA, West Coast of SA and East Asia



Figure 1-9 Import Container from NA, West Coast of SA and East Asia to El Salvador

Honduras

32. Major export commodities of container cargoes from Honduras are Bananas, Coffee, Apparel & Clothing and Melons which account for around 70% of total export container cargoes. In terms of import, various commodities are observed.
33. East Coast of North America has the dominant share (91%) in export container from Honduras. In terms of import container to Honduras, East Asia accounts for 20% of the total as shown below.



Figure 1-10 Export Container from Honduras to NA, West Coast of SA and East Asia



Source: IHS Markit Data (2020)

Figure 1-11 Import Container from NA, West Coast of SA and East Asia to Honduras

1.4.4 Cargo Movement at Ports of Central America

34. Based on the database of COCATRAM, trends of cargo handling at the ports in Central America are shown below:

Table 1-3 Cargo Volume (Export)

Cargo Volume (Embarked)														'000MT
Country	Cargo Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
GUATEMALA	General Cargo	676	544	664	633	531	579	569	631	779	1,089	544	483	470
	Containerized	2,662	3,266	3,532	3,700	4,213	4,072	4,524	4,580	5,021	5,282	5,859	6,101	5,954
	Ro-Ro	182	162	81	33	2	3	1	191	6	0	1	4	7
	Solid Bulk	1,100	722	871	966	990	1,234	2,122	4,069	4,107	3,122	3,547	2,360	1,934
	Liquid Bulk	1,133	1,227	1,128	1,063	1,031	901	1,110	1,152	1,276	1,382	1,529	1,298	1,460
	Others	2	0	0	74	291	437	202	273	217	58	8	0	0
GUATEMALA Total		5,755	5,922	6,275	6,468	7,057	7,226	8,528	10,896	11,405	10,934	11,487	10,245	9,825
EL SALVADOR	General Cargo	1	7	1	6	2	10	22	6	2	10	0	2	1
	Containerized	401	472	402	516	169	173	487	459	460	475	518	437	360
	Ro-Ro	0	0	0	0	0	0	1	0	0	0	2	0	0
	Solid Bulk	252	245	265	322	282	344	379	401	455	296	342	323	466
	Liquid Bulk	415	485	312	352	219	341	333	224	264	242	279	249	220
	Others	0	2	0	8	0	0	0	0	0	0	0	0	0
EL SALVADOR Total		1,068	1,211	980	1,204	672	867	1,222	1,090	1,180	1,024	1,141	1,011	1,048
HONDURAS	General Cargo	323	115	87	89	86	43	91	92	54	40	43	60	38
	Containerized	1,850	2,275	2,015	2,211	2,470	2,511	2,502	2,523	2,666	2,679	2,801	2,903	2,784
	Ro-Ro	0	29	0	0	2	2	1	2	0	0	0	0	0
	Solid Bulk	185	143	256	642	1,339	2,047	2,885	2,446	1,276	984	1,040	1,154	1,323
	Liquid Bulk	222	251	258	273	265	353	407	463	461	696	581	679	703
	Others	613	673	545	568	683	675	687	697	770	785	809	181	171
HONDURAS Total		3,193	3,486	3,162	3,783	4,844	5,630	6,574	6,223	5,227	5,184	5,273	4,977	5,019
NICARAGUA	General Cargo	47	40	24	43	24	60	170	358	168	112	70	49	88
	Containerized	175	191	212	260	325	352	308	407	446	539	751	705	722
	Ro-Ro	2	0	0	0	0	0	0	0	0	1	0	1	0
	Solid Bulk	193	129	80	183	201	223	196	86	204	137	249	353	352
	Liquid Bulk	75	96	168	205	106	133	196	209	166	234	206	270	288
	Others	0	0	0	0	0	0	0	1	0	0	0	1	2
NICARAGUA Total		492	456	484	692	655	768	871	1,061	986	1,022	1,275	1,378	1,453
COSTA RICA	General Cargo	55	36	55	42	180	173	108	70	61	125	174	193	220
	Containerized	5,253	5,370	4,973	5,700	5,968	6,262	6,567	6,814	6,213	6,869	7,007	7,593	7,426
	Ro-Ro	168	93	58	71	40	49	6	0	0	0	2	1	1
	Solid Bulk	112	29	95	19	61	66	180	215	268	311	236	269	190
	Liquid Bulk	92	130	44	19	131	216	223	199	205	176	228	252	287
	Others	80	45	15	0	1	0	0	0	0	1	1	12	0
COSTA RICA Total		5,761	5,703	5,240	5,851	6,380	6,766	7,085	7,299	6,746	7,481	7,647	8,319	8,123
PANAMA	General Cargo	453	321	275	315	297	93	213	212	204	333	204	179	21
	Containerized	13,967	15,537	14,970	18,954	23,151	23,767	22,822	23,040	21,602	19,128	21,671	23,055	24,719
	Ro-Ro	145	175	67	166	156	118	98	104	48	44	84	146	152
	Solid Bulk	77	43	0	173	8	0	12	0	0	21	50	33	651
	Liquid Bulk	6,429	3,648	10,007	4,814	4,100	8,640	11,388	11,513	14,762	11,027	12,721	11,630	12,934
	Others	0	0	0	0	0	0	0	0	0	0	0	0	0
PANAMA Total		21,072	19,725	25,319	24,422	27,713	32,619	34,533	34,869	36,617	30,554	34,728	35,043	38,476
Total		37,341	36,502	41,460	42,420	47,321	53,875	58,812	61,438	62,162	56,199	61,552	60,973	63,943

Source: COCATRAM

Table 1-4 Cargo Volume (Import)

Cargo Volume (Landed)															'000MT
Country	Cargo Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
GUATEMALA	General Cargo	775	645	365	544	486	485	720	642	780	1,080	950	837	1,002	
	Containerized	2,975	3,014	2,863	3,416	3,875	3,816	3,949	4,103	4,218	4,313	4,634	5,062	5,063	
	Ro-Ro	281	219	84	64	37	45	46	48	64	48	51	60	73	
	Solid Bulk	3,297	2,866	2,604	3,194	3,438	3,506	3,708	4,599	5,326	5,610	5,963	6,585	7,430	
	Liquid Bulk	3,792	3,194	3,788	3,073	3,319	3,340	3,391	3,751	4,311	4,418	4,229	4,160	4,585	
	Others	2	0	0	116	89	49	34	27	66	12	9	11	7	
GUATEMALA Total		11,121	9,938	9,703	10,408	11,244	11,240	11,848	13,170	14,766	15,481	15,837	16,715	18,160	
EL SALVADOR	General Cargo	309	277	53	128	141	171	238	234	300	356	382	407	423	
	Containerized	781	824	691	782	263	306	409	823	876	910	976	1,089	1,186	
	Ro-Ro	0	0	0	0	14	16	40	16	17	19	23	21	20	
	Solid Bulk	1,555	1,409	1,199	1,353	1,532	1,414	1,224	1,405	1,601	1,704	1,574	1,706	1,885	
	Liquid Bulk	2,443	2,249	1,960	1,908	2,084	2,151	1,997	1,913	2,131	2,386	2,156	2,129	2,102	
	Others	0	41	47	16	26	0	2	4	0	0	30	0	0	
EL SALVADOR Total		5,087	4,800	3,951	4,187	4,060	4,059	3,909	4,395	4,926	5,375	5,140	5,351	5,616	
HONDURAS	General Cargo	747	266	109	161	210	295	302	304	375	276	456	468	591	
	Containerized	1,313	1,906	1,574	1,855	1,956	1,973	1,919	2,007	2,251	2,466	2,456	2,725	2,596	
	Ro-Ro	0	55	4	2	1	2	2	1	0	0	0	12	24	
	Solid Bulk	1,282	1,539	1,449	1,355	1,700	1,594	1,694	1,761	2,043	2,158	2,208	2,904	2,793	
	Liquid Bulk	2,602	2,546	2,587	2,796	2,760	2,891	2,954	2,956	3,180	2,980	2,885	2,825	3,119	
	Others	682	678	566	630	665	672	673	684	768	775	814	216	184	
HONDURAS Total		6,626	6,990	6,289	6,798	7,293	7,427	7,544	7,712	8,617	8,655	8,820	9,150	9,307	
NICARAGUA	General Cargo	33	63	26	57	30	41	51	25	78	70	107	163	94	
	Containerized	268	305	282	343	424	456	466	538	622	673	723	650	638	
	Ro-Ro	20	14	7	13	18	26	22	24	30	36	26	16	4	
	Solid Bulk	717	611	483	605	763	884	835	838	932	997	1,107	932	1,001	
	Liquid Bulk	1,410	1,351	1,551	1,298	1,547	1,476	1,377	1,366	1,628	1,599	1,589	1,446	1,573	
	Others	0	0	0	0	0	0	0	1	0	0	0	0	0	
NICARAGUA Total		2,446	2,344	2,350	2,317	2,783	2,883	2,752	2,793	3,290	3,375	3,553	3,207	3,311	
COSTA RICA	General Cargo	699	907	398	582	672	671	719	706	764	963	917	946	789	
	Containerized	2,396	2,596	2,086	2,478	2,529	2,756	2,820	2,962	3,158	3,363	3,401	3,470	3,302	
	Ro-Ro	287	219	108	131	95	109	70	60	83	92	72	73	79	
	Solid Bulk	2,027	1,851	1,561	1,953	2,142	2,002	1,976	2,002	2,162	2,226	2,424	2,613	2,513	
	Liquid Bulk	2,487	2,644	2,582	2,480	2,390	2,387	2,262	2,470	2,421	2,540	2,679	2,512	2,861	
	Others	18	16	94	0	0	0	0	0	8	4	3	14	1	
COSTA RICA Total		7,913	8,233	6,829	7,623	7,827	7,926	7,847	8,201	8,598	9,189	9,496	9,629	9,546	
PANAMA	General Cargo	132	73	209	118	494	1,981	534	282	108	376	87	19	135	
	Containerized	12,092	13,969	14,280	18,730	22,732	23,156	22,203	23,175	23,788	22,131	24,085	23,463	24,364	
	Ro-Ro	279	311	155	281	289	268	243	237	162	160	180	269	289	
	Solid Bulk	1,414	305	862	840	393	808	1,390	1,394	997	1,512	1,081	1,331	1,717	
	Liquid Bulk	9,837	11,443	14,057	10,429	10,804	15,877	17,052	19,306	23,817	19,029	21,944	19,820	22,927	
	Others	0	0	0	0	0	0	0	0	0	0	0	0	0	
PANAMA Total		23,754	26,101	29,563	30,398	34,713	42,090	41,421	44,395	48,872	43,208	47,377	44,901	49,432	
Total		56,948	58,405	58,684	61,732	67,919	75,625	75,321	80,666	89,068	85,283	90,223	88,952	95,372	

1.5 Trend of Maritime Situation in Central America

1.5.1 Container Shipping

35. Ports on the west coast of central America are considered as secondary ports of call for container services. The following three types of container service are observed along the west coast of central America.

- Trunk line service connecting Asia and the west coast of South America through the west coast of USA (California) and Mexico.
- Regional service connecting the west coast of the United States (California), Mexico and the west coast of South America. The services include direct calls to some Central American ports on the west coast. The service range is narrower than above but covers the routes from North America to South America extensively.
- Feeder service and shuttle service within the west coast of Central America.

36. A fleet of larger size container ships is used on trunk line services and thus the total turn-round days for one voyage is longer than other services. In order to take full advantage of the scale of economy of such type of service, number of calling ports in one voyage is limited to the major ports of the region such as Los Angeles, Mexico and Panama. The cargo from Asia to central American ports located in between these ports is generally covered by the

regional services with transshipment from the nearest major ports or covered by the feeder services that provide transshipment service across shorter distances. Major world-wide container shipping lines such as Maersk, CMA CGM, MSC, China Cosco, and Evergreen have adopted this system to deliver the containers to final destination ports in Central America. Most of the lines provide the services under a joint operation scheme with other lines or under slot charter arrangement with other lines.

37. So long as major shipping lines deliver containers to Central American ports under this system, the large container vessels that engage in long haul transpacific trunk lines services will not make direct calls at Central American ports on the west coast. However, the size of container vessels directly calling Central America ports may gradually become larger due to the cascading effect in world container shipping. The details of container services provided by major shipping lines are shown below.

1.5.2 Car Carriers

38. Motor vehicles are exported from Asia, Europe, the United States, Mexico and South America to Central American countries. Japan, Korea, Mexico and Argentina are the major exporting countries of vehicles bound for ports on the west coast of Central America. Most of these motor vehicles are transported through sea route using car carriers specially designed for the carriage of motor vehicles in large quantity.
39. The standard type of car carrier has a maximum loading capacity of 6,400 units (of compact size passenger cars), or an effective capacity of about 4,500 units. Despite the large number of motor vehicles loaded, average draft of a fully loaded vessel is only 9 to 10m due to the light unit weight of passenger cars.
40. Shipping companies which operate Car Carriers are limited; currently, following shipping companies provide service to the west coast of Central America: NYK, K Line, MOL, EUKOR, GLOVIS and Hoegh Autoliners.
41. Regular discharging ports of motor vehicles on the west coast of Central America are Puerto Quetzal, Acajutla, San Lorenzo, Corinto, and Puerto Caldera. Most of the car carriers make direct calls to Puerto Quetzal and Puerto Caldera due to the sizable quantity of discharging vehicles. Some other ports receive a direct call depending on the total quantity of discharging vehicles at the port. If the quantity does not justify a direct call, the vehicles are transported via transshipment at another port.

1.5.3 Characteristics of Shipping Service in Central America

42. Shipping service in Central America has traditionally focused on the carriage of locally produced fruits. In particular, there are many shipping services from the Atlantic side of Central America to the US Gulf, East Coast and Europe dedicated for the carriage of fruits. Major fruit producers such as Dole, Chiquita and Del Monte have their own shipping company with their own fleet and reefer containers.

1.5.4 Regional Shipping in Central America

43. There are some regional shipping activities in Central American countries for the carriage of dry bulk cargo, liquid bulk cargo and some general cargo by conventional vessels. As to general cargo in container, feeder services by foreign shipping lines, as discussed above

1.5.1, are the only examples of sea transport by regional shipping services. Such container feeder services are mostly used as the second carriage of foreign trade cargo from Asian countries with transshipment at regional ports, thus this sea transportation service is not used for regional trade within Central American countries as traditionally regional trade and traffic has fully relied on land transport by trucks. Governments of Central America have been trying to promote regional sea shipping with TMCD program (Short Distance Maritime Transportation) under COCATRAM framework. In response, the private sector has also made some attempts to increase the utilization of sea transport such as a Ro-Ro Ferry Project between La Union in El Salvador and Puerto Caldera in Costa Rica and the Great White Fleet's unsuccessful container service between Puerto Chiapas, Mexico and Puerto Quetzal, Guatemala.

1.5.5 Coastal Ferry Services in Central America

44. Most of the existing ferry services in Central America are small size passenger only services, crossing a small bay or connecting nearby islands over a short distance. Ro-Ro type cargo-passenger ferry services are only seen in Nicoya Bay, Costa Rica and Baja California in Mexico. There are two passenger ferry services in the Fonseca Bay area. One service connects La Union and Potosi in Nicaragua, the other connects Honduran islands and the mainland of Honduras. Both are non-regular passenger services using small craft with maximum passenger capacity of 10 persons and powered by outboard motor.

1.5.6 Vessels Calling at Ports in Central America

45. Based on the database of COCATRAM, trends of ship calls at the ports in Central America are shown below:

Table 1-5 Number of Ship Calls

Number of Ship Calls														Ship Calls	
Country	Ship Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
GUATEMALA	Conventional	441	359	359	399	273	348	323	268	264	374	265	154	157	
	Refrigerators	298	302	286	344	376	345	273	283	282	209	149	193	186	
	Ro-Ro	433	336	155	127	107	86	84	78	83	81	104	113	100	
	Liquid Bulk Carrier	328	301	388	307	319	337	390	407	414	398	408	412	449	
	Solid Bulk Carrier	231	190	178	218	217	232	269	361	383	343	346	307	340	
	Oil	18	47	18	14	15	13	13	12	12	9	10	5	5	
	Gasman	10	11	6	5	6	9	7	14	18	14	14	11	11	
	Barge	13	13	20	7	15	0	13	9	11	3	22	7	5	
	Cruise	83	96	104	83	60	59	60	64	68	82	99	115	99	
	Others	65	33	55	59	48	44	71	78	54	62	71	71	70	
	Container	1,626	1,682	1,711	1,938	1,892	1,735	1,831	1,765	1,684	1,774	1,836	1,794	1,876	
GUATEMALA Total		3,546	3,370	3,280	3,501	3,328	3,208	3,334	3,339	3,273	3,349	3,324	3,182	3,298	
EL SALVADOR	Conventional	109	101	50	79	25	33	54	51	60	59	67	54	62	
	Refrigerators	0	0	0	0	0	0	25	3	4	0	0	1	0	
	Ro-Ro	0	0	0	0	59	55	50	53	61	76	94	82	60	
	Liquid Bulk Carrier	113	132	110	92	79	81	202	233	251	231	235	141	221	
	Solid Bulk Carrier	108	103	103	112	121	119	110	102	121	120	120	148	136	
	Oil	0	0	38	0	88	85	0	0	3	1	0	41	0	
	Gasman	32	21	7	2	3	13	0	1	3	16	14	14	13	
	Barge	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Cruise	0	0	0	0	2	0	2	4	3	4	8	4	8	
	Others	200	83	85	32	38	41	17	36	70	67	48	32	32	
	Container	293	289	275	303	310	316	350	283	247	227	255	229	246	
EL SALVADOR Total		855	729	668	620	725	743	810	766	823	801	841	746	778	
HONDURAS	Conventional	212	138	95	127	101	143	93	137	130	90	116	142	80	
	Refrigerators	48	91	70	54	59	19	3	0	2	5	0	7	16	
	Ro-Ro	481	410	209	105	69	70	62	62	75	94	110	62	72	
	Liquid Bulk Carrier	61	63	84	74	82	111	103	99	83	82	81	89	85	
	Solid Bulk Carrier	116	125	149	143	188	191	214	190	151	145	141	143	155	
	Oil	203	198	171	173	145	118	107	102	106	109	118	170	151	
	Gasman	36	36	40	19	30	33	47	46	53	47	42	4	46	
	Barge	19	6	9	2	0	0	0	0	0	0	0	0	0	
	Cruise	145	197	153	101	397	267	252	337	270	338	348	379	404	
	Others	60	54	155	62	38	30	33	42	61	13	41	66	61	
	Container	1,166	1,138	1,212	1,392	1,461	1,351	1,369	1,346	1,361	1,466	1,420	1,320	1,390	
HONDURAS Total		2,547	2,456	2,347	2,252	2,570	2,333	2,283	2,361	2,292	2,389	2,417	2,382	2,460	
NICARAGUA	Conventional	193	208	180	200	221	207	182	163	229	225	207	162	83	
	Refrigerators	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Ro-Ro	78	55	43	58	71	70	66	65	76	81	103	65	28	
	Liquid Bulk Carrier	0	0	0	0	4	0	20	4	0	0	0	0	0	
	Solid Bulk Carrier	0	0	0	0	4	0	43	14	0	0	0	0	83	
	Oil	161	160	126	112	97	101	106	108	113	131	143	141	145	
	Gasman	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Barge	0	0	0	1	0	0	0	0	0	0	1	1	0	
	Cruise	38	60	60	45	48	41	35	39	35	45	80	59	65	
	Others	9	4	2	0	1	0	1	3	5	0	1	5	5	
	Container	197	186	185	224	196	150	189	189	210	239	259	220	203	
NICARAGUA Total		676	673	596	640	642	569	642	585	668	721	794	653	612	
COSTA RICA	Conventional	248	294	224	183	211	264	259	249	218	265	261	213	214	
	Refrigerators	870	856	807	798	789	654	617	625	479	466	358	276	196	
	Ro-Ro	359	260	202	214	156	128	91	80	98	103	110	102	79	
	Liquid Bulk Carrier	80	121	62	43	46	48	51	46	45	34	43	37	30	
	Solid Bulk Carrier	113	10	92	99	133	131	147	158	182	186	176	166	169	
	Oil	42	21	31	24	11	1	1	1	1	1	0	4	0	
	Gasman	45	115	116	114	116	108	113	110	127	118	100	108	136	
	Barge	0	0	5	25	0	0	54	37	52	44	36	33	22	
	Cruise	216	234	261	241	234	219	224	261	270	312	347	284	318	
	Others	41	52	25	10	168	354	237	89	109	135	123	70	42	
	Container	1,201	1,115	1,184	1,385	1,509	1,415	1,402	1,256	1,279	1,357	1,452	1,226	1,401	
COSTA RICA Total		3,215	3,078	3,009	3,136	3,373	3,322	3,196	2,912	2,860	3,021	3,006	2,519	2,607	
PANAMA	Conventional	635	348	232	423	190	232	307	231	154	117	164	162	168	
	Refrigerators	233	135	170	181	176	176	123	94	63	66	56	100	55	
	Ro-Ro	487	460	286	387	356	402	381	362	365	402	357	373	355	
	Liquid Bulk Carrier	46	257	189	191	209	200	174	111	128	122	136	106	62	
	Solid Bulk Carrier	77	171	113	81	79	117	87	84	88	97	80	82	103	
	Oil	663	392	471	576	664	496	647	661	887	746	787	739	799	
	Gasman	23	0	0	0	2	87	60	56	46	65	74	37	21	
	Barge	68	510	420	326	310	220	233	109	349	147	45	22	88	
	Cruise	228	214	218	233	207	164	205	193	197	173	245	193	190	
	Others	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Container	4,110	4,334	4,435	4,989	5,896	5,829	5,751	5,662	5,840	5,487	5,206	5,160	5,602	
PANAMA Total		6,570	6,821	6,534	7,387	8,089	7,923	7,968	7,563	8,117	7,422	7,150	6,974	7,443	
Total		17,409	17,127	16,434	17,536	18,727	18,098	18,233	17,526	18,033	17,703	17,532	16,456	17,198	

46. Based on the AIS data from September 2017 to August 2019 (two years), dimensions of the vessels calling at the ports in Central America are distributed as shown below:

Table 1-6 Numbers of Callings at Ports in CA (DWT Class by Vessel Type; ; Except Container Vessel)

DWT	general cargo	bulk carrier	bulk carrier with container capacity	edible oil tanker	ferry	fruit juice tanker	general cargo with container capacity	passenger (cruise)	passenger ro/ro	Passenger Vessel (unspecified)	product tanker	Roll On Roll Off	roll on roll off with container capacity	vehicle carrier	Total
Unknown	11				8			139	2	330					490
0-4999	88			7	13	47	275	295	11		3,945	335		2	5,018
5000-9999	191	3					291	745			407	100	2	16	1,755
10000-14999	64	1					214	239			21	5		241	785
15000-19999	23	30					121				22	86	5	857	1,144
20000-24999	9	19					4				13			608	653
25000-29999	19	240					58				16	4		116	453
30000-34999	13	851					54					5	3	67	993
35000-40000	11	842	4				47				191			42	1,137
>40000	10	2,224	8				76				2,344			45	4,707
Total	439	4,210	12	7	21	47	1,140	1,418	13	330	6,946	548	10	1,994	17,135

Table 1-7 Numbers of Callings at Ports in CA (Design Draft by Vessel Type; Except Container Vessel)

Design Draft	general cargo	bulk carrier	bulk carrier with container capacity	edible oil tanker	ferry	fruit juice tanker	general cargo with container capacity	passenger (cruise)	passenger ro/ro	Passenger Vessel (unspecified)	product tanker	Roll On Roll Off	roll on roll off with container capacity	vehicle carrier	Total
<5 / Unknown	66	4		7	21		151	263	6	330	230	332		2	1,412
5-6	13						138	143	7		2,569	3		2	2,875
6-7	72	3				47	4	44			1,537	100	2		1,809
7-8	116	1					328	301			25	3			774
8-9	76	31					156	663				1		165	1,092
9-10	53	556					134	4			54	87	5	660	1,553
10-11	25	1,391					95				146	20	3	778	2,458
11-12	9	91	12				75				75			342	604
12-13	9	1,142					50				764	2		45	2,012
13-14		680					9				1,003				1,692
14-15		226									536				762
15-16		4									7				11
17-18		21													21
18-19		60													60
Total	439	4,210	12	7	21	47	1,140	1,418	13	330	6,946	548	10	1,994	17,135

Note) Roll-on roll-off with container capacity are the same as vehicle carrier which can carried containers. There are three vessels calling at ports in Central America from 2017 to 2018. They are: 1) "Seaboard Sun" which called at Roatan Island in Honduras, 2) "Iki" which called at Cristobal in Panama, and 3) "Kuwana" which called at Puerto Quetzal in Guatemala.

Table 1-8 Numbers of Callings at Ports in CA (Real Draft by Vessel Type; Except Container Vessel)

Real Draft	general cargo	bulk carrier	bulk carrier with container capacity	edible oil tanker	ferry	fruit juice tanker	general cargo with container capacity	passenger (cruise)	passenger ro/ro	Passenger Vessel (unspecified)	product tanker	Roll On Roll Off	roll on roll off with container capacity	vehicle carrier	Total
<5 / Unknown	118	29		7	21	1	256	242	6	330	3,431	354		2	4,797
5-6	53	37	1			25	133	149	7		639	4	2		1,050
6-7	74	221				21	189	58			282	69	1	5	920
7-8	125	361	3				226	240			395	24	1	387	1,762
8-9	39	446	2				109	716			624	79	3	823	2,841
9-10	16	705	1				96	13			312	17	3	599	1,762
10-11	8	1,033	1				82				308	1		172	1,605
11-12	5	668	4				47				672			6	1,402
12-13	1	588					2				192				783
13-14		50									29				79
14-15		57									62				119
15-16		11													11
16-17		1													1
17-18		1													1
18-19		2													2
Total	439	4,210	12	7	21	47	1,140	1,418	13	330	6,946	548	10	1,994	17,135

Table 1-9 Numbers of Callings at Ports in CA (TEU & LOA; Container Vessel)

					LOA	2018	2019	2020	2021
					<100		34	60	46
					100-120	2	53	75	22
					120-140	982	1,026	898	454
					140-160	457	396	219	107
					160-180	1,892	2,081	2,113	1,076
					180-200	886	1,572	1,353	719
					200-220	2,998	3,033	3,149	1,543
					220-240	859	1,202	1,533	880
					240-260	397	354	387	178
					260-280	445	657	1,137	691
					280-300	872	1,372	1,973	1,209
					300-320	412	662	503	362
					320-340	937	1,339	1,775	1,195
					340-360	219	299	410	229
					360-380	160	314	642	525
					Total	11,518	14,394	16,227	9,236
TEU	2018	2019	2020	2021					
0-499	32	81	114	73					
500-999	1,382	1,409	1,258	606					
1000-1499	954	1,137	796	400					
1500-1999	1,580	1,778	1,864	1,049					
2000-2499	1,157	1,468	1,194	527					
2500-2999	2,477	2,683	2,899	1,450					
3000-3499	642	687	841	426					
3500-3999	206	483	759	489					
4000-4499	617	788	1,255	732					
4500-5000	394	458	711	317					
>5000	2,077	3,422	4,536	3,167					
Total	11,518	14,394	16,227	9,236					

Source: AIS Data (Jan. 2018 = Jun. 2021)

Table 1-10 Numbers of Callings at Ports in CA (Design & Real Draft; Container Vessel)

Design Draft	2018	2019	2020	2021	Actual Draft	2018	2019	2020	2021
<5 Unknown	40	114	131	68	<5 Unknown	256	138	330	415
5-6		13	23	21	5-6	59	103	148	38
6-7		17	17		6-7	669	722	575	296
7-8	846	992	826	419	7-8	1,185	1,529	1,427	611
8-9	1,057	1,096	931	377	8-9	1,903	2,347	2,382	1,020
9-10	936	1,162	1,118	617	9-10	2,463	2,856	2,761	1,329
10-11	858	1,208	1,649	934	10-11	2,003	2,124	2,367	1,522
11-12	3,880	4,274	4,131	2,029	11-12	1,368	1,804	2,198	1,290
12-13	1,329	1,537	1,975	1,204	12-13	884	1,479	1,746	998
13-14	862	1,059	1,306	726	13-14	639	1,173	1,679	921
14-15	1,404	2,220	2,952	1,925	14-15	87	118	585	755
15-16	277	509	852	602	15-16	2	1	29	41
16-17	29	193	316	314					
Total	11,518	14,394	16,227	9,236	Total	11,518	14,394	16,227	9,236

Source: AIS Data (Jan. 2018 = Jun. 2021)

1.6 Current Status of Major Ports Surrounding La Union Port

47. The following figure shows the locations of major ports around La Union Port.



Figure 1-12 Major Ports around La Union Port

Acajutla Port

48. Acajutla Port is located on the Pacific coast 85 km from the capital San Salvador. It serves as an import / export base for container cargo to and from the west coast of North America, the west coast of South America, and the Asian region. It also serves as an export base for sugar, molasses, and ethyl alcohol, which are the country's main products. It also serves as an import base for bulk cargo such as corn and wheat, and fuel.

49. The following table shows the cargo handling volume throughput from 2011 to 2019. In 2012, the volume of cargo handled recorded a 4% decrease from the previous year, but since then it has been increasing every year at an average rate of 4%. The import volume is comparatively large, and the ratio to the export volume is almost 3: 1.

Table 1-11 Cargo handling volume throughput from 2011 to 2019

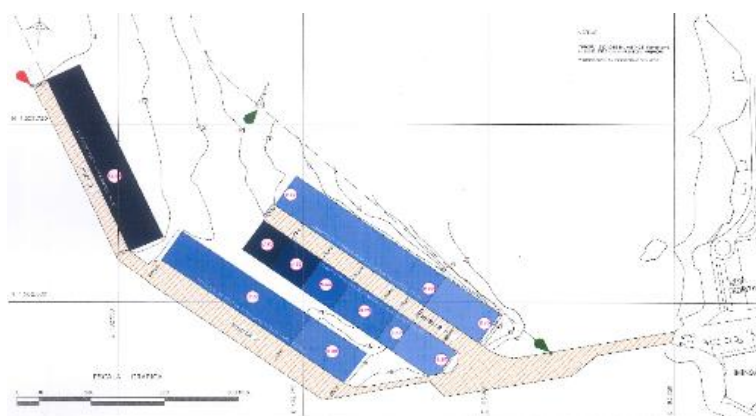
	2011	2012	2013	2014	2015	2016	2017	2018	2019
unit: ton									
Import									
General Cargo	153,101	155,251	251,742	227,644	286,510	344,421	393,017	401,907	414,723
Container Cargo	915,960	789,416	939,121	1,002,921	1,062,020	1,105,163	1,183,621	1,313,856	1,429,316
Dry Bulk Cargo	1,513,831	1,380,287	1,193,546	1,373,029	1,578,817	1,694,253	1,583,443	1,705,775	1,908,851
Liquid Bulk Cargo	493,456	513,095	437,107	482,759	433,472	485,572	452,932	379,809	383,139
Total	3,076,348	2,838,049	2,821,516	3,086,353	3,360,819	3,629,409	3,613,013	3,801,347	4,136,029
Export									
General Cargo	1,796	9,555	21,677	5,954	1,760	10,606	2,135	1,856	783
Container Cargo	615,086	490,386	570,327	439,231	529,234	538,423	587,373	681,850	613,916
Dry Bulk Cargo	281,764	343,554	378,865	400,638	454,512	295,907	341,862	323,197	466,070
Liquid Bulk Cargo	178,320	285,377	320,782	224,423	264,267	242,420	279,408	249,244	220,219
Total	1,076,966	1,128,872	1,291,651	1,070,246	1,249,773	1,087,356	1,210,778	1,256,147	1,300,988
Total	4,153,314	3,966,921	4,113,167	4,156,599	4,610,592	4,716,765	4,823,791	5,057,494	5,437,016

Source: CEPA

50. A finger-type mooring facility consisting of Docks A, B and C. Dimension of Docks is shown in the following table. Container yards and warehouses are developed on land connected to the pier.

Table 1-12 Dimension of Docks in Acajutla Port

DOCK CHARACTERISTICS				VESSEL MAXIMUM CHARACTERISTICS		
Name		Length	Max. Depth	Beam	Length	DWT
Dock A		323 meters	10.5 meters	36.0 meters	300.0 meters	95,000 M.T.
Dock B	North	362 meters	9.5meters	36.0 meters	330.0 meters	80,000 M.T.
	South	330 meters	10.7 meters	36.0 meters	295.0 meters	80,000 M.T.
Dock C		270 meters	12.5 meters	36.0 meters	250.0 meters	95,000 M.T.



Source: CEPA

Figure 1-13 Present Docks of Acajutla Port

51. CEPA, in cooperation with the Korean Government, conducted Acajutla Port Development Master Plan Study with a target year 2030. According to the report, land development including the office relocation is expected to begin in the near future. A new container terminal will be constructed in 2025, and a multipurpose terminal will be built in 2030.

Cargo Volume Forecast

52. The handling volume of four types of cargo, container cargo, general cargo, bulk cargo, and liquid cargo, is forecast up to year 2040 in three cases: Conservative Case, Neutral Case, and Optimistic Case.

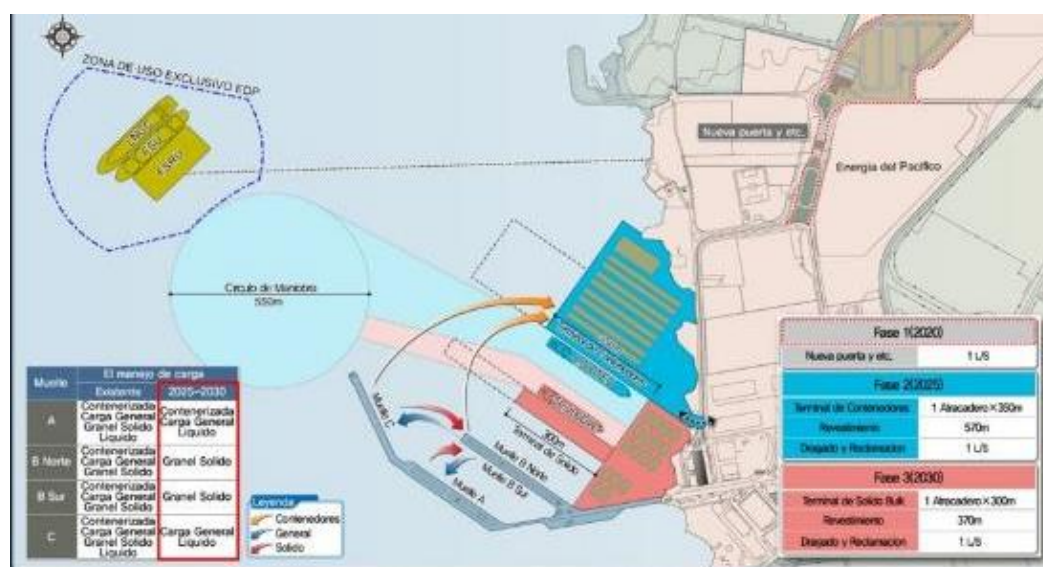
Table 1-13 Cargo volume Estimation at Acajutla Port

		2016	2020	2025	2030	2035	2040	annual growth rate (%)
Conservative Case								
Container Cargo	thousand TEU	202	251	352	472	627	724	5.5
General Cargo	thosand tons	366	468	673	970	1,153	1,393	5.7
Bulk Cargo	thosand tons	2,010	2,056	2,533	3,017	3,298	3,726	2.6
Liquid Cargo	thosand tons	728	735	760	790	815	844	0.6
Neutral Case								
Container Cargo	thousand TEU	202	276	383	519	682	779	5.8
General Cargo	thosand tons	366	526	724	1,055	1,267	1,531	6.1
Bulk Cargo	thosand tons	2,010	2,235	2,814	3,315	3,665	4,095	3.0
Liquid Cargo	thosand tons	728	758	800	849	906	918	1.0
Optimistic Case								
Container Cargo	thousand TEU	202	293	410	550	716	818	6.0
General Cargo	thosand tons	366	552	767	1,108	1,318	1,607	6.4
Bulk Cargo	thosand tons	2,010	2,324	2,899	3,382	3,775	4,258	3.2
Liquid Cargo	thosand tons	728	780	816	875	915	927	1.0

Source: CEPA

Neutral Case and Optimistic Case

- A new container terminal will be constructed in 2025,
- Bulk cargo will be consolidated in Dock B,
- Dock A will handle container cargo, general cargo, liquid cargo,
- Dock C will handle general cargo and liquid cargo.
- A new bulk terminal will be constructed in 2030.



Source: CEPA

Figure 1-14 Facility development plan (Neutral and Optimistic Case)

Ports of the Neighboring Countries

- Quetzal Port is located on the Pacific coast about 98 km from the capital Guatemala City. Quetzal Port is serving as an import / export base for container cargo to and from the west coast of North America, the west coast of South America, and the Asian region. It also serves as an export base for sugar and bananas, which are the country's main products, and imports energy resources such as coal and LPG, and corn. A number of projects are planned for the development of Quetzal Port, including the deepening of the water area, expansion of the south quay, a second phase of the container terminal (APM Terminal), improvement of the existing quay to accommodate larger vessels, and facilities to receive LNG. There are also plans to develop a free zone in the area adjacent to the port.
- Cortes Port is located on the Atlantic coast 400 km from the capital Tegucigalpa. Cortes Port is serving as an import / export base for container cargo between Honduras and the east coast of North America, the east coast of South America, and the European region. It also serves as an export base for bananas, coffee and free zone products, which are the country's main products, and as an import base for oil, corn, wheat and fertilizer. Berth 6 of 350m in length with two quay cranes was completed in October 2018. OPC invested USD 145 million under a concession contract. A 200-m extension of the quay is planned as Phase 2 project. The construction of additional berths with land reclamation is included in the long-term plan.
- San Lorenzo Port is located in the Gulf of Fonseca on the Pacific coast, 120 km from the capital Tegucigalpa. As the only port on the Pacific side of Honduras, it serves as an import /

export base for Far East Asian countries such as China and Taiwan, as well as an export base for iron oxide and sugar, which are the country's main products and as an import base for oil, automobiles, etc. The port does not have a long-term plan. In National Freight Logistics plan – PNLOG Honduras, 2019-2030, Improvement of the port including channel dredging is mentioned as a priority project related to Economic Corridor Puerto Cortés sub-SP. Sula-Tegucigalpa-San Lorenzo.

56. Caldera Port is located on the Pacific coast 80 km from the capital San Jose. Caldera Port serves as a gateway to the Pacific side of Costa Rica, and a base for import and export of container cargo and a base for importing grains such as corn and wheat. MOPT prepared a master plan of Caldera Port in the report of PLAN MAESTRO PORTUARIO DEL LITORAL PACÍFICO (Planes Maestros, Puerto Caldera) in January 2020. The plan is divided into three phases: Phase A is from 2020 to 2031, Phase B is from 2031 to 2042, and Phase C is after 2042. Phase A includes extension of berth 4 with 15m in depth, reform of current berth 1, 2 and 3 to new berth 1 and 2. pavement of yards, warehouse removal, bulk cargo handling facility development, quayside cranes (Shor to Ship; STS) and purchase of a yard cranes (RTG).
57. Corinto Port is located on the Pacific coast 150 km from the capital Managua. Corinto Port serves as a gateway to the Pacific side of Nicaragua and handles mainly container cargo, general cargo, liquid bulk cargo.

1.7 Port Management and Operation, Financial Situation

58. Administration systems on ports differ from country to country. Responsible organizations for port administration, management, and operation are summarized in the Table below:

Table 1-14 Responsible Organizations for ports

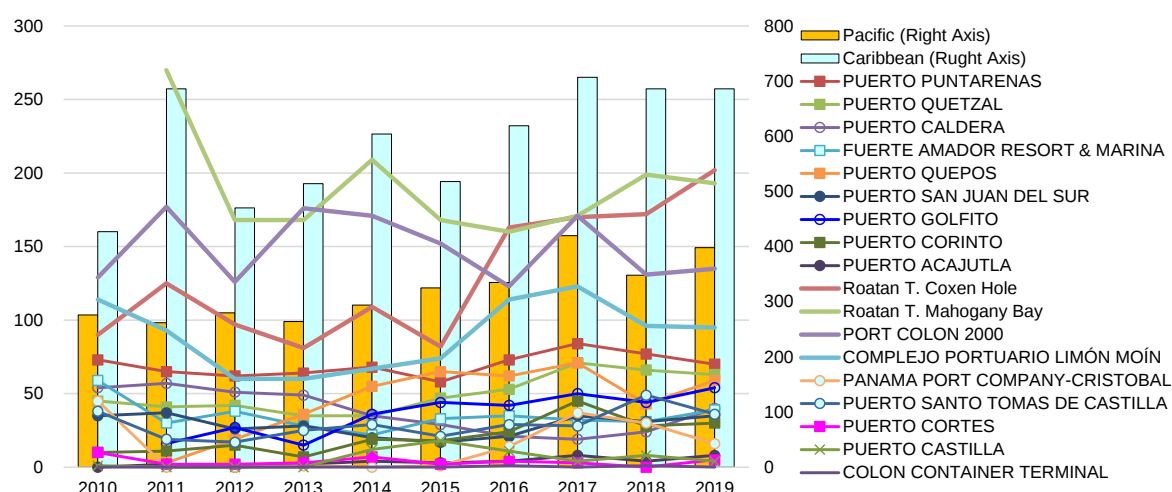
	Responsible Ministry	Maritime Authority	Port	Port Authority	Terminal Operator (Concessionaire)
Guatemala	CPN	AP	Quetzal Port	EPQ	APM Quetzal
			SANTOCAS Port	EMPORNAC	
			Barrios Port	Terminal Ferroviaria Puerto Barrios	Chiquita
El Salvador	MOPT	AMP	Acajutla Port. La Union Port	CEPA	
			Other ports		
Honduras	MTI	DGMA	Cortes Port	EPN	OPC
					TEH
			Other Ports		
Nicaragua			All Port		
Costa Rica	MOPT		Caldera Port	INCOP	SPC, SPGC, SAAM
			Ports on Pacific Coast		
			Limon/Moin Port	JAPDEVA	
			Moin Container Terminal		APM Moin
Panama		AMP	Balboa Port	AMP	PCC
			PAS Terminal		PSA
			Cristobal Port		PCC
			MIT		MIT
			CCT		CCT
			Other ports		

Source JICA Survey Team

1.8 Trend of Cruise Movement Centering on Central America

1.8.1 Trend of Cruise Ship Call at Ports in Central America

59. Cruise ships called at twelve (12) ports on the Pacific coast: Puerto Quetzal; Puerto Acajutla; Puerto La Unión; Puerto Corinto; Puerto San Juan Del Sur; Puerto Puntarenas; Puerto Caldera; Puerto Quepos; Golfito Port; Panama Port Company-Balboa; Decal Panama; and Fuerte Amador Resort & Marina. On Caribbean coast, ten (10) ports of Puerto Santo Tomas De Castilla, Puerto Cortes, Puerto Castilla, Roatan T. Coxen Hole, Roatan T. Mahogany Bay, Limón Moín Port Complex, Port Colon 2000, Port Colon 2000-Home Port, Colon Container Terminal and Panama Port Company-Cristobal received cruise ships in these five years.
60. On the Pacific coast, Puerto Quetzal, Puerto Puntarenas and Puerto Quepos receives more than fifty (50) cruise ships in a year on average. On the Caribbean coast, Roatan T. Coxen Hole, Roatan T. Mahogany Bay and Limón Moín Port Complex receive more than one hundred (100) cruise ships in a year on average.



Source: Prepared by the JICA Survey Team based on COCATRAM statistics

Figure 1-15 Ship Calls at Ports of Six (6) Central American Countries

1.8.2 Cruise Terminal in Central America

61. Puntarenas Port and Limón Moín Port Complex in Costa Rica, Port Colon 2000 in Panama, Port of Roatan and Mahogany Bay in Roatan Island of Honduras are famous cruise terminals in the Central American region. These ports provide dedicated wharves to cruise ships. In other ports, berthing priority is given to cruise vessels. Outlines of cruise terminals of four (4) ports are shown below.

1.8.3 Cruise Ship Calls at Acajutla Port and La Union Port

62. Numbers of cruise vessels which called at Acajutla Port in these five years are three in 2015, four in 2016, eight in 2017, four in 2018 and nine in 2019 according to the statistics issued
63. According to the statistics of La Union Port, cruise vessels called at La Union Port four times in the three years from 2017 to 2019. SERENISSIMA called once in 2017 and twice in 2019. SILVER EXPLORER called once in 2018.

1.9 Road Transport in Central America

1.9.1 Road Network

64. The structure of the Central American Regional Road (CA Road) network varies depending on the socio-economic conditions, topography, industrial location, and location of major ports in each country. The three northern countries (Guatemala, El Salvador, and Honduras) have a dense network. Most CA Road networks are consistent with the Mesoamerican International Highway Network (RICAM) set by the Mesoamerica Integrated Development Plan (Proyecto de Integración y Desarrollo de Mesoamérica: PM). Some roads in Nicaragua, Costa Rica and Panama are not included in the CA road network.

1.9.2 Road Traffic

65. The average daily traffic volume (AADT) of CA Roads and national highway-class major roads of each country shows large values in the area around the capitals and major cities of each country. On the other hand, focusing on the corridors, the traffic volume of the inter-ocean corridors CA4, CA5, and CA9 is relatively large, as well as the CA1 and CA2 lines running through Central America.

66. The figure below shows the truck traffic volume (including empty cargo) on the CA road and the main roads of each national highway level in Central America. Based on the limited data collected in this survey, cargo flow in the Pacific Corridor and cargo flow to major ports on the Atlantic coast, such as Cortez Port (Honduras) and Limon / Moin Port (Costa Rica), is large.

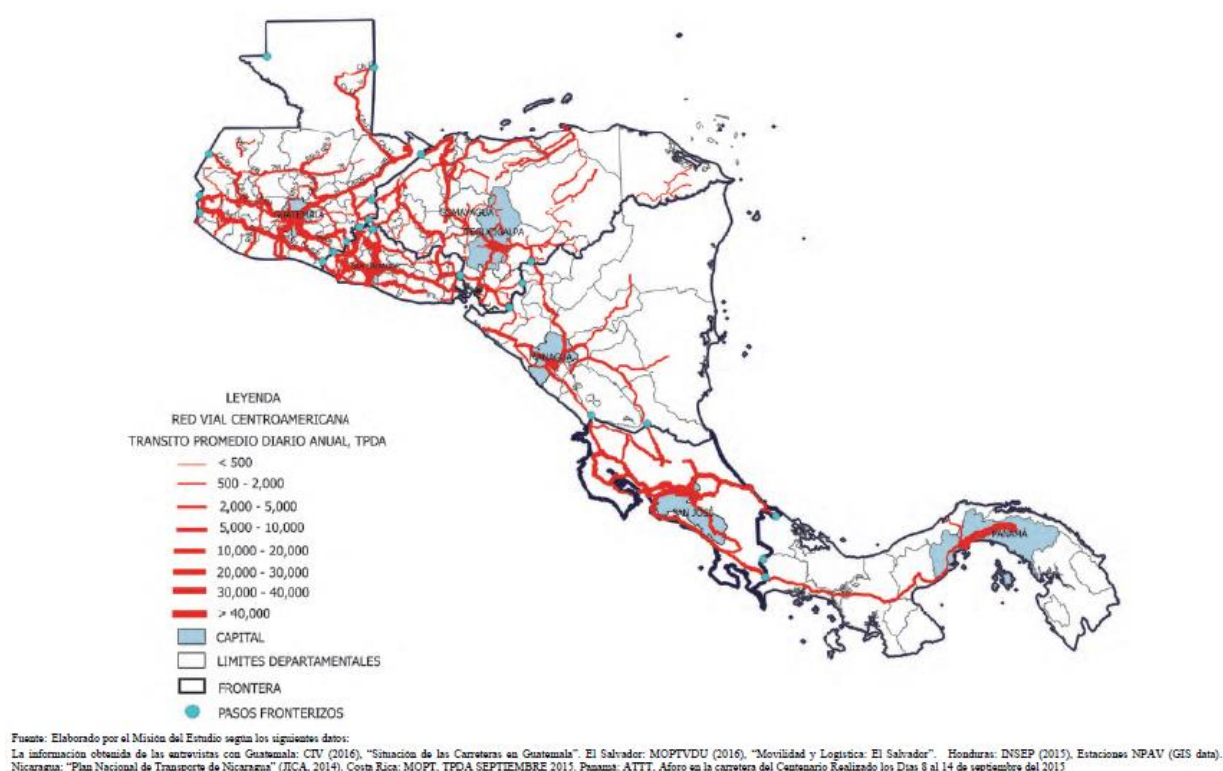


Figure 1-16 Average Daily Truck Traffic Volume of Main Roads in CA

Source: Proyecto de Estudios Para Diagnóstico, Mapeo y Diseño de La Institucionalidad Regional de la Movilidad y Logística en Centroamérica (2017/JICA)

67. According to Associations of Truck Transportation in Central American countries, the average cost and transport days between major cities and ports in Central America are shown in the table below:

Table 1-15 Average cost and transport days between major cities and ports

From: \ To:	Hidalgo City (border)	Guatemala City	St. Tomas Port	San Salvador	Tegucigalpa	San Pedro Sula	Cortes Port	Managua	San Jose	Panama City
Guatemala City/day	\$575/3		\$650/	\$575/3	\$1,200/4	\$900/4	\$1,025/	\$1,675/4	\$2,600/4	\$4,250/5
San Salvador/day	\$1,000/3	\$600/3	\$750/4		\$875/3	\$875/3	\$1,075/5	\$1,125/3	\$1,700/6	\$4,375/8
Tegucigalpa/day	\$1,650/5	\$1,250/4		\$850/3				\$850/3	\$1,300/4	\$2,700/5
San Jose/day	\$2,150/5	\$1,850/4	\$1,850/	\$1,550/3	\$1,450/2	\$1,600/3	\$1,675/3	\$650/2		\$1,350/2
Panama City/day		\$3,600/6		\$2,800/5	\$2,700/5		\$3,600/5	\$2,200/4	\$1,275/3	

Note: -Based on a 40-feet container truck, -Return route is assumed to be empty, -In the case of a 20-foot container truck, approximately 0.8 times the price of a 40-foot container truck is applied (based on interviews), -Trucks from Panama are assumed to be 48-foot box trucks, - The number of days is the number of days required for one way
Source: Prepared by the Study Mission according to the following data.
El Salvador: Information obtained through interviews with ASTIC / ASETCA / ACOSSETCA
Honduras: Information obtained through interviews with Catrachos & CATT
Costa Rica: Information obtained through interviews with ANATRAC

Source: *Proyecto de Estudios Para Diagnóstico, Mapeo y Diseño de La Institucionalidad Regional de la Movilidad y Logística en Centroamérica (2017/JICA)*

68. The unit cost per kilometer for a 40-foot container truck is calculated at approximately 1.5 ~ 2.5 USD/km. Since the weight of an international maritime container in Central America is estimated to be 8.9 ton/TEU, the average unit cost per ton-km is calculated to be approximately 8 ~ 14 US cents / ton-km. This value is lower than the World Bank survey (17 US cents / ton-km shown in the “What Derives the High Price of Road Freight Transport in Central America?” 2014). It is higher than the international average unit cost of developed countries of 2 ~ 5 US cents / ton-km as shown in the IDB survey.

1.9.3 Current Situation of Cargo Transport in El Salvador and Costa Rica

69. The Logistics Study describes the status of freight transport in Central American countries based on interviews with trucking associations in each country. Among the descriptions of cargo transportation in El Salvador and Costa Rica, matters related to ferry transportation are summarized below.

El Salvador

- Many sheets of DUT are required in case of consolidated cargo because DUT is prepared for each item.
- It takes a lot of time for clearance because container inspection at the border customs is conducted without a scanner.
- Documents of DUT are complex.
- It is possible to drive past 6:00 in the evening, but security costs are incurred.
- Large trucks (greater than 8 tons) are prohibited to enter San Salvador City at the edge of the city on the main roads (Santa Ana Road, Comalapa Road, Northern Gateway Road, Eastern Gateway Road, Boulevard Constitution) between 5: 00-8: 00 and 16: 30-19: 00.

- Loading/unloading works of trucks over 15 tons is restricted to nighttime (20:00-5:00).
- Due to congestion in urban areas, large vehicles cannot deliver cargo in the city; Development of a truck terminal is required.
- There is a lack of transshipment facilities in the suburbs which needs to be addressed by government agencies.

Costa Rica

- Border customs facilities are aging, and capacity has not responded to the increase in freight traffic.
- At Peñas Blancas (the border with CA1 Nicaragua), there is a shortage of cargo inspection sites. Inspection is being carried out using a private warehouse facility about 5 km away from the border.
- Since the 2000s, many cargoes from Asia have been transported by land via hub ports in Panama. At the border with Panama, facilities have not been improved in response to increased traffic. It takes long time for inspection due to lack of a scanner.
- TIM is digitized, but customs clearance requires submission of the original documents. Use of its own DUT causes problems.
- Server connections often go down. Requires application of local rules in addition to DUT.
- Transit cargo from Costa Rica to Guatemala needs to be screened in Nicaragua and El Salvador.

1.10 Customs Clearance

70. In Central America, despite the fact that the countries in the region as well as international organizations have worked towards improving procedures and realizing bilateral agreements, the logistics cost in the region is higher than in other regions, and the cost of customs clearance at the border is high. The time-consuming procedures and the reliance on land for most of the intra-regional trade have not been improved, which is an obstacle to the economic development of the region. In El Salvador, not only the improvement of customs procedures on the border with Guatemala and Honduras but also the improvement of border customs procedures is an urgent issue when considering regional logistics using sea routes.
71. The Central American General Treaty on Economic Integration, signed in 1960, stipulates the establishment of the Central American Customs Union (Unión Aduanera Centroamericana). It reaffirmed the gradual achievement of a customs union and allowed the conclusion of bilateral or multilateral framework treaties. In December 2007, the governments of Central American countries signed the "Central American Customs Union Framework Agreement" to strengthen the goals and principles of action necessary to achieve the Central American Customs Union. Regional tariffs on exports (original products) from the five Central American countries have been eliminated, except for coffee (unroasted / roasted), sugar, ethyl alcohol, petroleum products and distilled liquor.
72. On May 7, 2019, the Central American Customs Declaration System (DUCA) came into effect in Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama. DUCA has three modalities: DUCA-F is the transaction of goods generated in Central America, DUCA-D is the import / export transaction of goods with third countries other than Central America, and

DUCA-T is the international land transportation system.

73. SIECA has adopted a strategy (ECFCC *) focused on coordinated border control to facilitate trade and enhance competitiveness for improving logistics.

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1.11 Existing Development Plan / Concept

1.11.1 Five-Year Development Plan (PQD) 2015-2019

74. In El Salvador, successive administrations have formulated a five-year national development plan (PQD), and based on this plan, each ministry and agency prepare a five-year plan for responsible departments and manages the administration. President Bukele came to power after winning the presidential election in February 2019, but the official sector plan has not yet been announced because the PQD of the Bukele administration scheduled for January 2020 has not yet been announced. (Ministry of Economy information).

1.11.2 Cuscatlán Plan

75. In El Salvador, the only official policy currently available is considered to be the Cuscatlán plan, which was announced as a collection of promises when President Bukele took office, as all previous plans will be blank during the transition of power.
76. The plan mentions President Bukele's reforms of the new administration, especially security issues, corruption, and the bureaucratic and inefficiencies of the previous administration by sector.

1.11.3 Economic Take-off Plan

77. In January 2020, the government announced that it would develop an economic take-off plan aimed at improving the situation of the state, both at the macro and micro levels. According to the plan, import tariffs on electric vehicles can be reduced from 30% to 0%, traffic electrification can be promoted, and innovation, modernization and environmental friendliness can be promoted. President Bukele said the plan was expected to be developed in six months, but as of October 2020, at the time of writing, the plan has not yet been announced.

1.11.4 Eastern Region Development Plan

1.11.4 (1) Master Plan for Economic Development in the Eastern Region of El Salvador (CND, 2004)

78. PNOTD (ELS Plan Nacional de Ordenamiento y Desarrollo Territorial) is a national regional development plan (March 2004), and Vol.8 shows the development plan for the eastern region.
79. The Final Report on Economic Development in El Salvador (March 2004) is positioned as the Master Plan for Economic Development in the Eastern Region of El Salvador (herein after referred to as "Master Plan 2004-2019"), which consists of the following items:

- Eastern region development frame with 2019 as the target year,
 - Scenario of eastern region development by activation of La Unión Port,
 - Development programs and projects,
 - System and financial measures
80. The Master Plan 2004-2019 emphasizes that in order to fully utilize the external economic effects of developing La Unión Port, it is necessary to develop the local industry simultaneously with La Unión Port. In this regard, Professor Michael Porter stated the following: "If the local industry is unproductive, it will slow down the export industry".
81. The development scenario in the eastern region is strongly linked to the revitalization of La Unión Port. By combining two types of activities, namely, port-induced economic activity and strategically initiated port utilization, a wider range of economic activities supported by base industries and logistics could be realized. Based on this concept, the development scenario for the eastern region was proposed in the masterplan.
82. The development scenario is composed of three phases after the completion of the La Unión Port up to the year 2019 together with the required initial development as the base of the phased development scenario. The related projects and institutional measures that need to be implemented to ensure proper operation of the port from the beginning are initially proposed."
83. Under the plan, San Miguel By-pass construction project financed by JICA and other infrastructure development such as the sporadic projects of the FOMILENIO II program by the United States are on-going. Some companies such as CALVO have set up factories subject to the Free Zone Law. It is important to confirm the current progress of the related projects and Initial Development described as the base of the phased development scenario.

1.11.4 (2) Development Proposal for La Unión Subregion (CND, 2008)

84. This proposal is based on the Spatial Development Plan for the Subregion, Vice Ministry of Housing and Urban Development (VMVDU) prepared in 2006, at La Unión Subregion (6 cities of La Unión, Conchagua, Intipucá, Meanguera del Golfo, Pasaquina, San Alejo), which proposed the formation of an organization necessary to form a port town centered on La Unión Port as originally proposed in the Eastern Development Master Plan (CND, 2004). It mentioned the necessity of reviewing the regional outline and characteristics, current status and review (reconfirmation) of the back zone development strategy centered on the port, and the synergistic effect of port activation and back zone development for regional development. It is proposing the establishment of Area Under Special Regime (ABRE) as a promotion body and coordinator for that purpose.

1.11.4 (3) Eastern Region Development Master Plan 2015-2025 (STPP, 2016)

85. Under the framework of PQD (Five-Year Development Plan) 2015-2019, it was recreated as a plan that incorporates the voices of the field based on the limited results of the Eastern Regional Development MP (CND, 2004) and lessons learned from the implementation process.
86. The Master Plan consists of 6 programs, 24 strategic sub-programs, and investment projects* in the eastern region and 4 provinces consisting of short-term (2015-2019),

medium-term (2020-2022) and long-term (2023-2025). (* Selected from 120 strategic action guidelines by Casual Analysis)

87. At present, neither CND nor STPP exist, and the current authority in charge of economic development in the eastern region is the Secretary of Commerce and Investment. In this survey, meetings and interviews were not realized.

1.11.5 Infrastructure Master Plan (IDB) (January 2020)

88. Master Plan for ports and airports is still being prepared by the Government of El Salvador. However, IDB (Inter-American Development Bank / Banco Interamericano de Desarrollo) has formulated “El Salvador Infrastructure Master Plan 2019-2030” (Plan de Maestro de Infraestructura de El Salvador 2019-2030) in January 2020. The demarcation of roles between Acajutla Port and La Union Port was not clearly addressed. However, regarding the Port of La Union, the following three points were raised in the Portfolio of investments prioritized by sector:

- Acquisition of Container Cranes and Dredger
- Ferry Implementation: Route Puerto Caldera - Puerto La Unión route.
- Development of CEPA extra port zones

1.11.6 Conceptual Technical Proposal and Potential Investments in Infrastructure and Economic, Social and Financial Analysis (UNDP)

89. UNDP, within the framework of the Modernization and Management of Strategic Assets Program that it carries out with CEPA, contracted feasibility studies in the tourism, aquaculture and shipyard sectors in 2020.

1.11.7 Master Plan for the Development of the Ports in El Salvador (2020-2030)

90. The Master Plan for the Development of the Ports in El Salvador (2020-2030) was formulated by UNDP in June 2021. In this Master Plan, both Acajutla and La Union should be operated in a complementary manner, and the study defines the function of La Union Port and Acajutla Port as shown in the table below.

	La Union	Acajutla
Uses of the Port's space. Attention to all types of cargo. Public use for all users who require the services.	Mixed port (commercial, industrial, recreational, and fishing) for the economic development of the Eastern Region of El Salvador.	Commercial port specializing in the operation of each type of cargo being handled to increase the competitiveness of El Salvador's international trade.
Design vessel	10 m draft	14 m draft.
Operation type The vessels' gear is used. Low specialization of port equipment.	Multi-purpose Semi-specialized maneuver.	Dedicated facilities by type of cargo. Specialized handling.
Berthing preferences.	First come, first served.	Container cargo scheduled arrivals. Rest of cargo first come, first served.
Target maritime connectivity.	Container feeder services, and tramp vessels. Tourist cruises.	Direct Services for Containers. Other cargoes are trap vessels.
Management model.	Landlord CEPA; Port Administrator Operator; Private concessionaire	CEPA will continue to be the port manager and operator.
Relation to its extra-port zones	Promotion of the establishment of companies and industries that generate cargo for the port.	Encourage the establishment of logistics activities to support existing chains.

91. It would be beneficial for La Union Port if various private industries begin to use the extra-port zones since the cargo generated there would eventually be handled in the port.

Chapter 2 Ferry Project

2.1 Short Sea Shipping Situation in Central America

2.1.1 TMCD in Central America

92. The movement to establish an intra-regional maritime transport system in the Central American area began in the 1980s and has been debated and studied among relevant countries at COCATRAM.
93. In 2001, COCATRAM completed a Pre-feasibility Study on TMCD.
94. Subsequently, in 2013, the Maritime Authority of Panama, with the technical collaboration of COCATRAM, within the scope of the Mesoamerican Integration and Development Project, coordinated the Feasibility Study of the Development of TMCD.
95. In 2019, COCATRAM reported the progress of the TMCD to the Council of Ministers Responsible for Transportation in Central America (COMITRAN). In this report, the endeavors towards the inauguration of a ferry service between La Union Port and Caldera Port is introduced as a specific move toward realizing TMCD.
96. As indicated in the 2019 report above, the countries concerned are supposed to develop their own systems related to TMCD operation by country, and each country has to create its own National Action Plan, which will lead to the TMCD Regional Action Plan.
97. Guatemala has already set up a TMCD Inter-institutional Committee, which has been working on drafting a National Action Plan. It is expected that Guatemala will provide an example of good practices and be a positive influence on neighboring countries.

2.1.2 History of Challenges in Introducing Ferry Transport at La Union Port

98. Ferry services in Central America are not active compared with other areas of the world.
99. Following is a chronology of attempts to open a new ferry service connecting La Union Port to other Central American ports in the Pacific:

Table 2-1 Chronology of Attempts to Open a New Ferry Service

Year	Events
2013	✓ Spanish shipping company “Naviera del Odiel” (Odiel) announced its ferry service plan between La Union Port / Corinto, Nicaragua.
	✓ A cooperation agreement between CEPA / Odiel was signed, with the aim of starting service in November 2013.
2014	✓ Odiel continued to make necessary arrangements in order to launch the service in October 2014, subject to Nicaragua government approval.
	✓ In another movement, Presidents of three countries (El Salvador, Honduras and Nicaragua) agreed on “The Fonseca Bay Area Joint Development Plan” at the presidential meeting held in August 2014. The plan is supported by the Central American Bank for Economic Integration (CABEI). The project includes a plan to rebuild the regional ferry route connecting La Union / Corinto / Amapala / San Lorenzo, along with promoting tourism, agriculture and fisheries in the region.

Year	Events
2015	✓ The response from the Nicaraguan government to the ferry service was slow and Odiel's plan to connect La Union with Corinto by ferry was stalled.
	✓ Odiel newly selected Puerto Caldera, Costa Rica as alternative ports of call, and has planned a ferry service between La Union and Caldera.
	✓ Odiel disclosed the fare level of \$ 800 with an operation plan of 3 services per week.
2016	✓ Costa Rican government and Odiel issued a joint statement, aiming to launch a new ferry plan within the year.
	✓ Odiel disclosed the operation plan using the Ro-Ro ship "MV La Paz Star".
	✓ Odiel entered into a lease agreement with CEPA for the use of port facilities of La Union Port.
2017	✓ Odiel announced that it will withdraw from the ferry project. It is said that the reason was that the applicable tariff for ferry operation at Caldera Port could not be agreed with the Costa Rican authorities.
2018	✓ The Nicaragua crisis broke out in April 2018. Citizens who were dissatisfied with the government's policies engaged in protests including the blockade of main national highways connecting with neighboring countries. The road traffic passing through Nicaragua was severely affected by this action for a considerable portion of the year. Because of the crisis, the need for alternative transport routes for the traffic passing through Nicaragua was greater than ever before.
	✓ In July 2018, the governments of El Salvador and Costa Rica reached a basic agreement on the promotion of ferry projects connecting both countries and to accelerate the development of necessary regulatory scheme in both countries.
	✓ Grupo Desacarga, a logistics company in Costa Rica, was granted the country's first multi-modal transport license from the Government of Costa Rica. Desacarga announced that they are going into the ferry business between La Union and Caldera.
	✓ In addition to Grupo Desacarga, several other companies were reported to be interested in exploring ferry business on the same route. These are FJA Logistics in Costa Rica, Baja Ferries in Mexico and others.

2.1.3 Views of Stakeholders on Ferry Service to/from LA Union Port

100. In El Salvador, we conducted interviews with the Chamber of Commerce and Industry of El Salvador (CAMARASAL), La Unión division of CAMARASAL, around 30 companies participating in the COEXPORT, the Sugar Association (Asociación Azucarera), the Industrial Chemicals-Pharmaceutical Association (INQUIFAR), Truck Associations, National Commission of Micro and Small Companies (CONAMYPE) and Federation of Chamber of Commerce for Central American Isthmus (FECAMCO), etc. In the interviews, many of the companies pointed out various problems associated with land transportation such as the complexity and time required for customs clearance at borders, and unexpected costs and safety issues. High expectations for the use of ferries for on-time transportation, time-saving benefits, and cost reductions associated with safety measures were confirmed.
101. Regarding the truck associations, it was basically said that the use of ferry would be considered depending on the cost of the ferry. However, some transportation unions are worry about a business that would compete with truck transportation, while some companies/associations have identified ferry as a transportation option.
102. When using a ferry, the ferry fee needs to be paid in advance to the trucking company, and it takes about one week to receive the payment against the invoice, which is issued after the completion of the entire transportation process. For this reason, they mentioned the necessity of a financial system to finance this short period to ease the financial burden..

103. Some shipping companies are concerned about a conflict of interest between the ferry operator and the existing truck industry. In consideration of this point, the COCATRAM TMCD Report also noted the importance of coexistence with the truck industry in implementing inter-regional short sea shipping (including ferry).

2.1.4 Ship Provision and Operation

2.1.4 (1) Naviera del Odiel

104. Naviera del Odiel ("Odiel") is a Spanish shipping company with a long history. In the past, they managed and operated container vessels within Europe and in transatlantic trade and later engaged in container terminal operation in Spain. Currently, they carry out activities in other ports such as La Paz, Baja California, Topolobambo, Los Mochis, Sinaloa; Miami, Puerto Rico, Dominican Republic, Bilbao, Algeria, Corsica and Sardinia.. In 2013, Odiel launched a new Ro-Ro ferry project to connect La Union Port and Corinto in Nicaragua. However, due to the slow pace of development on the Nicaraguan side, Odiel opted for Puerto Caldera in Costa Rica rather than Corinto for the connecting port. The project, however, was suspended in 2017 because institutional mechanisms at Caldera Port were not properly developed to receive ferry service and because ferry service would not be economically viable due to the extremely high port tariff at Caldera Port. In 2018, protests in Nicaragua led to the closure of national roads which temporarily paralyzed road traffic between neighboring countries. In 2020, due to the Corona-virus pandemic, Nicaragua/Costa Rica border has been intermittently closed which again hampers road traffic between neighboring countries. Under such circumstances, demand for establishing an alternative transportation route by sea is steadily growing. Odiel is now working with CEPA to initiate ferry service between La Union and Puerto Caldera in Costa Rica at the earliest opportunity. In this connection, the option of Puerto Golfito in Costa Rica was discarded in the middle of 2020 due to the extra distance (approximately 170 nm) with respect to Puerto Caldera.

105. Outline of ferry service currently planned by Odiel is as follows:

Main Point	Contents
Service frequency	3 services per week
Cargo per voyage	60' trucks x 70~100 units per voyage
Cargo details	Trailer with tractor-head, Trailer without tractor-head, mixed loading
Cargo operation	Self-discharge and self-load for Trailer with tractor-head by truck driver Shipping company (Odiel) handles discharge and loading for Trailer without tractor-head using Odiel's own equipment (tractor-head) at both ports
Hours at port	Discharge time: 3 hours, Loading time: 3 hours (Total of 6 hours at port)
Hours for navigation	15~17 hours one-way (voyage), depending on the vessel
Mooring Method	Stern of the vessel is moored to the berth (the so-called "Mediterranean Method")
Designated berth	La Union: Multi-purpose Berth (or Passenger Berth) Puerto Caldera: Berth No. 3
Vessel Type	Depends on availability at the start of service, but basically a vessel equipped with mobile and hydraulic ramp for cargo discharge and loading as well as an azimuth propeller system for easy maneuvering without tugboat help is used.
Remaining Issue	Port Charges at Puerto Caldera

106. Grupo Desacarga (hereinafter referred to as “Desacarga”) is a logistics provider in Costa Rica. They have been engaged in the development of a ferry project since 2018 as a vital solution to various problems pertaining to road transportation within Central American countries. They are the first company authorized by the Costa Rican Government as a provider of multimodal transport. Desacarga has been working closely with exporters and relevant parties of both countries in preparing for the new ferry service between La Union and Puerto Caldera.
107. According to the Desacarga's plan, a vessel with a capacity of about 100 trucks, a maximum draught of 6.5 meters, a captain of 170-185 meters, and a minimum speed of 17 knots will be procured on the second-hand market, and she will be operated on the 340 nautical mile route between La Union and Caldera in 17-20 hours each way, The service will be offered three round trips per week.
108. As to the ferry operation at port, Desacarga is of the opinion that the vessel should be tied in the conventional manner, namely, parallel to the berth for the safety of the ship and port operation. For a typical ferry vessel equipped with cargo ramp at stern, it is necessary to install a movable “floating pontoon” between the ship’s stern and the berth in according to the situation of tidal change. Desacarga is also looking for a suitable ferry vessel to be used for the service but has yet reached a final decision on this matter.

2.2 Viability of Ferry Transport Business

2.2.1 Features & Advantages of Ferry Service

109. There are pros and cons for both “sea transport” and “road transport”. Ferry/Ro-Ro transport is basically more punctual and faster rather than container vessel transport.

Table 2-2 Pros & Cons of Ferry/Ro-Ro Transport

Items	Ferry/Ro-Ro Transport	Road Transport
Unit transportation cost (per km)	Less than other modes	Fairly large (e.g., 1.5 ~ 2.5 USD/km for 40f container trailer in Central America region based on the Logistics Survey in CA (2017, JICA)
Transportation time	Longer than other modes	Door to door transport is swift
Reliability/Punctuality	Basically reliable and punctual except in case of rough sea condition	Sometimes unstable due to traffic jams, accidents and so on
Possible damage to cargo	Not much	Some damage could occur during journey
CO ² Emission	40 g-CO ² /ton/km	200~220 g-CO ² /ton/km
Resilience to natural disasters	Resilient to natural disaster except in case of heavy damage to port facilities	Sometimes fragile in case of natural disaster, and recovery works can be time-consuming

110. Ferry/Ro-Ro transport services should be competitive against road transport. But at the same time, initiatives to collaborate with road transport should also be pursued because the ferry service will not be realized without road access.

2.2.2 Demand Analysis

2.2.2 (1) Ferry Cargo Demand Estimated by Market research

111. For estimating the amount of cargo expected to be handled at La Union Port, a questionnaire survey was given to import and export companies in El Salvador and Costa Rica regarding their interest in using ferries between La Union Port in El Salvador and Caldera Port in Costa Rica. The questionnaire survey was conducted with the cooperation of the Chamber Exporting Companies in El Salvador (COEXPORT) and in Costa Rica (CADEXCO), to which many of the exporting companies belong. Interviews were conducted with each member company in the period of November 2019 and February 2020.
112. Almost all the companies interviewed answered that they are interested in ferry operation as it is an additional option as long as the total logistics cost is lower than the all-truck route. (The cost of all-road route would be around 1,300 ~ 1,500 USD according to our interviews conducted in the first field survey in November 2019). Majority of the companies (23) said that cost is the key factor in whether they will use the ferry. 15 companies mentioned that time is important as most of them encounter problems at the border crossing.
113. Competition with land transport needs to be duly considered. A shipping company used to try container vessels service once a week between Chiapas Port in Mexico and Acajutla Port. However, in response, the truck companies/association increased the frequency of truck transport and also reduced fees, resulting in a sharp drop in demand for container ships; the service was eventually discontinued. La Union Port would be well advised to examine possible measures that could be taken by trucking companies.
114. Sea transport and ferry service between Costa Rica and El Salvador, which straddles Nicaragua because of the troublesome and time-consuming procedures involved in passing through that country, is a route with strong demand. Good coordination with the truck industry will be important for the implementation of ferry operation.

2.2.2 (2) Land Trade Volume and Commodities to/from Costa Rica and Panama

115. The JICA Survey Team examined the cargo volume and commodities between El Salvador and Costa Rica as well as Panama passing through the land border (El Amatillo) in 2017 and 2018. Almost all land transportation cargo between El Salvador and Costa Rica, Panama passes through El Amatillo.
116. The main export commodities to Costa Rica are paper, food, steel products, plastic products, etc. The average export cargo volume of 2017 and 2018 is 136,350 tons.
117. The main export commodities to Panama are foodstuffs, paper, detergents and oils, plastic products, steel products, etc. The average export cargo volume of 2017 and 2018 is 32,500 tons.
118. The main import cargoes from Costa Rica are foodstuffs, cement and stone, steel products and metals, wood products and charcoal, pottery and glass products, plastic products and chemical products, chemicals, cosmetics and detergents. The average import volume from Costa Rica in 2017 and 2018 is 150,550 tons.

119. The main import commodities from Panama are apparel and their materials, decorations, machinery, marine products, plastic products and chemical products, etc. The average import volume from Panama in 2017 and 2018 is 33,300 tons.

2.2.2 (3) Estimation of El Salvador Transit Cargo Volume

120. The JICA Survey Team assumes that the cargo being transported between Guatemala and Costa Rica as well as Panama on land may take the ferry between La Union Port and Caldera Port.

Table 2-3 Estimated Land Transit Cargo Volume between Guatemala and Costa Rica, Panama passing through El Salvador

unit : 000 ton

		Destination			total
		Guatemala	Costa Rica	Panama	
Origin	Guatemala		225	40	265
	Costa Rica	244			244
	Panama	26			26
	total	270	225	40	535

Source: JICA Survey Team

2.2.2 (4) Estimation of Potential Cargo Volume by Ferry

121. The transport time and cost using ferry service between La Union and Caldera are assumed as follows based on the field survey.

Table 2-4 Time and Cost Comparison between All-Road and Road & Ferry Route

	Road & Ferry Route	All-Road Route
Transport Time	SSV ~ PLU: 5 hours La Union: (T) hours...CIQ procedure etc. La Union ~ Caldera: 20 hours (with 17 knots) Caldera: (T) hours...CIQ procedure etc. Caldera ~ San Jose: 2 hours Total: 1 day + (3 + T *2) hours	SSV ~ San Jose: 3 ~ 5 days
Transport Cost	SSV ~ PLU: 250 ~ 300 USD PLU: (C ₁) USD PLU ~ Caldera: (C ₂) USD Caldera: (C ₃) USD Caldera ~ San Jose: 100 ~ 150 USD Total: 350 ~ 450 + (C ₁ + C ₂ + C ₃) USD	SSV ~ San Jose: 1,300 ~ 1,500 USD*

Note) SSV: San Salvador, PLU: La Union Port

*



Source: Compiled by the JICA Survey Team

122. Based on the table above, Road & Ferry Route has a big advantage in terms of transport time. However, it is found that there would be not much difference in terms of transport cost, which depends on the fare of ferry and port due and tariff in both ports, i.e., La Union and Caldera.
123. According to the port due and tariff of both ports, C1 (tariff at La Union Port) would be around 50 USD per 15MT truck, and C3 (tariff at Caldera Port) would be around 100 USD per 15MT truck. Therefore, if C2 (ferry fare) were set to 900 USD for example, the total cost of Road and Ferry Route would be 1,400 ~ 1,500 USD, which might be slightly higher than the All-road route..
124. It should be also noted that there are two types of cargo that may use ferries. Land trade cargo between El Salvador and Costa Rica, Panama and land transit cargo passing through El Salvador. Considering the competitiveness in terms of transport time and cost, the JICA Survey Team estimated the potential cargo volume to be transported by ferry assuming modal share between the two routes, i.e., All Road Route and Road & Ferry Route as follows: 40% for the route between El Salvador and Costa Rica / Panama and 20% for the routes between Guatemala and Costa Rica / Panama).

Table 2-5 Estimation of Export/Import Cargo to/from El Salvador

From La Union Port to Caldera Port					tons
Origin	Destination	Volume	Share of Ferry	Volume of Ferry	
El Salvador	Costa Rica	136,350	40%	54,540	
	Panama	32,500	40%	13,000	
Total		168,850		67,540	

From Caldera Port to La Union Port					tons
Origin	Destination	Volume	Share of Ferry	Volume of Ferry	
Costa Rica	El Salvador	150,550	40%	60,220	
Panama	El Salvador	33,300	40%	13,320	
Total		183,850		73,540	

Table 2-6 Estimation of Transit cargo through El Salvador

From La Union Port to Caldera Port				tons
Origin	Destination	Volume	Share of Ferry	Volume of Ferry
Guatemala	Costa Rica	225,000	20%	45,000
	Panama	40,000	20%	8,000
Total		265,000		53,000

From Caldera Port to La Union Port				tons
Origin	Destination	Volume	Share of Ferry	Volume of Ferry
Costa Rica	Guatemala	244,000	20%	48,800
Panama	Guatemala	26,000	20%	5,200
Total		270,000		54,000

2.2.3 Assumption of Operation Plan Based on Cargo Demand

125. The number of vehicles that use ferry is calculated with average loading weight per vehicle based on the cargo volume estimated in the above, 2.2.2. The JICA Survey Team assumes the average loading weight is 16 tons per truck.

Table 2-7 Cargo Volume and Number of Trucks Transported by Ferry

Cargo Volume and Number of Units (Trucks) Transported by Ferry					tons
Direction		Origin	Destination	Cargo Volume	Number of Units
La Union Port → Caldera Port		El Salvador	Costa Rica & Panama	67,540	4,221
		Guatemala	Costa Rica & Panama	53,000	3,313
		Total		120,540	7,534
Caldera Port → La Union Port		Costa Rica & Panama	El Salvador	73,540	4,596
		Costa Rica & Panama	Guatemala	54,000	3,375
		Total		127,540	7,971

Assuming 16 tons per truck

126. The departure and arrival times of La Union Port and Caldera Port should be set to the same time on different days of the week. The following conditions are taken into account when calculating the number of operations.

- The annual operation period is 12 months (Maintenance period could be ignored at this moment but should be considered at a later stage.)
- The number of vehicles in one operation is about 70% of the maximum capacity

127. Number of ferry trips from La Union Port to Caldera Port as well as trips from Caldera Port to La Union Port are:

- La Union to Caldera: $7,534 \text{ units} \div 52 \text{ weeks} \div 70 \text{ cars} = 2.1 \text{ /week}$
- Caldera to La Union: $7,971 \text{ units} \div 52 \text{ weeks} \div 70 \text{ cars} = 2.2 \text{ /week}$

128. From the above results, it is considered that 2-3 services are required per week.

- In the case of 3 services/week:
 $(7,534 + 7,971) \text{ units} \div (3 \times 52) \text{ services} = 50 \text{ units / service}$
- In the case of 2 services/week:
 $(7,534 + 7,971) \text{ units} \div (2 \times 52) \text{ services} = 75 \text{ units / service}$

2.2.4 Vessel Procurement

129. At La Union Port, it is desirable to deploy a vessel with a Side Ramp which can use a quay

without special facilities at the port. But in order to keep flexibility in the ferry operation plan, a ferry with a Stern Ramp should also be considered. It should also be noted that the quay modification, i.e., introducing slope area in a part of quay, would be recommended for any type of vessel due to the substantial tidal change.

130. In the case of a ferry with a stern ramp, it is recommended to install a connection facility (floating pontoon) linking the quay and the ferry's stern considering the big in La Union Port tidal change (the difference between LWL and HWL is around 3.5m) and the gap between the crown height of the quays in La Union Port and the height of vehicle cargo deck of a ferry (the height of the quay is 5.13m from LWL), Without this connection facility, the mooring cross sections of the quay to ferry are depicted as in the figures below assuming a) freeboard (height vehicle cargo deck) is around 2m, and b) the distance between the quay and the ferry would be 5m or 18m. Then, it is found that vehicle cargo can be unloaded/loaded only in the timing of high tide. In other words, during the tide level is less than HWL, it is difficult to unload/load vehicle cargo because the end of stern ramp could not reach the surface of the berth.

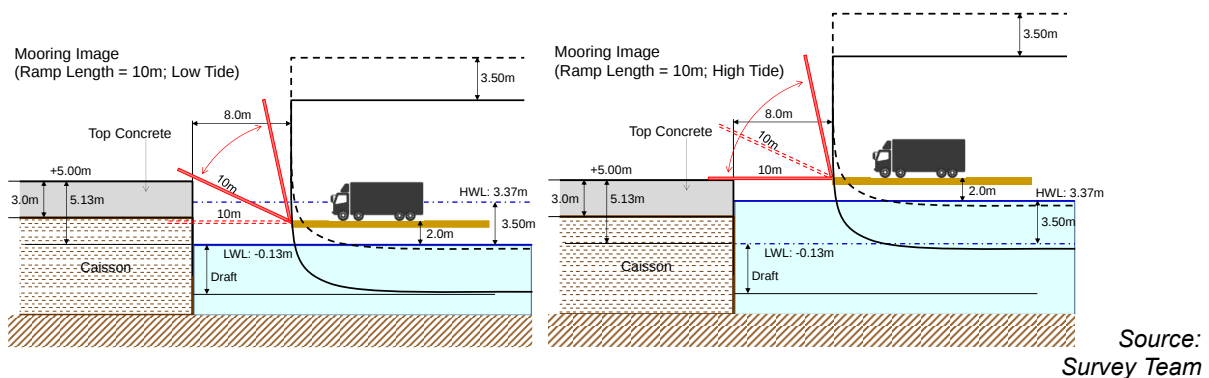


Figure 2-1 Cross Section of Quay to Ferry (in case of Low Tide (Left), High Tide (Right))

131. We also examined whether the slope could be installed on the quay and whether the ramp could be down all the time regardless of tide level. The mooring cross sections of the quay to ferry are depicted as in the figures below: In this case, the ramp can be down all the time, but it is found that the ramp angle would be too steep for unloading/loading vehicle cargo and the end of ramp will be in the water during the high tide. Therefore, it would be not desirable because handling time would be limited from the low tide to the middle tide.

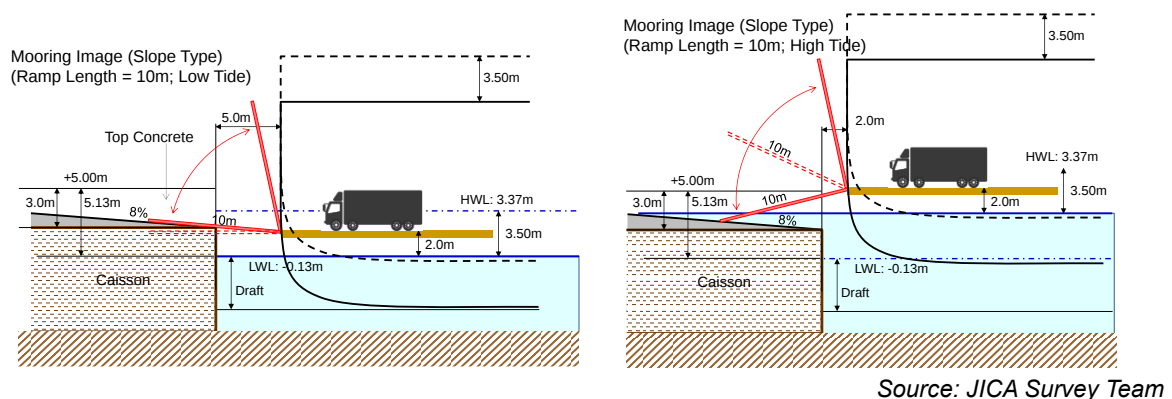


Figure 2-2 Cross Section of Quay with Slope to Ferry (in case of Low Tide)

132. Based on the above examination, it is recommended that a kind of connection facility linking the quay and the ferry should be installed for the safe and stable vehicle cargo handling.
133. Considering the Standards of Vehicle in Central America, dimensions of truck on board are set as follows (trucks on board will be accompanied by truck driver(s)): (For the unhooked cargo, we need to consider trailers with container chassis.)
- Maximum weight: 45.5 ton
 - Maximum Length: 21 m
134. Since vessel purchase cost constitutes the largest portion of the initial investment cost, deployment of a second-hand vessel can increase project viability. if the retrofit work can be managed within the reasonable level of cost.

2.2.5 Cost of Multimodal Transport by Ferry

135. The costs related to the ferry operation such as land transportation costs, port and cargo handling charges (based on the tariffs of La Union and Caldera ports), and vessel operation costs including fuel costs are calculated assuming “La Paz Star” (16,776 Gt). The details are shown in the main report.

2.2.6 Financial Viability

136. Based on the above costs as well as the total annual transportation volume of 15,505 trucks estimated in the demand analysis, estimated break-even fare is 1,000 USD per truck in the case of 3 services per week, and 800 USD in the case of 2 services per week as shown the tables below (The speed is assumed as 17 knots). Both cases are viable for a ferry operator, but considering the competitiveness against the all-road route by truck, the latter case, i.e., 800 USD of fare for 2 services per week seems to be realistic. (The total cost is calculated around 1,250 USD (800 USD (for Ferry) + 300 USD (land transport cost between SSL and PLU) + 150 USD (land transport cost between Caldera and San Jose), which is less than the all-road transport cost (around 1,300 USD). This is because the load factor (L/F) becomes high (75%) in the case of 2 services per week compared to the case of 3 services per week (L/F=50%).)

2.3 Infrastructure and Operation at La Union Port

2.3.1 Basic Concept

137. The basic concept in formulating the improvement plan and initiating ferry service at La Union Port is as follows:
- As a project to trigger the revitalization of La Union Port, stakeholders should work together to expedite project implementation.
 - Development of facilities and operation method of the ferry terminal should be prepared based on the results of the study that CEPA has been working on so far and information obtained and analyzed in this survey.
 - Existing facilities will be utilized as much as possible to reduce the size of the new investment and shorten the period until service.

2.3.2 Berth Location

138. The JICA Survey team compares the three options for the case of a ferry with a stern ramp as shown below. Option-1 is to berth at the Passenger berth, Option-2 is to berth at the multi-purpose berth, and Option-3 is to berth at the opposite side of the terminal. (In the case of side/quarter ramp, the berth location should be Option-1 or 2 and it would not be necessary to introduce connecting facility but slope on the quay would be necessary to deal with the tidal change. The Option-3 is not applicable for the side/quarter ramp.)



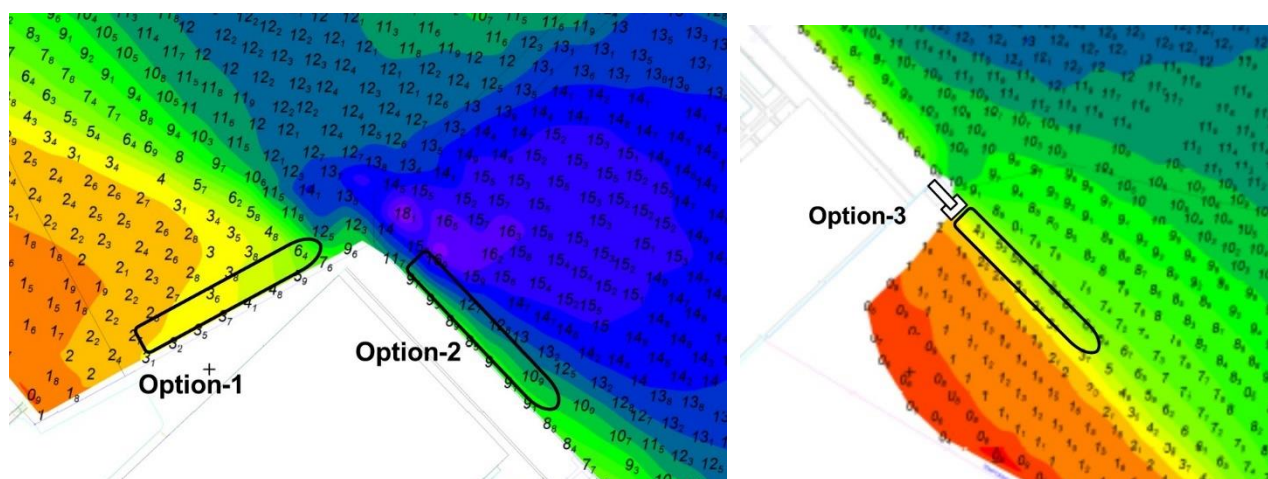
Figure 2-3 Options for Berth Location for Ferry

139. The conditions to be compared are the development cost, the need for maintenance dredging, the impact on other port operations, and the operational efficiency. The following table shows the comparison results of the three options. Option-1 would realize the most efficient operation because the distance between the parking area and ferry berth is shortest. However, some amount of cost is required for initial and maintenance dredging for Option-1 and maintenance dredging work may sometimes hinder ferry operations. Therefore, based on the current depth of the quays and considering the cost and operational risk of the dredging, Option-2 is considered to be preferable and safe side at this moment. Option-1 would be second best on condition that the maintenance dredging will be carried out regularly. In any case, the part of quay would be affected by installing the connecting facility. It is difficult to clarify the affected area before the specification of ferry is known, but it would be an area of 50 m to 60 m.

Table 2-8 Comparison of Option 1, 2, and 3 for Berth Location (For Stern Ramp Style)

	Option-1	Option-2	Option-3
Development item	Connecting facility and slope on the quay	Connecting facility and slope on the quay	Connecting facility and Berthing facility
Development cost	Installment cost for connecting facility and cost for quay modification (introduction of slope)	Installment cost for connecting facility and cost for quay modification (introduction of slope)	Installment cost for connecting facility and berthing facility
Necessity of Maintenance dredging	Requires some amount of volume for maintenance dredging	Not necessary	Requires some maintenance dredging
Impact on other port operations	No impact	Operation of multipurpose wharf will be slightly affected	Operation of multipurpose wharf and container terminal will be affected
Operational efficiency	Good; the parking area is close to the ferry berth	Fairly good; the parking area is not far from the ferry berth; vehicle flows may not interfere other traffic flow	Not good; the parking area is far from the ferry berth; vehicle flows may interfere other traffic flow

140. According to the water depth survey conducted by CEPA in June 2018, water depth along the Passenger berth is -9.5m near the seaside corner but becomes -3.2m on the land side. Therefore, dredging up to about -7.4m is necessary to secure the ferry berthing, but there is a possibility that siltation will return after dredging. It may be necessary to carry out maintenance dredging to ensure safe berthing. On the other hand, the multi-purpose berth has a water depth of 12m or more.



Source: CEPA

Figure 2-4 Bathymetric Conditions for Option-1 and Option-3

2.3.3 Planning Conditions

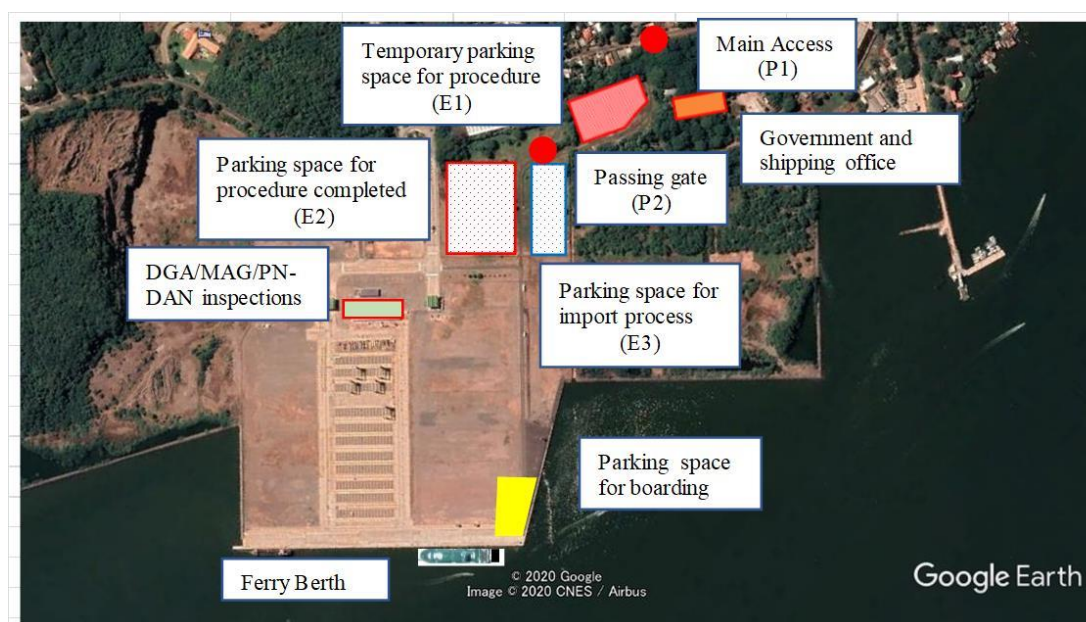
141. The target vessel for port planning is the same as previously indicated in section of 3.2.2.

Table 2-9 Target Vessel (Ferry)

Items	Dimensions	Remarks
Class:	30,000 GT	
Capacity:	100 units	Number of 53 ft trailers (or 400 cars); Lane meters is over 2,000m)
Draft:	6.7 m	
LOA:	190 m	
Beam:	28 m	

2.3.4 Port Facility Plan

142. The basic layout plan of the ferry facilities of La Union Port is shown below.



Source: JICA Survey Team (processed information by CEPA)

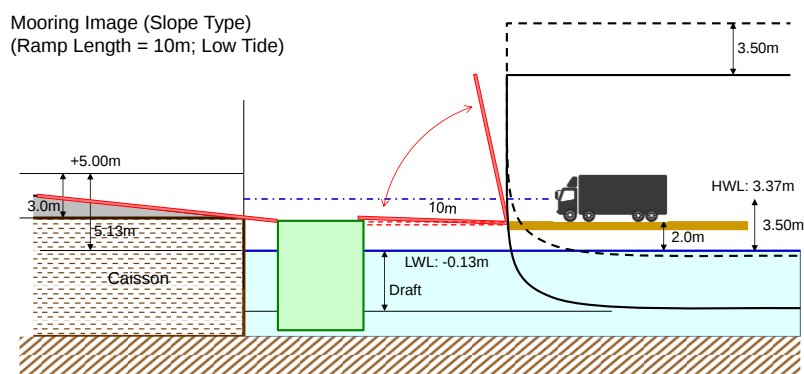
Figure 2-5 Basic Layout Plan of the Ferry Facilities of La Union Port

143. The length of the berth is designed as the total length of the target vessel plus the length required for the ship's main and stern lines.

144. The water depth of the berth shall be the maximum draft of the target ship + extra water depth. The surplus water depth should generally be about 10% or more of the maximum draft. If the target vessel is 190m long, 28m wide and 6.7m in maximum draft, the berth length and berth depth would be as follows.

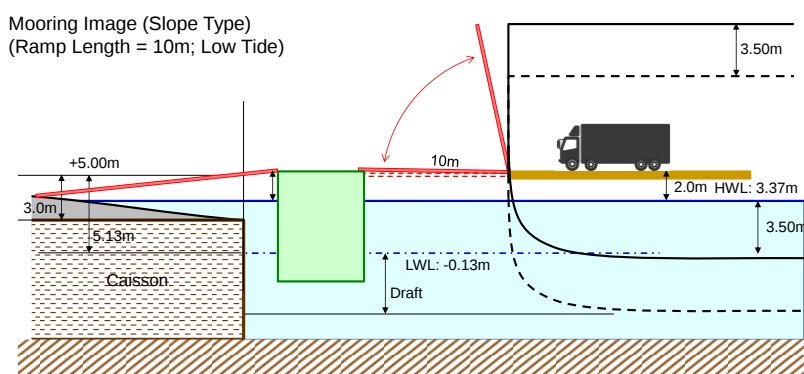
- Berth length : $190\text{m} + 28\text{m} / 2 / \tan 30 = 214\text{m}$
- Berth depth : $6.7\text{ m} \times 1.1 = 7.4\text{m}$

145. In the case of a ferry with a stern ramp, it is recommended to install a connection facility (floating pontoon) linking the quay and the ferry's stern because there is the big tidal change in La Union Port (the gap between LWL and HWL is around 3.5m) as well as the gap between the height of quay and the height of vehicle cargo deck of a ferry (the height of the quay is 5.13m from LWL). The floating pontoon will secure a smooth and safe operation when unloading/loading vehicle cargo.



Source: JICA Survey Team

Figure 2-6 Cross Section of Quay to Ferry through Floating Pontoon (in case of Low Tide)



Source: JICA Survey Team

Figure 2-7 Cross Section of Quay to Ferry through Floating Pontoon (in case of High Tide)

146. The required channel depth is calculated as follow considering the 10% allowance to the design draft of the target vessel.

- Channel depth : $1.1 \times 6.7 = 7.4\text{m}$

147. Since most of ferries are equipped with the side thruster, the diameter of the turning basin is considered twice the total length of the target vessel.

- Turning basin : $190\text{m} \times 2 = 380\text{m}$

148. According to the chart information, La Union Port has a water depth of 12m or more in front of the multipurpose berth, which would be sufficient for ferry operation.

149. La Union Port's ferry terminal facility was put into service on January 24, 2020, but roads and parking lots in the terminal are unpaved. It is recommended that the following onshore facilities to be developed before the ferry's practical scheduled operation starts.

Table 2-10 Necessary Onshore Facilities to be Developed and Rough Quantities

Facility		Rough quantity	Remarks
Gate	P1	1	
	P2	1	
Road pavement		600m × 10m	
Parking pavement	E1	150m × 95m	
	E2	150m × 150m	
	E3	150m × 75m	
	Parking space for boarding	2400m ²	20 cars

2.3.5 Operation at port

150. La Union Port and Caldera Port are 640 km (340 nautical miles) apart, and assuming a ferry speed of 17-20 knots / hour, the time required for a one-way voyage is about 17-20 hours. In order to introduce a regular schedule, it is preferable to set the one-way operation cycle to 24 hours.

Table 2-11 Ferry Operation Time Cycle

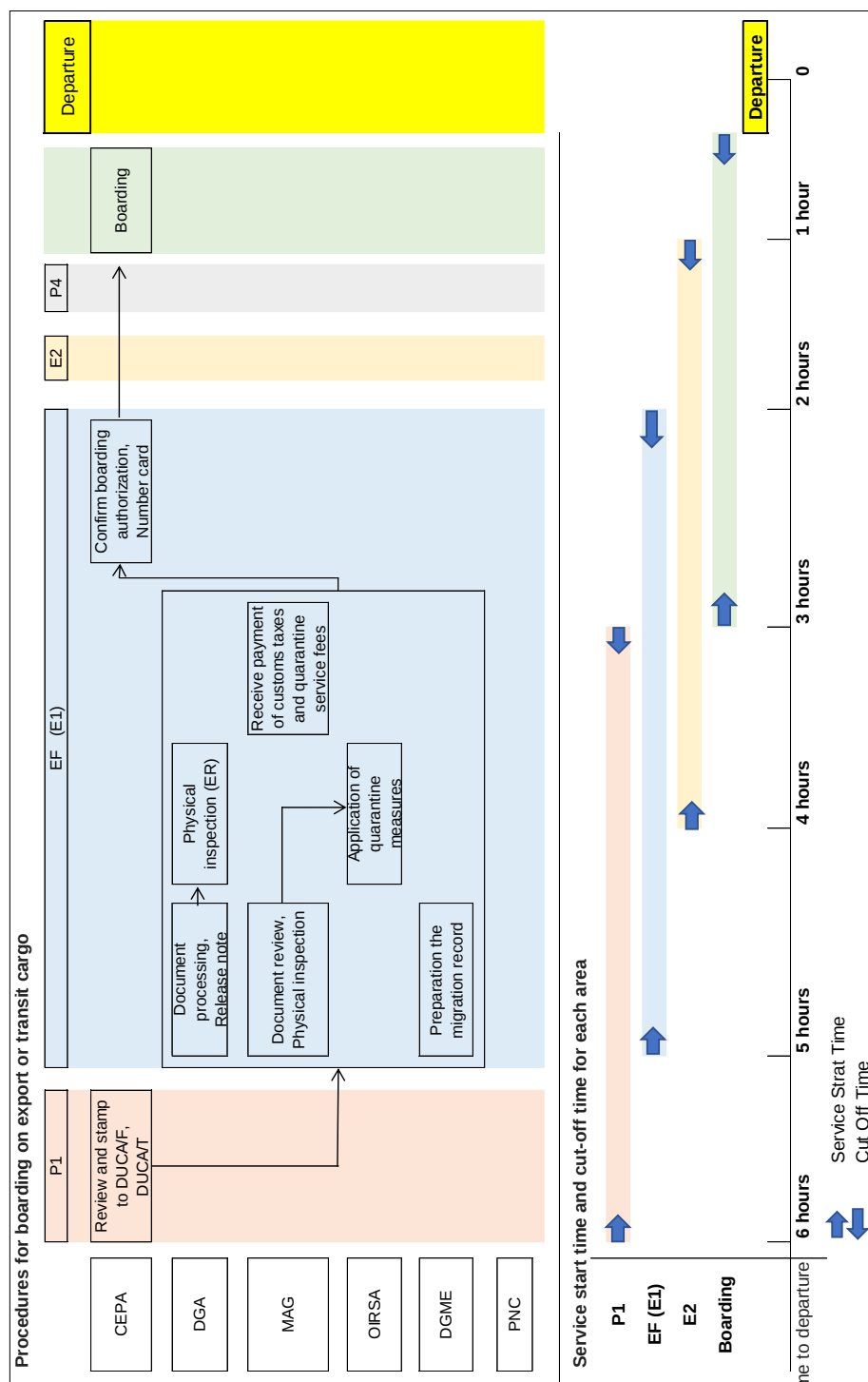
Activity		Time (hours)
Navigation	Between La Union Port and Caldera Port	20
Berthing		0.25
Disembarkation	Truck and trailer (max 100 numbers)	1.0
Boarding	Truck and trailer (max 100 numbers)	2.5
Departure preparation		0.25
total		24

151. The La Union Port ferry terminal facility was put into service on January 24, 2020. Although the actual operation has not been started yet, the truck flow plan of the ferry operation at La Union Port is shown below.



Figure 2-8 Track Flow Plan of the Ferry Operation at La Union Port

152. CEPA, with the support of the World Bank, prepared the following documents in January 2020: “User Guide for the Use of the Multimodal Transport (ferry) in the Port of La Union” and “Integrated Contingency Program for the Use of the Multimodal Transport (ferry) in the Port of La Union”
153. The following shows the flow of procedures for trucks or trailers carrying export cargo at the terminal, and the predetermined time for each procedure until the departure of the ferry.

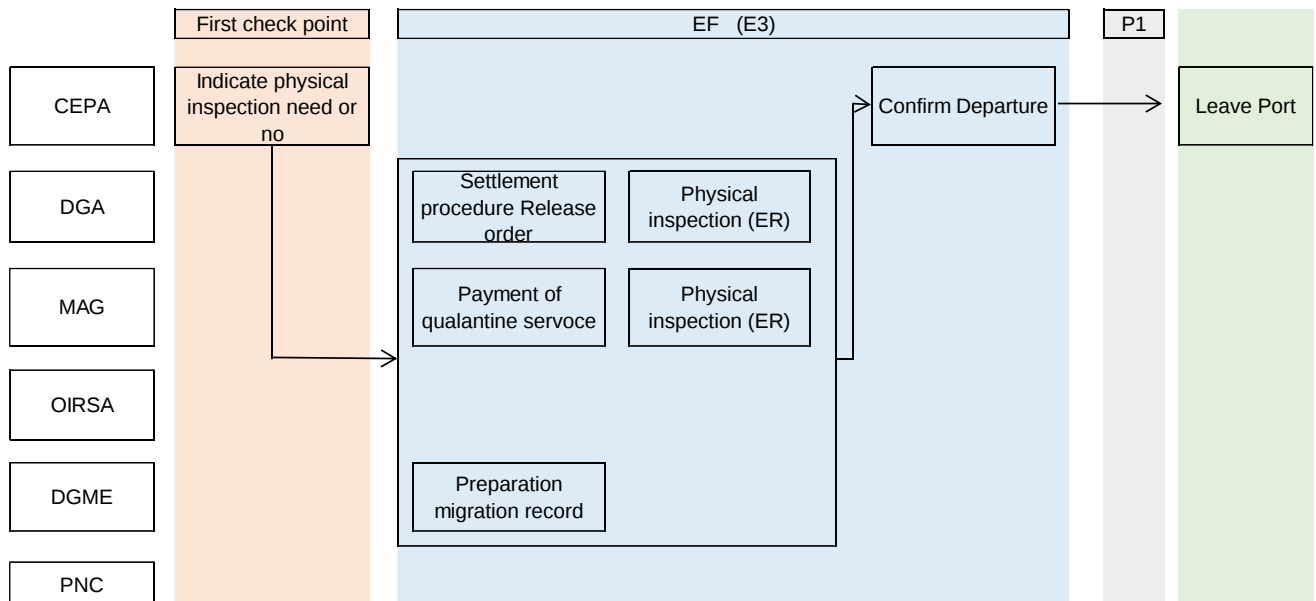


Source: JICA Survey Team, based on the “User Guide for the Use of the Multimodal Transport (ferry) in the Port of La Union”

Figure 2-9 Flow of Procedures for Trucks/Trailers (in the case of exporting)

154. The following shows the flow of procedures for trucks or trailers carrying import cargo at the terminal. In order to shorten the total transportation time, all the trucks should be disembarked within 1 hour, and the CIQ procedures should be expedited.

Procedures for import



Source: JICA Survey Team, based on the "User Guide for the Use of the Multimodal Transport (ferry) in the Port of La Union"

Figure 2-10 Flow of Procedures for Trucks/Trailers (in the case of importing)

2.3.6 Unhooked Cargo Operation

155. For unhooked cargo, the chassis loaded with cargo is towed by the ferry company's tractor head when boarding and disembarking the ferry. After carrying the unhooked cargo on board, the tractor head disembarks and only the chassis with the cargo is carried by ferry. The following figure shows an image of the operation flow.

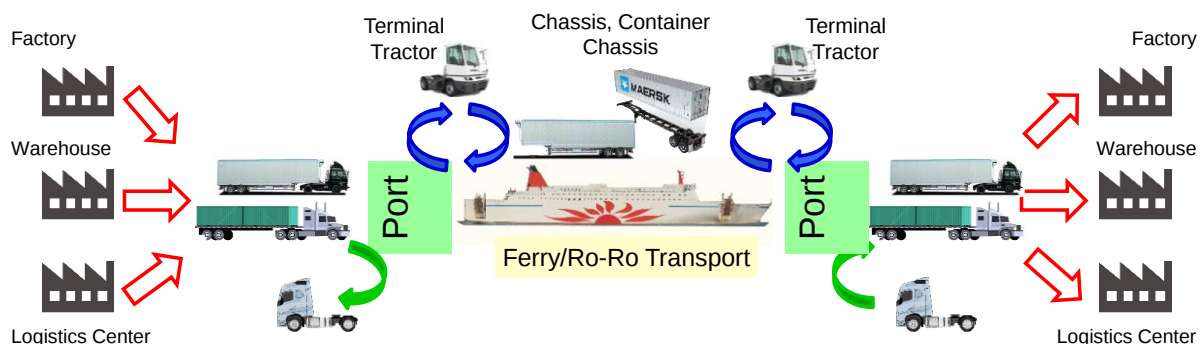


Figure 2-11 Unhooked Operation Flow Image

156. According to the explanation from Odiel, it takes about 3 hours to board and disembark about 100 trucks and trailers including unhooked cargo. In order to secure an operation schedule in which the departure times from La Union Port and Caldera Port are the same even on different days of the week, it is preferable to set the one-way operation cycle to 24 hours. In that case, the sailing time will be 17.5 hours, and since the port of La Union and the port

of Caldera are 640 km (340 nautical miles) apart, the required sailing speed of the ferry will be 19.4 knots / hour. The one-way ferry operation cycle is set as follows.

Table 2-12 Ferry One-way Operating Time including Unhooked Cargo

		time
Navigation	La Union Port – Caldera Port	17.5 hours
Mooring		0.25 hours
Disembark	Truck & trailer (about 100)	3.0 hours
Boarding	Truck & trailer (about 100)	3.0 hours
Preparing for departure		0.25 hours
Total		24 hours

2.3.7 Preliminary Design and Cost Estimate

157. The preliminary implementation cost of the ferry facilities for La Union Port is roughly estimated as shown in the following table on the assumption that a connecting facility between a ferry ramp and the quay will be installed. The design of a connecting facility (a pontoon and a ramp) depends on the specification of a candidate ferry, and therefore, design work should be carried out after determining the candidate ferry.

Table 2-13 Preliminary Cost Estimate of Ferry Facilities for La Union Port

Description	Unit	Quantity	Unit Price (USD)	Amount (USD)	Remarks
1. Construction Cost					
1-1. Mobilization & Demobilization	Sum	1.0	500,000	500,000	
1-2. Vessel Operation Facility					
1) Linkspan - Fabrication	Sum	1.0	1,600,000	1,600,000	
2) Linkspan - Transportation	Sum	1.0	500,000	500,000	
3) Linkspan - Installation	Sum	1.0	300,000	300,000	
4) Pontoon - Fabrication	Nos	1.0	500,000	500,000	
5) Pontoon - Transportation & Installation	Nos	1.0	200,000	200,000	
6) Concrete Demolition of Quaywall	m3	400.0	350.0	140,000	
7) Lighting & Electric Systems	Sum	1.0	200,000	200,000	
1-3. Superstructure					
1) Truck Gate	Nos	2.0	48,000	96,000	P1, P2
2) Port Inner Road	m2	6,000	95.0	570,000	600m x 10m
3) Asphalt Pavement (Truck Parking E1)	m2	14,250	85.0	1,211,250	150m x 95m
4) Asphalt Pavement (Truck Parking E2)	m2	22,500	85.0	1,912,500	150m x 150m
5) Asphalt Pavement (Truck Parking E3)	m2	11,250	85.0	956,250	150m x 75m
6) Asphalt Pavement (Boarding Area)	m2	2,400	85.0	204,000	
			Sub Total	8,890,000	
2. Engineering Fee (Design & Supervision)	Sum	1.0	2,000,000	2,000,000	
			Sub Total (1. + 2.)	10,890,000	
3. Price Escalation				544,500	(1. + 2.) x 5.0%
4. Contingency				1,089,000	(1. + 2.) x 10.0%
			Grand Total (Project Cost)	12,523,500	

2.3.8 Preliminary Construction Schedule

158. The preliminary implementation schedule of the ferry facilities for La Union Port is as shown in the following figure.

Table 2-14 Preliminary Construction Schedule (La Union Port)

Description	Month							
	1	2	3	4	5	6	7	8
1. Vessel Operation Facility								
1) Linkspan - Fabrication								
2) Linkspan - Installation								
3) Pontoon - Fabrication								
4) Pontoon - Installation								
5) Concrete Demolition of Quaywall								
2. Superstructure								
1) Gate								
2) Port Inner Road								
3) Asphalt Pavement (Truck Parking)								

Figure 2-12 Preliminary Construction Schedule of Ferry Facilities for La Union Port

2.4 Infrastructure and operation at Caldera Port

2.4.1 Basic Concept

159. The basic concept in formulating the improvement plan and initiating ferry service at Caldera Port is as follows:

- Development of facilities and operation method of the ferry terminal should be prepared based on what INCOP and other relevant organizations have been working on so far and information obtained and analyzed in this survey.
- Existing facilities will be utilized as much as possible to reduce the size of the new investment and shorten the period until service.

2.4.2 Berth Location

160. In Phase B of the master plan, the berthing facilities for the ferry / Ro-Ro ship are planned to be constructed with a jetty inside the breakwater and connected to the existing berth as shown in the following figure.

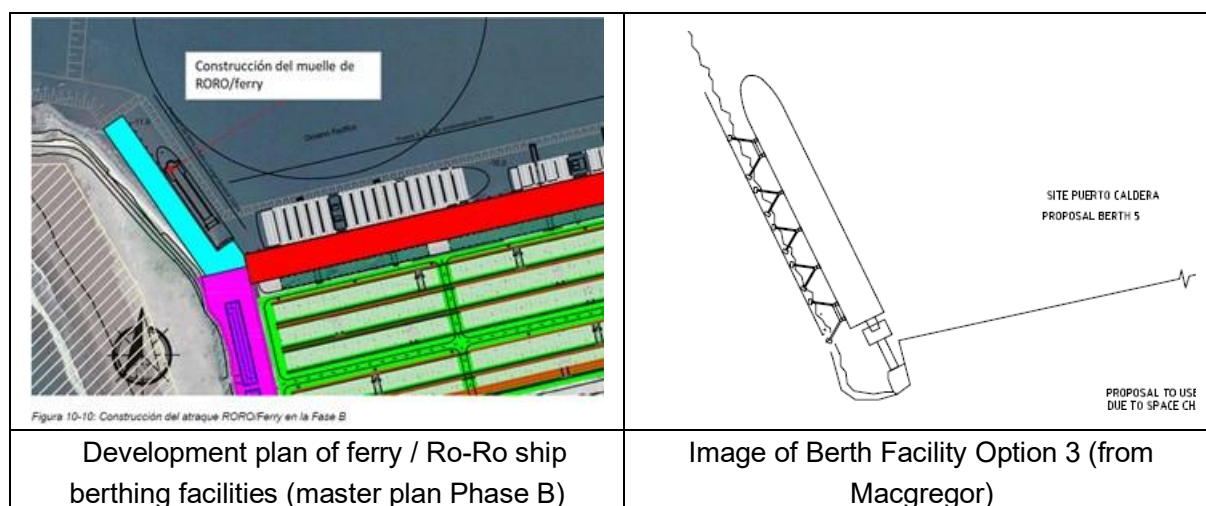


Figure 2-13 Development plan of ferry / Ro-Ro ship berthing facilities

161. Options 1 and 2, which use existing berths for ferry operations, have also been proposed. However, it is considered difficult to allocate exiting berths for ferry operations because of high occupancy ratio of berth utilization.



Figure 2-14 Image of Option 1 and Option 2

2.4.3 Planning conditions

162. Planning conditions are the same as the conditions in the case of La Union Port.

2.4.4 Port Facility Plan

163. As of March in 2020, the ferry terminal facility at Caldera Port has not been developed. The ferry terminal needs to be developed in accordance with the contents of the master plan of Caldera Port mentioned below. The basic layout of the ferry facilities at Caldera Port (draft) taking into account the master plan is shown below.



Figure 2-15 Basic layout of caldera port ferry facilities (draft)

164. The dimensions of the ferry berth are as follow:

- Ferry berth length: $190\text{m} + 28\text{m} / 2 / \tan 30^\circ = 214\text{m}$
- Ferry berth depth: $6.7\text{m} \times 1.1 = 7.4\text{m}$

165. On February 4th, 2020, INCOP indicated where to park trucks and set up government offices and inspection facilities for ferry operations. In addition to this Truck Parking Lot, the following on shore facilities need to be developed before the ferry's practical scheduled operation starts.

Table 2-15 Necessary Onshore Facilities to be Developed

Facility	Rough Dimension	Remarks
Truck Parking lot		INCOP scope
CIQ Office		ditto
CIQ Inspection space		ditto
Truck Parking lot paving	225m × 115m	
Parking paving	2400m ²	Parking space for boarding for 20 trucks

2.4.5 Operation at Port

166. The truck flow plan for the ferry operation at Caldera Port is shown in the following figure. It is possible to set two kinds of traffic flow lines inside and outside the port.

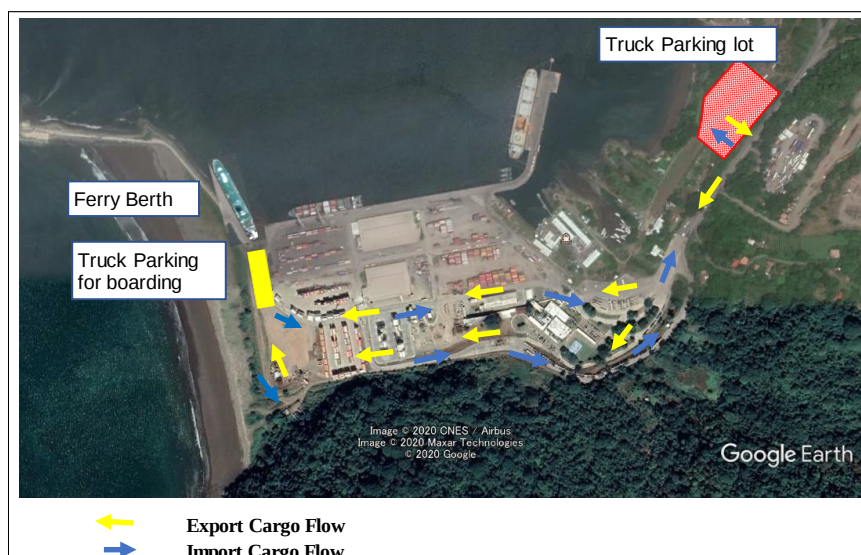


Figure 2-16 Truck Flow Plan of Ferry Operation at Caldera Port

2.4.6 Preliminary Design and Cost Estimate

167. The preliminary implementation cost of the ferry facilities for Caldera Port is roughly estimated as shown in the following table.

Table 2-16 Preliminary Cost Estimate of Ferry Facilities for Caldera Port

Caldera					
Description	Unit	Quantity	Unit Price (USD)	Amount (USD)	Remarks
1. Construction Cost					
1-1. Mobilization & Demobilization	Sum	1.0	800,000	800,000	
1-2. Vessel Operation Facility					
1) Linkspan - Fabrication	Sum	1.0	1,600,000	1,600,000	
2) Linkspan - Transportation	Sum	1.0	500,000	500,000	
3) Linkspan - Installation	Sum	1.0	300,000	300,000	
4) Lighting & Electric Systems	Sum	1.0	200,000	200,000	
5) Steel Pile (φ600, L=20m)	Nos	28.0	18,000	504,000	
6) Coping Concrete	m3	350.0	480.0	168,000	
7) Fender	Nos	7.0	12,000	84,000	
8) Mooring Bitt	Nos	4.0	5,000	20,000	
9) Catwalk	Sum	1.0	300,000	300,000	
10) Navigation Lights	Sum	1.0	30,000	30,000	
1-3. Superstructure					
1) CIQ Office	Nos	1.0	80,000	80,000	
2) Port Inner Road	m2	3,000	95.0	285,000	300m x 10m
3) Asphalt Pavement (Truck Parking)	m2	25,875	85.0	2,199,375	225m x 115m
4) Asphalt Pavement (Boarding Area)	m2	2,400	85.0	204,000	for Boarding
			Sub Total	7,274,375	
2. Engineering Fee (Design & Supervision)	Sum	1.0	3,000,000	3,000,000	
			Sub Total (1. + 2.)	10,274,375	
3. Price Escalation				513,719	(1. + 2.) x 5.0%
4. Contingency				1,027,438	(1. + 2.) x 10.0%
Grand Total (Project Cost)				11,815,531	

2.4.7 Preliminary Construction Schedule

168. The preliminary implementation schedule of the ferry facilities for Caldera Port is as shown in the following figure.

Table 2-17 Preliminary Construction Schedule of Ferry Facilities for Caldera Port

Description	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
1. Vessel Operation Facility												
1) Linkspan - Fabrication												
2) Linkspan - Installation												
3) Steel Pile (φ600, L=20m)												
4) Coping Concrete												
5) Fender												
6) Mooring Bitt												
7) Catwalk												
8) Navigation Lights												
2. Superstructure												
1) CIQ Office												
2) Port Inner Road												
3) Asphalt Pavement (Truck Parking)												

2.5 Road map / Action Plan for Realization of Ferry Transport

2.5.1 Current status of efforts to start ferry service

169. The following conditions must be met to realize ferry service business.

- Implementation system of ferry service operators
- Preparation of necessary facilities and operation system at ferry terminal
- Administrative arrangement for ferry transportation business

2.5.2 Initiatives required for ferry project implementation

170. The project involves several agencies, such as ferry carriers, port authorities of La Union Port and Caldera Port, terminal operators at both ports and administrative agencies related to trade and international shipping in El Salvador and Costa Rica. In order to realize the project, it is necessary for all stakeholders take appropriate measures. In addition, coordination with trucking companies is indispensable for smooth implementation.

171. The following chart shows a proposed timeline for the necessary actions to be taken by CEPA as Port Authority.

Table 2-18 Measures and Timeline (CEPA)

Measures	1 st year				2 nd year			
	1 st Q	2 nd Q	3 rd Q	4 th Q	1 st Q	2 nd Q	3 rd Q	4 th Q
To attract Ferry Users								
Preparation of Ferry Terminal Plan								
Terminal layout and facility plan								
Institutional arrangement								
Construction of Landing/Boarding Facility								
Investigation and Design								
Bidding and Construction Work								
Completion of the Facility				★				
Transportation/Installation of the Facilities								
Construction of Terminal facilities								
Investigation and Design								
Bidding and Construction Work								
Completion of the Facility				★				
Establishment of Operation System								
Operation Plan and Preparation of Manual								
Preparation of Regulations								
Staff Assignment								
Training for Operation								
Coordination with Relevant organizations								
Plan Adjustment								
Explanation to Stakeholders								
Coordination with Agencies at La Union Port								
Commencement of Ferry Operation					★			

2.5.3 Future Actions after the Commencement of Ferry Service

172. Since the ferry service is a new transportation system, unexpected situations may occur after the start of operation. It is necessary for ferry operators as well as CEPA to listen carefully to the voices of customers such as shippers and consignees, importers/exporters, and truck operators and to take necessary measures in order to continue the ferry service.
173. In order to realize sustainable ferry services, it is important to deepen the stakeholders' understanding of the new transportation system, i.e., ferry transport system, and make efforts to attract new customers.
174. Considering that this project is expected to trigger the revitalization of La Union Port, CEPA, as the port authority, shall make continuous efforts to increase ferry service users through promotional campaigns in cooperation with stakeholders.
175. Under the current plan, cargo is transported on a truck bed without separating the truck head and the driver remains in the truck. There are many ferry services in the world in which only cargo or containers on the chassis is transported after separating the truck head at the terminal (so-called unaccompanied chassis system). Under this method, truck heads and drivers would have opportunities to engage in other works. Therefore, it may be worthwhile to consider the feasibility of this type of transport in the Central American region. In case of this type of ferry service, the style of terminal use and operation method are a little bit different from those assumed in the ferry operation plan as described in this report. Additional equipment and/or facilities such as tractor heads would be required in the terminal and it is necessary to study a terminal layout, works at a terminal, traffic lines of truck and chassis,

location and size of parking area, boarding and landing methods etc.

176. There are many ports where ferry services are also provided for passengers. It is expected to consider the feasibility of passenger use of the ferry service between El Salvador and Costa Rica. This seems to be significant from the viewpoint of improving the feasibility of the project and revitalizing La Union Port. In this case, it is necessary to consider the separation of the traffic flow between vehicles and passengers, the separation of freight vehicles from passenger cars, and the handling of the passengers' luggage.
177. Regarding short-sea shipping in Central America, which is one of the important themes of the MESOAMERICA project, COCATRAM and related countries have been conducting various studies and identifying issues related to short-sea shipping. In this context, since the ferry service between La Union Port and Caldera Port is a pioneer project under the concept of short sea shipping, it would be useful to share the experience of the La Union ferry project and to address issues currently discussed in the COCATRAM.
178. Some ports in Panama, Guatemala and Mexico are said to be interested in ferry service. Extension of the service to ports in Panama or Guatemala or development of a new service to such ports should be examined in future.
179. The ferry service between La Union and Caldera Port is expected to trigger the revitalization of La Union Port. It is important to attract companies engaged in trade activities with neighboring countries around the port so that they can enjoy the benefits of La Union's ferry service, i.e., punctuality and swift transport (these benefits should be stressed during promotional activities).

Chapter 3 Potential and Activation Strategy of La Union Port

3.1 Advantages of La Union Port

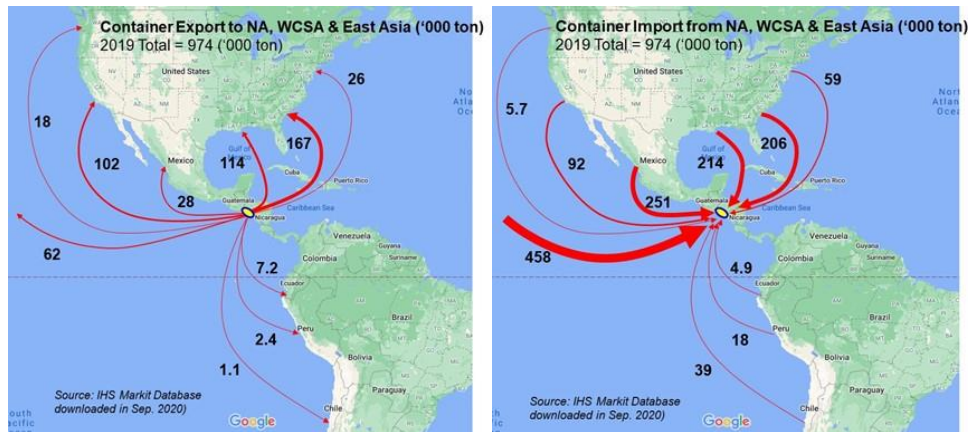
180. The advantages and disadvantages of La Union Port are summarized below from the viewpoint of port facility aspect, Geographical aspect and Regional economic aspect.

Viewpoint	Advantages	Disadvantages
Port facility aspect	✓ Large available land area compared to other ports in Central America, which is currently unused but able to be used immediately	✓ Relatively shallow channel and basin compared to other ports in CA ✓ Large scale of sedimentation which makes it costly to maintain the depth of channel and basin
Geographical aspect	✓ Convenient access to the Pan-American Highway ✓ Strategically located at the gateway of the Dry-Canal route ✓ A part of Honduras and Nicaragua could be considered as the hinterland of La Union Port.	✓ Far from the capital as well as the area where cargoes are generated / destined ✓ Acajutla Port is closer to the capital as well as the cargo area
Regional economic aspect	✓ The eastern part of El Salvador, which is the hinterland of La Union Port, has a development potential in future ✓ Located in Fonseca Bay, the port is blessed with an enriched environment as well as abundant tourism resources	✓ Few industries in the hinterland area

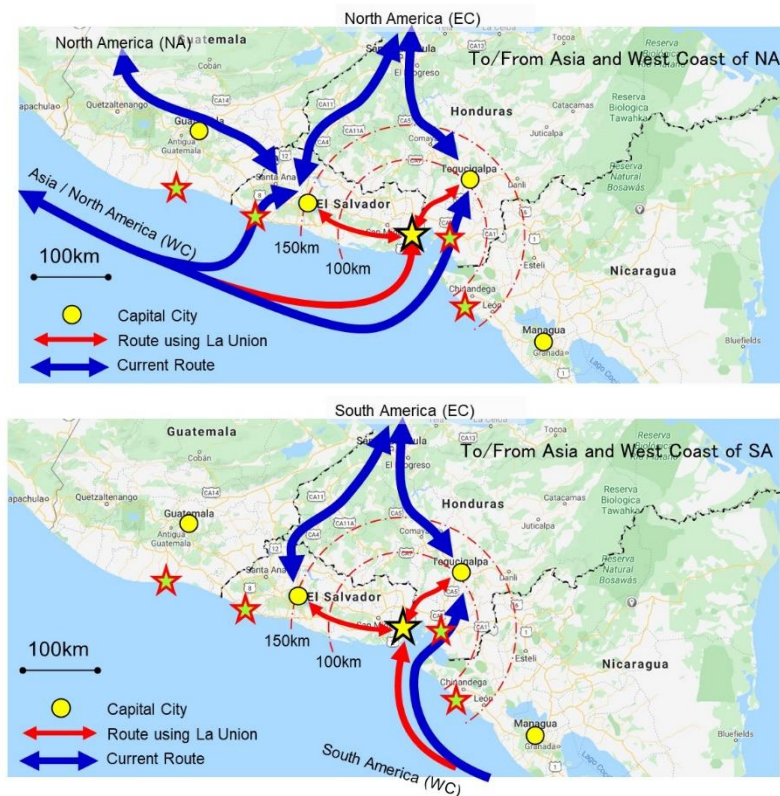
3.2 Competitiveness of La Union Port

3.2.1 Local Container (including transit container to/from Honduras)

181. Containers which would use La Union Port in future are considered to move between the hinterland of La Union Port and trade partners such as East Asia, the west coast of North America and the west coast of South America.



182. Geographically speaking, the following OD routes have the potential to use the La Union Port.
- Sea trade cargo between Asia/North America and the eastern region of El Salvador which includes 4 states; Usulután (Usulután), San Miguel (San Miguel), Morazán (San Francisco Gotera) and La Union.
 - Sea trade cargo between Asia/North America and the pacific side of Honduras, a part of which could be considered as the hinterland of La Union Port.
183. A part of the cargo volume for the above OD could be handled at La Union Port according to the share of the eastern region of El Salvador as well as the share of the pacific side of Honduras, which is depicted in the following images.



Source: IHS Markit data (November 2019), Processed by the JICA Survey Team

Figure 3-1 Transport Route Alternatives Centering on La Union Port

3.2.2 Transit Container Cargo (via Dry Canal Route)

184. The OD which is considered to possibly use the Dry-Canal (between La Union and Puerto Cortes) instead of the Panama Canal is:

- Asia ~ North America (West Coast) ~ Panama Canal ~ North America (East Coast)

185. The following 3 alternative routes are compared in terms of transportation cost and time for container OD (Origin and Destination) between East Asia (Shanghai) and East Coast North America (Savannah).

- All Water: Shanghai – Manzanillo (Pa) – Savannah
- All Water: Shanghai – Manzanillo (Pa) <Transship> – Savannah
- Dry Canal: Shanghai – Manzanillo (Mex) – La Union – Dry Canal – Puerto Cortes – (Santo Tomas) – Savannah



Figure 3-2 Image of Transport through Dry Canal and Panama Canal

186. Evaluation of the transport time and cost via the Dry Canal route is as follows: (Assuming the land transport cost of Dry Canal route is 200 USD/TEU, which means 400 USD/FEU truck).

- The transport time is almost the same as that of the all-water direct route via Panama Canal, while around 5 days faster than the all-water route via transshipment at Balboa.
- The transport cost (918 USD/TEU) is 75% higher for the-all water direct route via Panama Canal (523 USD/TEU), and 10% higher for the all-water route via Balboa transshipment (837 USD/TEU).

187. If the land transport cost for Dry Canal is assumed to be 500 USD/TEU instead of 200 USD (as the distance of the Dry Canal route is 370km, the transportation cost for a 40ft container would be calculated to be $370 \times 2.59 \text{ USD} = 1,000 \text{ USD/FEU}$), the cost of the Dry Canal route would increase to 1,218 USD/TEU, which is around 50% higher than the all-water route via Balboa transshipment (837 USD/TEU). This greatly reduces the competitiveness of the Dry Canal route.

188. Based on the above consideration, the Dry Canal route would not be economically feasible for the transportation between the East Coast of North America and Asian region. However,

since the transportation time via the Dry Canal route is shorter than the all-water route, if an attractive service in both terms of price and lead time would be offered by an international forwarder in cooperation with shipping lines, land transport companies, and both ports (La Union and Puerto Cortes), there may be a possibility of using the Dry Canal route.

3.2.3 Finished Vehicles

189. As La Union has sufficient unused space at this moment, one of the possible cargoes to be handled at La Union Port would be finished vehicles. Vehicle handling requires wide space, i.e., motor pool area, for their storage.
190. Furthermore, sea transportation of finished vehicles is carried out by Car Carrier which is a vessel specially designed to transport motor vehicles on a roll on roll off basis. One of the characteristics of the car carrier is its relatively shallow draft compared to the size of the vessel, which means it could be accommodated at La Union Port.
191. One of the merits of using La Union Port is that value-added services such as PDI and facilities for the installation of additional parts can be established in the motor pool of port, taking advantage of the large unused port area which is best fit for such car related new business.
192. However, land transportation costs from La Union Port to dealers' premises in San Salvador would be higher than those using the Acajutla Port, which is a big bottleneck to shift vehicle handling from Acajutla to La Union. Therefore, incentives such as lowering port due and/or port tariff would be necessary to make La Union Port more attractive.
193. Considering the above matters, it is proposed that CEPA should try to approach major import car dealers of El Salvador such as Excel Automotriz and Grupo Q, Japanese car manufacturers and shipping companies in an attempt to encourage such stakeholders to consider La Union Port rather than Acajutla Port as their discharging port for their finished vehicles. CEPA should explain the benefits of using La Union Port such as lack of congestion and the possibility of developing value-added services.
194. It may also be worthwhile for CEPA to approach car dealers in Honduras. In this case, La Union Port could be a kind of distribution center in the region, but it is necessary to assure smooth bonded transport from La Union Port to the border post of El Amatillo.
195. Based on the above consideration, the potential of vehicle cargo handling at La Union Port is estimated as follows: Whole volume of vehicles currently handled at Acajutla Port, plus volume of vehicles imported to Honduras from Asian region, which would be 14.2 + 6.4 thousand ton based on the OD table.

Table 3-1 OD Table of Motor Vehicles, Tractors and Work Trucks

Origin - Destination Table (Total Trade)

Year 2018

Motor vehicles, tractors and works trucks

Destination \ Origin	Guatemala	El Salvador	Honduras	Nicaragua	Costa Rica	Total
USA & Canada	42.6	24.6	30.6	4.4	18.2	120.4
Mexico & Belize	7.7	12.1	10.8	3.0	12.0	45.7
Caribbean	0.0				0.0	0.1
South America	9.9	2.0	1.5	1.2	9.0	23.6
Europe	3.0	0.3	0.3	1.4	9.6	14.6
Africa	0.3	0.1	0.3	0.0	0.3	1.0
East Asia	34.5	10.9	14.2	7.4	28.4	95.4
Other Asia	13.6	4.8	6.9	2.9	19.2	47.4
Total	111.6	54.7	64.7	20.3	96.8	348.1

Source IHS Markit Database (September 2019)

196. In this section, assuming that vehicles bound for Honduras will be handled at La Union Port together with vehicles which is currently handled at Acajutla Port (which eventually means that calls at both ports will be consolidated into a single call at La Union Port), the transport costs for the following cases were calculated and compared in the same manner as in comparison of the cost of the Dry Canal route.

Present

- Around 200 vehicles are transported from Acajutla Port to San Salvador
- Around 100 vehicles are transported from San Lorenzo port to Tegucigalpa

Future

- Around 200 vehicles will be transported from La Union Port to San Salvador
- Around 100 vehicles are transported from La Union Port to Tegucigalpa



Source: Survey Team

Figure 3-3 Alternative Route for Vehicle Transport to El Salvador and Honduras

197. Compared to the current situation, the total cost savings will be about 25,000 USD, that is, if 300 units of cars are unloaded at La Union for El Salvador and Honduras, the savings per one unit of vehicle will be 83 USD.
198. As the land transport cost would be 0.7 USD per km based on the fact that the car carrier cost for 10 vehicles from Acajutla Port to San Salvador is 600 USD, the difference in land transport costs when unloading at La Union Port is calculated as 84 USD/unit assuming the difference in transport distance is around 120 km, which is almost the same as the above

savings amount. Similarly, in the case of Honduras, the difference in land transport costs when unloading at La Union Port against unloading at San Lorenzo port is about 50 USD/unit, which is considerably lower than the above savings amount. There is a significant advantage in using the transport route via La Union Port.

199. However, it should be noted that the vehicle handling at La Union Port could be realized on the premise that the amount of cost reduction in shipping companies could be successfully transferred to offset the increase in land transport costs. In order to consolidate both ship calls at Acajutla and San Lorenzo port to one ship call at La Union Port, intensive discussions and coordination among shipping companies, car dealers in both countries, and vehicle manufacturers in collaboration with Honduras are keys to realization.
200. In the event that car carriers choose their calling ports, vessel operators should listen closely to the requirements of powerful or influential consignees/dealers. Interviews should be arranged to obtain their opinions. Based on their opinions, the following action plans should be implemented. (This is under the condition that the necessary depth will be maintained as described in Chapter-5.)

3.2.4 Other Potential Cargo

201. The following cargoes are considered to have the potential to be handled at La Union Port: Cargoes already being handled at Acajutla Port, and Cargoes which have increasing potential in the future.
202. Based on the cargo commodity analysis, the following commodities are examined to identify potential cargoes at La Union Port.

Export

- Sugar (dry bulk) / Molasses (liquid bulk)

Import

- Corn (dry bulk) : For animal feed
- Fertilizer (dry bulk): For agriculture
- Wheat (dry bulk): For foodstuff
- Petroleum product
- General cargo: Construction materials such as steel products, cement and others

203. Potential shares of La Union Port are summarized as follow:

Cargo		Assumption of Potential Share
Container (El Salvador Local)		20%
Vehicle		100%
Ferry		100%
Dry Bulk	Sugar (SV total)	27%
	Corn (SV total)	20%
	Fertilizer (SV total)	25%
	Wheat (SV total)	20%
Liquid Bulk	Molasses (SV total)	27%
	Petroleum (SV total)	20%
General Cargo		20%

3.2.5 Potential of Cruising Vessel Calling at La Union Port

204. The Government of El Salvador formulated a tourism master plan in 2013 and updated it in 2017. The Master Plan includes measures to attract cruise ships to ports of Acajutla and La Union. The Master Plan states that the ports of Acajutla and La Union are located at strategic points on the route along the pacific coast of Central America. The plan says that the development of cruise terminals should be promoted.
205. Minimum channel depth of La Union Port is 7.2 m which allows vessels with less 6.3 m draft to be accommodated. Table below shows actual draft of cruise ships when they arrive at the port in CA in 2018. Although most vessels have a draft exceeding 8 m in the Central American region, vessels with less than 6 m draft are also found. Accordingly, it can be said that there is a possibility to attract those cruise ships to call at La Union Port even under the current channel depth.
206. Number of cruise ship calls at the ports on the Pacific coast of CA in 2008 with draft (actual) of less than 7.2 m are shown below. The table is prepared based on AIS data. The cruise ships listed in the table are ships which could potentially call at LA Union Port.
207. Based on the actual draft of cruise vessels when calling at ports in CA, calling ships with less than 8.6m draft cover 90% of total callings. Accordingly, if the channel is dredged to –10m in depth, almost all cruise ships calling the ports of Central America could enter La Union Port.

3.3 Regional Development Projects for Activation of La Union Port

208. The Port of La Union is conceived as a socioeconomic development hub for the eastern area of the country, CEPA, with UNDP support, is examining the potential business opportunities to be developed in the area, based on the infrastructure and land available in La Union Port.

3.3.1 Development of Tourist Business in La Union Port

209. In the UNDP's survey, the following three projects were selected from 17 candidate projects related to tourism (food court, Gulf of Fonseca sightseeing boat, water sports, hotels, marina, sightseeing tour operator, restaurant, etc.): a) Sightseeing tour operator, b) Water sports business, c) Marina for recreation business and sports boats. The result of financial analysis on each project shows the projects except c) marina are considered to be highly profitable if regular ferry service is introduced..

3.3.2 Fish Collection and Processing Plant

210. There are more than 19,200 fishermen throughout the country, including the Gulf of Fonseca. As shown in the table below, total exports of marine products in 2017-18 totaled 109,000 tones, providing an economic value of approximately \$ 26 million, 70% of which was exported to the United States. Among them, canned tuna accounts for more than 70% of the export value of marine products, and its contribution to GDP is significant.
211. This fish collection and processing plant is designed based on the policy of purchasing fish provided by local cooperatives around the Gulf of Fonseca and providing the products to the domestic and international markets. The plant will add value and produce two types of products: frozen and dry salt.

3.3.3 Shipyard Project

212. In the UNDP's survey, it is assumed that the vessels that use the shipyard are fishing vessels operating in the Pacific region and tugboats operating in the surrounding ports, and the repair and maintenance of these vessels is the business of the shipyard. Potential demand is analyzed to be around 1,518 fishing boats and 18 tugboats.
213. Services to be provided are: Inspections, use of facilities, structural repairs, machinery repairs, pipe repairs, hull repairs, cleaning and painting, accommodations, electrical repairs, among others.

3.3.4 Fuel Supply and Distribution Base

214. La Union Port has the potential to be a supply base of fuel to the hinterland and to the ferries that are expected to begin their service with Caldera Port in Costa Rica
215. The fuel demand in 2030 are estimated 39,025 ton of Gasoline and 12,160 ton of Diesel.

3.4 Logistics Challenges for the Activation of La Union Port

3.4.1 Logistics Center / Dry Port

216. The area centering on La Union Port including the part of Honduras is a logistically strategic area where two trunk roads cross each other connecting Central American countries in the east-west direction as well as Pacific and Caribbean side. Namely, the Pan-American Highway passes around 50 km from the port, and the port is the gateway to the Caribbean coast from the Pacific coast. On the other hand, La Union Port could play a role as a distribution center for imported vehicles, provide multi-modal transportation service as an international ferry terminal, and cater to bulk cargo for industries in the hinterland.
217. Therefore, the activation of La Union Port is expected to be a trigger to develop this region as an integrated logistics center. A dry port on the border of El Salvador and Honduras is one of ideas to contribute to the regional development in synergy with La Union Port, .
218. Dry ports have drawn attention in recent years because they are expected to play an important role in supply chain management. There are various types of dry ports depending on their functions and management scheme. The type of dry port required in this area will be determined based on the expected utilization of La Union Port and the development of the surrounding areas though, it would possibly have functions such as bonded storage area for distribution to the neighboring country and processing area if necessary. As reference, the cases of a large dry port in Europe and a dry port located near a border are introduced as shown below.

3.4.2 Barge Service between La Union and Acajutla

219. It is recommended to conduct a study on the establishment of a barge service between La Union and Acajutla for the containers of which the origin or destination is in the Eastern Region of El Salvador such as San Miguel and its vicinity. The containers to/from Eastern Region are currently transported by trucks through the highways connecting Acajutla Port and Eastern Region. The idea is to promote a modal shift from land to sea transport by

providing the barge service connecting Acajutla and La Union Port. From La Union Port, containers would be delivered to their destination/origin by truck.

3.5 Summary of the Activation Strategy

3.5.1 Measures to be taken to activate La Union Port

220. Necessary measures and actions to attract cargoes to La Union Port are as follows:

Table 3-2 Necessary Measures and Actions to Attract Cargoes to La Union Port

Measures	Actions
To accelerate port promotion activities	✓ To establish a specialized group/office in CEPA to engage exclusively in marketing and promotion activities ✓ To conduct a promotional campaign targeted at exporters/importers in the eastern part of El Salvador and in the hinterland area of Honduras ✓ To conduct promotional campaign targeted at shipping agencies/lines
To explore vehicle handling at La Union Port	✓ To explore the possibility of vehicle cargo handling at La Union Port consolidating ship calls at Acajutla and San Lorenzo port ✓ To examine incentives related to port due and/or port tariff to induce vehicle cargo handling at La Union Port ✓ To encourage the utilization of a land/motor pool in the port with value added activities and/or a distribution center in the region
To realize the Dry-Canal transport	✓ To improve the road network including road condition ✓ To reduce the land transport cost between La Union and Puerto Cortes ✓ To examine collaboration with Puerto Cortes to streamline transit procedures, provide cost incentives and so on ✓ To examine smooth and efficient bonded transport between La Union Port and Puerto Cortes
To expedite the industrial and/or logistics development in the hinterland of La Union Port	✓ To examine mechanism of special incentive zone such as Dry Port
To conduct effective and efficient dredging of the channel and basin	✓ To formulate a stepwise deepening plan with clear setting of target vessel ✓ To build institutional setting in CEPA for efficient and effective maintenance dredging

221. Other activities, proposed by CEPA, to activate La Union Port are as follows:

- To attract cruise vessels by improving/developing tourism potential of the region including Fonseca Bay

- To encourage fishery activities in Fonseca Bay and promote fishery processing industries using the land and facilities of/around La Union Port
- To introduce a supply and/or maintenance base for vessels or a shipyard since there is a lack of such kind of facilities along the west coast between Mexico and Panama

3.5.2 Activation Strategy of La Union Port

222. Based on the examination above on the advantages and disadvantages as well as the potential of La Union Port, strengths, weaknesses, opportunities and threats related to the activation of La Union Port are summarized below:

Strengths, Weaknesses, Opportunities and Threats (SWOT)

Table 3-3 Strengths, weaknesses, opportunities and threats of L Union port

Strengths	Weaknesses
✓ Large available space/land area in the port ✓ Almost no berth occupancy (berthing facilities are available at any time) ✓ Close to the borders of Honduras and Nicaragua ✓ Convenient access to the Pan-American Highway ✓ Located at the gateway of the Dry Canal route	✓ Shallow channel and basin (a part of inner channel is about 7m) ✓ Large scale of sedimentation ✓ Far from the capital ✓ Few industries in the hinterland area (the eastern part of El Salvador)
Opportunities	Threats
✓ Significant development potential in the hinterland ✓ Located in Fonseca Bay which is blessed with an enriched environment and abundant tourism resources ✓ Customs integration among neighboring countries or in Central America region in the future	✓ Development of a competitive port in Fonseca Bay such as Amapala New port ✓ Large scale development at Acajutla Port ✓ Improvement of competitiveness of land transport against short sea shipping including ferry

223. Based on the table above, the JICA Survey Team recommends that CEPA have a clear concept for the cargo-wise functional/role demarcation between Acajutla and La Union, and proposes “Functional/role Demarcation Concept between Acajutla and La Union” as follows:

Table 3-4 Functional/role Demarcation Concept between Acajutla and La Union

Target	Acajutla	La Union
Container	Main port	Complementary port For containers which have ODs in the eastern region of El Salvador For containers between a part of Honduras and Asian region
Ferry	None	Exclusive use
Ro-Ro	None (shifting to La Union)	Exclusive use For finished vehicles
General Cargo	Main port	Complementary port For general cargoes which have Origins/Destinations in the eastern region of El Salvador and in a part of Honduras e.g., Construction materials
Bulk Cargo	Main port	Complementary port For bulk cargoes which have Origins/Destinations in the eastern region of El Salvador and in a part of Honduras e.g., Sugar, Cereal such as corn, wheat, Fertilizer, Fuel / Petroleum product
Cruise Vessel	Complementary port	Main port

Chapter 4 Middle and Long-Term Plan

4.1 Socio-economic frame (GDP, population)

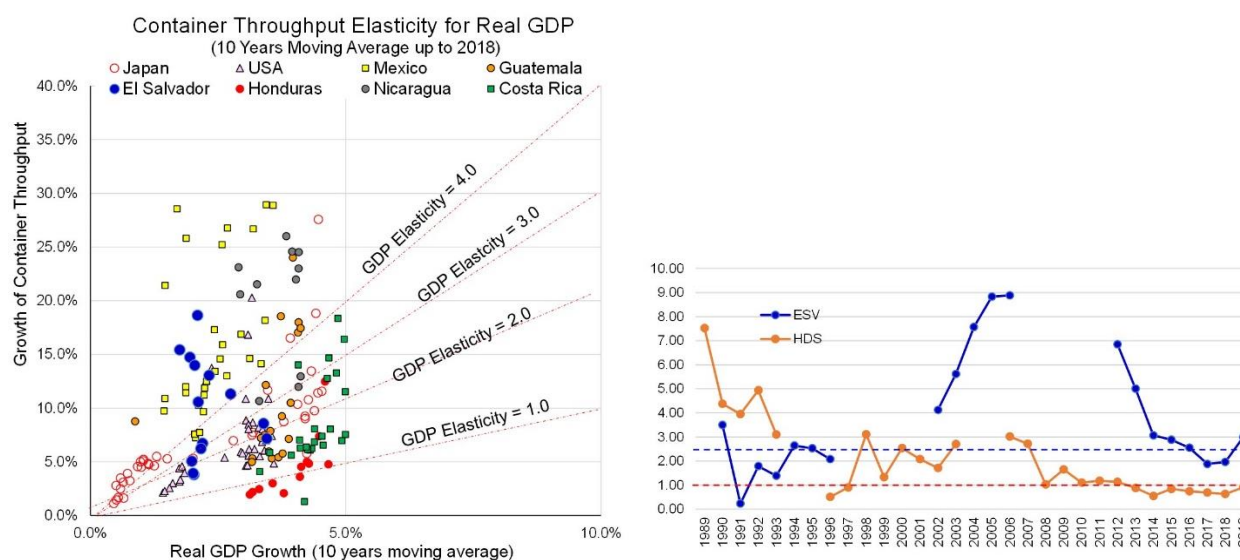
224. The population frame was set with reference to the projections by the United Nations WPP, ECLAC' projection for the year 2100 (nationwide) and the projections by province (2035) by DIGESTYC. The GDP growth rate is based on the IMF's forecast up to 2025 and the long-term outlook.

4.2 Cargo Demand Analysis

225. GDP Elasticity of container throughput in El Salvador was more than 2.0 in case of utilizing a 10-year moving average, which is higher than that of other Central American countries. Based on this observation, we set 2.5 and 1.0 for El Salvador and Honduras respectively as future GDP elasticity, which is an average figure for the past 5 consecutive years.

Table 4-1 GDP Elasticity of Container Throughput

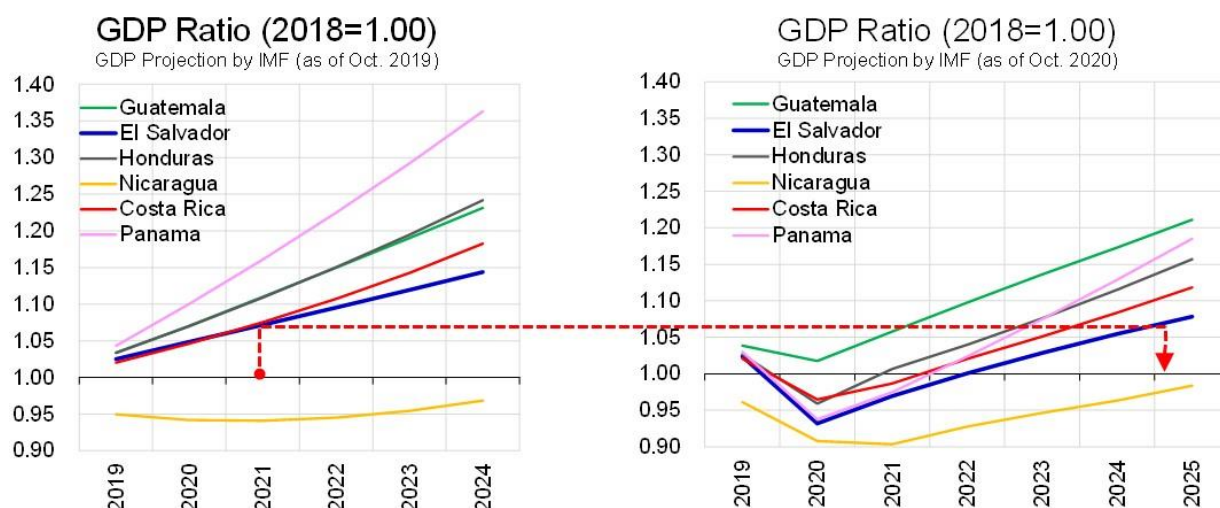
	High Case	Middle Case	Low Case
GDP Elasticity	2.5	2.25	2.0



Source: World Bank, UNCTAD, Website of Port Authorities, etc

Figure 4-1 Comparison of GDP Elasticity / GDP Elasticity of Container in El Salvador

226. According to the latest IMF projection of Real GDP growth, GDP of El Salvador will be 1.078 in 2025 (2018 = 1.0) which would be around 4 years behind the original projection in 2019 which forecasted 1.072 in 2021. Based on this projection, we set 2.25% as the GDP growth ratio after 2026 for the moderate development scenario, and 2.5% for the high case and 2.0% for the low case.



Source: IMF

Figure 4-2 GDP Growth Projection for 6 Central American Countries

227. Demand analysis described above is summarized in Table 4-2. It should be noted these figures are calculated based on the following assumptions including that the maximum potential share of La Union Port would be realized in the long-term.

- For some cargo i.e., container, sugar/molasses, and fertilizer, the share of La Union Port in 2030 is assumed to be its potential share (as described in 3.2.4 (7)), and the share in 2025 would be half of it, based on the fact that container and fertilizer has already been handled at La Union Port in the past and sugar companies (two) are located in the hinterland of La Union Port which indicates the strong potential to utilize the port.
- For the other cargo such as corn, wheat, general cargo, the share of La Union Port in 2030 is assumed to be half of its potential share, and the share in 2025 would be half of that in 2030.
- As for the volume of Dry Canal transit containers, although there might be a possibility for transit containers to use the Dry Canal route, it is difficult to estimate the volume. Therefore, the figure of Dry Canal transit container is excluded from the table.

Table 4-2 Summary of Demand Analysis

		Ratio of PLU				2019	2025	2030
Commodity		Long-term			Units	Volume (2019)	Volume (2025)	Volume (2030)
		2025	2030					
Container	El Salvador Total				TEU	257,317	336,734	455,965
	La Union	10%	20%	20%	TEU		33,673	91,193
	Honduras				TEU		36,161	43,448
	La Union Total				TEU		69,834	134,641
Vehicle	La Union	100%	100%	100%	Unit	9,906	12,901	14,867
Ferry	La Union	100%	100%	100%	Unit	15,505	16,331	18,253
Dry Bulk	Sugar (SV total)				ton	466,070	483,920	539,211
	La Union	14%	27%	27%	ton		65,329	145,587
	Corn (SV total)				ton	787,177	817,268	903,437
	La Union	0%	10%	20%	ton		0	90,344
	Fertilizer (SV total)				ton	215,719	227,215	253,953
	La Union	13%	25%	25%	ton		28,402	63,488
	Wheat (SV total)				ton	326,322	343,712	384,159
	La Union	0%	10%	20%	ton		0	38,416
La Union Total					ton		93,731	337,835
Lq. Bulk	Molasses (SV total)				ton	220,219	238,201	265,582
	La Union	14%	27%	27%	ton		32,157	71,707
	Petroleum (SV total)				ton	332,097	349,791	390,953
	La Union	5%	10%	20%	ton		17,490	39,095
La Union Total					ton		49,647	110,802
General Cargo (SV total)					ton	394,911	439,594	511,592
La Union		5%	10%	20%	ton		21,980	51,159

La Union Total					
Container	Total	TEU		69,834	134,641
Vehicle	Total	Unit		12,901	14,867
Ferry	Total	Unit	15,505	16,331	18,253
Dry Bulk	Total	Ton		93,731	337,835
Liquid Bulk	Total	Ton		49,647	110,802
General Cargo	Total	Ton		21,980	51,159

228. It should be noted that the above figures are not a demand forecast but just to show the potential of La Union Port to explore the target cargo and necessary actions to attract them to La Union Port. It should also be noted that this potential will not be realized simply through economic development in El Salvador and the region; it can only be realized if the El Salvadorian aggressively promotes the port to the consigners in the hinterland of La Union Port including a part of Honduras, shipping companies and the other related stakeholders.
229. To examine the number of ship calls corresponding to the cargo volume, the average handling volume per ship call are assumed as follows based on the record at Acajutla Port.

Cargo Type	Vessel Type	Cargo Volume per Call
Container	Container Vessel	1,000 TEUs (Unloading and Loading)
Vehicle	Vehicle Carrier	200 units for El Salvador (Unloading) 100 units for Honduras (Unloading)
Dry Bulk	Bulk Carrier	Sugar: 30,000 tons (Loading) Corn, Wheat: 15,000 tons (Unloading) Fertilizer: 10,000 tons (Unloading)
Liquid Bulk	Product Tanker	Molasses: 12,000 tons (Loading) Petroleum Product: 12,000 tons (Unloading)
General Cargo	General Cargo Vessel	5,000 tons (Unloading)
Ferry	Ferry	150 units (Unloading and Loading / 2 weekly services)

Source: JICA Survey Team

230. The table below shows estimates of cargo demand and number of ship calls at La Union Port in 2025 and 2030. Around 230 ship calls are expected in 2025 and around 460 in 2030.

231. BOR (Berth Occupancy Ratio) is around 35% on average in 2030, which means the number of berths is sufficient to cope with the cargo demand.

La Union Total			2025			2030		
Cargo Type		Units	Volume (2025)	Annual handling days	# of callings	Volume (2030)	Annual handling days	# of callings
Container	Total	TEU	69,834	53	70	134,641	102	135
Vehicle	Total	Unit	12,901	14	43	14,867	17	50
Ferry	Total	Unit	16,331	18	109	18,253	25	152
Dry Bulk	Total	Ton	93,731	18	5	337,835	62	20
	Sugar	Ton	65,329	11	2	145,587	26	5
	Corn	Ton	0	0	0	90,344	15	6
	Fertilizer	Ton	28,402	7	3	63,488	15	6
	Wheat	Ton	0	0	0	38,416	6	3
Liquid Bulk	Total	Ton	49,647	10	4	110,802	22	9
	Molasses	Ton	32,157	7	3	71,707	17	6
	Petroleum	Ton	17,490	2	1	39,095	5	3
General Cargo	Total	Ton	21,980	6	4	51,159	15	10
* Ship size: TEU Class for container vessel, GT for Ferry, DWT for other cargo vessel			113 231			227 365		
1.68 TEU/box			14% BOR (CT)			28% BOR (CT)		
			18% BOR (MPT)			38% BOR (MPT)		

4.3 Planning of Channel and Basin

232. The dimension of channel and basin are reviewed analyzing the vessel sizes calling at ports in Central America using the AIS data (Jan. 2018 ~ Jun. 2021 for container vessels; Sep. 2017 ~ Aug. 2019 for other vessels). Then, based on the analysis above, we set the target size of vessels by type which define the dimension of channel and basin.

233. The width of channel is determined by the beam of the target vessels according to the PIANC standard, while the diameter of the turning basin is determined by the LOA of the target vessels according to the international standard, i.e., 2L (two times of LOA).

234. Regarding the depth of the channel and maneuvering basin, the usual method would be that it is determined by the maximum draft of the target vessels considering the 10% allowance. However, as the La Union Port has a large tidal range, i.e., more than 3m, and the actual calling drafts are less than the maximum draft, the design depth of the channel and basin is

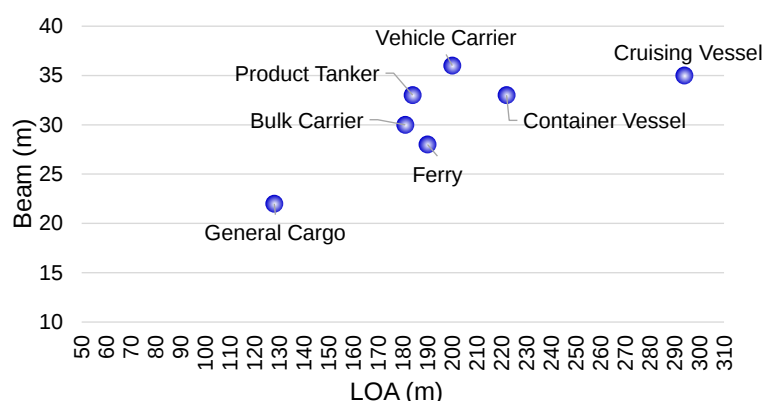
set at a depth which secure more than half a day during the day in average when vessels arrive at or sailing from the port.

4.3.1 Vessel Size Analysis

235. The result of the vessel size is summarized as shown in the table below.

Table 4-3 Summary of the Target Vessels

Vessel Type	Class	LOA (m)	Beam (m)	Design Draft (m)
Container Vessel	3,000TEU (2,500~2,999)	222	33	12.0
Vehicle Carrier	25,000DWT (20,000~24,999)	200	36	10.3
Bulk Carrier	40,000DWT (30,000~39,999)	181	30	10.6
Product Tanker	50,000 DWT (40,000~49,999)	184	33	13.3
General Cargo	15,000DWT (10,000~14,999)	128	22	9.2
Cruise Vessel	100,000Gt (90,000~99,999)	294	35	8.5

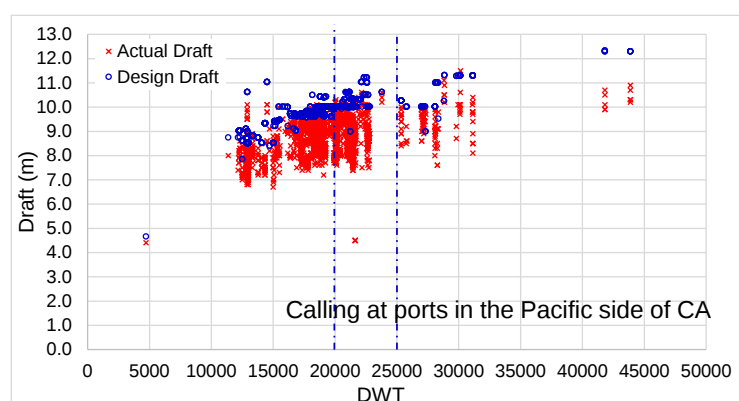


Source: JICA Survey Team

4.3.2 Target Water Depth

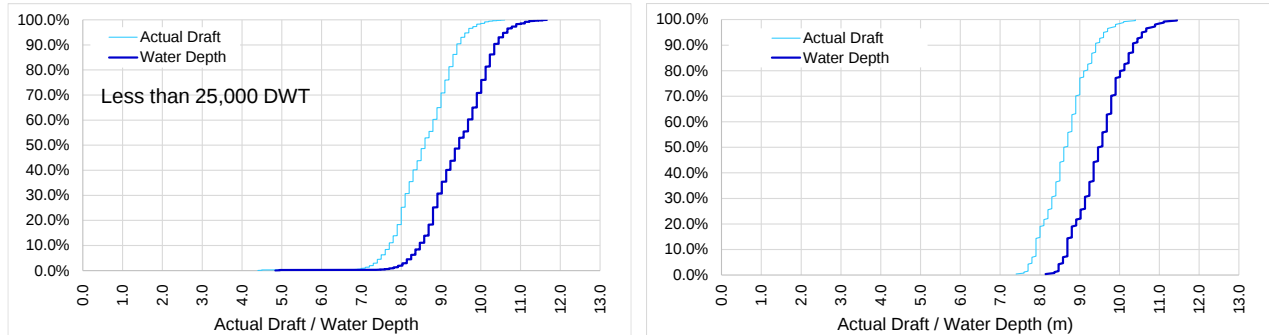
236. AIS data contains actual draft of ships arriving at /sailing from a port. Therefore, the actual drafts calling at ports in the Central America are analyzed using as the same AIS data as in the previous section. For example, the analysis on vehicle carriers is shown below.

237. A standard vehicle carrier deployed in the services in Central America has a carrying capacity of 6,000 ~ 6,500 cars with a draft of around 10m.



Source: AIS Data (from Jan. 2018 to Jun. 2021)

Figure 4-3 Distribution of Actual Drafts (Vehicle Carriers)



Source: AIS Data (from Jan. 2018 to Jun. 2021)

Figure 4-4 Coverage by Actual Draft / Water Depth
(Vehicle Carriers; left - Less than 25,000 DWT, right - 20,000 ~ 24,999 DWT)

238. The table below shows the cover ratio meaning how many target class vessels are covered by the channel depth, which is based on ship calling data at ports on the western side of Central America.

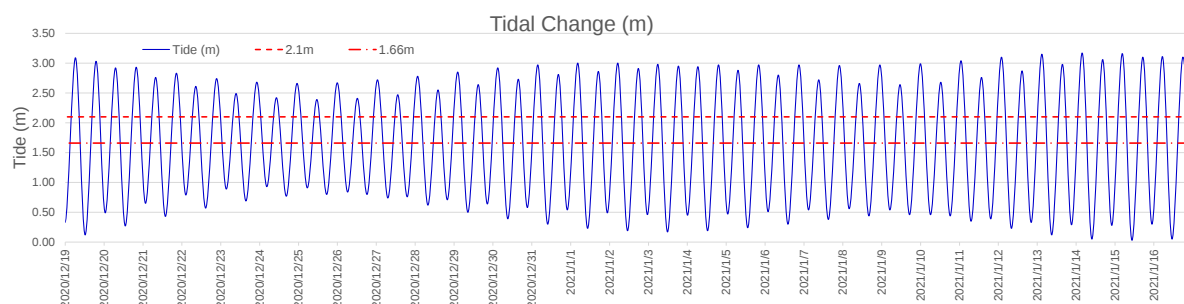
Table 4-4 Cover Ratio of Target Vessels by Channel Depth

	Target Class	8m	9m	10m	11m	12m	13m	14m
Container Vessel	2,500 ~ 2,999 TEU	1.4%	8%	28%	65%	94%	100%	
Vehicle Carrier	20,000~25,000 DWT		26%	80%	98%	100%		
Bulk carrier	30,000~39,000 DWT	15%	27%	41%	63%	98%	100%	
Product Tanker	40,000~49,000 DWT	1.6%	11%	26%	40%	60%	93%	100%
General cargo vessel	10,000~14,999 DWT	53%	77%	98%	100%			
Cruise Vessel	0~99,999 Gt	51%	85%	100%				
(Ferry)	30,000 GT	100%						

239. Table 4-4 shows the cover ratio of each class of vessel in the condition that the sea level is LWL, in other words, the vessel sizes which can enter/sail out of the port all the time regardless of the tide level. However, La Union Port has a large tidal change of more than 3m that can be utilized for larger vessels to enter/sail out of the port. Accordingly, the cover ratio would be more than the figures in the above table in terms of navigation hours.

240. Based on the tidal change in a month, the sum of available time in a day (for navigation) can be calculated in accordance with the tide allowance as shown below: (Tide allowance should be less than 2.1m considering everyday availability)

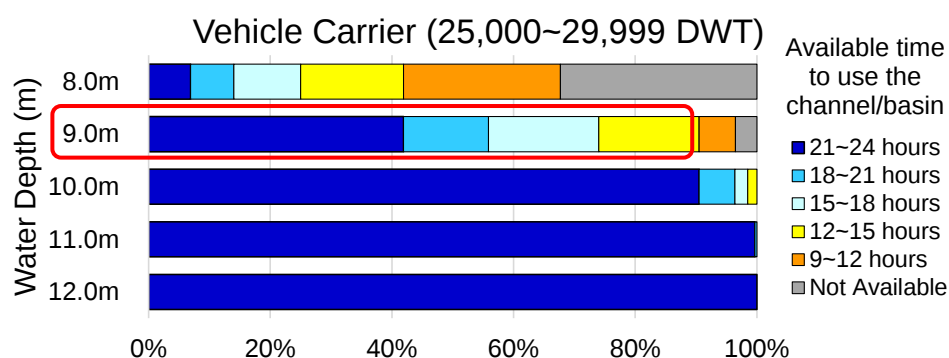
Tide Allowance	Available Time
0 ~0.58 m	less than 24 hours (~21 hours)
~ 0.89 m	less than 21 hours (~18 hours)
~ 1.22 m	less than 18 hours (~15 hours)
~ 1.66 m	less than 15 hours (~12 hours)
~ 2.10 m	less than 12 hours (~9 hours)
~ 2.45 m	(not available) 6 ~ 9 hours in average but not everyday
~ 2.74 m	(not available) 3 ~ 6 hours in average but not everyday
~ 2.96 m	(not available) 1 ~ 9 hours in average but not everyday



Source: Processed by the JICA Survey Team

241. Considering the tidal change described in the above, available time to enter the channel/basin is analyzed by ship type/class using the AIS data.

242. For example, as for vehicle carriers of the 30,000 DWT class (ranging from 25,000 to 29,999 DWT), the water depth required to accommodate vessels for more than 12 hours in a day is -9m according to the figures below.



Source: AIS Data (from Jan. 2018 to Jun. 2021)

Figure 4-5 Available Time to Enter the Channel/Basin (Vehicle Carriers)

243. In conclusion, although the target depth would differ according to the target type and class of vessel as shown in the analysis, it can be said that -10m would be sufficient because more than 80% of all type of the target vessels except product tankers are able to enter the port for more than 12 hours in a day considering the utilization of tidal change (1.66m).

244. It can also be said that a vessel with a draft of -10.6m can be received with channel of -10m using tidal change ($(10\text{m} + 1.66\text{m}) / 1.1 = 10.6\text{m}$), and vessels with the actual draft of 10.6 m or less covers 80% or more of the target vessel except product tanker. Therefore, **the target depth of the channel are set at -10m.**

Table 4-5 Target Vessels

Vessel Type	Class	LOA (m)	Beam (m)	Design Draft (m)	Acceptable Max. Draft (m)
Container Vessel	3,000TEU (2,500~2,999)	222	33	12.0	10.6m (With -10m depth of the channel/basin)
Vehicle Carrier	25,000DWT (20,000~24,999)	200	36	10.3	
Bulk Carrier	40,000DWT (30,000~39,999)	181	30	10.6	
Product Tanker	50,000 DWT (40,000~49,999)	184	33	13.3	
General Cargo	15,000DWT (10,000~14,999)	128	22	9.2	
Cruise Vessel	100,000Gt (90,000~99,999)	294	35	8.5	

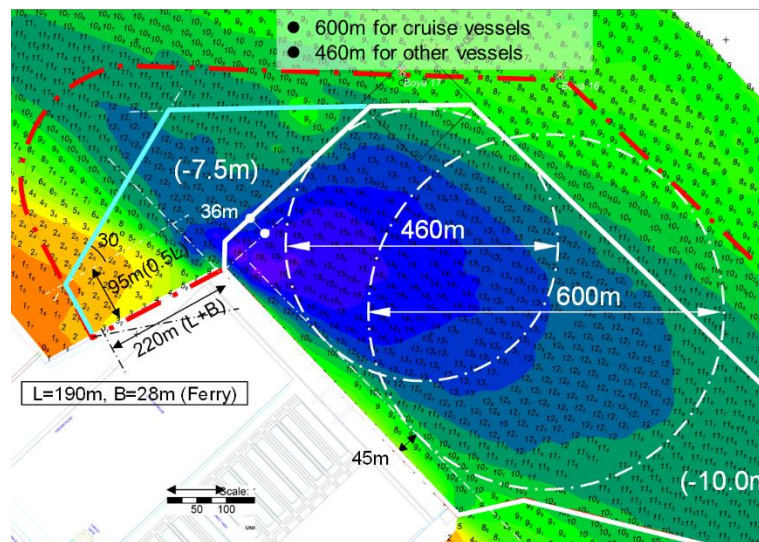
245. Of course, the current depth of 7m is enough for ferries and some of general cargo vessels, and 8m depth would be sufficient for general cargo vessels and cruise vessel. 9m depth would be sufficient to receive vehicle carriers because more than a half of them will be able to enter the port at almost any time in a day. (Waiting time for tide is just 3 hours at maximum.)

4.3.3 Access Channel and Maneuvering Basin Layout

246. In accordance with the PIANC guideline, the required width of the access channel is calculated using the maximum beam of the target vessels, i.e., 36m (for Vehicle Carrier); The result is the same as the original width of the channel, i.e., 140m.:

- $W = W_{BM} + W_i + W_{BR,BG} = 1.5B + 2.1B + 2 \times 0.1B = 3.8B = 3.8 \times 36m = 136.8m \approx 140m$

247. As the maximum LOA of the target vessels is 294m (around 300m) for a cruise vessel, the diameter of maneuvering basin ($2L = 2 \times 300m = 600m$) with the necessary depth (8.5m x 1.1 = 9.4m) is secured in front of the berth as shown in the figure below. For the other target vessels, the maximum LOA is 222m (around 230m) of container vessels (3,000 TEU class) and the diameter of maneuvering basin is calculated as 460m ($2L = 2 \times 230m$). This maneuvering basin with the depth of -10m is also secured in front of the berth as shown in the same figure.



248. The channel alignment was set complying with the PIANC standard, but captains and/or pilots who have experience passing the channel have stated that ship maneuvering at the bending channel point is difficult when the current is strong. In order to ensure sufficient ship stopping distance after the Punta Chiquirin point, it may be necessary to expand the channel area to the north as in the figure below (red dotted line). It will be necessary to carry out ship navigational simulations to set the detailed dimensions of the channel.

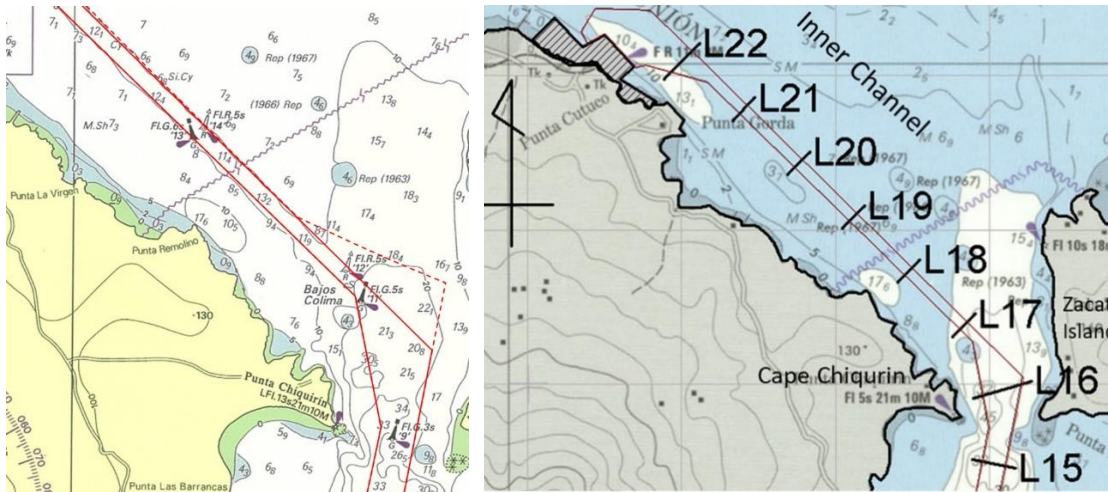
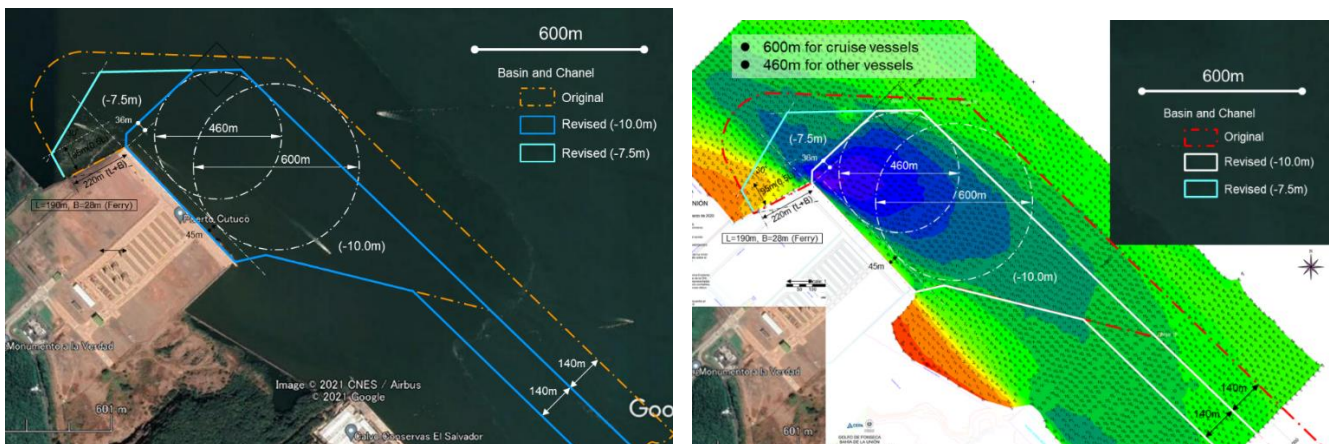
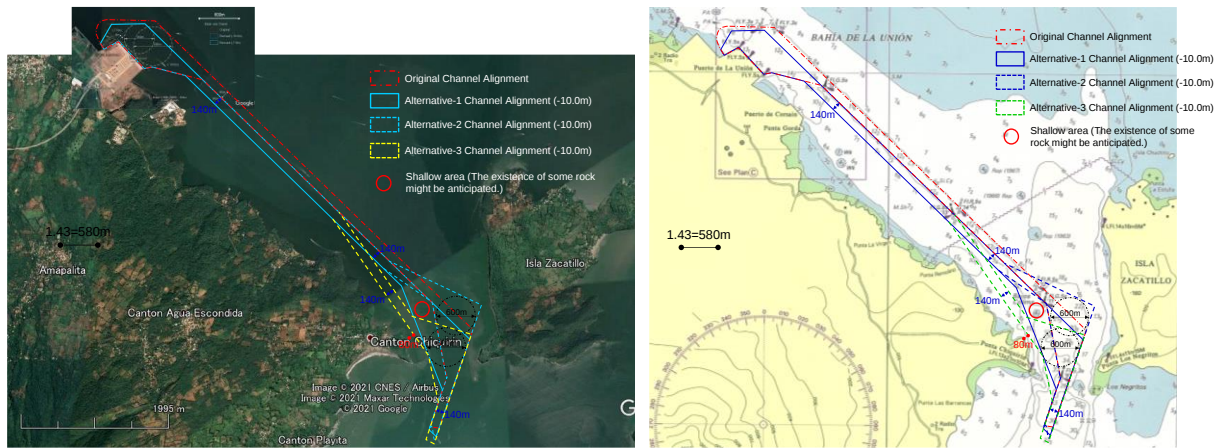


Figure 4-6 Channel Alignment (Left: Chart in 2010, Right: Chart in 2000)

249. Regarding the inner channel alignment, the existing alignment would be the best considering the sedimentation situation. (The existing line is placed almost at the deepest point; more sedimentation would occur in the north.) On the other hand, as there are some deeper points near the coastline, there would be an option to re-set the new inner channel alignment closer to the coast.
250. Based on the dimension of the target vessels, the layout of the maneuvering basin is revised as described in the previous section, which make it possible to re-set the new inner channel alignment to be closer to the coast by 140m as shown in the figure below,
251. Sedimental simulation based on this option was carried out and the result is shown in Chapter-5. It is found that the sedimentation volume is expected less than the original alignment. However, in order to realize this option, additional seabed and soil condition survey and navigational simulation will be required because there could be some areas with hard rock and the channel alignment will have several bending points as shown in the figures.





Source: JICA Survey Team

Figure 4-7 Relocation of the Inner Channel Alignment

4.4 Port Facility Plan of La Union Port

252. Prerequisites for examining the facility layout plan are as follows:

- The estimated cargo volume is the potential cargo volume of La Union Port in the target year 2030.
- The location and area scale of the port-related industrial facilities (shipyard, fish collection and processing plant, marine entertainment facilities) will be in accordance with the contents of the Master-plan Study implemented by UNDP.
- Dump trucks will be used for the transportation of dry bulk cargo between the quay and the storage facility for the time being, but it is conceivable that a belt conveyor will be installed in future.
- Transport of liquid bulk cargo between the quay and the storage facility shall be by pipeline.
- The container berth shall be used only by container vessels, while the multipurpose berth will be used by car carriers, conventional cargo ships, bulk cargo ships, tankers, and cruise ships.
- The multi-purpose berth could also be utilized by ferries for the time being (until the basin in front of the passenger berth is dredged).
- The passenger berth is utilized by small boats for the time being. It will also be utilized for cruise vessels and ferries when the front basin is dredged up to the planned depth.

253. Based on the examination considering the above conditions, three alternatives of zoning layout are drafted as follows:

Plan-1

254. The port cargo-related facilities will be installed as follows. The container yard will be prepared behind the container berth. For imported vehicles and conventional cargo, the storage facility will be set up behind the multipurpose berth. The storage facility for bulk cargo (corn, wheat and fertilizer) will be installed on the east side of the CEPA administration building. The storage facility for sugar and molasses (liquid bulk), which are export cargoes, will be installed in the innermost part behind the multipurpose berth. The figure below shows an image of facility layout (zoning plan).



Figure 4-8 Zoning Plan-1

Plan-2

255. The port cargo-related facilities will be installed as follows. The container yard will be prepared behind the container berth. Imported cars and conventional cargo will be stored behind the multipurpose berth. The bulk cargo storage facilities will be installed at the extra port area in the western landfill area. The figure below shows an image of facility layout (zoning plan).

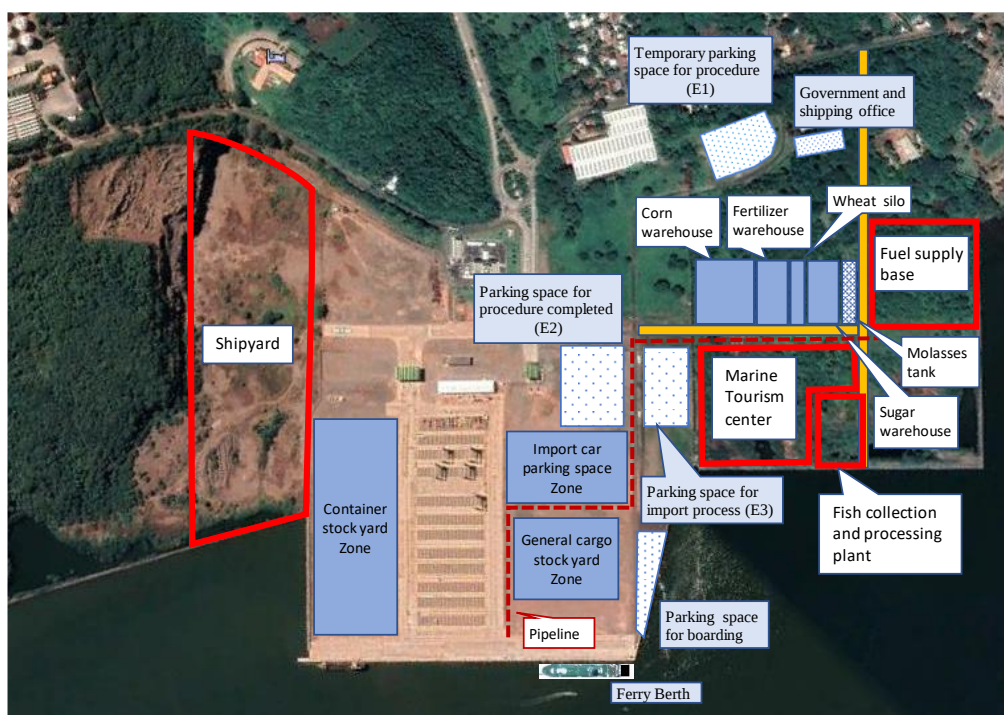


Figure 4-9 Zoning Plan-2

Plan-3

256. The port cargo-related facilities will be installed as follows. The container yard will be prepared behind the container berth. For imported cars and conventional cargo, a storage facility will be set up behind the multipurpose berth. The bulk cargo storage facility will be located in the area to be rented to private companies under a concession contract in the western landfill area. The figure below shows an image of facility layout (zoning plan).

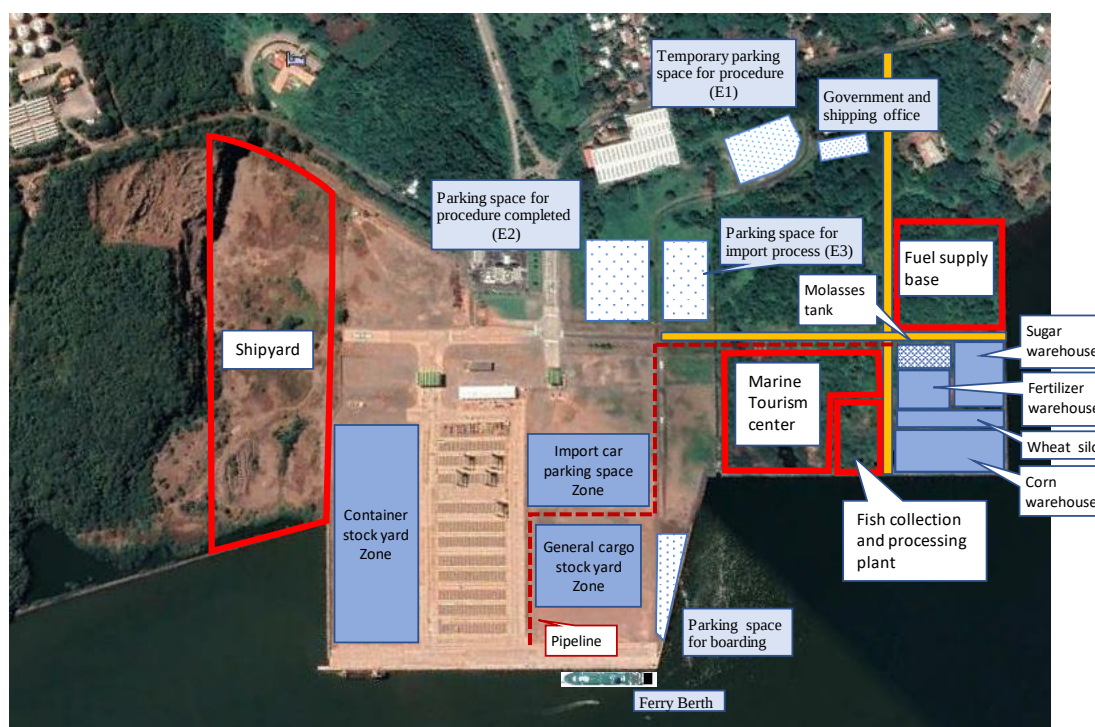


Figure 4-10 Zoning Plan-3

4.5 Cruise Terminal Plan

4.5.1 Goal and Target

257. La Union Port is activated by enhancing its function as a port of call (transit terminal) of cruise ships.

258. The plan consists of two phases: mid-term plan with a target year of 2025 and a long term plan of 2030. Targets of each plan are:

- Middle-term: Ship call(s) in every year, Call of Cruise ships of multiple cruising companies
- Long term: Ship call(s) in every month, Regular calls of Cruise ships

4.5.2 Planning Conditions

259. The existing facilities shall be used for receiving cruise ships in principle. But small facilities or equipment may be installed as necessary in the mid-term plan. It is desirable to maintain the channel depth at -9.5m as in the original development plan in order to cover more than 90% of cruise vessels in service in the Central America region.

260. In the long-term, the special facilities for cruise ships or passengers may be built. The plan shall be prepared by reviewing the surrounding situation including implementation of channel dredging up to 10 m.
261. It is assumed that dimensions of target cruise ships are 227 m in length, 7.2 m in actual depth with a passenger capacity of 930 based on cruise ships calls at ports on the Pacific Coast of CA in recent years.

4.5.3 Terminal Layout

262. La Union Port is planned as a port of call (Transit terminal). Accordingly, it does not need designated fixed facilities for cruise ships. Existing facilities can be temporarily used by passengers. Generally, passengers disembark and embark by using the ramp installed on the cruise ship.
263. The terminal layout and traffic line as a cruise terminal are shown below.

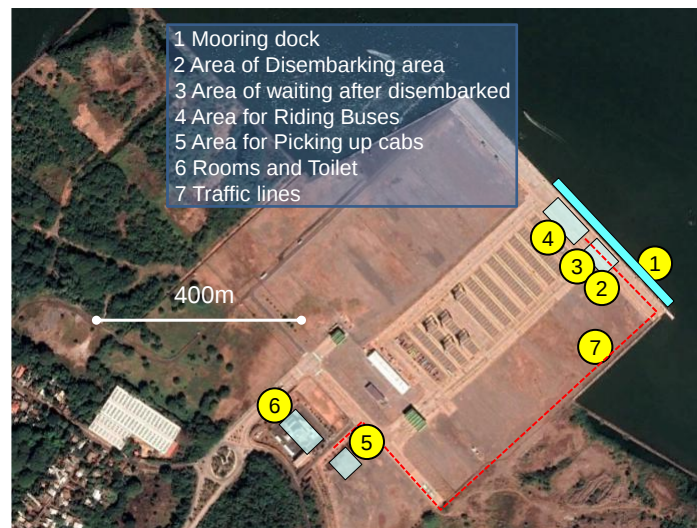


Figure 4-11 Layout of Main facilities/Functions

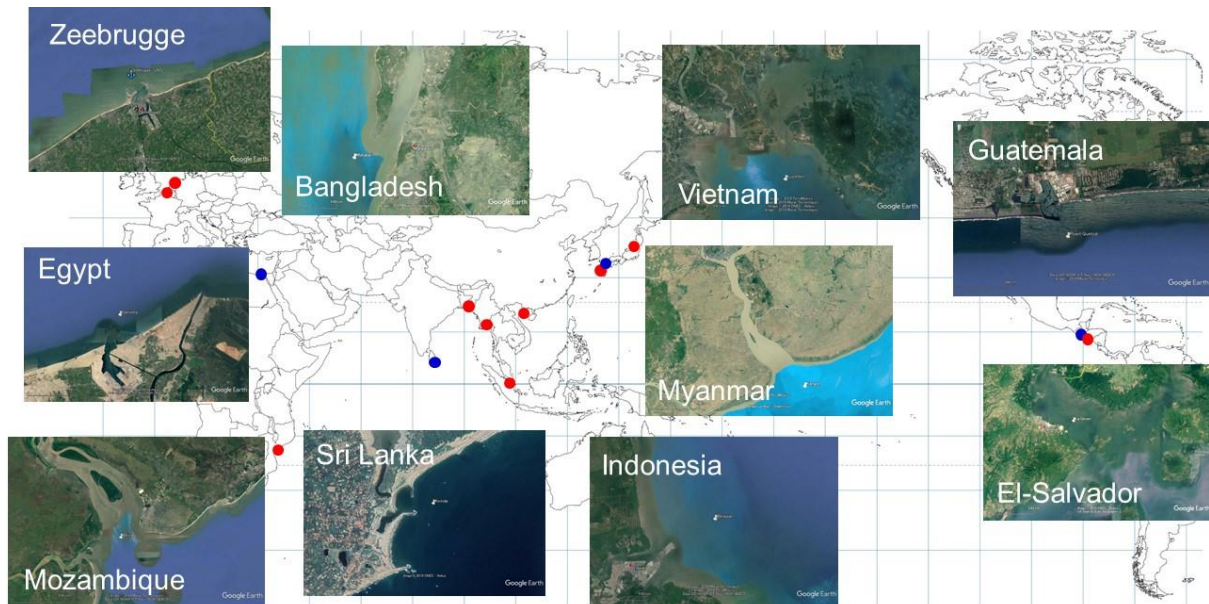
4.5.4 Countermeasures against COVID-19

264. According to the statement, members of the Cruise Lines International Association (CLIA) have voluntarily suspended operations of cruise vessels due to COVID-19. The cruise industry has been reviewing and enhancing their protocols to determine ways to go further in the protection of the health of passengers, crew and the general public. IMO and UNWTO recognize the importance of the cruise sector for the world economy and also the efforts made by the cruise industry, countries and international organizations to protect the safety, health and well-being of passengers and crew, and the health of the population of destination port states of cruise ships. WTO and IMO are encouraging the cruise industry and Governments to continue their efforts to enable the safe resumption of cruise operations.

Chapter 5 Improvement of Channel and Maintenance Dredging

5.1 Examples of Sedimentation/Siltation in the ports throughout the World

265. Sedimentation/siltation in the ports can be a heavy burden on the National Government/Port Management Body throughout the world since maintenance dredging is required.



5.2 Sedimentation Volume and Maintenance dredging Cost for target depths

266. The present depth along the access channel is shown in Figure 5-1. The topography was surveyed in July 2013, 4.5 years after capital dredging. The minimum depth is currently 7m in the Inner channel; re-dredging volume required to reach the target depth is estimated as shown in the table below:

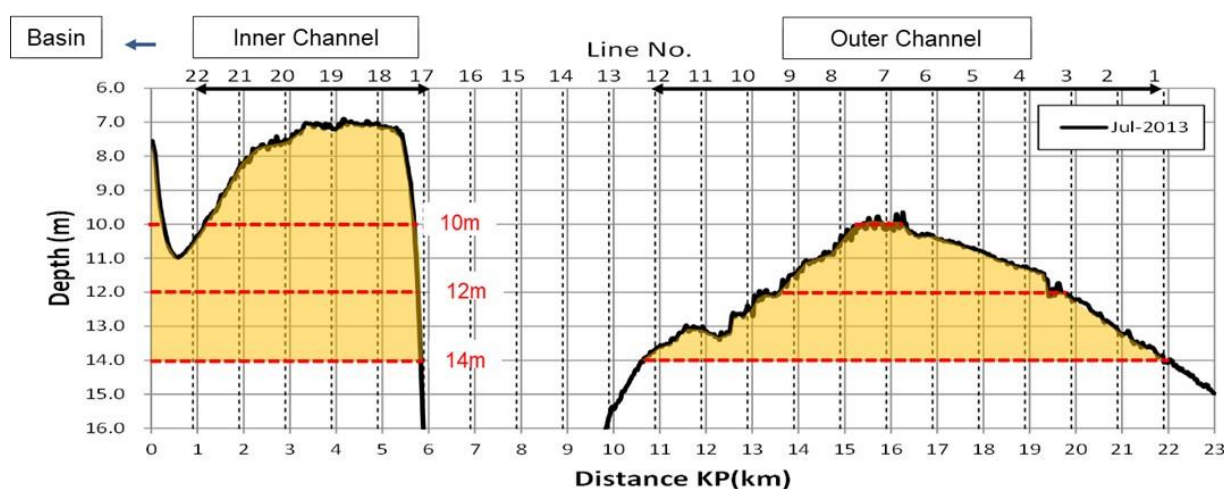


Figure 5-1 Present channel depth along the centerline of access channel

Table 5-1 Re-Dredging volume to reach target depth

Depth (m)	JICA, 2014				CEPA, 2018			
	Outer Ch.	Inner Ch.	Basin	Total	Outer Ch.	Inner Ch.	Basin	Total
D.L.-9.0	0	895	0	895	10	723	242	975
D.L.-10.0	25	1,535	59	1,619	202	1,360	305	1,867
D.L.-11.0	404	2,215	344	2,964	722	2,046	463	3,231
D.L.-12.0	1,161	2,936	798	4,895	1,541	2,744	822	5,107
D.L.-13.0	2,284	3,696	1,471	7,452	2,636	3,449	1,307	7,392
D.L.-14.0	3,882	4,496	2,186	10,565	4,021	4,158	1,874	10,053

267. In the previous study of "Special technical assistance for maintenance dredging of the port of La Union" conducted from 2011 and 2014, an empirical model* to predict sedimentation velocity was developed as a function of the depth difference inside and outside the channel and the elapsed time after dredging. The model is based on actual bathymetric survey data from 2006, the time of the port construction stage, to 2012, several years after the port construction. The sedimentation volume for each target depth is estimated by using the empirical model for depths from -9 m to -14 m with 1 m intervals, and the results are shown in the table below, where the cycle time in the table is the interval of maintenance dredging. (* It would be difficult for the sedimentation model to be more reliable and predictable without an accumulation of actual sedimentation data. It should also be noted that the empirical model is considered as one of the most reliable methods on predicting sedimentation speed in case without countermeasures.)

Table 5-2 Estimated Maintenance Dredging Volume for Each Target Depth (JICA,2014)

Target Navi. Depth (m)	Cycle time (month)	Dredging Volume by areas(10 ³ m ³ /cycle)			Total (10 ³ m ³ /cycle)	Total (10 ³ m ³ /year)
		Outer	Inner	Basin		
-9.00	3.00	0	54	0	54	215
	4.00	0	75	0	75	224
	6.00	0	123	0	123	245
	12.00	0	323	0	323	323
-10.00	3.00	0	193	0	193	770
	4.00	0	267	0	267	802
	6.00	0	435	0	435	871
	12.00	0	1,107	0	1,107	1,107
-11.00	3.00	5	358	3	365	1,461
	4.00	7	495	4	505	1,516
	6.00	11	798	6	815	1,631
	12.00	33	1,937	19	1,988	1,988
-12.00	3.00	164	519	53	736	2,944
	4.00	230	715	74	1,020	3,060
	6.00	384	1,140	125	1,650	3,300
	12.00	1,057	2,401	355	3,813	3,813
-13.00	3.00	438	677	182	1,297	5,188
	4.00	613	928	256	1,797	5,390
	6.00	1,011	1,463	428	2,902	5,804
	12.00	2,620	2,532	1,190	6,342	6,342
-14.00	3.00	818	831	419	2,068	8,272
	4.00	1,139	1,133	589	2,861	8,584
	6.00	1,857	1,766	982	4,605	9,210
	12.00	3,904	2,846	2,691	9,442	9,442

268. If the dumping site would be closer to the dredging site, for example, if the Site 5 as shown in the figure below would be available, the maintenance dredging unit cost will be reduced

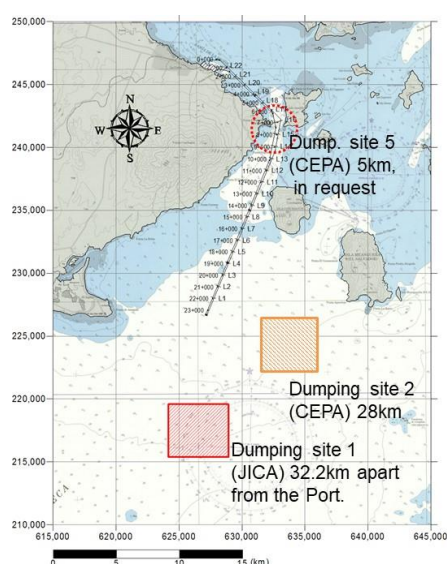


Figure 5-2 Proposed locations for dumping sites

269. Based on the alternative discharging sites shown above, we compared the re-dredging cost among the alternatives as shown in Table 5-3. For the maintenance dredging cost, the cost comparison (in case of 3 moths cycle) between contract base and own-dredger base is summarized in Table 5-4 which is the case using Site-1 (Dump.-1), and Table 5-5 which is the case using Site-2 (Dump.-2) for outer channel and Site-5 (Dump.5) for inner channel.

270. It should be noted that these figures are rough estimates based on the analysis in the past studies including the JICA study (2014), and thus should be carefully used. It is not easy to accurately predict the sedimentation volume; the estimated figures would contain a range of deviation, say more than plus/minus 30%. Therefore, to improve the accuracy of sedimentation prediction, it should be necessary to re-dredge the channel, for example, one meter deep to -8m, to acquire data of sedimentation in actual field.

Table 5-3 Re-Dredging Cost Depending on the Dumping Site

Depth (m)	Volume (1000m ³)	Dredging unit cost by contract base (US\$/m ³)	Dredging cost by contract base (million US\$)	Dredging unit cost by contract base (US\$/m ³)	Dredging cost by contract base (million US\$)
8	338	15.23	5.1	13.37	4.5
9	895	13.58	12.2	11.71	10.5
10	1,619	11.09	18.0	9.56	15.5
11	2,964	10.05	29.8	8.52	25.3
12	4,895	6.65	32.6	5.61	27.5
13	7,452	6.42	47.8	5.45	40.6
14	10,565	5.60	59.2	4.75	50.2
Contract Base		Dump. Site = Dump.1(32.2km)		Dump.2(28km) for outer ch. Dump.5 for inner ch.	

Source: JICA Survey Team

Table 5-4 Maintenance Dredging Cost Using Dumping Site-1 (in case of 3-month cycle)

Target Navi. Depth (m)	Total (1000m ³ /year)	Dredging Cost by Contract base ^{*)}		Dredging Cost by own Dredger ^{*)}	
		(US\$/m ³)	(million US\$/year)	(US\$/m ³)	(million US\$/year)
8	85	12.58	1.1	8.19	0.7
9	215	12.56	2.7	8.18	1.8
10	770	10.15	7.8	7.00	5.4
11	1,461	9.46	13.8	6.64	9.7
12	2,944	6.13	18.0	3.94	11.6
13	5,188	6.05	31.4	3.89	20.2
14	8,272	5.28	43.7	3.24	26.8

Source: JICA Survey Team

Table 5-5 Maintenance dredging cost using dumping Site-2 for outer channel and Site-5 for inner channel (in case of 3-month cycle)

Target Navi. Depth (m)	Total (1000m ³ /year)	Dredging Cost by Contract base ^{*)}		Dredging Cost by own Dredger ^{*)}	
		(US\$/m ³)	(million US\$/year)	(US\$/m ³)	(million US\$/year)
8	85	10.70	0.9	6.97	0.6
9	215	10.70	2.3	6.97	1.5
10	770	8.60	6.6	5.93	4.6
11	1,461	7.77	11.4	5.45	8.0
12	2,944	5.09	15.0	3.27	9.6
13	5,188	5.13	26.6	3.30	17.1
14	8,272	4.48	37.1	2.75	22.7

Source: JICA Survey Team

5.3 Consideration of Sedimentation Countermeasures

271. Countermeasures for decreasing the sedimentation volume have been examined. The basic idea to reduce sedimentation in the inner channel is shown in Figure 5-3. Some excavated terrain can be found in the vicinity of the tip of the cape because of faster tidal current generated by the topography. This indicates that some current control structure like jetties may enhance tidal current and generate deeper areas. In addition, structure such as a training wall is recommended not only to enhance current speed but also to block sedimentation. In this study, 5 training wall layout plans are tested by numerical current simulations to examine possible countermeasures against sedimentation.

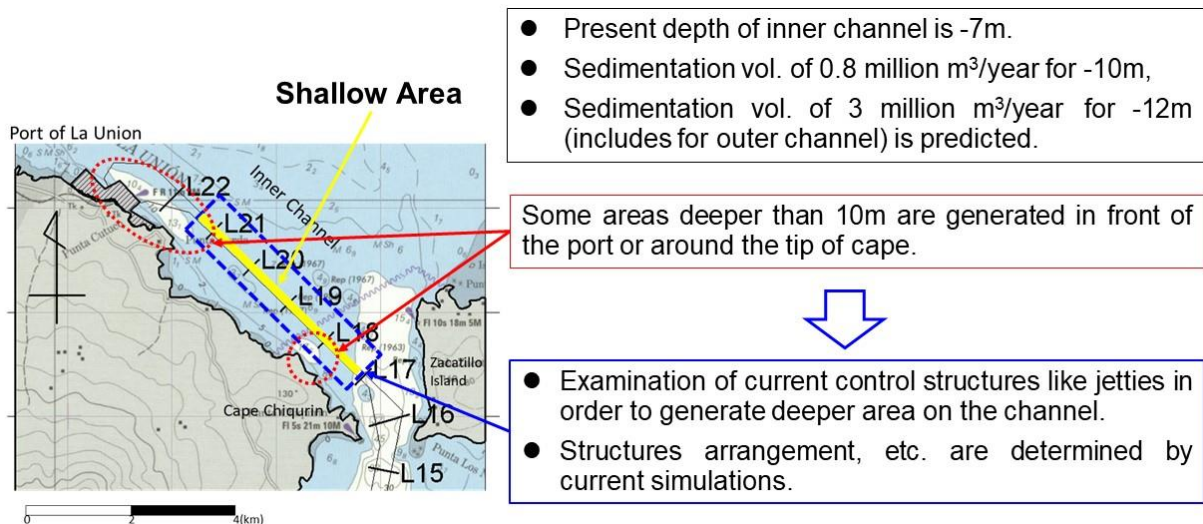


Figure 5-3 Basic idea to countermeasures against sedimentation

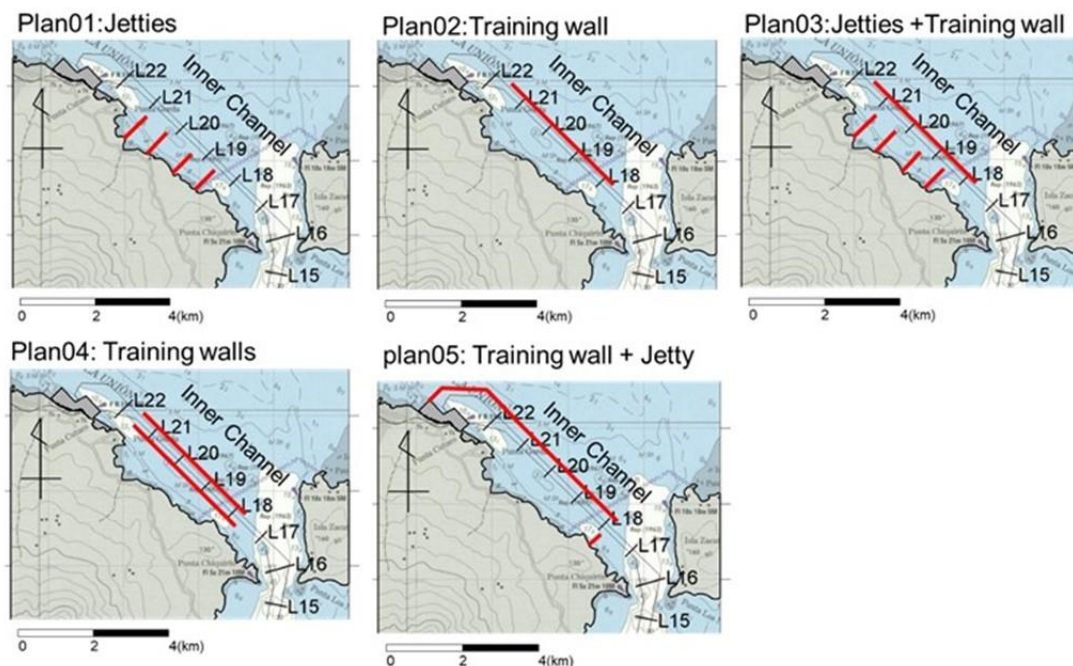


Figure 5-4 Layouts of structures for countermeasure against sedimentation

272. The difference of maximum current velocity between with and without countermeasures is

shown below. In the calculations, channel depth is set as 14m and structures are expressed as non-permeable line boundaries. The current speed near the tips of jetties in plots of Plan 01 and Plan 03 is apparently faster than that of Plan 00. The current speed in the channel between training walls of Plan 04 is almost the same as Plan 00. The result indicates that the training walls installed parallel to the channel do not significantly change the tidal current because the tidal current originally flows parallel to the channel. In case of Plan 05, structures almost completely surround the port and thus the channel and the tidal current around the channel is almost perfectly blocked.

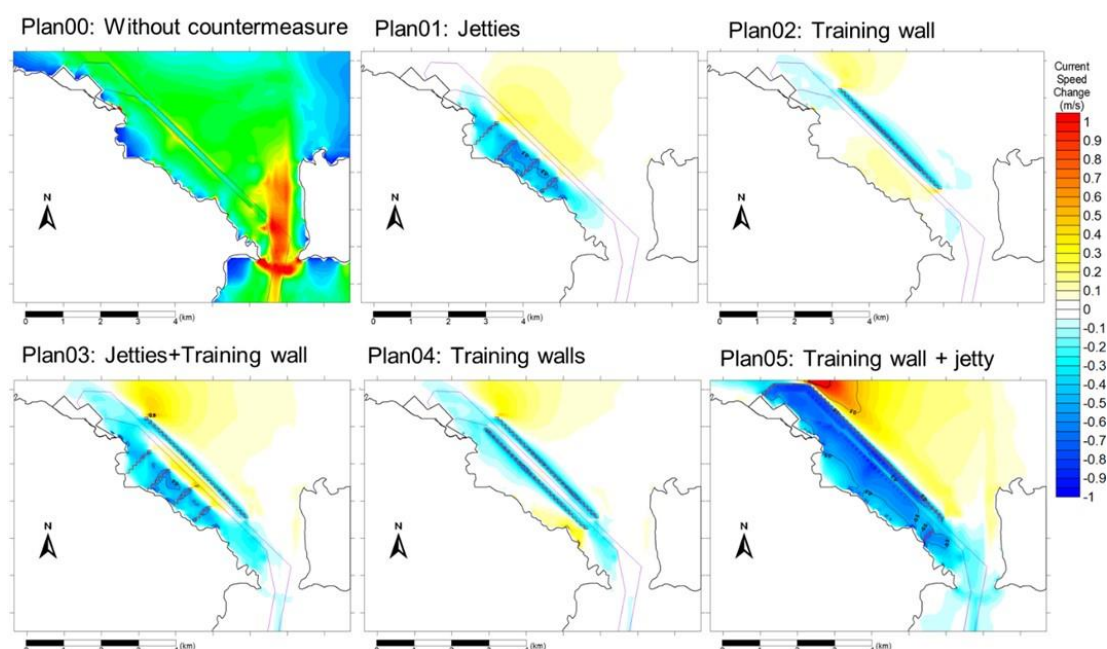


Figure 5-5 Difference of maximum current speed between with countermeasure and without countermeasures

273. In order to examine the effect of countermeasures to reduce sedimentation in the inner channel, sediment transport by advection-diffusion process of suspended mud has been calculated by using the results of tidal current simulations, under the assumption that fine grained sediment of 0.03mm in grain diameter exists on the sea bed and can be transported by the tidal current and waves which act in the offshore. Figure 5-6 shows the resultant erosion-deposition distributions. The deposition pattern around the port and the inner channel differs with respect to the layout of countermeasures. (Basic design work is needed to estimate the cost, and the cost depends on the structure of training walls. In the case of . Plan05, it might cost around 400 million USD, but it depends on the structure and ground conditions.)

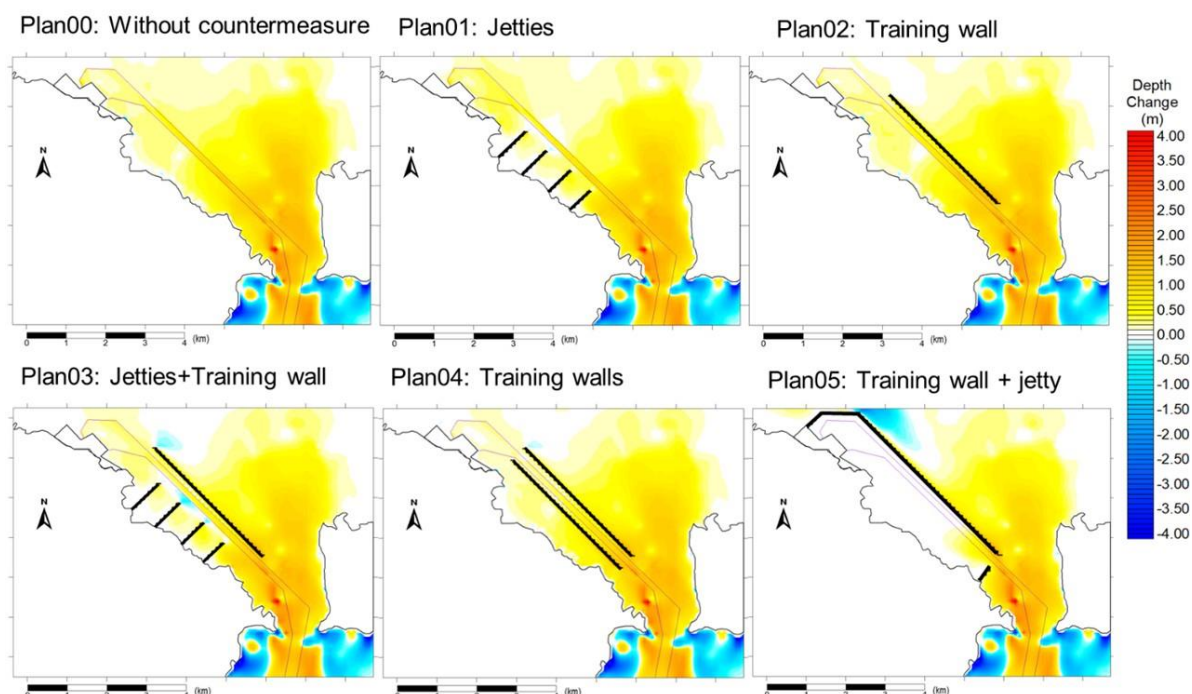


Figure 5-6 Calculated results of erosion/deposition pattern

274. The reduction rate of sedimentation by countermeasures is almost the same regardless of the channel depth. The effects of countermeasures in the case of -14m channel depth are summarized below:

- Plan01 makes sedimentation 103% of plan00, where the sedimentation has been increased. The jetties increase current speed and deepen around the tip of jetties, while the deposition around the basin area increases as shown in Figure 4.8.
- Plan02 makes sedimentation 94 % of plan00, where the training wall slightly decreased sedimentation. Its effect to reduce sedimentation is small.
- Plan03 makes sedimentation 82% of plan00, where the countermeasure reduces sedimentation in the inner channel, but increases sedimentation in the turning basin.
- Plan04 makes sedimentation 74% of plan00, without increasing sedimentation in turning basin.
- Plan 05 makes sedimentation 33% of plan 00, where the sedimentation is predicted to occur in a small area around the entrance formed by structures.

275. Thus, the simulation results indicate that the countermeasure of introducing training walls to block sediment inflow into the channel is more effective than that by jetties to enhance current velocity. Therefore, countermeasure of plan 05, where structures almost surround the port and the inner channel, is evaluated to be the most effective measure to prevent sedimentation in the channel.

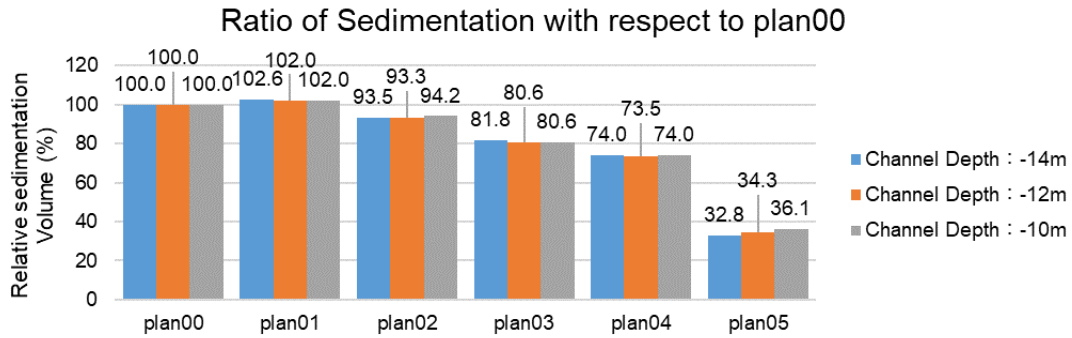


Figure 5-7 Ratio of sedimentation volume in inner channel and basin with respect to that of plan00 (without countermeasures)

276. The lifecycle cost (LCC) is estimated by sum of the construction cost and the maintenance dredging cost. As the seabed around the channel is super soft ground, measures to cope with the soft ground would have to be considered when constructing training walls. Figure 5-8 shows calculated LCCs of ‘without’ (plan 00) and ‘with’ countermeasures (plan 04 and 05), where 6.2 USD/m³ is uniformly used as the unit cost for estimating maintenance dredging cost for simplification. In the case of -14m depth, Plan 05 is the most effective countermeasure to reduce sedimentation and the LCC of 50 years of Plan 05 also estimated much lower than Plan00. However, in the case of -12m depth, LCC of plan05 is almost the same as LCC of plan00 (the case only maintenance dredging without any countermeasures), and in the case of -10m depth, LCC of plan00 is the lowest. From these results, it could be said that maintenance dredging without any hardware countermeasures would be best when the channel depth will be maintained less than -12m.

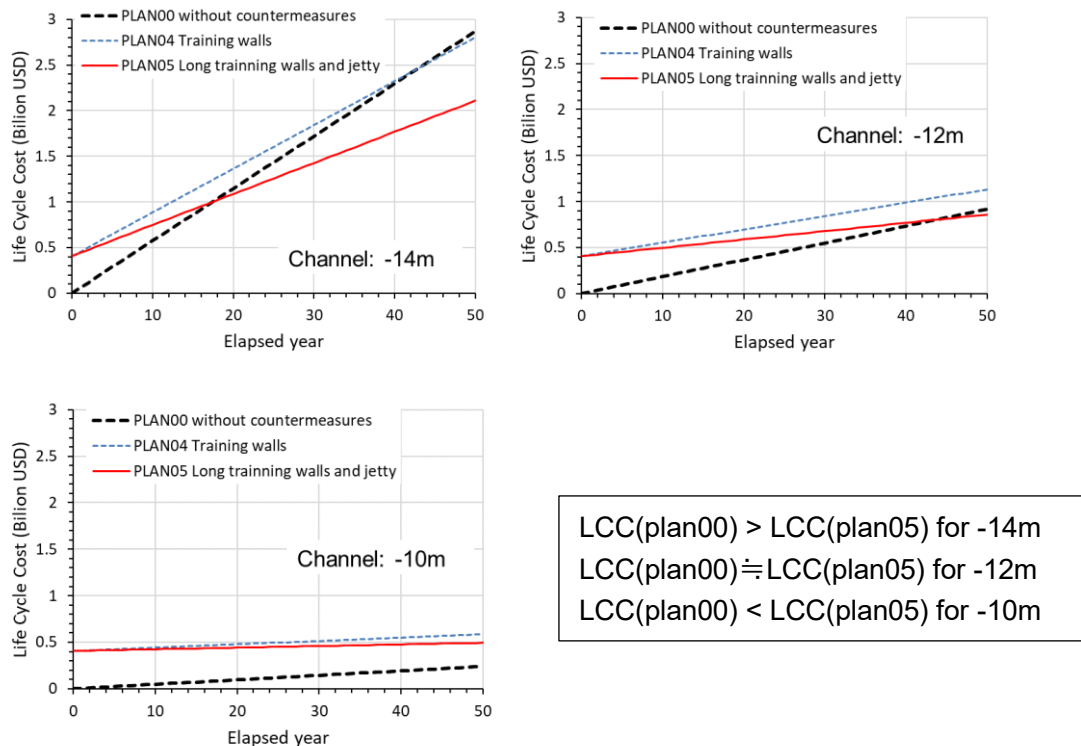


Figure 5-8 Life Cycle Cost (LCC) in comparison of Plan00, Plan04, and Plan05

5.4 Comparison of Sedimentation Depending on the Channel Alignment Alternatives

277. In order to investigate the possibility of reducing the dredging volume, we also examined changes in the alignment of the inner channel. The figure below shows the superposition of the relocated channel position and the topographic map, where the original channel is shifted 100 m landward and 200 m landward, respectively. Looking at the cross-section January 2012 in the figure, the water depth is 8.5 m at the center of the original channel, while it is about 8.9 m when moving 200 m to the west. Therefore, it is considered that the amount of dredging volume can be reduced by relocating the channel landward. On the other hand, when relocating the channel 200 m landward, there is a shallow area (probably a rock) near the end of the inner channel, which might be a concern when the channel relocation be actually applied.

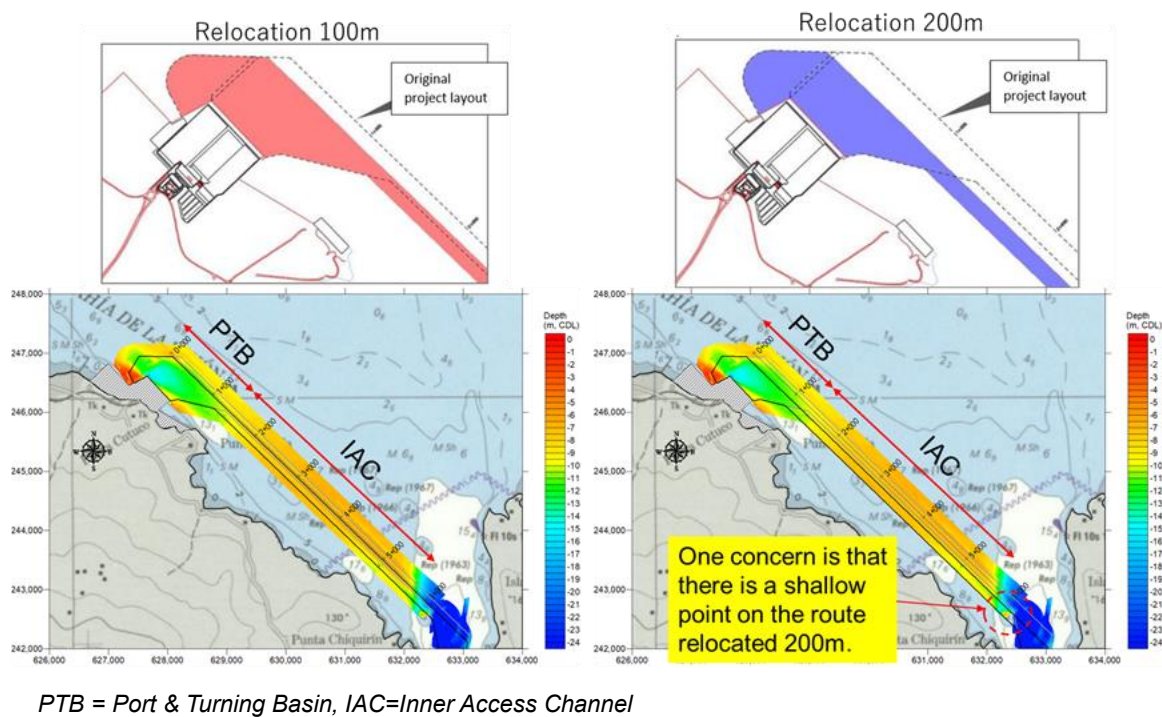


Figure 5-9 The relocated channel layouts of 100m landward (westward) and that of 200m

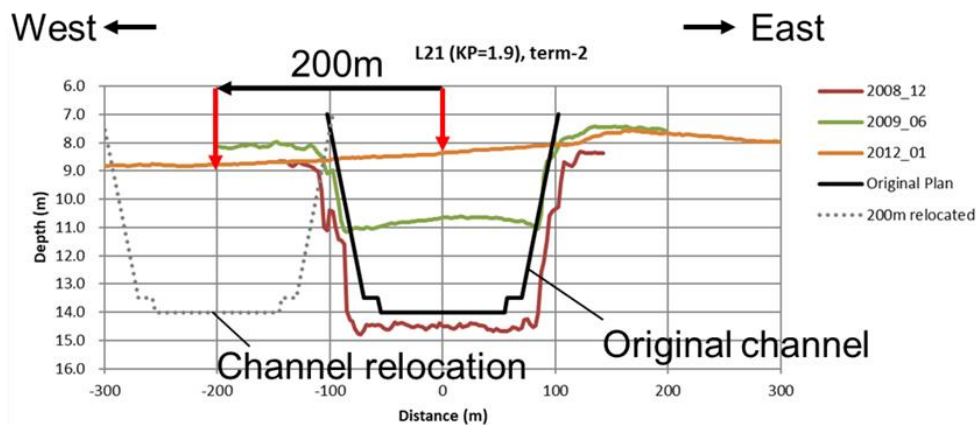


Figure 5-10 Channel cross section of the inner channel (1.9km apart from the port)

278. In the table below, a comparison of dredging volume with respect to the channel relocation is shown when the target depth is 10 m. The table indicates that the amount of maintenance dredging can be reduced by relocating the channel (the reduction rates were 85% for 100m relocation and about 70% for 200m relocation). Also, if the dredging cycle is shorter than 6 months, the height of the maintenance dredging is less than 1 m, which seems a realistic height of dredging. In this way, the channel relocation can reduce the amount of maintenance dredging. However, in the case of relocation by 200 m, the channel would have to be re-designed to avoid shallow points.

Table 5-6 Comparison of maintenance dredging volume for the target depth of 10 m

Location of Inner Ch.	Cycle time (month)	Dredging Volume by areas($10^3\text{m}^3/\text{cycle}$)			Total ($10^3\text{m}^3/\text{cycle}$)	Annual ($10^3\text{m}^3/\text{year}$)	Average Height of dredging (m)		
		Outer	Inner	Basin			Outer	Inner	Basin
Original Plan	3.00	0	193	0	193	770	0.00	0.34	0.00
	4.00	0	267	0	267	802	0.00	0.48	0.00
	6.00	0	435	0	435	871	0.00	0.78	0.00
	12.00	0	1,107	0	1,107	1,107	0.00	1.98	0.00
Relocate 100 m	3.00	0	165	0	165	659	0.00	0.29	0.00
	4.00	0	229	0	229	687	0.00	0.41	0.00
	6.00	0	372	0	372	744	0.00	0.66	0.00
	12.00	0	942	0	942	942	0.00	1.68	0.00
Relocate 200 m	3.00	0	135	0	135	542	0.00	0.24	0.00
	4.00	0	188	0	188	564	0.00	0.34	0.00
	6.00	0	305	0	305	611	0.00	0.55	0.00
	12.00	0	770	0	770	770	0.00	1.38	0.00

5.5 Sedimentation in front of the Ro-Ro Berth

279. As another alternative to Option-1, the case where a sediment disposal site is located close to the port was considered. Figure 5-11 shows the assumed layout of the esplanade (landfill) for the disposal site. A numerical simulation was used to study the sedimentation volume of the anchorage basin with and without the esplanade.



Figure 5-11 Location of Ro-Ro berth on Option-1 and a landfill for the disposal site

280. Based on the simulation results, the calm water area between the Ro-Ro berth and the landfill would lead to faster rates of siltation there compared to the present situation. Thus, existence of the landfill change the pattern of tidal current and the area of spatial deceleration of flow, which can lead to increase sedimentation around the north corner of the multipurpose

Terminal.

281. If the landfill (esplanade) would exist, the dredging cycle would be short from every 3.0 months to 1.5 months, in other words, the required dredging would be more frequent and the annual volume of dredging would be twice the case without landfill. The result indicates that the landfill increases sedimentation around the Ro-Ro berth and therefore the feasibility of landfill is very low.

5.6 Dredging and Disposal Methods

5.6.1 Comparison of Dredging Methods by Type of Dredger

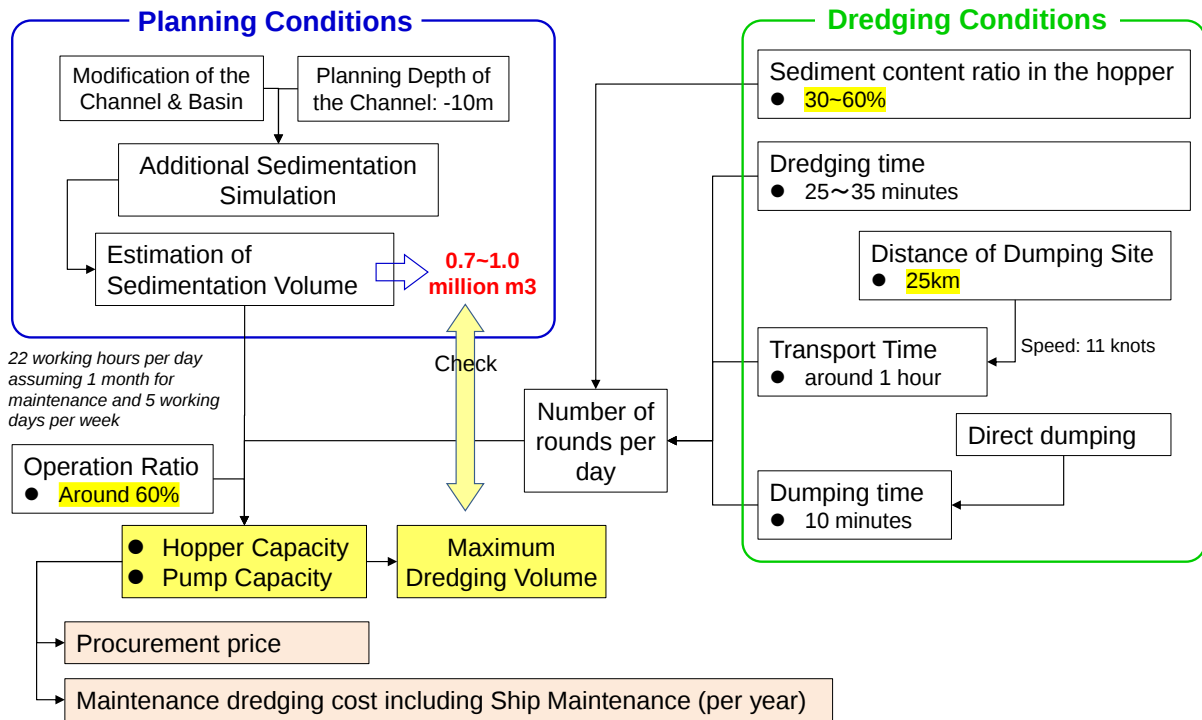
282. Dredging methods by three types of dredgers, i.e., “Pump Dredger (Cutter Suction Dredger)”, “Grab Dredger” and “Trailer Suction Hopper Dredgers (TSHD)”
283. Conditions for comparison are:
- The area near the dredging site (around 5km away) can be used as a dumping area (if the distance is farer, pump (cutter suction) dredging will not be feasible.)
 - Assuming that approximately 3 million m³ will be dredged annually
284. Based on the examination, we would recommend that the maintenance dredging at La Union Port be carried out by TSHD for the channel and Grab Dredger for the basin in front of Ro-Ro berth. Both of them do not require complicated handling or a lot of maintenance of equipment.

5.6.2 Disposal Method for Dredged Materials

285. Installing a discharge pipe at the bottom of the sea is one of the measures to suppress the turbidity of seawater, but there is a concern that operation will be very complicated.

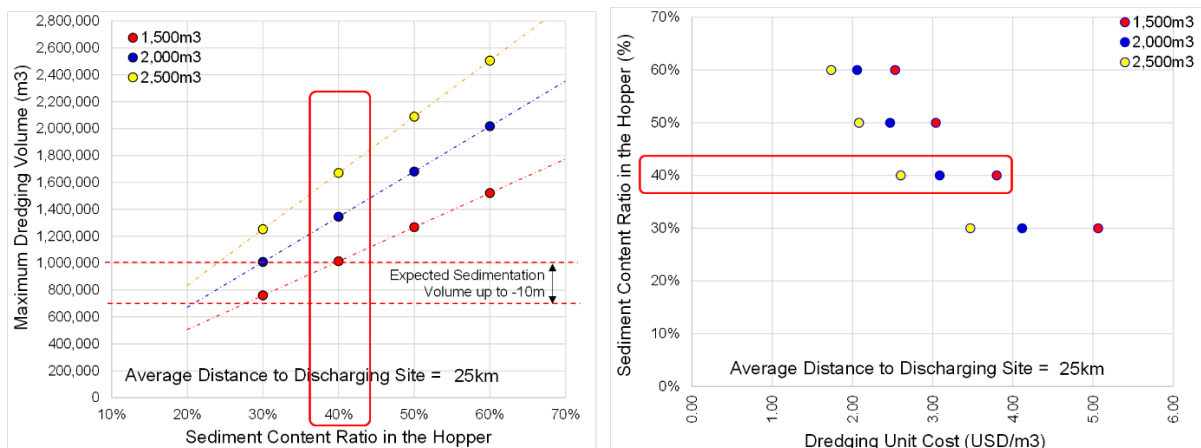
5.7 Examination of Dredging Plan by TSHD

286. On condition that the maintenance dredging will be carried out with a TSHD, the specifications of the TSHD are examined in accordance with the following procedure. “Sedimentation Content Ration in the Hopper”, which is critical for the performance of the TSHD, is assumed in the range from 30% to 60% considering the dredging records in the initial channel dredging from 2005 to 2008.



287. As a result of the calculation with various conditions and assumptions, maximum capacities of dredging volume are depicted as shown in the graph below (left side). If 40% of the Sediment Content Ratio in the Hopper is assumed, the annual maximum dredging volume is around 1 million m³ with a 1,500m³ hopper, 1.4 million m³ with a 2,000m³ hopper, and 1.7 million m³ with a 2,500m³ hopper. On the other hand, the expected sedimentation volume up to -10m will be in the range of 0.7 ~ 1 million m³ per year, and therefore, a hopper with a 1,500m³ capacity would be sufficient to deal with the annual maintenance dredging up to -10m. But if the sediment content ratio in the hopper is down to 30%, a 1,500m³ hopper would not be sufficient to deal with the annual maintenance dredging up to -10m.

288. The graph below (right side) shows the dredging unit cost by sediment content ratio. The unit cost becomes lower in larger hopper capacity.



289. As a result of the examination, the hopper capacity of the TSHD should be over 2,000 m³ to maintain the depth of -10m.

- Considering the uncertainty of the sediment content ratio in the hopper, it would be better to procure TSHD with 2,000 m³ hopper or over.
 - 1,500 m³ would be sufficient to dredge only for La Union Port, but 2,000m³ would be desirable if other port areas of El Salvador require dredging.
290. Important issues to carry out the dredging work by El Salvador's side are summarized as follow.
291. Appropriate workforce for the TSHD management and operation should be prepared.
- More than 30 crew members (3 teams) are necessary for the operation of the TSHD in accordance with the weekly dredger operation.
 - A management team for supporting dredging work is also necessary.
292. Appropriate maintenance of the TSHD should be conducted.
- Daily maintenance and regular inspection of the TSHD is required.
 - Dock maintenance once every 3 to 5 years is also required.
293. The dredging cost is:
- Re-dredging cost up to -10m is estimated at about 4 to 6 million USD depending on the sediment content ratio in the TSHD hopper.
 - Maintenance dredging cost to keep -10m is estimated at about 2 to 4 million USD per year (including ship maintenance) depending on the sediment content ratio in the TSHD hopper..
294. The expected timeline would be as follows:
- Building the TSHD including detail design will require at least two years after the contract with the shipbuilding company is finalized.
 - More than one year is required for re-dredging up to -10m depth, which depends on the hopper volume and on the sediment content ratio in the hopper.
295. Periodical updating of the estimated sedimentation volume is necessary.
- The simulation model is formulated based on limited information and data.
 - Therefore, it is necessary to monitor the depth change / sedimentation speed when dredging is conducted. Based on the monitoring data, the simulation model as well as estimation should be periodically updated to realize efficient dredging.
296. Environmental issues should also be carefully examined. For example, it may be necessary to deal with claims from fishermen and others if turbidity occurs at the dredging site and/or dumping site.
297. Regarding the dredging in front of Ro-Ro berth, it is difficult for a TSHD to dredge in front of it; therefore, other dredging methods such as the backhoe dredging or the grab dredger's dredging should be considered.

Chapter 6 Institutional Strategy

6.1 Port Promotion Strategy

298. The short-term and middle/long-term port activation plan aim to activate La Union Port which is currently underutilized. The plans have been summarized based on an analysis of the potential of La Union Port and future prospect for development and utilization of the port and the surrounding areas.
299. In order to bring out the full potential of the port, CEPA needs to systematically take measures to promote use of La Union Port as the port management body.

6.1.1 Goals

300. Based on the background of the development of La Union Port, the current situation, and the expectation for activation of the port, the following basic goals are set out.
- To expand port use of the customers who have already used the port in the past, and find potential port users to expand use of the port
 - To solicit the opinions of port users and respond to their requests including infrastructure development

6.1.2 Strategy

301. CEPA will carry out port promotion under the following strategy.

Urgent Realization of the Ferry Service at La Union Port

- The commencement of the ferry service between La Union Port and Caldera Port of Costa Rica has been agreed between the presidents of both countries and is one of the urgent and important policies of El Salvador.
- CEPA needs to work with relevant ministries and agencies to improve the environment for the ferry service by effectively using its public infrastructure in order to realize the government's policy.
- This ferry service will be one of the pioneering efforts in the creation of a multi-modal logistics system in Central America. CEPA should continue to strengthen the functions of La Union Port as an international ferry terminal.

Activation of Port Use as a Distribution Center

- La Union Port is close to the Pan-American Highway which traverses longitudinally in Central American region. In addition, it is expected to be a gateway to a dry canal which runs across the Central American region. The port is located at strategic place for land transportation in the Central American region.
- La Union Port has the largest terminal area among the ports on the Pacific coast of Central America as well as modernized facilities.
- Utilizing the above advantages of La Union Port, CEPA should conduct various activities which are shown in the med/long-term port activation plan in a systematic manner in order

to attract regular container service, inviting car carrier calls, strengthening the port's function as a bulk cargo terminal and improve terminal facilities for fuel import.

Activation of Port Use Integrated with Tourism

- The growth rate of global tourism has surpassed that of the global economy in recent years. Cruise tourism has become popular with the number of cruise tourists steadily increasing.
- The Tourism Master Plan of El Salvador places priority on cruise tourism. However, the number of cruise ship calls at La Union Port has been limited.
- Therefore, CEPA should make efforts to attract cruise ships together with the Ministry of Tourism and tourism companies. In addition, CEPA should also attempt to make LA Union Port more attractive for potential cruise passengers by providing a ferry service to tourist sites in relatively close proximity to the port. These efforts may produce a synergistic effect.

Activation of Port Use by Industrial Activities Surrounding the Port

- La Union Port has been constructed under the concept of combined development with the eastern region and is expected to support industrial activities in the hinterland. Industries which can take advantage of port services are expected to be attracted to the area.
- Therefore, CEPA should work to attract industries that take advantage of the characteristics of the port and coastal areas and make efforts to attract industries such as ship building or fishery business together with relevant parties and such industries would benefit from using the port.

Improvement of infrastructures

- It is necessary to make efforts for the full usage of the existing facilities. But requirements for port facilities and infrastructure will change in the environment surrounding the ports such as changes in the world economy or international maritime transportation.
- Expansion of the port's use sometimes results in the need to improve physical conditions of port facilities Port users may sometimes point out the necessity to improve the facilities.
- The necessary improvement of port facilities/infrastructures will be implemented considering the customers' requests as well as the effects of investment, financial justification, and the project implementation scheme including private investment.

6.1.3 Implementation Structure

302. It is recommended that CEPA establish a division in charge of port promotion to promote the port.
303. In addition, it is recommended that CEPA set up the Port Utilization Promotion Committee (tentative name) which is composed of port business enterprises, logistics companies, port users, shippers, local government agencies, and national port-related organizations in order to implement port promotion effectively.

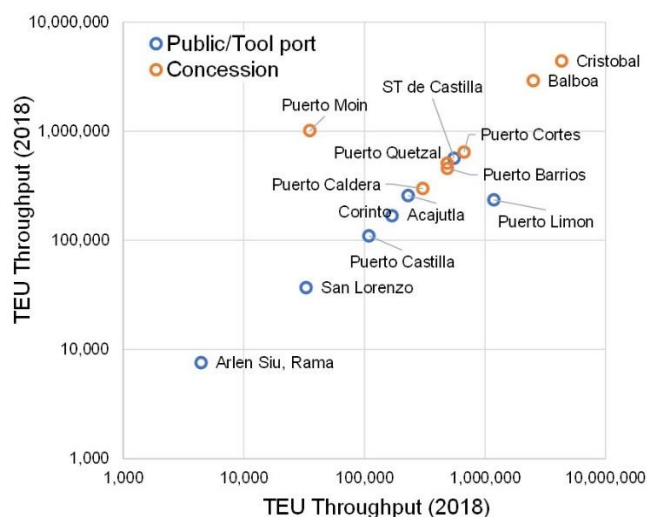
6.2 Management Strategy

6.2.1 Financial situation of CEPA

304. Organization of CEPA is composed of four (4) subsidiary companies (airport, two ports and railway) and a headquarters organization. Since CEPA headquarters has no income source, expenses of headquarters are borne by subsidiary companies. Namely, 50% of headquarters personnel expenses are borne by the airport company and another 50% are borne by the Acajutla Port company. All financial transactions related to external loans for the La Union Port construction, such as interest payment and depreciation, are registered in the La Union Port account.
305. CEPA has shown a profit in recent years. The latest financial statement of the year 2019 shows a net profit of US\$ 9,187,000 after 30% income tax and 25% fiscal retribution.
306. As for La Union Port, due to the lack of calling vessels, annual operating income has been in the US\$ 200 thousand range. In order to keep the port being ready to receive vessels, minimum staffing arrangements were maintained and necessary maintenance work was carried out. Annual total expenses including payment of interest for external debt and depreciation was around US\$ 15 million. As a result, annual losses of around US\$ 10 million have been incurred in recent years.
307. Financial situation of Acajutla Port in the past 6 years is shown in the table below. Due to a steady increase in the cargo handling volume, the operating income of the port has increased about 5% per annum, reaching US\$ 52,967,000 in 2019. The net profit after tax in the same year is US\$ 9,737,000 which is the highest among the four CEPA subsidiary companies. This profit is almost balanced out by the deficit of La Union Port.
308. Financial analysis was conducted using financial indicators such as the return on assets (ROA) and return on equity (ROE). Average ROA in the last 6 years was 0.91% and average ROE in the same period was 1.41%. Both are at a relatively low level which indicates a lack of sufficient income to justify the size of assets and amount of equities.
309. Same analysis was made for Acajutla Port, a cash-cow among the CEPA subsidiaries. Average ROA in the last 6 years was 7.16% and average ROE in the same period was 8.12% which are satisfactory levels.

6.2.2 Port Management Schemes

310. In Central America, some ports are managed and operated as Public Service Ports while some are managed and operated as Landlord Ports in the form of Concession. The types of management schemes adopted at ports in Central America as well as container handling volumes are shown in the figure below. It should be noted that a concession scheme is generally introduced at ports which handle a substantial volume of container cargo.



311. The prerequisite for entrusting the operation to the private sector under a concession scheme is that the operation of the port/terminal is economically viable and attractive to private operators.
312. As La Union Port has not yet been fully utilized since its opening, the JICA Survey Team considers that it would be firstly necessary to identify practical ways to utilize the port facilities and establish a roadmap towards realization.
313. Such work is unlikely to be carried out by a private terminal operator who by nature undertakes port terminal management on a purely commercial basis with the aim of securing a certain profit in the short term. Accordingly, such work is primarily the task of government and port authorities.
314. It is also important to note the relation between Acajutla Port and La Union Port. If La Union Port is separately operated by a private entity under a concession scheme, the two ports will naturally compete with each other in the same market. It will be difficult for the government (CEPA) to establish and maintain a mutually beneficial coexistence unless the government makes an effort to foster ties between the two ports.
315. Although a concession scheme can be considered as one valid option for future port management, it would be difficult for private operators to prepare a profitable business plan in the short term under the present circumstances in which there are no immediate prospects of attracting cargo to La Union Port.
316. Therefore, the government (CEPA) should take the initiative in establishing a functional demarcation between Acajutla and La Union Port and set up clear guidelines on cargo distribution among the two ports, which includes shifting car carriers from Acajutla to La Union and exclusive use of La Union Port for ferry services. Port promotion work should be aggressively conducted by CEPA in order to create a cargo flow through La Union Port.
317. Only when cargo starts moving through La Union Port as a result of these efforts will it be time to start considering the port concession. If it is judged that the surrounding circumstances have not matured to the point where a concession scheme is viable, the option of maintaining operation by the public sector should not be precluded. Partial transfer of cargo handling work to a private entity could also be considered in the transitional stage (a

kind of tool port).

6.2.3 Basic Concept of Port Management

318. Each country and port management body have had to tackle challenges related to port management and operation due to the changing circumstances surrounding maritime transport and ports in this era of economic globalization. Enhancement of functions as the gateway of the country is an essential matter to be addressed by the port sector of each country.
319. El Salvador which faces only the Pacific Ocean needs to make full use of functions of Acajutla Port and La Union Port under strategic management.
320. La Union Port is a newly constructed port and is expected to be developed in combination with the development of the east region of the country. In order to achieve the goal of the development of La Union Port, measures for activating La Union Port should be taken strategically based on the government policies. The ferry service project is one such project which can contribute realizing the port's goals.
321. It is necessary for CEPA to strategically manage both Acajutla Port and La Union Port as essential gateways of the country including functional demarcation between both ports as described Table 3-4 in Chapter-3.

6.3 Organization Strategy

322. In order to activate La Union Port, assignment of dedicated staff for marketing and port promotional campaigns, ferry operation, and dredging issues are necessary. Furthermore, it would be recommended to set up a specialized task force/office for assigning such staff in CEPA.
323. A concrete and detailed proposal for that organizational arrangement was going to be examined in the next field survey in El Salvador and was going to be proposed in the Interim Report, but due to the difficulty of conducting the field survey, the following organizational recommendations are made based on the online meeting with CEPA.

Organization	Objective
Port Promotion unit	✓ To promote the use of La Union Port (including ferry services) through meetings/dialogues with shippers, exporters/importers, forwarders, shipping agencies/companies, car dealers and auto-makers, etc.
Ferry Operation unit	✓ To arrange a proper ferry operation system at La Union Port including coordination with related organizations such as CIQ
Dredging unit.	✓ To make a dredging plan to maintain the water depth of the channel and the basin at La Union Port and carry out dredging work.

Chapter 7 Conclusion and Recommendations

7.1 Functional/Role Demarcation between Acajutla and La Union Port

324. In order to activate La Union Port in the future, CEPA is encouraged to have a clear concept for cargo-wise functional/role demarcation between Acajutla and La Union, which includes shifting vehicle cargo handling from Acajutla Port to La Union Port and exclusive use of La Union Port for ferry service. The Survey Team proposes the following “Role Demarcation Concept between Acajutla and La Union Port”.

Table 7-1 Functional/Role Demarcation Concept between Acajutla and La Union

Target	Acajutla	La Union
Container	Main port	Complementary port For containers which have ODs in the eastern region of El Salvador For containers between a part of Honduras and Asian region
Ferry	None	Exclusive use
Ro-Ro	None (shifting to La Union)	Exclusive use For finished vehicles
General Cargo	Main port	Complementary port For general cargoes which have Origins/Destinations in the eastern region of El Salvador and in a part of Honduras e.g., Construction materials
Bulk Cargo	Main port	Complementary port For bulk cargoes which have Origins/Destinations in the eastern region of El Salvador and in a part of Honduras e.g., Sugar, Cereal such as corn, wheat, Fertilizer, Fuel / Petroleum product
Cruise Vessel	Complementary port	Main port

7.2 Roadmap for Attracting Vessels/Cargoes to La Union Port

325. Based on the “Functional Demarcation between La Union and Acajutla” as well as the result of “ship call and required water depth” analysis, the Survey Team proposes the Roadmap for the activation of La Union Port as follows.

326. Ferries can be operated with the current water depth, and it is a reasonable approach to first aim at attracting ferry service to La Union Port. When smooth cargo transport via the ferry service is realized with other Central American countries, especially Costa Rica, it will not only bring benefits to the industries in the hinterland of La Union Port but may create opportunities for industry to be newly developed in the hinterland.

327. Measures and actions necessary to realize ferry transport to/from La Union Port are as

follows:

Measures	Actions
To attract and create cargo demand	✓ To conduct a promotional campaign targeted at shippers and transporters/trucking companies not only in El Salvador but in Costa Rica ✓ To introduce incentives such as lower port due and/or port tariff to induce vehicle cargo handling at La Union Port to reduce the total transportation cost incurred by shippers
To attract and support ferry service providers	✓ To conduct a promotional campaign targeted at logistics/shipping companies in the region to begin ferry service at La Union Port ✓ To support ferry service providers
To develop necessary port facilities and equipment for the ferry operation	✓ To install connecting facility between the quay and the ferry to secure safe and stable unloading/loading of vehicle cargoes (in case of a ferry with stern ramp) ✓ To develop a vehicle parking/waiting area with suitable pavement
To establish an efficient ferry operation system	✓ To prepare/develop guidelines for ship navigation and mooring and vehicle cargo handling ✓ To prepare/develop manuals related to CIQ and other necessary procedures in the port based on the World Bank project ✓ To conduct desktop operational simulations as well as in the field ✓ To conduct effective training of CEPA staff to realize an efficient ferry operation
To collaborate with the partner ports/countries (Costa Rica, Panama)	✓ To set up a working group to develop a harmonized system to handle ferry transport in collaboration with each other ✓ To attract ferry transport cargo including incentive programs ✓ To develop mutual understandings on technical and/or operational matters to secure smooth operation at both ports

328. From the viewpoint of the required water depth, the next target vessels would be car carriers and cruise vessels which can make the best use of the tourism potential of the Fonseca Bay. As for car carriers, the superiority of La Union Port would increase if ship calls at Acajutla and San Lorenzo could be integrated into a La Union call. To realize this La Union Port call, It is important for the El Salvadorian side to coordinate among the stakeholders such as shipping companies, car-dealers, forwarders and car manufacturers in both countries in collaboration with the Honduran side.
329. In this step, the required water depth will be -10m taking tide use into account. Therefore, maintenance dredging in the order of 1 million m³ per year (in case of 4 times dredging per year) is required. Dredging methods should be carefully examined and determined.
330. When the channel depth of -10m is maintained, it would become possible to conduct promotional activities in order to persuade shipping companies to use La Union Port instead of Acajutla; it might also be possible to attract a part of Honduran containers. General cargo vessels could be also targeted in terms of import of steel products and other construction

materials to cope with the demand in the hinterland (the eastern region of El Salvador). In addition, the export of sugar/molasses from the hinterland as well as the import of bulk cargo such as wheat, corn and petroleum products could potentially be handled at La Union Port. It is important for the El Salvadorian side to promote La Union Port to all the stakeholders including companies in the hinterland.

7.3 Other Actions to Activate Use of La Union Port

7.3.1 To Promote the Port Hinterland as a Logistics Complex

331. La Union Port, being close to the Pan-American Highway, holds an important geographic position connected to the other Central American countries by land transport. The port is also expected to be a gateway of the Dry Canal route linking the Pacific coast with Caribbean coast.
332. Therefore, CEPA and El Salvadorian Government would be advised to promote the port hinterland functioning as a kind of logistics complex taking the geographical advantage of the port, which includes a dry port development at around the crossing point of the Pan-American Highway and the dry canal route. As the road along the dry canal also plays an important role for the logistics network in the region, it is recommended that the El Salvadorian Government expedite the dry canal road improvement in cooperation with the Honduran Government.

7.3.2 To Collaborate with Regional/Industrial Development

333. La Union Port was constructed under the concept of combined development with the development of the eastern region. This concept should not be changed. The port shall be expected to support industrial activities in the hinterland.
334. Therefore, CEPA and the El Salvadorian Government would be advised to promote the port hinterland as an industrial complex or a sort of free trade zone which would be attractive for business entities who could take advantages of the vicinity of the port.
335. CEPA should also promote industries in/around the port, such as shipyard business, fishery business at Fonseca Bay including fishery processing industries, and encourage the local business enterprises to use the port.

7.3.3 To Collaborate with Tourism Development

336. CEPA should make efforts to attract cruise ships together with the Ministry of Tourism and tourism companies. In addition, CEPA should continue to make LA Union Port more attractive for potential cruise passengers by providing a ferry service to tourist sites in relatively close proximity to the port. These efforts may produce a synergistic effect.
337. It is also recommended that CEPA promote the tourism potential of Fonseca Bay in cooperation with neighboring countries, i.e., Honduras and Nicaragua.

7.4 Timeline of Actions (2022~2030)

