

Results Analysis of Surveys Made to Stakeholders in the Pacific Ports in the Panama Canal: A Study Focused to Improve the Efficiency of Loading/Discharging Operations

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Abstract: This research aims to analyze the communication process between the different participating actors in the port of Balboa, in the Panamanian Pacific. The starting hypothesis begins with the normal operation of the port itself. Considering which strategic actions have potential development and which specific strategic actions are proposed for their improvement, the article begins with a discussion of the nature of ports in Panama and their relationships with the Panama Canal, followed by a literary review of all the effects that climate change may have on navigation on the Panamanian Pacific coast. Next, the implication between the coordination and cooperation between the port, the Panama Canal pilots, and the other actors involved with the arrival and departure of vessels from the port will be analyzed. In a third part, the results of the perception of a significant sample of these actors who were surveyed, which are related to the process, are presented. The document concludes with recommendations on how the Panamanian Pacific port can improve its individual interests through the application of improvements derived from the results of the surveys, for more efficient inter-institutional coordination and cooperation.

Key words: Canal, Panama, ports, Pacific.

1. Introduction

Panama is a country that has developed a maritime trade economy since its discovery in the year 1501 [1], due to its strategic position, it is the most important isthmus in the world with a surface of 88,500 km² [1] and its narrow territory which separates the Atlantic from the Pacific by only 80 km [2]. For these reasons, in the year 1616, the first explorations took place in the province of Darién to analyze the possible interoceanic communication through the territory [1], but it was not until the year 1904 that the construction of the Panama Canal began, by a wealthy French company [3], end

later completed by the North Americans in 1914 [3]. With the development of the Panama Canal, Panama's port growth began [4]. This development began to gain strength in 1928, when the movement of ships through the Canal was consolidated, with the calls of ships in Panamanian ports, together with commercial activities and naval repairs, at that time 1,093 ships transited, 135 of them used the dry dock [5]. Port trade took a turn towards development when in 1993 the privatization of ports in Panama began [6], giving rise to the port system that is currently growing in the country. According to logistic systems development analysis sources, Panama is placed at number 1 for the Atlantic

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Ocean and number 3 for the Pacific Ocean with the categorization of terminal throughput, at the port level in the list of the ECLAC (Economic Commission for Latin America and the Caribbean) of the ports of Latin America and the Caribbean [7].

To improve the port system of Panama, it is necessary to implement improvements at the level of infrastructure, personnel and technology among other aspects according to the AMP (Maritime Authority of Panama), explained in the 2019-2030 master plan. In this, two environments are analyzed, the terrestrial and the maritime, where it is concluded that the technology and improvements in the infrastructure must be developed.

Based on the needs presented in the master plan, this document is governed by a significant sample of interviews and surveys that analyze how the maritime environment develops related to the arrival and departure of vessels at ports. People related to the ship arrival and departure process were interviewed to obtain their perception and experience of the current situation.

Where the main effects were analyzed in the aquatic or maneuvering zone, and in the connection zone with land, 80% of those surveyed agree that the time necessary to arrive at the Pacific ports has increased due to a combination of factors such as climate change, the increase in vessels waiting in the bay to carry out lockage, and the “Panama Maritime Single Window, VUMPA” platform has improved the communication process with future vessels that are going to arrive to the terminals.

1.1 Literature Review

The waits for trucks outside the facilities of the Pacific ports of Panama indicate that a review must be made of the possible situations that may be causing this problem to affect the population living in the surrounding area of the ports. We are going to carry out a literary review of everything related to the sea route, the operation of the port in the arrival and departure of vessels [8], the approval process for the navigation of

ships [9], the restrictions due to change climate [10], communication with the shipping companies (TFG Grecia Espinosa), the demands of the ACP (Panama Canal Authority) on the adaptations that the terminal must have with respect to the draft for the dock area (Notice 4 ACP), the changes in the size of the navigation channel (see Fig. 1 and 2, Harbor of the ACP), analysis of the statistical changes that the ACP has had, with respect to what is currently allowed to be navigated through the interoceanic waterway (Monthly -Canal-Operations-Summary-January 2019 to January 2024) they are equal.

The ACP, over the years, has made improvements in the navigation spaces for the entrance to the Pacific and better development of port approaches, as we can see in Figs. 1 and 2, if we compare the images, it shows how the navigation areas have been adapted.

The operation of the port of Balboa with respect to the arrival and departure of ships is developed within the operations department, the Marine Services section is in charge of managing communication with the shipping agencies, the itineraries of the ships per day, thus coordinating with the ACP to carry out ship maneuvering functions, taking into account some factors such as dimension or cargo distribution, among others. In these operations, different variables are evaluated such as production hours per crane, estimated arrival time, estimated departure time, ship production hours, among others [8].

The Berthing is a PDF file [8], that is obtained from the port’s operating system, which shows a visualization of the dock with all the ships that dock at the port per day, which shows various factors such as: the number of crews, ship operational services, ship priorities in relation to time, and the different customers of the terminal [8].

Within the port, one of the state offices that plays a very important role in waiting times at the ANA (National Customs Authority), is in charge of overseeing customs processes in its different areas such as import, export; where we see the importance of document matching

and physical verification of requirements to control smuggling and phytosanitary, zoo sanitary and human health risks.

In the Import Area, activities were focused on

orientation, training and teaching of import processes of different cargo within it. What we have called the entry and exit of merchandise to the national territory were carried out, in order to increase international trade [11].

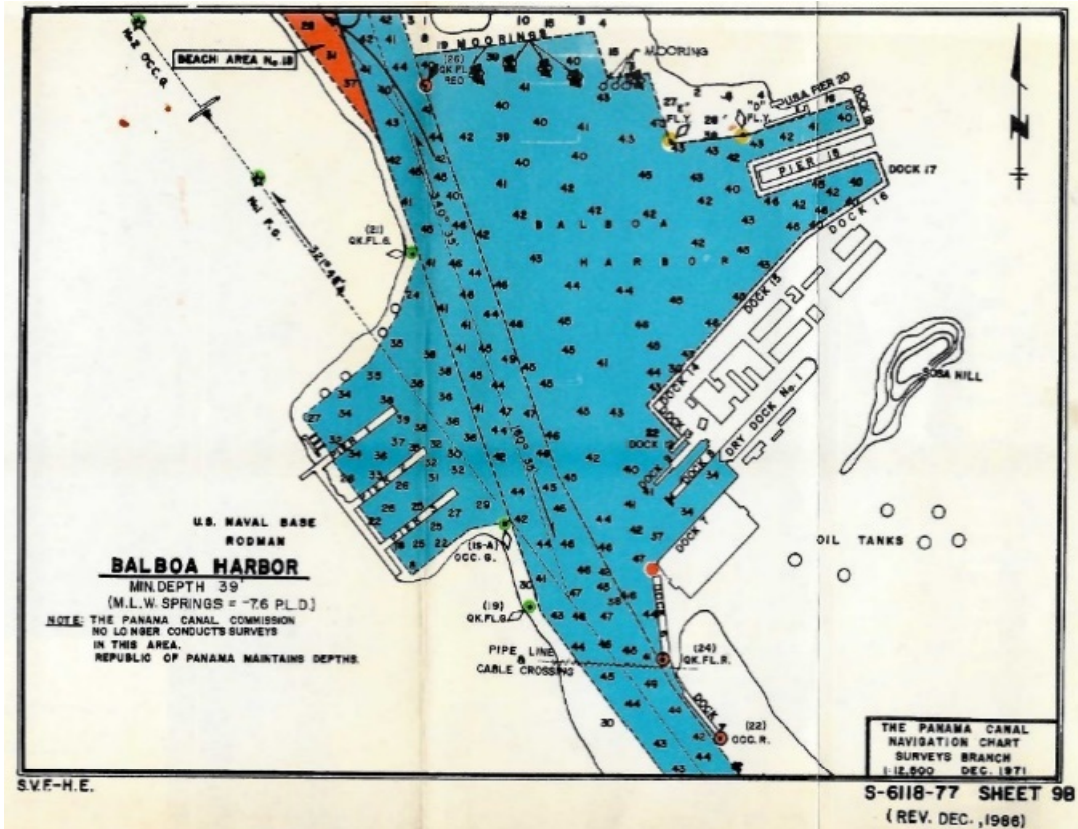


Fig. 1 Balboa Harbor, 1986. Source: ACP (all rights reserved).

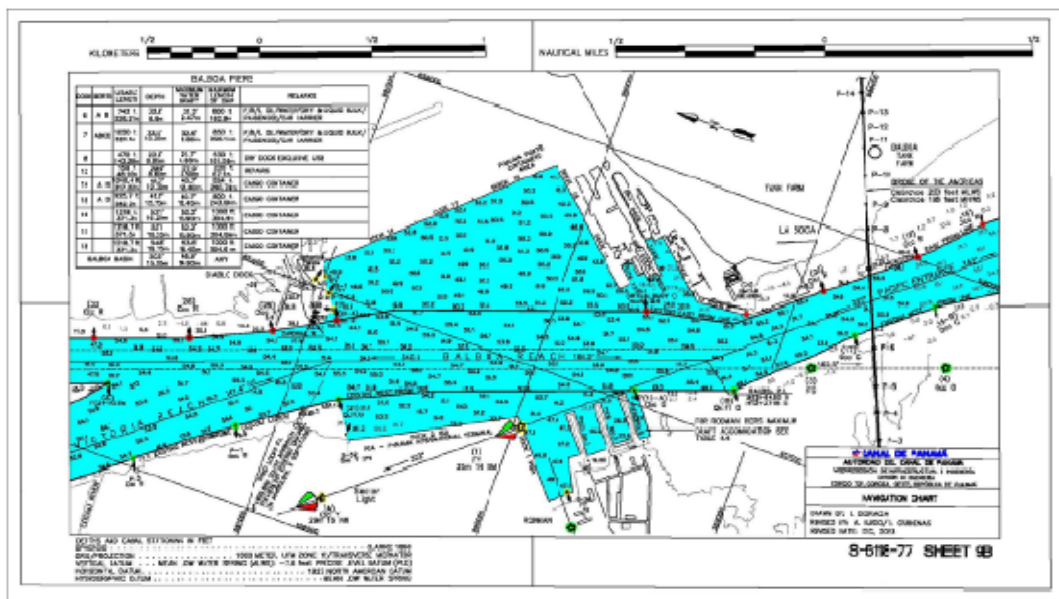


Fig. 2 Balboa Harbor, 2024. Source: ACP (all rights reserved).

In the Export and Re-export area, customs documents are verified and additionally the recognizing of goods, that are going to be directly Exported and Re-exported, outside the country.

And finally, at dock six and the gate of the port of Balboa, where internal transits and land transfers are carried out, pending goods, corresponding to the different agencies and companies that do not belong to the national territory and that are stored. In addition, the verification of supplies and ship parts is carried out in the database, in the integrated customs management system [11].

In the case that vessels, after arriving at the port to load and/or unload, must transit through the Panama Canal, they must have approval from the Naval Architecture Office, which is part of the Captaincy Section. Sur is responsible for the evaluation and approval of the plans of new or existing ships that wish to transit, either through the new or old locks, of the Panama Canal. This is done with the objective of guaranteeing safe, efficient transit and minimizing the delay in its passage [9].

To achieve these objectives, vessels must comply with a series of requirements established by the Panama Canal in the “Vessel requirements OP Notice to Shipping No. N-1-2023”. This document contains the MROPC (Maritime Regulations for Operations in the Panama Canal) and is updated on January 1 of each year [9].

In order for there to be good communication with the port within the shipping companies, there is an operations department that is in charge of contracts with the country’s ports and terminals, negotiating rates related to tugboats, moorings, port operations, container handling, productivity and crane deployment. In addition, they are responsible for monitoring ship operations at terminals and shipyards to avoid delays and improve productivity, saving costs and avoiding downtime [12].

Currently, to the coordination of the arrival and departure of vessels to the Pacific and Atlantic ports of Panama, another variable is added to consider, with

respect to waiting times, which are restrictions due to climate change, which generates an increase in the vessels that are in the anchoring area waiting to carry out their navigation.

The CHCP (Panama Canal Hydrographic Basin) has the Alhajuela and Gatún lakes as reservoir systems. From these, water is extracted to meet the demand of the population, municipal and industrial consumption, and navigation demand. Some of the measures used by the ACP to measure performance related to water use are water and draft reliabilities [10].

In recent years, it has become increasingly common to hear the phrases “draft restriction” or “transit restrictions” through the Panama Canal due to the low level of Gatun Lake. This is due to the decrease in precipitation in the Panama Canal Hydrographic Basin, the increase in evaporation and infiltration, especially during the dry season months [10].

Additionally, the appearance of the El Niño phenomenon of greater intensity is becoming more frequent, since there are not neutral years, but years of the La Niña Phenomenon were followed by years with the El Niño Phenomenon. The expansion of the canal, even with the construction of new locks and the use of water-saving tanks, demands the use of water resources that were not consumed before [10].

Another important factor to take into account after the enlargement is that, in order to transit vessels with greater draft, the level of the lake cannot drop below a certain level, since then larger vessels would not be able to transit, so the lake has a smaller margin before reaching the elevations where draft restrictions begin to be implemented [10].

Currently, the ACP, through OP Notice to Shipping No. N-2-2024 [13], notifies the port operation rules and regulations used to control the movement of vessels in the operational waters of the Panama Canal. Cristóbal, Balboa and the Canal entrances to reduce the risk of accidents, detail the coordination and procedures of vessels at the entrance to the Pacific, the conditions of port tugboat services, the depths and drafts in the port

Table 1 Traffic statistics, advisory to shipping, ACP.

January Arrivals	Daily average	High	Low
2020	36.64	44	26
2021	33.32	47	18
2022	34.52	47	23
2023	35.90	47	27
2024	23.70	31	17

Source: ACP, all rights reserved.

of Balboa, control of movements of small vessels in the port of Balboa, vessel movements in and out of the dry dock, movements of Panamax Plus and Neo Panamax vessels in and out of Balboa.

In the Advisory to Shipping, the ACP publishes the first days of each month, the all-shipping agents, owners, and operators, of the closing of operations of the previous month, through the Monthly Canal Operations Summary. If we make a comparison of what is allowed in January 2020 versus the year 2024, according to Table 1, the daily average for the year 2020 is 36.64 compared to the year 2024, which has a daily average of 23.70, they have a decrease of 12.94 vessels on average less.

2. Method

After a first bibliographic review, based on the consultation of academic articles and technical reports, which describe the forms of communication between the different authorities responsible (Port Authority, ACP and other actors) for the entry and exit operations of the Panama Canal ships, a series of interviews and surveys were carried out with ship captains and tugboat masters.

The purpose of these interviews was to identify the main effects on the water surface or maneuvering area of the ships, in addition to those existing in the land connection areas that hinder free transit through the Panama Canal.

The specific objectives are the following:

- Conducting surveys of the actors involved.
- Identifying possible obstacles in the ship's

approach, docking, unloading and shipment of cargo by land.

- Measuring waiting times for ships in the vicinity of the terminal.

In a stage prior to carrying out the surveys and interviews, the possible effects on the operations of the vessels were grouped into the following sections, adapting the interviews to different actors depending on the sections in which they were involved:

- communication,
- navigation,
- waiting times for the arrival or departure of ships at the port,
- navigation channel conditions,
- availability of dock space.

The development of the surveys was in person or virtually, as in the case of the interviews. To prepare the surveys, the Office Form platform was used, with 13 questions for which responses were received automatically. In parallel, 20 interviews were carried out, 50% of which were carried out with Captains (or pilots who enter the ships) who are sailing in the Panamanian Pacific and calling at the two different terminals.

The surveys carried out were focused on knowing:

- Time taken from boarding the ship at the pilot point to the destination port
- Waiting time before arriving at the berth
- The possibility of having an exclusive channel for the entry and exit of the ports
- If there is, if it would be a safe route
- If in recent years, the waiting time to access the locks has increased and how much 20%, more
- The possible improvement of navigation conditions by having two sets of locks
- Suggestions to improve the common area of the ports and the channel

3. Discussion and Results

The interview stage was carried out with up to 20 people related to the institutions that manage the arrival

and/or departure of vessels to port facilities in the Panamanian Pacific. From the results that emerge from their most notable comments, Table 2 has been prepared, which shows the recommendations and suggestions for the best operations that we present below.

The most repeated comment in the different interviews is that “space is the biggest limitation”, both for navigation from the anchorage and for maneuvering with several boats at the same time.

The surveys developed a set of 13 questions, which were answered by both pilot and tugboat personnel. Through Google’s Form platform, responses were received automatically. In parallel, 20 interviews were carried out, 50% were carried out with captains who are sailing in the Panamanian Pacific in the different terminals, the other interviews were carried out with shipping companies, planning staff of the port of Balboa, customs and the MINSA (Ministry of Health).

A survey was presented on both the experience of Panama Canal pilots and tugboat captains.

The surveys and interviews obtained comments based on the current conditions of climate change, which can be considered a condition that has been increasing restrictions.

The following results were obtained from the

surveys, shown in Fig. 3:

(A) An exclusive channel should be suggested for the entry and exit of the Ports, where 86% of those surveyed consider that it is not prudent, due to the draft restrictions that the Panama Canal has with respect to depth, but also regarding the available width.

(B) What is the wait like to go through the locks? Forty-three percent (43%) of those surveyed consider that there has been an increase of 20%.

(C) Regarding division where you work, 57% of the respondents were from the pilot section and 42% from the tugboat section.

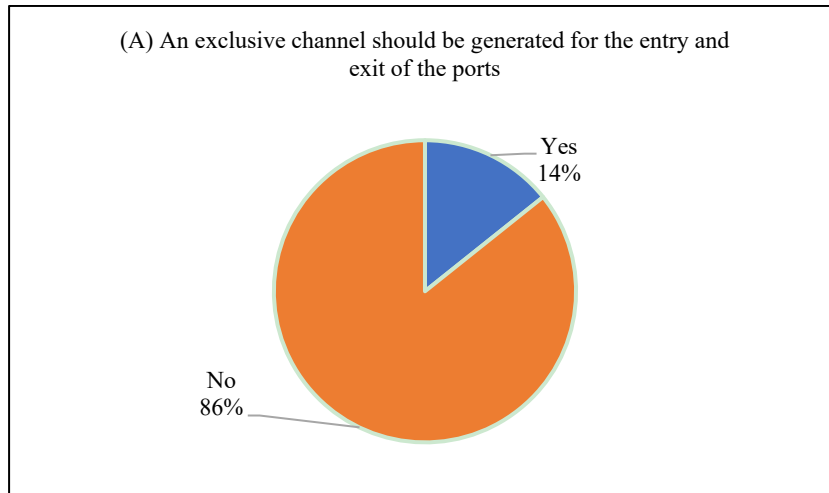
(D) Regarding how navigation times through the locks have changed, 57% consider that it is done in less time.

(E) Years of service were divided into two groups: those of less than 9 years and those of more than 9 years in navigation in the Panama Canal, based on years of experience and the possibility of being able to navigate different classes of vessels. The surveys were carried out on 68% of captains with high experience.

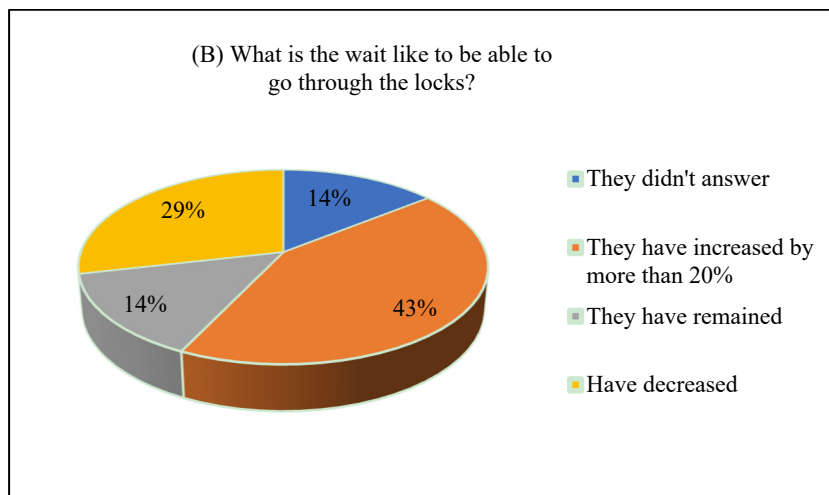
In the Advisory to Shipping, the ACP publishes the first days of each month, the all-shipping agents, owners, and operators, of the closing of operations of the previous month, through the Monthly Canal Operations Summary. Given that, if we make a comparison of what

Table 2 Featured comments in interviews.

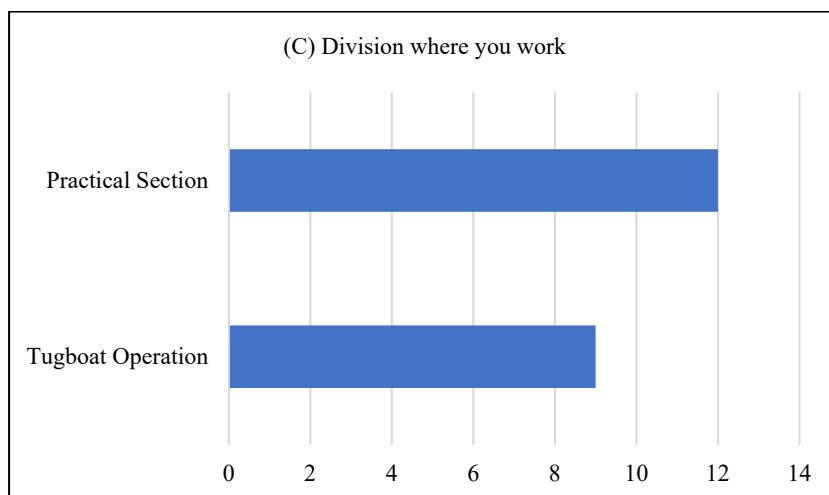
Featured comments in interviews	Amount
Container tracking must be implemented	3
VUMPA has improved processes	4
Maneuver time in 30 to 45 min on average	3
The navigation channel is the responsibility of ACP	2
Docks and mirror of the docks responsibility of the AMP	2
There are ships that must be inspected before arriving at the port or lock	2
Process efficiency must be improved	5
Economic benefits or effects may be generated	6
Space is the biggest limitation	7
The anchoring space has been increased, due to the number of ships calling	4
Effects due to the variation in climate, with stronger winds, bad weather, swells that did not affect in previous years	5
Laws must be created to protect fauna and marine environments	3
Implementation of Green Ports OMI-PANAMÁ	3
Establish spaces in the surrounding area, in concession to improve port facilities	1



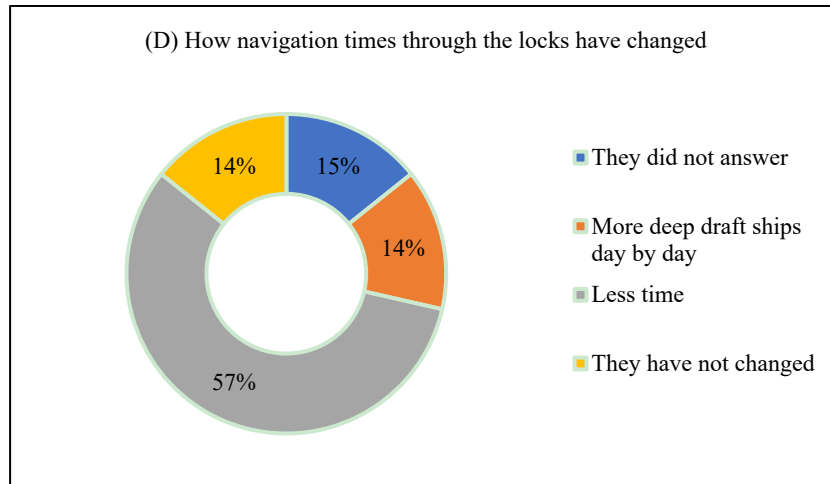
(A) The pilots and tugboats were asked if an exclusive channel should be proposed for the entry and exit of the ports, where 86% answered that they were not in favor. The explanations were based on the draft restrictions that the road has.



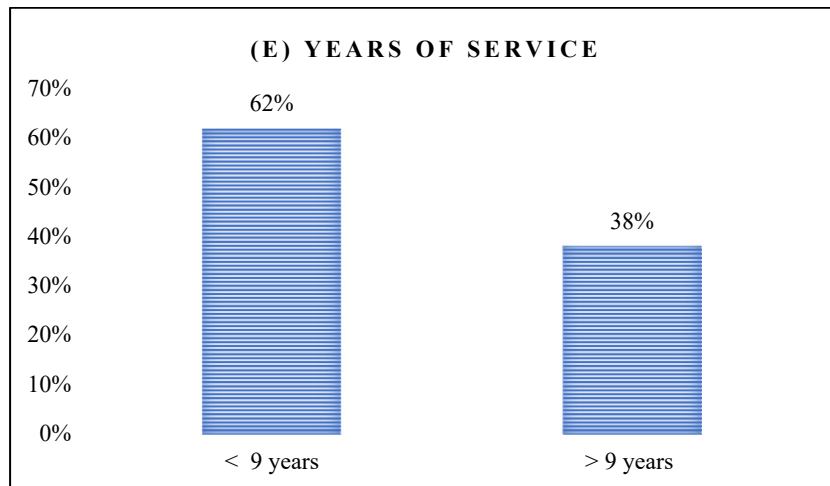
(B) The pilots and tugboats were asked: How has the waiting time to pass the locks changed? 43% answered that it increased more than 20%.



(C) Among the surveys sent to the target audience made up of pilots and tugboats, the group of respondents that responded the most were pilots.



(D) The pilots and tugboats were asked, how have navigation times through the locks changed? And 57% answered less time, relating the decrease to more space due to the new locks.



(E) The pilots and tugboats were asked how many years of service they had in the ACP and 63% have more than 9 years.

Fig. 3 The results obtained from the surveys.

is allowed in January 2020 versus the year 2024, according to Table 1, the daily average for the year 2020 is 36.64 compared to the year 2024, which has a daily average of 23.70, they have a decrease of 12.94 fewer vessels on average, which reflects the concern indicated by those surveyed in the interviews.

4. Conclusions

With the objective of measuring the main effects in the aquatic or maneuver zone, and in the connection zone with land, it is possible to know:

- Waiting times in the maritime sector are coordinated taking into account all the restrictions that currently exist.

- 80% of those surveyed agree that the time necessary to arrive at Pacific ports has increased, due to different combinations of factors, such as climate change, the increase in vessels waiting in the bay to be able to carry out the lockage.
- The “Panama Maritime Single Window, VUMPA” platform has improved the communication process with future vessels that will arrive at the terminals.
- Vessel attention times in the port of Balboa are under the criteria of 16 h or more than 16 h and their placement on the dock allows the work to be carried out under coordination; of the time that the planners establish, which can delay all the maneuvers.
- The variables that intervene in port development

and that create effects on the mobility of merchandise in a terminal are time, size of the terminals, establishing priorities, and achieving coordination with all the actors involved in the management of ports. The cargo, which is placed in the port, at the time of delivery to the carrier, is the variable that, when identified with this research, that will be developed in the approach of the model, part of the operational research that studies the behavior of systems, whose elements include waiting lines.

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