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Airports as Actors in the in the Transformation of the Environment and Hydrological Environment

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Abstract: "How does an airport transform the environment of a region?" As a case study, the Cancun airport is proposed, which is the second in importance at the national level. It is explained that in the international civil aviation system there are norms and recommended methods that guide the construction of the airport infrastructure, to conserve and contribute to their environment in compensation of the social, economic, environmental and political transformation carried out. ASUR (aerodromes operations group) governed by Mexican aeronautical legislation, every 5 years presents its master development plan to contribute to the improvement of the environment and the prudent use of Cancun's natural resources, thus, although the inhabitants have a contrary perception about the Cancun airport, it has become a sustainable infrastructure, which although it is true it modified the environment, nowadays it is the most important tourist bridge in the country leaving an economic development, social and cultural development superior to that of other airports. The above is concluded based on a mixed methodology that used the survey as an instrument for collecting information, statistics for data analysis and documentary information to provide legal support to the study.

Key words: airport, environment, hydrological resources

1. Introduction

In the present investigation a question is looked to be answered "How does an airport transform the environment of a region?". First we have to define that an airport is a terrain in which you can find facilities and flight tracks that are used for the takeoff and landing of aircraft, it´s used to give maintenance as well, to operate the loading and unloading of the former ones, and at the same time to be able to make the boarding and off boarding of passengers [1].

The airport is divided in 2 parts: side air where you can find the flight tracks, the aircraft movement street, aircraft operations and everything moving around these, the earth side is the terminal building where it can be found the documentation rooms, security filters, migration, waiting rooms, banks restaurants and shops [2].

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The airport helps the economic development of the region or country, improves the communication with any place, leads to generate more employment and increases the economic activity in the environment [3]. All airports are of utmost importance provided that it helps in the touristic activities and business activities of any country.

It is necessary to understand that, in the planning stage of an airport, the influence area analysis of the project is made, the region where its potential users are located, historical precedents must be known, economic, politic, social and geographic, such as the physical media, in this case the Hydrology and the biological environment [4].

This is divided in 2: direct influence area, where in an evident way the environmental and sociocultural impacts are presented, and which correspond to these physical areas potentially affected by the facilities and activities of the project; indirect influence area, the

territory in which indirect environment impacts are manifested [5].

It is worth mentioning that the Indirect influence area contemplates the contamination level that the superficial bodies of water suffer or in earth due to the construction work, as well as the contamination for cargo operations and/or transportation that affect the rain water that is filtered in the ground and to the bodies of water [6]. In this way, the space domain is examined where the possible environment impacts are created by the airport activity; in this area the scale and intensity of the different impacts are evaluated to be able to define prevention or mitigation measures through a development plan [7].

It's worth mentioning that, civil aeronautics designs an environment administration system, that has for objective to organize and to structure the environment administration. This is taking into consideration the affectations that the operations have due to the noise, the land use, liquid residue, as these affect the environment. From the Environment Administration system, civil aeronautics has a procedure for the identification of the legal requirements that allows us to have a quicker access to the valid documents such as environment licenses and the permissions with which one is required to comply. As general planning, environmental noise control, contamination control, liquid residue management, solid residue management, water consumption and energy consumption.

Thus, we can analyze the physical media, biotic and social ones to be able to see how each one of the components is currently found un the airport activities. One of the most important is the environment changes, hence, they're taken into consideration when making one of these works because the environment management is one of the conditions to be able to expand the airport activities. Thus, the objective of the investigation is to define the environment and hydrological impacts that the Cancun airport has caused in the region.

2. Why Cancun Airport?

The Cancun international airport (IATA: CUN, OACI: MMUN, DGAC: CUN) with the geographic coordinates 21°02'12"N 86°52'37"O and elevation of 6 m/20 feet (msnm) has been remodeled and expanded to become the 2nd Mexican airport with biggest traffic of international passengers, besides being considered as one of the most important points in Latin America, [8] although Cancun was considered a fisher's island surrounded by virgin jungle and unknown beaches.

It's located 15 km south away from Cancun city, in the Mexican Caribbean coasts, in the Yucatan peninsula, geographically us a strategic point for the aerial transportation like a key element between the connectivity of tourists visiting it from different countries around the world.

Provided that Cancun is 370 km away from Chetumal, 70 km away from playa del carmen, it is adjoined with the Atlantic Ocean to the east, Mujeres island to north, and east to Lazaro Cardenas municipality and south to Morelos Port.

It is divided in 5 zones: Hotel, Urban; Juarez port, Franja Ejidal, and Alfredo V. Bonfil (where the highway 307 is found that goes to the international airport and to the Mayan Riviera)

In the hotel zone are the most of the beaches that surround the inner Nichupte lagoon system composed by seven water bodies: Bojorquez lagoon, North Basin, Central basin, South basin, English river, love river and Mediterranean lagoon. It's part of the coastal area which white sand is in all the Cancun coasts. And Juarez port is dedicated mostly to phishing.

Climate is Aw sub humid, this is the driest of the sub humid warm weathers, with rains in summer and an annual average precipitation of 1012.87 mm. Annual average temperature is 26.60, with dominant winds in winter coming from northeast and east (18 km/h) and in summer from southeast and east (12 km/h)

According to INEGI, the Environment System (ES) corresponds to the physiographical provincial Yucatan Peninsula and to the physiographical sub province Yucatecan Carso that takes the center and north entity,

according to the physiographical and geomorphological map of Quintana Roo state. Lithological superficial units are formed by sedimentary rocks originated in the Superior Tertiary (ST) or Neogene system until the Quaternary (Q), which rocks are dolomitic and solidified limestone and recrystallized, of clear coloring and with thin insertions of marl and gypsum according to the geological cards of the INEGI.

The relief is built of lightly uneven plains, with many cavities of dissolution, which favors the underground drainage. The edaphic cartography registers leptosols (young grounds with presence of carbonate residue mixed with mineral material) and Solonchak (colluvial grounds derived from carried materials deposited in the lithosols and swamp zones where there is organic matter deposits)

Environment system has a lack of superficial currents because the terrain nature is karstic and the lightly relief presents high permeability. The rainwater portion is not lost by evaporation, it filters to the ground, producing a saturation of superficial layers and its incorporation to the underground aquifer. The hydrological card of superficial water refers to the environment system of the 32 hydrological region, North Yucatan and it corresponds to a portion of the 32A Quintana Roo basin. In this basin the surface runoff is minimum and the infiltration in high, the bigger size water bodies correspond to coastal lagoons such as Nichupté, Conil and Chacmochuch; in the continental portion there are natural wells, gouaches and small lagoons. As for the underground waters Cancun is a free aquifer with rainwater and underground charge, the quantity of extracted water is acceptable for human consumption. In the Carribean Sea there are: Cancun tip, where there are colorful coral formations, it is easy to find stingrays, barracudas and sharks; Chital reefs where you can find lobster, rays and groupers; Nozouc tip with a great diversity of sea life where you can findlobster, groupers and stingrays. Also, Caribbean waters are the habitat of a great diversity of fish species such as the barracuda, sailfish, marlin, pretty fish, snapper, tarpon fish, among others. The flora is sub evergreen forest, low evergreen forest, low flooded forest, mangrove, savannah, flooded palm grove and coastal dune vegetation, as well as characteristic species such as tasiste, ramón, chaca, nakax palm, dye stick, chicozapote, chechén, red mangrove, chit palm, while in the natural well there is phytoplankton flora, generally dominated by diatoms.

In this way, with the intention of co-helping the region, in November 1972 the construction of the Cancun airport started and at almost 50 years after its inauguration the project hasn't reached its maximum development, the airport is still growing with government and interested enterprises in attracting to a bit more than 14 million visitors per year.

Its fundamental to understand that the development of an airport is ruled by the development masterplan, that is updated and verified every five years, being authorized and validated by the general agency of civil air force aeronautical authority in Mexico. In which, studies an analysis of feasibility are presented for the project to co help in the growth of the region, as well as a responsible use of the natural resources.

It is necessary to clear that the Cancun airport is developed according to the Chicago agreement in which the agreements for a safe and ordered development are stablished and in equality of opportunity for aeronautics, on the other hand, the bases are given for a development of technologies and in a fair economy for everybody. This agreement us accompanied by of 18 annexes, which contain the norms and methods recommended to develop any function in aeronautics.

Annex 14 of the OACI stablishes the physical characteristics of an airport, besides there are other manuals and documents that rule the correct way of building an airport. These regulations and recommended methods were adopted May 29th, 1951, based on the third Conference of the Aerodromes Department, external routes and terrestrial help of 1947

and of the fourth Conference in 1949 [1]. "This annex contains the regulations and recommended methods (specifications) that prescribe the physical characteristics and the limiting surfaces of obstacles with which aerodromes must count, and certain facilities and technical services that are normally supplied in an aerodrome" [1].

It's important to mention that the ANNEXES of the OACI are not of obligatory character, with based on the provisions in the First Part Aerial Navigation, Chapter 1 General Principles and applications of the Chicago Agreement, all hiring state is sovereign and responsible of safeguarding aviation in its territory, based on the regulations that come of its political structure. It is then understood, that the OACI is an organ that controls the international civil aviation, nevertheless, each hiring state or country is responsible of generating an aeronautics legislation of obligatory character, based on the regulations and recommended methods by the OACI [9]. Nonetheless, Cancun has fulfilled with what was said by the OACI.

Provided that Mexico was one of the first countries in signing the Chicago agreement, which gave it a privileged place in the aeronautics during the fifties, because the airport system in Mexico had grown exponentially administered principally by the State Governments, nevertheless, the responsibility and investment that airports require lead the Federal Government to create Airports and Auxiliary Services (ASA) as a dis centralized organ that took over the airport sector from 1965 until 1985.

In the 20s, airports grew and developed, based on the national and international guidelines having at the moment. To be more precise the airports aligned with the stablished in the ANNEX 14, becoming Mexican airports as a symbol of international prestige [10]. Nevertheless, in 1985 Mexico would live one of its worst economic and political crisis, forcing the government to sell important national enterprises. On February 19th, 1998 in the Official Diary (ODF) of the Federation the General Guidelines were published for the opening to the Mexican Airport System, this opening allowed that private enterprises could have a participation or an investment in the airports [11].

This event was made with the objective of keeping the security and efficiency status of the airports in Mexico, with the support of the private sector in the National Plan of Development of 1995-2000 it was stablished the priority of having an adequate infrastructure, modern and efficient in the airport network of the country. With the new challenges of Mexico and the sight into a new prosperity in 1995, the Civil Aviation Law and the Airports Law were published in the ODF, being Constitutional President of the United States of Mexico Ernesto Zedillo Ponce de Leon.

For all that, the Cancun airport fulfills the third Chapter of the Concessions and Permits, First Section of the Concessions, of the Airport Law emitted by the SCT (2018), is describes the requirements and the responsibilities of an airport administrator. In this point it is stablished that the concession application must come accompanied of: terrain description, terrain situation, investment required amount, proposed technical specifications, technical security requirements and standard provisions related to the Environment.

Besides, Cancun airport is also adhered to the regulation of the Aerodromes Law, which indicates that the application must be accompanied by many documents and informs, being the most meaningful for this investigation: technical capacity, technical security requirements and the standard provisions related to the Environment.

The former has the relation to the airport and complementary services represented in the aerodrome; in case of construction of the aerodrome, the technical viability study; the civil aerodrome location in a topographic card of the National institute of Statistic, Geography and Informatics, in scale 1:50,000 or less, the blueprints and descriptive memory of the aerodrome project, indicating the construction by

stages and its approximate time of creation; a study of the aerial space that determines the feasibility of the processes of arrival and exit of the aircrafts that includes the information of obstructions; the location of the terrains, with a study that specifies the suitability of the former ones, attending the meteorological conditions of the site according to the winds, cloud roofs, visibility and temperatures, and the climate data according to the pretended category, as well as topographic studies, hydrological, geological and of ground mechanic; a study in matter of Environmental impact; the proof of no affectation of urban development emitted by the local authorities; the legislation before mentioned has the objective of stablishing the minimum parameters to have a concession of aerodrome that allows it to administer, operate and exploit and in its case build, remodel or to expand and airport in Mexico [12].

In the present days the licensed airports are obligated to present a Master Program of Development (MPD), just like Cancun Airport did, which Is aligned to the National plan of Development, the Sectorial Program of the Communications and Transports Secretary, just as to the Development Program of the State and to the Municipal Plan of Development [13].

All the previous, is provided with basis on the article 134 of the Politic Constitution of the United States of Mexico, where its pointed out that the economic resources of the Federation, State entities, the Municipalities and territorial demarcation should be administered with efficiency, effectiveness, economy, transparency and honesty [14].

Thus, The Cancun Airport is the case of study to stablish the transformation this causes in the environment of the region.

3. Methodology

To fulfill the research, it is essential, to know the characteristics of the geographical zones near the airport, fundamental matter to determine the feasibility of the project and to generate strategies short, medium and long term strategies that mitigate environmental problems and affectations to the near communities. For practical purposes, it is used the perception of the inhabitants of the region to analyze the transformation of the environmental surrounding and hydrological of Cancun and the benefits or damages created by the airport.

Thus, we applied the mixt methodology, which formative period was since the 50s, rises up in the 70s, without giving the name of mixt design qualitative and quantitative approaches are mixed in the studies and investigations of different areas of knowledge. In 1973 Sieber mixes the studies of case with the surveys and in 1979, Jick introduces the basic terms of the mixt designs, by recurring to techniques and instruments given by positive paradigms and naturalistic for the date gathering. In the 80s, qualitative and quantitative approaches kept combining. Thus, until the end of the 90s paradigmatic debate period was given. While in the late 80s to the 2000 we have the procedural period. After that we have the *advocacy* as a period separate from design. In the 2007, Christ mentions that the investigation with mixt methods has been strengthened and the exploratory qualitative studies, followed of confirming studies, have been common and concurrent [15].

In this research it was decided to use a mixt design because “it represents the highest rank of integration of the qualitative and quantitative approaches. Both are combined in all the process of research, or at least, in most of its stages. It adds complexity to the study, but it contemplates all the advantages of each one of the approaches” [16].

Thus with the only objective to answer the questions of investigation the mixt method is used, provided that, in a way, we use the data gathering, through the documentary analysis that is used to decode texts, extract info and data that help to understand the context and make meaningful inferences of the feasibility study and the master plan of the airport in comparison with the final project, meaning, theory is compared with the

practice. On the one hand, theory is checked regarding the Master Plan of Development, the legislation, the Environment, hydrological resources and the sustainability. On the other hand, a survey is made in which through items it helps to obtain information of the perception of Cancun population, regarding the airport in its zone. It's made a pilot test to 100 inhabitants to know the usefulness of the instrument. Thus then, through a simple random sampling in accordance with the Cancun population of 1,857985 inhabitants, according to INEGI data, as presented next, sampling size of 1066.39 is obtained.

Simple random sampling in accordance with the Cancun population:

Data:

N= 1,857,985 inhabitants' quantity

Z= trust level of 95%

e=error margin of 3%

p= 0.5 and q=0.5 variance

* size of the Cancun population according to INEGI in 2020

Then, the adjustment in the sample size (No):

$$No = \frac{Z^2 Pq}{e^2} \quad (1)$$

$$No = \frac{(196)^2(0.5)(0.5)}{(0.03)^2} \quad (2)$$

$$No = \frac{(3.84)(0.25)}{0.009} \quad (3)$$

$$No = \frac{0.96}{0.009} \quad (4)$$

$$No = 1.067 \quad (5)$$

As population is known, according to N is the next:

$$n = \frac{No}{1+(\frac{No-1}{N})} \quad (6)$$

$$n = \frac{1067}{1+(\frac{1067-1}{1,857,985})} \quad (7)$$

$$n = \frac{1067}{1+(\frac{1066}{1,857,985})} \quad (8)$$

$$n = \frac{1067}{1+5.7374X10^{-4}} \quad (9)$$

$$n = \frac{1067}{1.00057} \quad (10)$$

$$n = 1066.39\ persons\ for\ the\ sample \quad (11)$$

In this way, it's decided to make the survey to this meaningful sample of the population. The survey is made in Microsoft forms because it allows the users to create personalized questionnaires, surveys, questionnaires, registries and much more in a quicker and simpler way; also to create the form you can invite other users to answer with any web browser or even with mobile devices. Thus, according as the results are being sent, we can use incorporate analysis to evaluate answers. Form data can be exported to Excel to make analysis or to assign notes (Microsoft).

Closed questions are used, multiple choice questions, for the data analysis to be easier and objective. The key questions were the next ones: What economic impact does the Cancun airport have on the region? What touristic impact does Cancun airport have on the region? What impact does Cancun airport have on the urban structures, highways, among others in the region? What impact on education and development does Cancun airport have? Nevertheless, a highlight was made on What impact does Cancun airport have on the air? What impact does Cancun airport have on the flora and fauna and the ground of the region? What impact does Cancun airport have on the aquifer bodies of the region? What impact does Cancun airport have on the coasts and sea? What impact does Cancun airport have on the drinking water of the region? What impact does Cancun airport have on the noise of the region?

Besides, if according to your observation and time living in the zone, have you seen reduction in the drinking water service? Have you seen sinking in the nearness of the airport or that you can attribute to the airport? Have you seen floods in the nearness of the airport or that you can attribute to the airport? And at the end, they were asked if the airport was a benefit or a risk according to their judgment and if they knew the Cancun Airport was mostly sustainable.

In this way, we own an exploratory research – sequential confirmatory with quantitative and

qualitative data with quantitative and qualitative analysis.

4. Result Analysis

It must be remembered, that an airport helps the economic development of a region or the country, improves communication of any place, generates jobs and increases the economic activity in the environment. In other words, the airport has the purpose of improving the region economic activities in any country. For this reason, the Development plan of Airports in Mexico aligns to the Plano or Program of Development of the region and of the country in general.

The Government Secretary (2019), presented The National plan of Development principally focused on stablishing objectives and strategies in 3 general axis: justice, wellbeing and economic development, it also mentions 3 cross-wise axis: gender equality, corruption combat and sustainable terrain and development.

In this sense, according to Cancun populations the objective of economic development has been fulfilled, provided that the 98% of surveyed Cancun inhabitants consider the airport has had a positive economic and touristic impact in the region. Also, the 81% of the surveyed inhabitants consider the airport has a positive impact in the urban infrastructure, highways and among others in the region. Besides, in development matter the 73% of the surveyed considers the Cancun airport has a positive impact on education and on the region development. Even Cancun inhabitants say the airport helps a 49% to the social development and a 26% in the cultural, as well as a 26% on the political. Therefore, it can be said that the Cancun airport has worked in pro of the wellbeing and the economic development of the region. It is noteworthy that, the generic axis of economic development of the country has been a constant in the Mexican Governments, in 2010 the Bank of Mexico set in motion a development plan of the Mexican Caribbean, being constitutional President Gustavo Diaz Ordaz who started the construction of Cancun as a base in the new public politics of encouragement to tourism [17]. With a little more than 50 years of the beginning of Cancun as a fundamental touristic cone in the Mexican Caribbean, it still is one of the most important in national level, as you can see in Fig. 1.

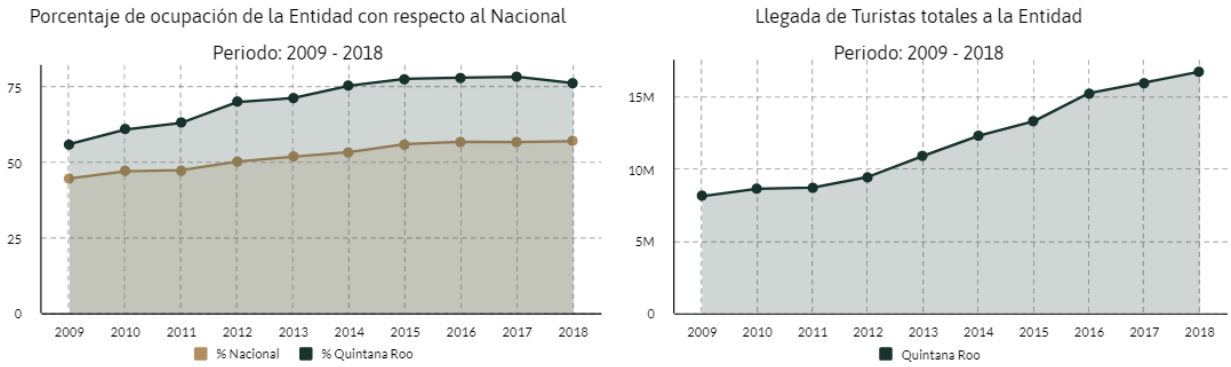

Fig. 1 Percentage of the entity occupation regarding to National/Total tourists' arrival to the entity, by México Quintana Roo Givernment, 2019. (Available online at: https://www.datatur.sectur.gob.mx/ITxEF/ITxEF_QROO.aspx)

Percentage of the entity occupation regarding to National/Total tourists' arrival to the entity.

Despite the pandemic being lived since 2019 in Mexico, Quintana Roo has been of the states that has recovered quicker in its economy, through a recovery of the economically active population over other states, being able to reduce its unemployment 0.17 percentage points regarding 2020 closure, as observed in Fig. 2.

With the application of national and international sanitary protocols and the support provided by the enterprises of the aeronautics sector it was possible to receive 12 million 373 thousand 291 tourists in the

beaches of Cancun reactivating commerce and hotel activity in the most important Mexican Caribbean zone [18]. For which, the airport has been essential and necessary.

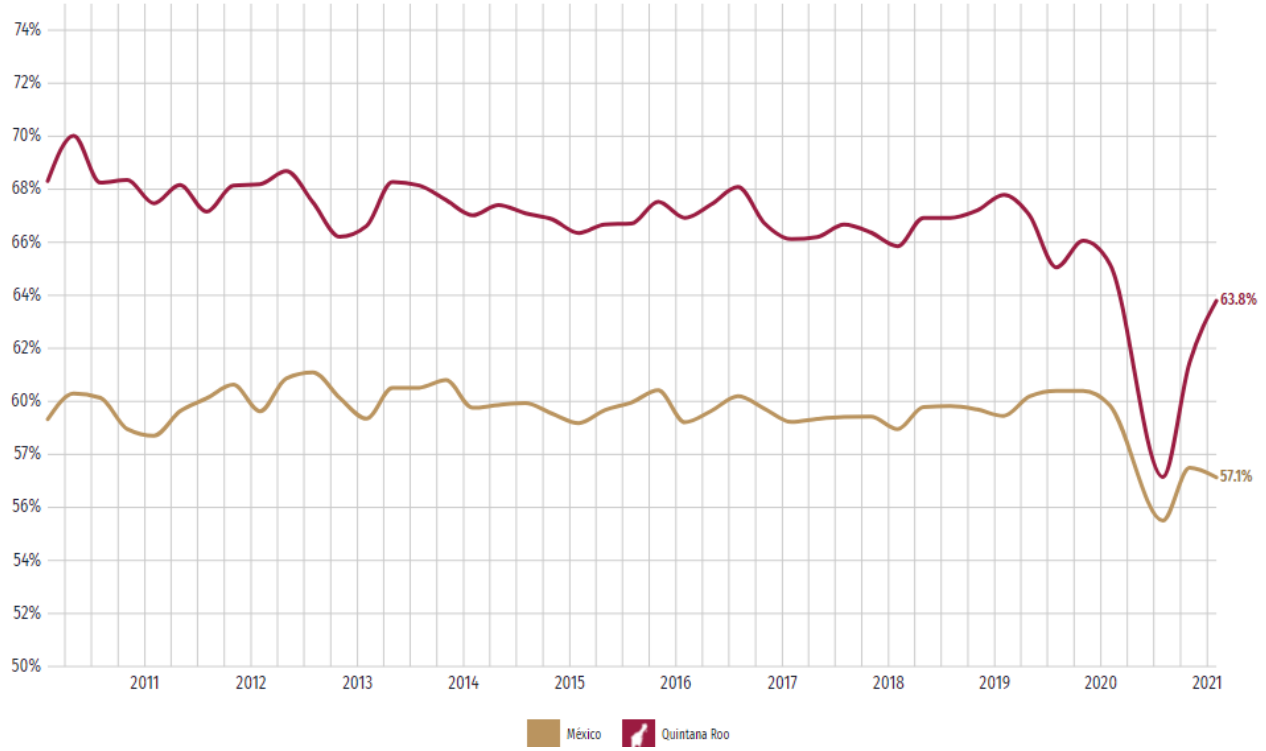

Fig. 2 Evolution of economically active population, by Data México Quintana Roo, 2020. (Available online at: https://datamexico.org/es/profile/geo/quintana-roo-qr?growthSelector1=growthPercentageOption#empleo)

On the other hand, the most of the surveyed consider that the airport has had a negative impact in the hydrological resources, the environment and the drinking water, nevertheless 85% recognizes that they don't know the airport is sustainable. Regarding the sustainable development, the National Plan of development indicates that the strategies come from the Federal Power and are centered in guaranteeing human and social rights in all levels. The access to water and a healthy environment with sustainability focus of the ecosystems, biodiversity, patrimony and the landscapes are rights that are pretended to be conserved and improved as of 4 strategies:

1) Preserve and protect terrestrial and aquatic ecosystems, as well as the biodiversity to guarantee the supply and quality of environmental services.
2) Sustainably take advantage of the natural resources and the biodiversity based on a planning and communal economic management with a territorial approach, of bio cultural landscapes and basins.
3) Restore ecosystems and recover priority species based on a better scientific knowledge and tradition available.
4) Strengthen the environmental ruling and territorial through participation, transparency, inclusion, equality, access to justice in environmental matters and recognizing the knowledge and traditional practices of the people.

The last update on the State Plan of Development of Quintana Roo, throws important data for this research, regarding the planning and investment in the aerial transportation [19]. Quintana Roo has 4 airports, from which airports of Cancun, Cozumel, and Chetumal are international and Playa del Carmen as a national airport, being Cancun the second place nationwide.

The strategies that integrate this plan in terms of sustainability and airports indicate that the construction, preservation and modernization of the infrastructure for the economic development, must be centered at connectivity impulse, the agile and safe transportation of people and merchandise that include sustainability criteria.

The honorable local government of the Benito Juarez municipality (2020) [20], is one of the most important in Quintana Roo state, it is located in Cancun which is the first place in touristic arrival, this has benefited the community to develop the biggest infrastructure of integral touristic services.

In favor of the region development the airport group Southeast Airport (ASUR for its acronym in Spanish), that has the concession of the International airport in Cancun in its Master Plan of Development 2014, announced the investment of 300 mod, for the construction of the terminal 4of the aerial complex in Cancun that started in 2015 and was ended in 2017.

With such expansion it can receive a bit more of 20 million users annually, the project contemplated 52 square meters, with 11 positions for aircrafts and all the required services for reception and dispatch [20]. Nevertheless, despite the sustainability criteria, Cancun inhabitants have a different perception, 68% of the inhabitants consider Cancun airport has a negative impact in the air quality of the region; 73% thinks the airport has a negative impact in the flora, fauna and region ground; 70% reflects on the negative impact there is on the aquifer bodies (rivers, lakes, among others); 62% speculates the airport impacts negatively in the Cancun coasts and the sea; also, 68% visualizes a negative impact in the drinking water of the region, thanks to the airport.

Nevertheless, ASUR as a socially responsible enterprise and compromised with the environment, has bet on the recovery of residue water, from treating plants to the interior of its airports and with support for the improvement of the infrastructure for water treatment in the near regions.

The project in the construction of the Terminal 4 (T4) along with the construction of the parallel road surface to the track 12L-30R of the Cancun International Airport, presented in its inform of flor use that the property, does not register superficial water bodies, nevertheless, natural water bodies were detected in wetlands to the east of the property, which does not represent a hindrance due to the fact that ASUR has implemented programs that have the purpose of recovering 100% of the water used in their airports and re use them for different actions inside the same and even in the near communities [21].

In the Cancun airport all the consumed water in the terminals is processed in 3 treatment plants, succeeding an irrigating quality and it is even filtered to the subsoil under the parameters marked by the Water National Commission (Conagua) and the Natural Resources Secretary (Semarnat). Thus program does not only have the objective to return water to the subsoil, with support of the national authorities the airport works constantly to determine the underground water quality that feeds the aerial terminals and near communities [22].

Water use in aerial terminals is responsible which has guaranteed not overloading hydrological resources on the habitats and near settlements. As principal elements of the program air conditionings have been updated, generators, pumps using water, to last-generation kind with a better efficiency reducing by 8.5% the waste of vital liquid in the airport [23].

The Terminal 1 (T1) has a cistern with 60 m^3, the Terminal 2 (T2) has its own cistern with capacity of 100 m^3, which is fed just like the one of the Terminal 1 by wells and it is supplied by through a hydroneumatic system, physical and chemical processes are applied previously to give the required quantity by the authorities [21].

The systems for supplying water in the Terminal 3 (T3) and 4 (T4) are different, in the T3 is used an activated carbon filtered. Water coming to the activated carbon filters comes from 4 wells of salty water, which

fill a cistern of 100 m^3 that are going to be supplied to the T3 previously passing by a filtering and softening process. Another part of the water is directed to a 500 m^3 cistern, used for the air conditioning systems. The T4 cistern is obtained by another well, before making it to the drinking water cistern with a capacity of 574 m^3, it goes by a filtering system and softening systems [21].

Treatment Plants of Residue Water of the Terminal 1, 2 and 3 are designed to treat a flow of even 8.5 liters per second, it's aerobic kind, conventional with extended airing. The new Terminal 4 counts with a Treatment Plant of Residue Sanitary Water that works based on a biological nature system, with an expense of 15 liters by second.

The airing systems is made of: Number of units = 4; total volume of each airing tank = 180 m^3; cellular retention time = 24 d; re circulation rate of mud = 30%; hydraulic residence time = 11.74 hours; overall Oxygen requirement = 470.29 kg/d and Relation F:M (microorganisms feedback) = 0.21 l/d.

Likewise, it has another Treatment Plants for those installations that by their distance they have no connection with the drainage network:

- Administration Building of ASUR, it has a Plant with a capacity of 0.5 liters by second, it means aerobic kind.
- Complementary Services Area, with a Plant of capacity of 0.5 liters by second, it means aerobic kind.
- For the residue water treatment of the aircrafts (blue water) is has a system of pretreatment (pimp truck) by water based dilution, reducing contamination by chemical products in the hydrological systems of the region.
- The mud generated in the zones of the airport is kept and treated in an aerobic digestion tank with a residence time of 10 days.

The before mentioned efforts have generated a meaningful saving in the reduction of the total consumption of water in a -8.0% regarding the evaluated periods 2019 and 2020. The total consumption of water refers to the annual total of the airport and it takes as a base the supplies that are generated by either the municipal supply or the one extracted by the wells. The total annual water discharge has a reduction of -48.9% [24].

Based on the previous and although, the inhabitants' perception is negative it is worth mentioning that in the Annual inform of Sustainability 2020 form the airport group ASUR, it's developed in the point nine the environment responsibility the enterprise has, the principal objectives point towards a reduction of the negative effects in the aerial operations that sustain this enterprise in the environment the prudent use of the natural resources [24].

ASUR has concentrated in managing the consumption of drinking water, as well as the management and treatment of black waters that generate in different processes of the airport. Eight of the administered airports by this group count with treatment plants of residue waters. The modernization of platforms in the airports of ASUR, has not only focused in the equipment and tools used to give service to the aircrafts, the pavements and procedures in the fluid supplies of aircrafts, as is fuels or oils, it allows a quick and efficient cleaning before a spillage, avoiding in this way the mix of these chemicals with rainwater, these advances have generated a reduction in the contamination of local water sources [24].

5. Conclusions

In addition, the airports are infrastructures that help in the integral development of the region, although it is understandable that a project of this size requires hydrological resources in the zone in a first stage, nevertheless, afterwards, through investment and new technologies, they become self-sustainable and even providers of certain services for the community.

It is important to highlight that ASUR, the airport group to which the Cancun Airport belongs, boards different objectives of Sustainable Development (OSD) contained in the agenda 2030 of the United Nations

(UN): Health and wellbeing; Quality Education; Work and Economic growth; Industry; Innovation and infrastructure; Climate Action, and terrestrial ecosystems Life.

In the case of the Cancun airport, this has a pump truck for pumping of rain water and residue water. It is the only airport in the country with a separating garbage plant that recycles 16% of natural resources.

The polyethylene terephthalate (PET) waste are reused. And it counts with an environment management System authenticated under the ISO 14001 system by the *European Quality Assurance* (EQA), certification and verification entity by its appropriate management of water and air.

Besides, the Cancun terminal has the certification LEED (*Leadership in Energy & environmental Design*) by its acronym in English, awarded to outlines buildings and built with excellence, at the same time they're leaders in the use of green technologies that bring autonomy and sustainability of the systems with which they operate, with a design that takes advantage of the natural resources in a responsible way and reduces the use of another sources of energy.

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