

Montano Armendáriz, Angélica; Pérez Concha, Juan Carlos

**Article**

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# **Analysis of the factors of economic resilience to natural disasters: the case of Los Cabos, Mexico.**

**Angélica Montaña Armendáriz<sup>1</sup>**

Universidad Autónoma de Baja California Sur

**Juan Carlos Pérez Concha<sup>2</sup>**

Universidad Autónoma de Baja California Sur

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<sup>1</sup> amontano@uabcs.mx

<sup>2</sup> jperez@uabcs.mx

## **Resumen**

Este documento tiene como objetivos: primero, identificar los factores que propician procesos de resiliencia en destinos turísticos vulnerables a desastres naturales, a partir de un análisis técnico perceptual que permita realizar un diagnóstico de la capacidad de resiliencia económica del turismo en Los Cabos; el segundo objetivo, valora la dimensión económico-empresarial de la actividad turística, con base en el análisis de variables económicas e indicadores turísticos que responden a la crisis ocasionada por el huracán. La aplicación empírica se realizó, tomando como estudio de caso, el destino turístico de Los Cabos, México.

La investigación cuantitativa, se fundamenta en un modelo de regresión múltiple de las variables que influyen en los procesos de resiliencia económica en los destinos de sol y playa. Los resultados presentan un análisis de la capacidad de resiliencia del destino respecto de variables y factores como: empleo, reactivación económica, equipamiento urbano, infraestructura y afluencia turística, derrama económica, inversiones, comportamiento de las empresas y autoridades frente a desastres naturales. El modelo econométrico propuesto resultó estadísticamente significativo dado que la varianza explicada es del 83%; por lo tanto, los resultados refieren que la afluencia turística e infraestructura hotelera, así como la variable post-huracán, impactan de forma positiva en la derrama económica en el destino turístico, propiciando un efecto multiplicador de las inversiones y un mayor dinamismo en la economía local.

## **Abstract**

The objectives of this document are two. Firstly, to identify the factors that foster resilience processes in tourist destinations which are vulnerable to natural hazards. The perceptual technical analysis allows us to make a diagnosis of the economic resilience capacity of the tourism sector in Los Cabos. The second objective assesses the economic-business dimension of tourism activity, based on the analysis of economic variables and tourism indicators that respond to the crisis caused by the hurricane. The empirical application was made, taking as a case study, the tourist destination of Los Cabos, Mexico.

The multiple regression models of the variables are the basis for this quantitative research. These variables influence the processes of economic resilience in the sun and beach destinations. The results present an analysis of the resilience capacity of the destination regarding variables and factors such as employment, economic reactivation, urban equipment, infrastructure and tourist influx, financial income, investments, the behavior of companies and authorities in the face of natural disasters. The proposed Econometric Model was statistically significant, since the explained variance is 83%; therefore, the results refer that the tourist affluence and hotel infrastructure as well as the post-hurricane variable positively impacts the economic income in the tourist destination, through the multiplying effect of the investments that are generated to enhance the hydrometeorological phenomenon, which leads to greater dynamism in the local economy.

*Palabras Clave:* Turismo, Resiliencia, Los Cabos.

*Key Words:* Tourism, Resilience, Los Cabos.

*JEL Classification System:* Q26, R58, R11

## **1. Introduction**

Severe natural disasters and the crisis in the tourism industry have an enormous impact into the Sun and beach destinations in Mexico. One of the most intense hurricanes ever registered ("Odile") affected the region of Los Cabos; whose restructuring in tourism, institutional, urban and housing structure, as well as the reactivation of the economy and tourist activity in the area, cost more than 1,625 million dollars (FONDEN, 2014)

The concept of resilience has been applied in the social sciences with a multidisciplinary character, it is the capability for recovery acquired when facing the effects of an adverse economic disturbance, as well as adapting to such results. This context boosts the necessity of fostering or developing processes that promote the capability for the resilience of the territory before extreme natural phenomena.

The necessity of a fast-economic recovery in an area affected by natural disasters requires of an entrepreneurial ability, defined by a behavior oriented to the harnessing of opportunities, which favors growth and improves the areas' adaptability. The role of the businessman is fundamental for the resilience of a local economic system, as well as the management and institutional support from the governments.

Due to the decisive contribution from the tourism industry to the national economy in general, and to Los Cabos in particular plus its evident vulnerability to hydro-meteorological phenomena, this document has two goals.

Firstly, to identify the factors that promote resilience processes in those touristic destinations vulnerable to natural disasters.

Secondly, to analyze the economic-entrepreneurial dimension of the touristic activity based on the analysis of economic variables and touristic indicators, which respond to the crisis caused by the hurricane due to the necessity of meeting the demands from the international tourism market.

The tourist destination of Los Cabos, México is the basis of the practical application in this case study.

The methodology includes a qualitative research, done through participative workshops and in-depth interviews to key actors to identify their perception about the matter. The quantitative research, is based from a multiple regression of the variables that influence the economic resilience processes in the sun and beach destinations.

The methodology is made up of qualitative and quantitative research. The qualitative research includes participative workshops and in-depth interviews with crucial actors to identify their perception of

the matter. The quantitative analysis is based from a multiple regression model of the variables that influence the economic resilience processes in the sun and beach destinations.

The results show an analysis of the capability for resilience from the destination regarding variables and factors such as: employment, economic reactivity, urban equipment, touristic infrastructure and affluence, economic income, investments, companies and authorities' behavior when faced with natural disasters.

## **2. Literature Review**

### **Los Cabos: regional threats and vulnerability before natural disasters.**

Historically, the state of Baja California Sur (BCS) has been affected (in a greater and lesser degree) by the threats that tropical storms represent<sup>3</sup>.

The National Weather Commission (CONAGUA, 2016), reports that during the period between the years of 1870 and 2015, a total of 48 storms damaged different places in Baja California Sur territory. Besides, in Los Cabos municipality, since its creation -in 1981- as a political-administrative body, a total of 15 hydro-meteorological phenomena have hit the municipal territory. "Odile" hurricane has been one of the most violent, taking into consideration the material and economic infrastructure damages to the area, but -above all- for the remarkable effects on the society and urban infrastructure (IMPLAN, 2014; Vila, 2015).

The geographical location of Los Cabos Baja California Sur, (in the coast of the Pacific Ocean Mexico's northeast at the south end of the peninsula) propitiates that recurrently, and year after year this region is vulnerable to the cyclonic season. This situation causes the region significant material damages on the urban infrastructure, economic activity stoppage, life quality dropping (in a social term) and -particularly- unmeasurable effect on the environment.

Based on the public available information, the climate change phenomenon (on a global scale) will increase the probability of the presence of extreme climate events, such as an intensification and increase in the frequency of tropical storms (UNISDR, 2013).

The area of Los Cabos, its imminent risk zone, its anthropogenic problems and the problems that occurred after hurricane Odile, such as communication systems, equipment, infrastructure to provide mobility and accessibility to the population brought out the vulnerability from the locations.

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<sup>3</sup> For this work, the term "storms" will have the same connotation that "hurricane", since it is the same weather phenomenon.

On the other hand, the necessity to strengthen the methods of preparation, mitigation, planning, organization, and construction, as well as improve prevention culture to face the effects from the hurricanes that can cause significant destruction endangering the economic environment of Los Cabos (IMPLAN, 2015).

### Resilience: General concepts

Resilience is a concept which –up until now- has no definition approved by the researches consensus that have analyzed this topic. The word “resilience” is derived from the Latin verb “salire” and from the term “resilio”, which combination means: to go back, stand out or bounce (Martin & Sunley, 2015; Kessell, Gibbs & MacDougall, 2014; Rose, 2007).

In social sciences, in the field of psychology is where in the late 70<sup>^</sup>s, this concept arises. Later on, this term aroused in ecology and environment, where ecologic resilience is understood to be the capability that a system must face disturbances or alterations and recover (Briguglio, Cordina, Farrugia & Vella, 2009; Adger, Hughes, Folke, Carpenter, & Rockström, 2005).

In the social sciences environment, many definitions exist for this concept; from them, it is worth highlighting the description and conceptualization that some specialists, researchers and international organisms that develop their activity in this field use, such as:

Author	Resilience
Holling, C. S. (1996)	Capability of a social-ecological system to absorb or resist disturbances or other exogenous factors, in such a way that the system remains and preserves its structure and functions.
OCDE 2016,	Ability for people, homes, communities and regions to mitigate, adapt and recover to tensions and crises, in such a way that they reduce their vulnerability, and inclusive growth is enabled.
Davoudi, S. (2012)	Reorganization degree or the ability of a system to respond, possibility, to a shock or event that has altered, in a substantial way, their conditions for functioning; a short and medium term evaluation is assumed, corresponding to what the specialists on the topic call “Capability for adaptation”.
ONU,2015	Defines “resilience” as “the capability of a system, community or society exposed to a threat to resist, absorb, adapt and recover from its’ effects in an appropriate and efficient way”, which includes preservation and restoration of its structures and essential functions.
Martin & Sunley, 2015	It refers to the differential ability of a region or location, to anticipate, prepare, respond and recover when faced with unforeseen events.

Table 1. Resilience Concept Interpretations. Source: Compiled by authors

### **Tourism resilience:**

As mention before, the concept of resilience has different assumptions. The resilience in this sector aroused the interest on the part of the actors both in public and private scenes both in research and desition-making. (Martin & Sunley, 2015; Bristow & Healy, 2014; ONU, 2015). In this sense, various researchers coincide to mention that resilience in a tourism sense is relevant, since it allows to identify and comprehend the capability of the local economies when faced with crises, altercation and natural phenomena that impact and effect (in an economic, social, environmental and cultural way) a touristic destination.

From what's stated by Biggs, Hall & Stoeckl (2012), it's possible to define the concept of tourism resilience as the options and response capability from the vulnerable sectors of the tourism industry, to face disturbances and changes generated in the local as well as regional or national environments. So, we have that resilience in tourism helps to identify and analyze the way in which the tourist activity and the main actors involved in it affect the demand of the destination, its income, and its indicators of social welfare. Active responses and the ability to adapt and cope are the keys to manage natural disasters and events.

Considering the presence of extreme phenomena affects the demand for the destination and, consequently, its economic revenue and social well-being indicators. Naturally, some regions are more sensitive to this kind of events; particularly, those in where their economy depends on tourism and are located on coastal zones, such as is the case of Los Cabos, where tourism constitutes the main economic activity. However, its geographical location expose it to extreme events such as tropical storms or hurricanes which threaten the natural environment, which constitutes the base of its touristic attractions (Montaño, Ivanova, Perez; 2017).

Directly linked to resilience in tourism, is the concept of community resilience, where the active participation from community members anticipate and respond to crises generated –for example- by hydro-meteorological phenomena and their capability to recover the destinations' functionality is recognized, situation that must be acknowledge as an attribute in residents of a touristic destination (Rodriguez, 2015; Rose, 2007). Community resilience is a concept linked to the capability of the community and its institutions, to absorb, manage and reorganize after a disaster and –in that way- try to improve their functions, structure, and identity (Uriarte, 2013; Biggs, 2011).

Encouraging and planning tourism resilience has emerged in recent years as an alternative to sustainable development. Moreover, to give a new perspective on the community and touristic resilience.



These concepts are deeply related to Los Cabos and its extreme conditions. In this context, it is convenient to acknowledge the existence of some differences between the sustainability paradigm and the planning that resilience involves. The first one focuses on trying to mitigate, prevail or maintain resources; meanwhile, resilience is a concept that adapts to change, attempting to build capacities to return to the desired state after the interruptions generated by crises or natural phenomena (Lew, 2013).

### **3. Methodological Approach**

To achieve the proposed objectives, the methodological process in this investigation consists of two parts. The first one, includes qualitative research through participative workshops and in-depth interviews with principal actors, with the goal of constructing a technical perceptual analysis and provide information that allows identifying the factors that satisfy a resilience process when faced with natural disasters on the touristic destination of Los Cabos.

The second phase, belongs to quantitative research through a multiple regression analysis. The primary goal of this study was to value the economic-entrepreneurial dimension of touristic activity, starting from the economic variables and touristic indicators report, as a reply to crises and response capability when faced with natural disasters, and at the same time try to keep up with the international touristic market demand. Los Cabos, as a tourist destination, gives the empirical evidence, considering an analysis period which goes from 1980 to 2017; the statistical information was obtained directly from the national touristic information system and the statistical and geography national institute. (INEGI)

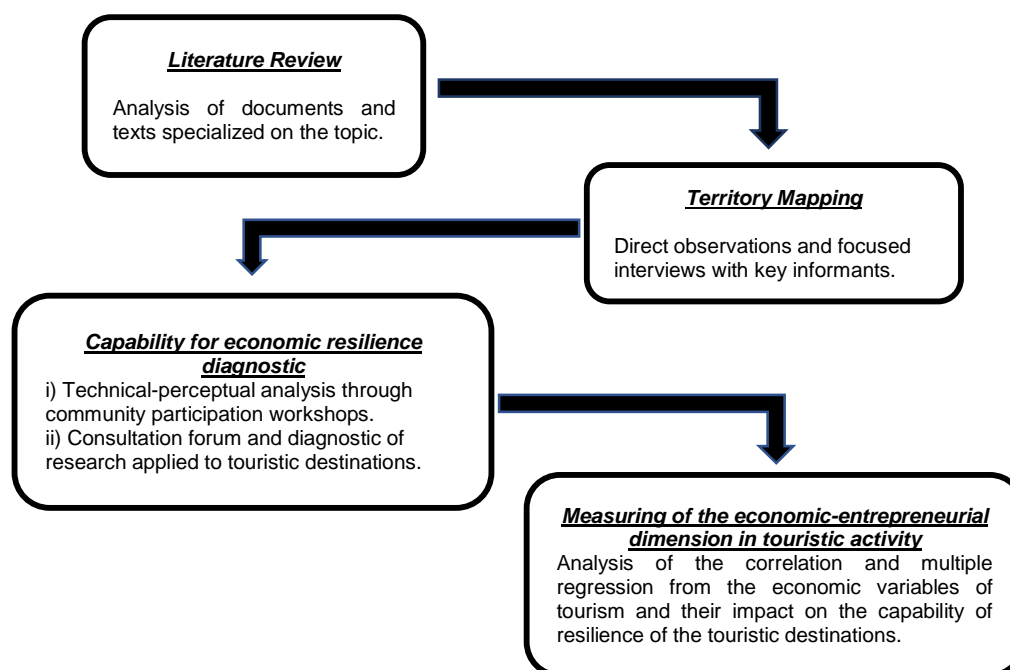


Diagram 1. Methodological process. Source: Compiled by authors

Such as its observed in diagram 1, the methodological process starts with a literature review which allowed to base –conceptually- the thematic topics that support the research. Mainly with specialized texts and successful case studies, those regarding resilience capability, when facing natural disasters. As well as those factors that influence in the economic and social resilience on consolidated touristic destinations.

Then interviews with critical actors and participatory workshops show the results of the research from which it seeks to identify the experiences and key aspects that were observed by the participants concerning the problematic, threats and weaknesses that were identified previously, during and after hurricane Odile.

At the same time, citizen proposals will strengthen the resilience process on the touristic destination. This resilient process will be possible through the recommendation of specific actions that local actors should undertake (in a sustainable development frame) to prevent, prepare, mitigate and recover before the threats of disasters caused by hydro-meteorological phenomena. In the understanding that community participation intent to boost local development.

The workshop “Resilience: a challenge of Los Cabos towards sustainable development,” took place in December 2014 and was organized by the Municipal Institute for Planning of Los Cabos (IMPLAN;2014). This workshop had 150 citizens’ entry. There were thirteen working tables with the presence of businessman, scholars, students, ONG's, unions of engineers, architects, active professionals, as well as organisms representing the main economic activities in the area such as the hotel association and the entrepreneurial coordination counsel, civil engineering and architect bars amongst others.

Meanwhile, the “Consult and assessment of research applied to consolidated touristic destinations” forum, organized jointly between Universidad Autonoma de Baja California Sur (UABCS), the Secretary of Tourism in Baja California Sur (SECTUR, BCS) and the XII Municipality of Los Cabos, in the frame of the research project “Viability analysis for the formation of a cluster around nature tourism in Los Cabos: an alternative to diversify a consolidated destinations’ offer in a local sustainable development frame”.

The forum included participative workshops based on four thematic tables (99 participants), one of which focused on “Resilience before a crises and extreme events in Los Cabos, BCS” whose goal was to analyze the vulnerability and response capability from touristic companies and local communities before hydro-meteorological phenomena.

Particularly, in this table, many aspects were addressed such as: protection measures, proposals to mitigate the storms impact, touristic companies’ organization to face crises originated by natural disasters, as well as identifying the touristic activities with the most impact or vulnerability.

The analysis of the information obtained from the working tables at this forum, allowed to detect resilience processes tending to provide a better competitiveness from the touristic sector of Los Cabos. This analysis is the result of an exchange of knowledge, experiences and methodologies applied, as well as identifying the leading present and future challenges (Montaño, Ivanova, Serrano; 2017).

On the participative workshops that contributed to the theoretical-perceptual analysis for resilience capability in Los Cabos, four types of agents participated.

- I) Economic agents of the local entrepreneurial environment, such as directors and touristic establishment owners, as well as entrepreneurial associations related with tourism and commerce representatives.
- II) Agents related with government management on a local level, among which participating and expressing their opinion were public and technical officials, whose field of competence is tourism and linked areas (urbanism, urban planning and environment, potable water and sanitation, etc.) of the state and municipality government.

III) Academic community (top-level) related to the professional training of touristic services providers.

IV) Social organizations not related to government, whose main activity is related with processes and operations related with tourism economy, amongst them the community observatory representatives stand out.

The research phase, corresponding to quantitative and correlational research (based on multiple regression analysis), incorporates two independent or explanatory variables: the international touristic affluence trend and the total hotel accommodation offer.

Three control or dichotomous variables, whereby the first one considers the economic crises that have affected touristic activities; the second one integrates the effects from the climate phenomena (in this case hurricanes) that have damaged the studied touristic destination; the third variable makes reference to the year following the hurricane. In this case, the dependent or explained variable, belongs to the economic flow generated by tourism as an economic activity. Based on the empirical evidence, an estimation of the indicators (or variables) analyzed is done. The period of analysis was from 1980 to 2017.

#### **Social context and indicators of touristic activity of Los Cabos.**

Los Cabos, in the southern end of the state of Baja California Sur (from a political-administrative point of view). Unlike the rest of the state, its rapid economic growth (sustained by touristic investments and linked services such as commerce) has favored a rapid growth in the number of population. (between 1980 and 2015 the population has increased in 1,450.0%), representing -in the present- 40.4% of the total population of BCS.

A situation that has favored the presence of strong underdevelopment in urban and social infrastructure, as well as margination and poverty. According to the Municipal Development Plan 2015-2018, in 2015, 28.5% of the population was found to be in a poverty situation, 40.3% was vulnerable due to social margination, 2.6% was vulnerable due to income, 5.6% was in an extreme poverty situation and only 28.6% of the population was not poor nor vulnerable.

The economic growth causes social inequalities in the access to the minimum well-being of the population. This situation generates a noticeable contrast among the exclusive mega resorts and big hotels in the touristic area next to the coastal limit (whose characteristic consists in isolating the tourist and separating him from the environment) and the lack of urban and social equipment that show poor neighborhoods and irregular settlements. It is urgent to create redistribution mechanism of the economic benefits that tourism

involves, to try to diminish the inequality gap and thus to encourage the touristic cities of Los Cabos to be a little more homogenous, equitable, integral and democratic.

In contrast, tourism has favored the creation of jobs; in 2017, the population working on a touristic activity in Los Cabos (considering the classification of INEGI that locates the people working in the area of lodging and preparing food and beverages establishments) represented a 30.5% of the economically active population (PEA) of Baja California Sur.

Year	Los Cabos Population	PEA of Tourism Industry	International Tourists	National Tourists	Tourists Total
1980	19,117	n.d.	39,200	70,300	109,500
1985	29,279	n.d.	105,500	134,800	240,300
1990	43,920	3,348	228,000	77,167	305,167
1995	71,031	5,346	390,355	91,580	481,935
2000	105,469	7,821	577,548	127,824	705,372
2005	164,162	11,435	1,006,963	221,873	1,228,836
2010	238,487	24,320	842,606	382,504	1,225,110
2015	287,671	39,295	1,277,250	425,750	1,703,000
2016	316,438	43,225	1,532,700	468,325	2,001,025
2017	348,082	47,547	1,869,894	515,158	2,385,052

Table 2. Demographic and Demand Indicators<sup>4</sup>.

It's evident that, from an economic and commercial point of view, Los Cabos is a thriving destination. Considering how attractive it is for an international tourist -historically- the market demand is what shapes the growth in the offer of rooms and touristic services.

As shown in the tables attached, the relationship between international and national visitors was of 3 to 1 in 2015. In 2005, before the real estate crisis in the United States, this relation was of 4.5 to 1 situation that -since the beginning of the destination- has been a common denominator in the area. This demand it has been one of the factors that have promoted significant investments in hotel infrastructure, commerce, and services to meet the growing demand.

Based on the available information, a series of factors are recognized to be basic in a touristic development and that have influenced in the competitiveness of Los Cabos:

<sup>4</sup> Source: Compiled by authors based in SECTUR, INEGI.

1. The proximity to the market of higher purchasing power in the United States, such as the western and southwestern states, notably California.
2. The development of a hotel infrastructure and timeshares of high quality and market value, as well as a significant offer of properties as a second residence for foreigners.
3. Natural resources with an availability of measure its value.
4. The installation of basic external economies in the competitiveness of the destination, such as an airport, telecommunication services, highways, marinas, marketing and promotion programs; expenses -for the most part- covered by the federal government of Mexico.
5. The exchange rate for the peso/dollar which has always favored the foreigner tourists.
6. Differently from other economic sectors, tourism, commerce and linked services, do not require an extensive labor specialization, which makes the labor costs to be relatively low.

#### **4. Results: perceptual diagnostic of the capability for resilience of Los Cabos**

As mentioned previously, the empirical results (based on the qualitative information) have as a basis the proposals, experiences and explained arguments from the experts, agents and local actors, and groups of interests that composed the forums and regional participative workshops. They also have the deep interviews made with association representatives and entrepreneurial organisms, civil associations, the urban observatory of Los Cabos, IMPLAN, and managers of the government.

The workshops and forums were the platforms to analyze the perception of the territorial actors regarding touristic development and resilience capability before critical events and natural disasters such as hurricane Odile was in Los Cabos.

The perceptual analysis was done out of two central themes: coordination and social organization and the natural -built physical environment, which -at the same time- included specific subtopics. These subtopics enclosed the main vulnerabilities, risks for the population and protection measures. All of this came out through the proposals from the participants to mitigate the impact of the hydro-meteorological phenomena in Los Cabos; also included were the successful examples when facing a crisis from extreme events such as hurricane Odile.

Table 3 shows a summary of the perception from the participants of the workshop and forum Resilience: "A challenge in Los Cabos towards Sustainable Development" (IMPLAN, 2014); as well as, the

focused interviews carried out with a civil organization, entrepreneurial organisms, touristic enterprises and critical actors.

Topic	Main perceptions of key actors
Equipment and infrastructure	<ul style="list-style-type: none"> <li>• According to the opinion of the participants, it is noteworthy the deficiencies regarding equipment and health services, which also were affected in their accessibility as well as their infrastructure.</li> <li>• The damage caused to the electrical infrastructure (to which it must add the lack of alternative energy sources) and to the supply of this service, was the main reason for the rationalization of fuel, operating water supplier wells and for the -consequently- potable water shortage.</li> </ul>
Housing and construction systems	<ul style="list-style-type: none"> <li>• In the frame of the participative workshop, the use of materials and construction proceedings not appropriate for the climate conditions and threats from natural phenomena that affect the area.</li> </ul>
Surface runoffs, streams and, coastal line	<ul style="list-style-type: none"> <li>• Local actors expressed their concerns due to the lack of structural solutions to the problems caused by surface runoffs and streams, one of them being floods affecting some parts of the urban areas.</li> <li>• There is a widespread concern against developers and builders who build low-income housing projects in risk areas. There is also a concern and indignation from citizens for the lack of fines and penalties to those who promote the illegal settlements on the middle of the streams, which are already considered to be high-risk zones.</li> </ul>

Table 3. Perceptual analysis of the risks and vulnerabilities in the physical and natural environment<sup>5</sup>

Protection measures proposed to mitigate the impact of hydro-meteorological events.

- I) Contingency plans design: throughout which the population can be alerted (early on) before any meteorological threat. This action should be joined by the spread of these programs, as well as the dissemination of the necessary knowledge that society must have about the responsibilities (or activities) that belong to each person before an extreme natural phenomenon.
- II) Drafting for preventive education planning: an activity that belongs to the local authorities to boost, for the benefit of society. This action should include the organization and realization of drills to face severe climate conditions, such as a hurricane.

<sup>5</sup> Source: IMPLAN, 2014

- III) Building standards to be able to face climate phenomena that affect the area: as a protection measure for tourism in general, building standards should be established such as it guarantees the safety for the tourists as well as the workers from establishments related with these activities.

Successful examples of citizen participation when facing the impacts of extreme events.

- 1) The organization that happened in the private sector and their representative organisms to overcome the crisis.
- 2) The speed and efficiency of the Federal Electricity Commission to act and repair the damage to electrical infrastructure in the municipality quickly.
- 3) The organization of the society in the matter of protecting their community. For example, in some neighborhoods, groups of vigilantes emerged, they divided the blocks, and each group of vigilantes watched over them, used whistles or some other kind of artifact that made noise where there was a situation; hearing this, neighbors went to that place to offered help.
- 4) The hashtag programs of Los Cabos "cabosstrongle" and afterward "cabosunstoppable" were a useful information and communication spread strategy between people and authorities. They worked as an appropriate tool to search for help through social media, find missing persons, spread campaigns using social media, give information to society, etc.
- 5) It helped create a lot of temporary jobs, a lot of which transformed into permanent ones.
- 6) The cities in Los Cabos improved in cleanliness and urban image.
- 7) Timeshare companies helped -in a significant way- to the recovery of Los Cabos economy since they promoted among tourist and unit owners to keep visiting the destination, despite the problems caused by the hurricane.
- 8) The federal government was forced to widen the programs of promotion of the tourist destination, to recover tourism and give the impression that Los Cabos was operating, and that the economic activity was able to recover rapidly from the crisis caused by the hurricane.



## Results: Multiple regression model analysis

### Model specifications

$$DET = \beta_{0,C} + \beta_{1,PEAt} + \beta_{2,TurEx} + \beta_{3,InvTc} - \beta_{4,Crisis} - \beta_{5,Hur} + \beta_{6,Post-Hur} + \phi_{AR(p)} + \theta_{MA(q)} + \varepsilon_t$$

Where:

DET: Economic revenue of the touristic sector

$\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \phi, \theta$ , parameters to take into consideration

C: models' constant

PEAt: Economically Active Population of the tourism sector

TurEx: Total of foreign tourists

InvTc: Growth rate of the inventory of available rooms

Crisis: Dichotomous variable referring to crisis periods

Hur: Dichotomous variable referring to the hurricanes that arrive in Los Cabos

Post-Hur: Dichotomous variable referring to the year after the arrival of the hurricanes

AR(p): Autoregressive order variable (p)

MA(q): Mobile mean order variable (q)

$\varepsilon$ : Error

### Explanation of variables and expected sign

The variables: DET, PEAt, and TurEx were converted into logarithms, with the purpose of shortening its size, a situation that -also- helps its interpretation by taking a percentage of change. The first variable (DET) is the dependent one, whereas the two left (PEAt and TurEx) are represented as independent variables. It is expected for the sign of these two variables to be positive, since -in theory- an increase in the economically active population is an indicator that the tourism sector is growing and, consequently, an increase in the economic income is expected. As well as the aggregated demand. Therefore; an increase on the arrival of foreign tourists would mean an increase in said economic income.

The variable InvTc, is handled as a growth rate of the inventory of hotel rooms and not as a simple available rooms stock. According to this, the variable turns out to be interesting, since it could be considered as a proxy for private investment done in the analyzed touristic destination. The expected sign of the coefficient is positive, since, more significant growth rate in the number of hotel rooms (or bigger investment in hotel- related activities), would impact the economic income positively.

Meanwhile, “Crisis”, “Hur” and “Post-Hur” represent control variables, they help explain the changes in economic income that impact for a determined period of time. The dichotomous variables that take the value of “1” when an unexpected phenomenon occurs (in this case, a crisis and/or hurricane, post-hurricane) and “0” when in the study period such phenomena doesn’t occur.

The inclusion of the “crisis” variable means that any economic activity is subjected to essential variation in the economic cycle; therefore, when the economy goes in a recessive phase, most of economic activities are affected as well. In the analysis period, the economic crises from the years of 1982, 1987, 1994-95 and 2008 were taken into consideration. Considering the magnitude of the economic impact after the crises started; the one from 1982 two years was found. Meanwhile the ones in 1987 and 1994-95 three years were considered; finally, in the case of the 2008 crisis, four years after it started to recover the economy were considered. It is expected for the sign of this variable to be negative since the presence of a crisis creates harmful effects in the economic income.

The variables hurricane and post-hurricane concerns those hurricanes that (constantly) have affected touristic destinations. It is also expected for the sign to be negative since this phenomenon cause important material losses in the sector, which would cause negative effects in the economic income.

The consideration of the variables AR(p) and MA(q), is done based on what the methodology Box-Jenkins suggests for the identification of the most adequate proves of the time series. The expected sign will be according to the dependent variable; thus, if the trend is low, the expected sign would be negative; on the contrary, is the trend is to grow, the sign would be positive.

#### *Unit root and stationarity tests*

Before estimating the model, the unit root and stationary tests were done to the DET, PEAt, and TurExt variables, with the goal of getting white noise<sup>6</sup> in the estimations and avoid the regression to be spurious.

On the attached table 4, results of the ADF and PP tests are shown, which are supported by the critical values of Mackinnon (1996) and its p unilateral associated values. In the ADF tests, the Schwarz Information Standard is used to determine the length of delay from each test equation; meanwhile, in the PP tests, the bandwidth was monitored, throughout the Newey-West bandwidth selection method and the Bartlett nucleus. The results of the KPSS test are based on the critical values proposed by Kwiatkowski, Phillips, Schmidt, and Shin (1992); meanwhile, to monitor the bandwidth, the Newey-West bandwidth selection method and the Bartlett nucleus are used.

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<sup>6</sup> The “White noise” is obtained when the mean from the regression errors is zero, constant variance and no error correlation.

Los Cabos					
DET <sub>t</sub>	I	-2.77 (Not rejected)	-7.45 (Rejected)*	0.70 (Rejected)**	I(1) o I(0)
ΔDET <sub>t</sub>	I	-4.76 (Rejected)***	-4.57 (Rejected)***	0.49 (Not Rejected)	I(0)
TurEx	I	-2.01 (Not Rejected)	-4.95 (Rejected)**	0.73 (Rejected)**	I(1) o I(0)
ΔTurEx	I	-5.65 (Rejected)**	-4.83 (Rejected)***	0.31 (Not Rejected)	I(0)
Rooms	I	0.53 (Not Rejected)	0.91 (Not Rejected)	0.74 (Rejected)*	I(1) o I(0)
ΔRooms	I	-5.05 (Rejected)***	-5.27 (Rejected)***	0.19 (Not Rejected)	I(0)

Table 4 Unit root and stationary test

Notes: ADF test: Increased Dickey-Fuller test; PP test: Phillips-Perron test; KPSS test: Kwiatkowski, Phillips, Schmidt and Shin test. H0: Null hypothesis, I: Intercept, T: trend. An asterisk (\*), two asterisks (\*\*), and three asterisks (\*\*\*) indicate the rejection of the null hypothesis to a level of 10, 5 and 1% respectively. Δ: indicates the operator of primary differences. Δ2: indicates the operator of secondary differences.

The results from the ADF and PP tests are based on the critical values of Mackinnon (1996) and its associated p unilateral values. In the ADF tests, the Schwarz Information Standard is used to determine the length of delay on each test equation. In the PP tests, the bandwidth is monitored throughout the Newey-West bandwidth selection method and Bartlett's nucleus. The results from the KPSS test are based on the critical values proposed by Kwiatkowski, Phillips, Schmidt, and Shin (1992) and to monitor the bandwidth, the Newey-West bandwidth selection method and Bartlett's nucleus is used.

Dependent Variable: Economic Revenue (DET)	
Independent Variables	Coefficient
TurEx	1.0665*** (0.0866)
InvTc	0.3846** (0.1513)
Crisis	-0.0065 (0.0250)
Hur	-0.0432*** (0.0360)
Post-Hur	0.0592* (0.0360)
AR(p)	0.5975** (0.1876), p=1
MA(q)	-0.1000** (-0.003), q=2
Test Statistics	
Num. of Obs.	37
R-squared	0.8733
(R-Squared. Adjusted.)	(0.8371)
F-stat.	15.432
(Prob. F-stat.)	(0.0000)
D. Watson	1.9746
Test-White	16.54***
Jarque-Bera	2.4472
(Prob.)	(0.2941)

Table 5 Results from the Multiple Regression model

Notes: The values inside the parenthesis indicate standard errors from the estimated coefficients. One asterisk (\*), two asterisks (\*\*), and three asterisks (\*\*\*) indicate a significance level of 10, 5 and 1% respectively. In the test statistics, the Akaike approach was used to determine the best specification given the Box-Jenkins methodology. The Test-White was to test that the error variance was constant, which H0: heteroscedasticity. The D. Watson test was used to test that the lack of autocorrelation of errors whose critical rejected value is: DW ≈ 2. The Jarque-Bera test was done to check that the distribution of the errors is normal, whose H0: normal, critical value: yes JB < 5 Not Rejected H0.

### *Results Interpretation*

In order to compare the results, a detailed review of the studies that address this topic with a quantitative approach was done; however, it was identified only studies that analyze the resilience in tourist destinations by qualitative research (Herrera y Rodríguez, 2017; Legorreta y Palafox, 2015; Vila, 2015), because of it, this research is a pioneer in terms of economic resilience in tourist destinations on the coastal areas of Mexico.

*The hydro-meteorological events (hurricanes) reduce the demand by a 0.0432.*

It's estimated that the hurricane "Odile" caused damage by more than the 1,750 million dollars (FONDEN, 2014), due to this, it is natural disaster most transcendent in the area of Los Cabos; actually, for the Mexican Association of Insurance Institutions of Mexico, Odile is considered the second most expensive hurricane, since insurance was paid estimated figures of approximately 1,200 million dollars, of which 64% correspond to the hotel sector, 16% to various industries, 10% to trade, 9% civil works and construction and 1% automobiles.

In reference to the obtained results, the economic model proposed was statistically significant, the variance explained is 83%, while the signs of the coefficients were as expected. The results refer that the variables of tourist affluence and hotel infrastructure have a positive impact on the economic income of the tourist destination by 106% and 38% respectively. In this context, considering the statistical data (DATATUR, 2017) after hurricane Odile, it is convenient to indicate that the tourist affluence variable increased from 1,331,223 visitors in 2014 to 2,385,052 in 2017, representing an increase of 79% while the offer of hotel rooms grew by 54% for the same period.

Economic crisis and hurricanes negatively affect tourism; however, the impact is greater for the case of hydrometeorological events (4%) compared to other crises (0.7%), which indicates that, in tourism matters, Los Cabos shows a greater vulnerability to natural disasters.

The post-hurricane variable shows a positive impact on the economic income at 5%, since after every hurricane, Los Cabos received investment (public and private) which had a multiplier effect on investments, boosting the local economy, particularly in the sectors of construction, trade and tourism; in this way, between 2014 and 2017 the number of registered companies (DENUE, 2017) increased from 9,051 to 13,997 economic units.

In this context, resilience contributes to identify the way in which the main actors of the activity (in this case tourism) respond to the challenges that arise after a natural disaster; in Los Cabos, resilience is

particularly important given the dependence and concentration of the local economy on tourism. In qualitative research (specifically in the perceptual analysis of territorial actors) the information obtained revealed the importance of citizen participation in the recovery of the destination which was manifested in the organization and prompt response of the private initiative agencies, the government and the general public, which contributed to quickly recover the economic activity of the destination.

## **5. Conclusions**

The results obtained by the econometric model proposed, allows to indicate that it is statistically significant.

The correlation coefficients are high; the data gathered in the root unit, and stationary tests imply that in the model there is no autocorrelation and that the error distribution is normal.

Los Cabos has a strong business and social network, linked to touristic activity due to mainly the economic impacts that create the movement in the territory.

One of the aspects affecting the process of resilience in Los Cabos is that even though it emerged as a CIP, nowadays it lacks proper touristic planning of the area, this generates a disorganize development with a deficiency regarding urban infrastructure and equipment.

This lack of touristic planning could have an impact if appropriate adjustment and mitigation measures are not adopted.

The management of resilience requires group work amongst the different actors that intervene in the territories of a touristic environment, where the governance towards resilience gets a leading role.

Among the threats detected, the physical, social, economic, and environmental conditions that Los Cabos is in stand out; even after hurricane Odile there is still population settled in the middle of streams, with houses made of improvised material and building developments with inappropriate construction systems for the conditions of the area.

The economic environment is resilient, due to the fast growth in touristic infrastructure and investment that the destination records up until the present. Regardless, the appropriate measures to contribute the process of resilience in a social, environmental an urban infrastructure have not been applied, a proof of this are the effects that hurricane Lidia caused in September of 2017.

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