Path Dependence and Social Network Analysis on Evolutionary Dynamics of Tourism in Coastal Rural Communities

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Abstract: The studies on the evolution of tourist destinations are not a new issue, however, most of them have been focused on consolidated destinations, whereas only a minimum has been done on tourism transformation in rural areas. The objective of this work is to diagnose the evolutionary process of tourism in Coastal Rural Communities (CRCs). To do this, we propose a model which combines two research approaches, Path Dependence and Social Network Analysis. The methodological approach is divided into three parts: design, application and validation, and it is based on collecting in situ and identifying key informants. In the first part, the stages of a Path Dependence for a CRC are conceptualized and bipartite graphs are constructed to show the relationships between: (1) the identified establishments built in a period of time and (2) positive and negative lock-ins with a greater degree of influence on the evolutionary process. On this basis, the resulting graphs are associated with the stages of the Path Dependence. In the second part, the model theoretically raised is applied as an empirical case at the CRC of Playa Ventura, Guerrero, in the Southern Pacific of Mexico. Finally, we validated the model based on the results obtained, which indicate that the model is suitable for the generation of knowledge about the evolutionary process of tourism in CRC's, and therefore, it opens the possibility of being replicated in other communities with the same characteristics.

Keywords: tourist evolution; tourism in rural areas; S_k graphics; k-core subgraphs; Playa Ventura Mexico

1. Introduction

Tourism is one of the most dynamic activities worldwide, and day by day, it renews itself in different market niches, thus, allowing tourists to choose among a myriad of segments in different geographical areas [1]. The globalization of tourism has led to its permanent expansion, and to transforming and resignifying territories into consumer goods [2,3]. Communities in rural areas have been paramount in recent years for the diversification of segments in countries where tourism is the key to income generation. In this context, sun and beach destinations are regularly associated with large mass resorts, although, it is also an offer in some Coastal Rural Communities (CRCs) worldwide [4–6].

CRCs' economies are based on small-scale sea-fishing complemented with agricultural activities [7]. However, fishing activities as a way of living are in decline, as a result of overexploitation of resources, privatization of the coast and climate change [8,9]. Accordingly, CRCs around the world are experiencing different types and transformation processes derived from their insertion into tourist activities [10].

However, not all the communities are prepared to face the challenges that the tourist activity involves in order to achieve sustainability in the short, medium and long term [11].

In order to assess whether tourism is a viable activity in terms of sustainability, it is necessary to study it through time [12]. The evolutionary study of tourism has been addressed under various scenarios and research perspectives [3]. Despite pointing out in CRC's the transformation that implies the appropriation of tourism as the main economic activity [13–15], there is little academic evidence on theoretically-applied models especially focused on these types of communities that are in different stages of development worldwide [10]. Given the circumstances, the central question of this work is based on whether it is possible to propose a model to diagnose the tourist evolution of CRCs in different geographical areas.

In this context, in recent years, two new research approaches for the evolutionary study of tourism activity have emerged: Path Dependence [16] and Social Network Analysis (SNA) [17]. So far, both approaches have been applied separately. However, even though both have different characteristics, they have certain relationships that together can help to establish a new paradigm for the generation of knowledge about the sustainable evolution of tourism in CRC's. Another important aspect about the approaches previously mentioned is that they allow for generating information in situ, since rural communities that offer touristic services generally do not have statistical information like the number of arrivals, tourism expenditure or overnight stay [18].

Based on this fact, the general objective of this research is based on the construction of a model that allows to diagnose the tourist evolution in CRC's through the combination of Path Dependence and SNA. Accordingly, three specific objectives were outlined for the development of the model:

1. To design a model that allows the integration of Path Dependence and SNA to diagnose the development of tourism in CRC's.
2. To apply the model in a CRC´s as an empirical case.
3. To validate if the model complies with the generation of knowledge about the development or tourism in a CRC.

In this respect, the model was applied and validated as an empirical case in the Playa Ventura, Guerrero CRC, in the South Pacific of Mexico, a community that, in recent years, has been characterized for its growth and tourist projection. The outcomes validate that the proposed model generates knowledge about evolution in the community and that this can be replicated in other communities with the same characteristics.

The rest of the document is organized as follows: in the first part, we carried out the literature review as a preparation for the construction of the model, in which we addressed theoretical aspects of both a CRC and the research approaches of Path Dependence and SNA. In the next section, we applied the model in the CRC mentioned above, then, in the discussion and conclusion, we validated why the proposed model is suitable for the evolutionary study of tourism in a CRC, finally, we attached the materials used in the appendices.

2. Background

2.1. Coastal Rural Communities (CRCs)

There is not a globally agreed definition of rural community, as each country can have its own, but for the greater part of them, it is referred to by land use and the size of population [19]. For this work, we define a CRC as the one that stands out for its sea–land relationship with unique customs and traditions and for having available spaces for visitors, whether they are natural, cultural, architectural, for leisure or consumption (e.g., hotels and restaurants). All these relationships differ from those in urban sun and beach resorts. Likewise, the CRCs economic sector is different as it includes primary activities (agriculture, fishing and livestock) and tourism, as well as for having low population density [4,9,10,20].

Tourism in a CRC can be developed under three scenarios: (a) endogenous (from the inside out), that is, the community's inhabitants build their own establishments in a certain period of time, (b) exogenous (from the outside in), entrepreneurs from other regions (natives or from abroad) who come to the CRCs to invest in small or large tourist service establishments, and (c) neo-endogenous development, which is the combination of endogenous and exogenous development [21,22].

For a long time, CRCs have been going through a socio-economical process of change, during which, some of them have become more dependent on tourism as their main source of income than others [9,10]. For example, in Latin America and the Caribbean, CRCs live dissimilar realities in the adoption of tourism. On the one hand, they have been the object of accelerated investment by large corporations [23,24] and on the other hand, in scenarios based in the community [6]. In both cases, there is a process of social, economic and environmental transformation in which it is difficult to reverse the stakeholders' decisions concerning the planning of this activity. Consequently, tourism can take different paths, which mark a milestone of a before and an after

2.2. Path Dependence: Theory and Application to Tourism

The knowledge and historical evolution of a destination can be addressed and analyzed from different approaches and models. These help to diagnose the behavior and the transformations of the destinations starting from key stages [25]. In tourism evolutionary studies, one of the most frequently used models has been the one proposed by Butler [26], the Tourism Area Life Cycle (TALC). Since its emergence, the model has been applied in different scenarios and important theoretical contributions have been made to solve its weaknesses [27,28].

Within the evolutionary studies' framework, Evolutionary Economic Geography has been turning into a reference that complements and expands traditional models [29]. In this context, Path Dependence is the most developed theory [30,31] and in recent years, it has been adapted to the study of tourism from different perspectives [25,29,32–37]. The first Path Dependence applications in tourism were made by Williams and Baláž [38] and Bramwell and Cox [35], although, the first model applied to tourism was the one developed by Ma and Hassink [16], in which the authors identify the importance of the micro and the macroevolution in the process and consider that the destination's decline would be the result of negative lock-ins that should have been overcome. So, Preformation, Path creation, Path development, Path as a dynamic process, Adaptation of local tourism paths, Path as movement to stable state and Local tourism paths stasis or declining are the phases to achieve the understanding of the tourist evolution, according to Ma and Hassink [16], which are based on the Path Dependence theory proposed by Martin and Sunley [39] and Martin [40].

Path Dependence has also been applied by Soares, Ivars-Baidal and Gândara [29], who have identified different phases (preformation, creation, development and path as a dynamic process) considering the coevolution of products/markets, public and private sectors, and territorial structure of the destination, besides the external environment.

In the theoretical part, the Path Dependence model contains certain similarities with the TALC model, mainly in the early phases: Exploration-Preformation, Implication-Creation of the Path and development [16,29,41]. However, the TALC is based on quantitative data, such as the number of tourists, and it is intended for mass tourism destinations. But in rural destinations where the economic transitional process towards tourism has begun, the lack of statistical information and data does not allow their analysis. Therefore, the TALC is not very effective when applied in rural contexts, which have a different territorial, social, cultural, economic and environmental structure that differs from that of urban sun and beach resorts. Furthermore, the TALC attributes a determining role to overcrowding and overcoming of the carrying capacity to predict the following stages, without considering the determining role of local agents and external factors [29]. Thus, unlike the TALC, the Path Dependence approach is based more on a qualitative analysis and therefore, it is better adapted to rural scenarios.

According to Brouder [42], Path Dependence is permissive for the study of the tourist evolution of any destination, since it has a great potential to understand the processes of change in a territory over time. In the same way, one of the advantages of the approach is that tourism does not look like a linear economic activity [29,43], due to the fact that tourist activity is dynamic and the roads of the route can be benefited or harmed according to the existing positive and negative lock-ins, both internal and external [44].

Lock-ins, in this case, can come from the destination's preformation: "initial conditions matter", and these may become evident in different areas inside and outside the structure of a destination, which could be cognitive, functional or political [16]. It should be noted that the non-intervention of the counterparts to compensate for negative lock-ins in an industry may generate a long-term decline [39]. Hence, the decline of a destination may be related to the absence of positive lock-ins that contribute to the remaining of the activity.

The path dependence approach in CRCs has already been applied by Halkier and Therkelsen [45] in the North of Jutland, Denmark, in which they argue that the path can be seen through plasticity, that is, the routes can be shaped through the external and internal connections among institutions, out of the possibility to combine knowledge with other destinations and their organization. On the other hand, Paige [46], in a recent work on climate change in a CRC, shows how the initial activities have suffered impacts from this phenomenon. Consequently, the work states that tourism has been an economic activity of escape as a new regional development path for this type of community.

2.3. Social Network Analysis (SNA) for the Study of Destinations' Evolution

SNA defines a network as a set of relationships which are determined by the actors (organizations, stakeholders, etc.) [47]. Tourism, as an industry, may be studied through SNA, since it is known for the high degree of interdependence among various factors and key actors, where the relationships emanating from it form a set of networks [48–50]. In this sense, SNA seeks to improve the understanding of organizational structures and sustainability in a tourist resort [17,51–53]. Networks serve to identify and examine relationships, show unobservable patterns, and explain essential typologies of the tourism phenomena [50,54–57]. SNA also allows the understanding of the different stages of the evolutionary process of a tourist destination: (a) from its beginning, (b) the dynamic structure and organization, (c) changes on the network and, (d) positive and negative impacts [17,58,59].

Networks related to the dynamic growth of tourism in a destination have not been widely explored [58]. However, Pavlovich [60] examined the evolution and transformation process in a rural community, in which he illustrates, through a network, the dynamics of small businesses and organizations in a given time period. Nevertheless, years later, when analyzing the same case, the author contrasts it as a non-linear model, where an evolutionary network of tourism can be seen as a rhizome [17].

In the same way, other authors, under different nuances, have used networks to show the changes in a period of time. For instance, Baggio and Sainaghi [61] analyze tourist demand over a period of 50 years in Livigno, Italy, Hernández and González-Martel [58] highlight the growth of the offer in a destination, Luthe and Wyss [62] study resilience and climate change in a governance context, Kim and Scott [63] review the evolution of tourism organizations in a transition period of economic development in South Korea, and Shih [64] and March and Wilkinson [48] focus on the structural characteristics of a destination. However, according to key informants, these works do not include the historical process about the internal and external factors that may harm or benefit the growth of the network in a period of time.

2.4. Main Relationships between the Path Dependence and the SNA Approaches

Path Dependence and SNA research approaches have aspects in common, both in the theoretical and in the application parts. Both approaches are characterized by being qualitative in the collection of in situ information. However, the SNA approach allows us to quantify the relationships among actors

that affect a phenomenon associated with the tourist activity in the structure of a network [64–66]. Nevertheless, the main relationships between both approaches can be defined for the evolutionary study of a tourist destination (see Table 1).

Table 1. Relationships between Path Dependence and Social Network Analysis (SNA) in evolutionary processes of tourist activity.

Relationship	Path Dependence	SNA
They point out the positive and negative changes, both internal and external, of the past and present	[35,67]	[68]
Describe the increase or decrease of tourist areas or phenomena associated with tourism	[33,45]	[17,58,59,69]
Identify the role of the stakeholders	[25,37]	[68,70,71]
Analyze dynamics, structure and organization	[30,35,72]	[51,58,64,65,71]

3. Evolutionary Model for the Diagnosis of Tourism in CRCs

As mentioned above, the proposal for this work is to use Path Dependence and SNA research approaches for the construction of a model to diagnose tourist developments in CRCs. As a result, three basic features are determined for the design of the model:

(a) integrating the Path Dependence for a CRC,
(b) establishing the growth of tourism in a CRC through the building dynamics of service establishments and their geometric representation, and
(c) identifying the most influential positive and negative lock-ins through key informants in a CRC and the typology of a bipartite chart.

The methodology for the construction of the model is divided into four important sections. In Part 1, basic definitions on Path Dependence are given to determine the evolution of tourism of a CRC. Next, in Parts 2 and 3, according to basic definitions in the SNA displayed in Appendix A, particular definitions are formulated for the elaboration of the graphs. To do this, in Part 2, the analysis is based on the relationships between tourist service establishments and the decade of start-up of operations through *Sk* graphs. In Part 3, according to the relationships between key informants and positive and negative lock-ins, the analysis is carried out through the decomposition of the main graph with the support of the k-core typology to determine the most influential locks ins. Finally, in Part 4, the model is applied in the Playa Ventura CRC as an empirical case.

3.1. Path Dependence Phase in CRCs

In this stage, Path Dependence for CRC phases are defined, for this, we rely on the stages proposed in the model of Ma and Hassink [16], supported by preconceptions found in Soares, Ivars-Baidal and Gândara [29] as well as tourist academic works carried out in this type of community [9,14,21,73,74]. Accordingly, the following conceptualizations are made in each of the stage's phases:

(a) **Preformation**. Existing initial conditions: sociocultural, political, environmental, economic, and geographical, among others. Suitable for the beginning of tourism, they mark the arrival of the first visitors, therefore, the first businesses arise depending on a demand.
(b) **Path Creation**. Tourism in the community is driven by stakeholders for the creation of products. This phase is signaled by the beginning of the initial economic transition of the CRC into tourism services.
(c) **Path Development**. The increased participation of the stakeholders, who can be residents, non-residents, businessmen or the government, as well as endogenous and exogenous factors that influence and favor the growth of the tourism network of the CRC.
(d) **Path as a Dynamic Process**. The evolution that depends on the path favors the general renovation of the CRC's tourist activity.

(e)　**Adaptation of Local Tourism Paths**. The stakeholders' capacity to adapt and respond to change processes, which influences the present and future evolution of the network. The beginning of new paths, where positive lock-ins allow CRCs to lead to more sustainable paths.

(f)　**Path as a Movement to Stable State**. The need for stakeholders in the CRC to intervene in negative, social, economic or environmental lock-ins.

(g)　**Local tourism paths stasis or decline**. Negative lock-ins in the different internal and external sectors generate turbulence and the decrease of tourism in the community.

Note that the first three phases of Path Dependence can develop in a negative, positive or balanced way, that is, the community may be in the stage of development of the path, but this phase may have a negative aspect, then these three phases are very important for subsequent paths, in other words, "initial conditions matter" [16]. It should be remarked that the historical perspective of key informants about the positive and negative lock-ins, along with the analysis of the graphic S_K y *k-core*, which are addressed methodologically in the following stages, allow us to infer the phases of the Path Dependence in which the tourist destination to be studied is located (see Figure 1).

3.2. Dynamics of the Construction of Tourist Service Establishments (Hotels and Restaurants) through S_k Graphics

Traditionally, growth in number of tourists is the key indicator for the diagnosis of a destination's evolution [26] Likewise, other authors have suggested other indicators to study the evolution of tourism, for example, the number of overnight stays in a given time period [59]. However, in the case of Mexico, CRCs' statistical information on that indicator is scarce or null and unreliable as it happens in the rest of this kind of destinations [75]. Therefore, we propose, as an indicator, the number of establishments and the year they started operations, because this indicator can be collected more easily in on-site work [18].

Then, based on the establishments, S_K, star graphs are constructed, which geometrically represent the number of buildings in a certain period of time (see the definition in Appendix A), that is, the relationships between the buildings of tourist establishments and the period of time in which they were built are shown.

Definition 1. *Let G (V, E) be a star graph (S_k) with central vertex α, the vertex set V = (B_i, α), where B_i are the tourist establishments built in the period of time i = 1, 2, 3 ... n and α is the decade associated with the period of time i. Note that the maximum degree of G is d(α), so we have that $\Delta(G) = d(\alpha)$ and it is the total of establishments built in time period i.*

S_k graphs are constructed from the preformation of the destination (*i = 1*), and successively for each period of time. Once the graphs are constructed, we denote *G* as the graph of the period of time to be analyzed. Next, the number of establishments of graph *G* and the number of establishments of the resulting graph from the previous time period are added, and the resulting graph is denoted as *G'* (refer to (b) in Figure 3). It can now be observed that graph *G'* could have a smaller, greater or equal number of establishments than graph *G*. Therefore, the comparative analysis is given between graphs *G* and *G'*. Taking into account the above considerations, we have the following proposition.

Proposition 1. *Let G and G' S_k graphs, $\Delta(G)$ and $\Delta(G')$ be the maximum degrees of G and G' respectively, then:*

(i)　*if $\Delta(G) > \Delta(G')$ implies that the number of establishments increases,*
(ii)　*if $\Delta(G) = \Delta(G')$ implies that the number of establishments stays static, and*
(iii)　*if $\Delta(G) < \Delta(G')$ implies that the number of establishments decreases.*

Note that the previous implications do not necessarily represent that the evolution of the CRC is positive, negative or neutral, but we obtain an a priori approximation of the diagnosis on the evolutionary process.

3.3. K-Core Typology and the Most Influential Negative and Positive Lock-Ins in Path Dependence

In order to identify lock-ins, a bipartite graph is constructed to represent the key informants and the positive and negative lock-ins. In this section, it is important to mention that we consider as key informants the stakeholders who have been living in the community for at least 10 years.

Definition 2. *Let G (V, E) be a bipartite graph, with vertex set V = (A, B), where A are the key informants and B the positive or negative lock-ins. The degree of vertex b that belongs to B reflects the frequency with which the blockage was mentioned by key informants.*

Consequently, to determine the lock-ins that most influence the Path Dependence, we use "k-core" topology, which allows for the identification of subgroups of particular vertices of a graph through its decomposition into subgraphs, which are obtained by the recursive elimination of all vertices of degree less than *k*, until all the vertices in the resulting subgraph have at least a *k* degree [76,77]. In other words, a subgroup 1k-core (k = 1) has all the vertices connected to each other, so, the vertices belonging to that subgraph have at least degree 1. In order to identify 2k-core, all the vertices of degree 1 are ignored and the connected points of degree 2 are retained. This is applied to obtain the following k-cores [78].

This particular case allows to identify the subgroups of the most influential lock-ins in Path Dependence. That is, according to the maximum or minimum degree of bottom-up-top-bottom, the most influential and least influential lock-ins are identified, whether positive or negative (see Figure 1). In turn, k-cores determine how key informants are connected.
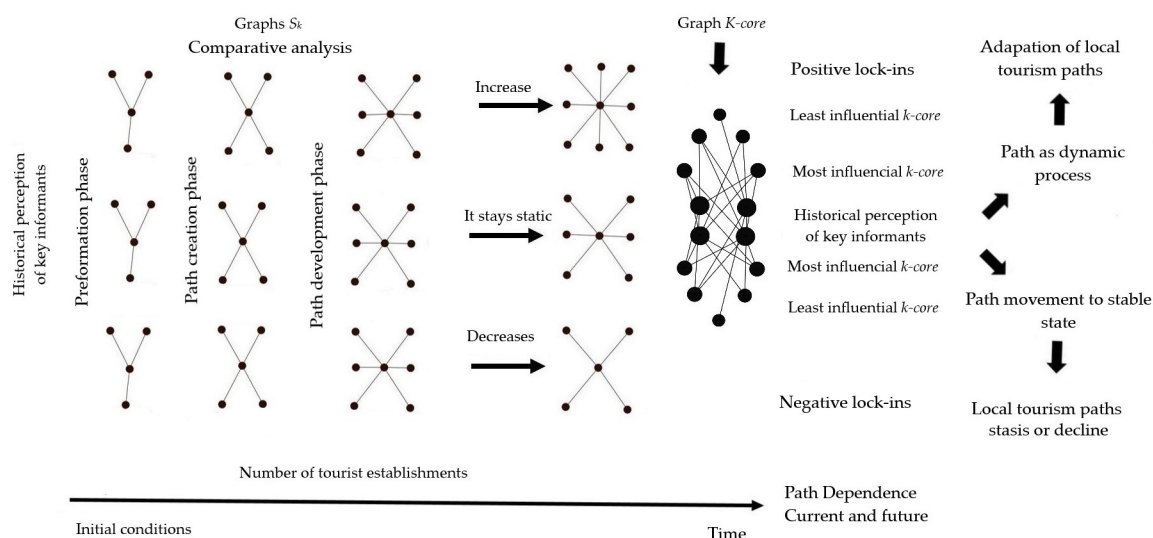

Figure 1. Model of Path Dependence and SNA applied to the evolution of tourism in a Coastal Rural Communities (CRC´s).

3.4. Application of the Model in a CRC as an Empiric Case

The state of Guerrero is located in the South Pacific of Mexico. Its predominant economy is tourism and it is known worldwide for its three destinations: Acapulco, Ixtapa-Zihuatanejo and Taxco de Alarcón. However, the State of Guerrero has a coastline longer than 500 km, where several CRCs with intense tourist vocation are recognized, such as El Carrizal, Hacienda de Cabañas, Papanoa, Troncones, La Bocana, Las Peñitas, Punta Maldonado, and Juan N Álvarez (Playa Ventura), where the model was applied.

Playa Ventura is located within the Costa Chica region, 14 km away from the Municipality of Copala, Guerrero (see Figure 2). According to the latest census conducted by the National Institute of Statistics and Geography of Mexico [79], the community has 555 inhabitants: 281 women and 274 men,

127 private dwellings inhabited, 24 of the inhabitants speak an indigenous language, and a part of its population is Afro-Mexican. Among the primary economic activities are, artisanal fishing, agriculture and livestock, as well as tourism, which stands out for being of endogenous nature.

The CRC of Playa Ventura differs from other communities of the state for being the one with the largest tourist projection on the coastal area with about 350 lodging rooms. It is recognized for its culture, unique gastronomy, variety of natural resources, more than 10 km of primeval beaches, and 7 km of lagoon where various tourist activities can be practiced.
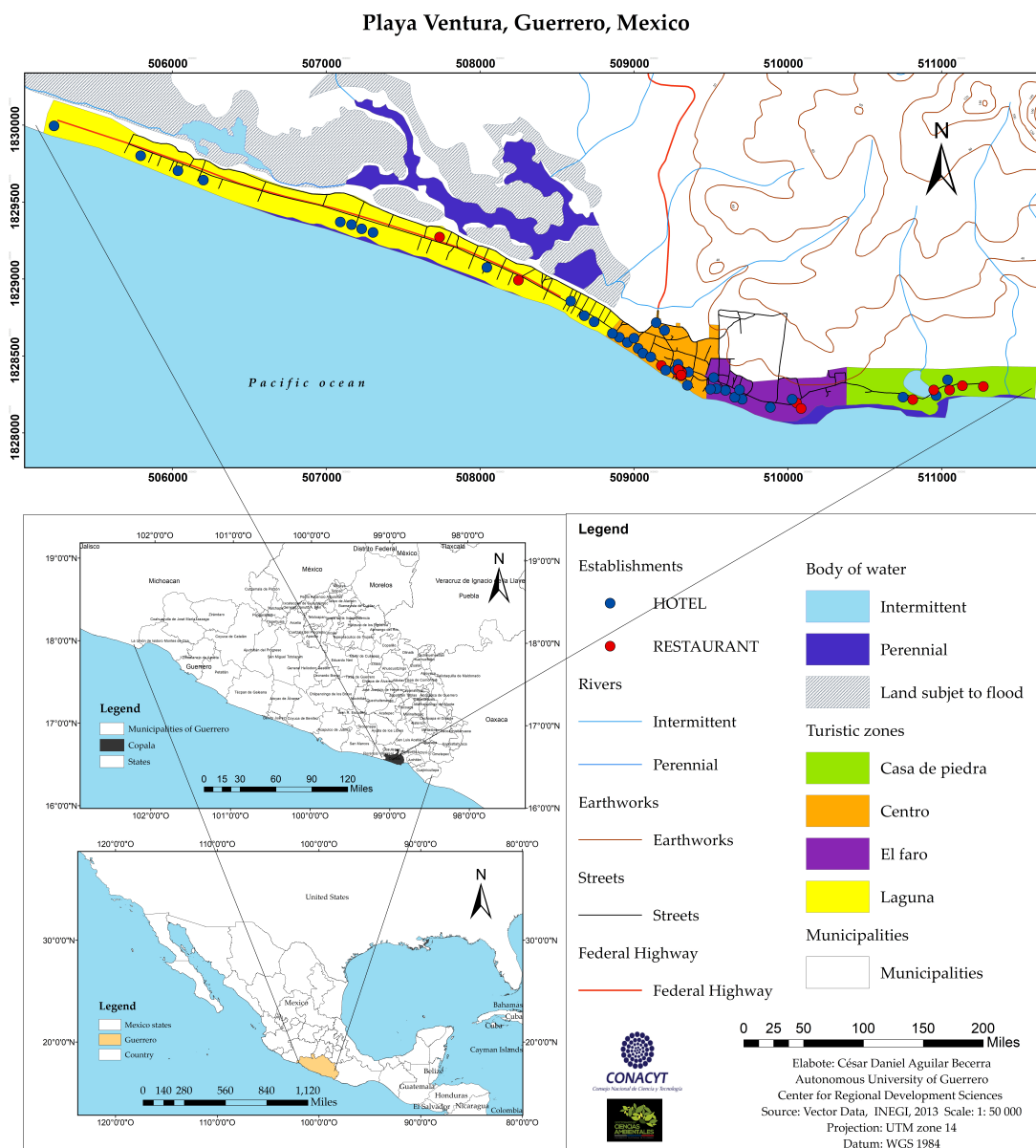

Figure 2. Tourist inventory, physical resources and location of Playa Ventura, Guerrero, Mexico.

3.5. Data Collection and Analysis

For S_k graphs, the year in which the establishment begins operations is taken into account, and then it is associated with decade *i*. For this purpose, a census of establishments was carried out during the months of November and December 2017, in which all the tourist service establishments were identified: 56 hotels and 17 restaurants. In the end, S_k graphs were constructed based on the metric degree of the network (see Appendix B, Figures 2 and 3).

For the second graph, a semi-structured in-depth interview was designed and divided into 2 sections (see Appendix C), (a) socio demographic profile (gender, age, schooling, number of years living in the community, current and past occupation), and (b) open questions, taking into account personal narrations about the historical process of the evolution of tourism, as well as positive and negative lock-ins, always considering the participant's observation [16,29,32,80].

In order to identify the key informants, the snowball method was used [32,49,76]. Accordingly, between January and June 2018, five visits to the community were done. In total, minding gender parity, 24 informants were contacted: 12 men and 12 women, all of them older than 30, with basic or higher educational level, from whom 70% were born in Playa Ventura, and 18 out of the 24 have been living in the community more than 20 years.

The current occupation of all the informants moves around the tourist activity either as owners or workers, and although their initial activities were related with the primary sector and government (farmers, housewives, scuba divers, government officials), only three of them have always been immersed in tourism (see Appendix D), so it can be inferred that various stakeholders are represented. All the interviews were audio-recorded, but only 13 key informants agreed to be videotaped. Every interview lasted from 30 to 50 min. In the end, the negative and positive locks-in were coded in an unweighted adjacency matrix. Gephi 9.2 free software was used for the construction and visualization of the graphs of all the work [81].

4. Tourist Evolution of Coastal Rural Community of Playa Ventura

According to the information collected, four Path Dependence phases were detected, Preformation, Path Creation, Path Development and Route of Stable Movement. These phases are addressed in the following sections.

4.1. Preformation of the Destination: 1970–1989

The community of Playa Ventura was initially founded by four families, the Venturas, the Pérez, the Tejadas and the Pachecos, in the beginning of the 1940s. Later on, in 1949, it received the official name of Colonia Juan N. Álvarez. The first inhabitants of the town lived mainly on primary sector activities (agriculture, fishing and livestock). The products they grew were corn (*Zea mays)*, watermelon (*Citrullus lanatus*), sesame seeds (*Sesamum indicum*) and, over time, they started to grow coconut (*Cocos nucifera*) and mango (*Mangifera indica*). In the last century, during the 50s, some inhabitants received training in snorkeling-diving and this was how they were able to extract lobsters and oysters (*Palinurus elephas y Crassostrea*). Hunting was part of their diet, too.

> "Here, before, it was just diving for seafood extraction. There was a lot! The first inhabitants to arrive were more dedicated to livestock and agriculture during the rainy season."—Key informant

From the 60s to the 90s, the growth of Playa Ventura's population more than tripled, from 100 inhabitants in 1960 to 444 in 1990 [82]. This is attributed to the arrival of relatives of the first founders of the town and residents of the municipal head (Copala), due to job opportunities related to diving.

Playa Ventura is divided in four areas (called zones) which are relevant to tourism development, Laguna, Centro, El Faro and Casa de Piedra (Figure 2). The first zones where tourist establishments were built were Centro, El Faro and Casa de Piedra. The first business which was named "Pancho Ventura"—a restaurant founded in 1972 in the El Faro Zone—was established by Francisco Ventura Rodríguez, who started calling this beach "Playa Ventura", a name which in time became its unofficial name and that up to date is very well-known and used to refer to such destination.

Throughout the decades of the 1970s and 1980s the first six establishments were built (at the present time, they are four hotels and two restaurants), and this period is considered as the preformation phase of the destination (Figure 3). These first establishments provided food services to fishermen and shellfish sellers. However, during holiday seasons and special holidays (Easter, summer, Christmas Day and New Year's Eve), visitors from the region and tourists from Acapulco came to the community for a

day's visit. Besides, there were those visitors who chose to stay and camp in the existing establishments, a segment that was characterized by backpacking and camping.

> "The first visitors were backpackers. Many of them stayed for a day or two to do camping."—Key informant
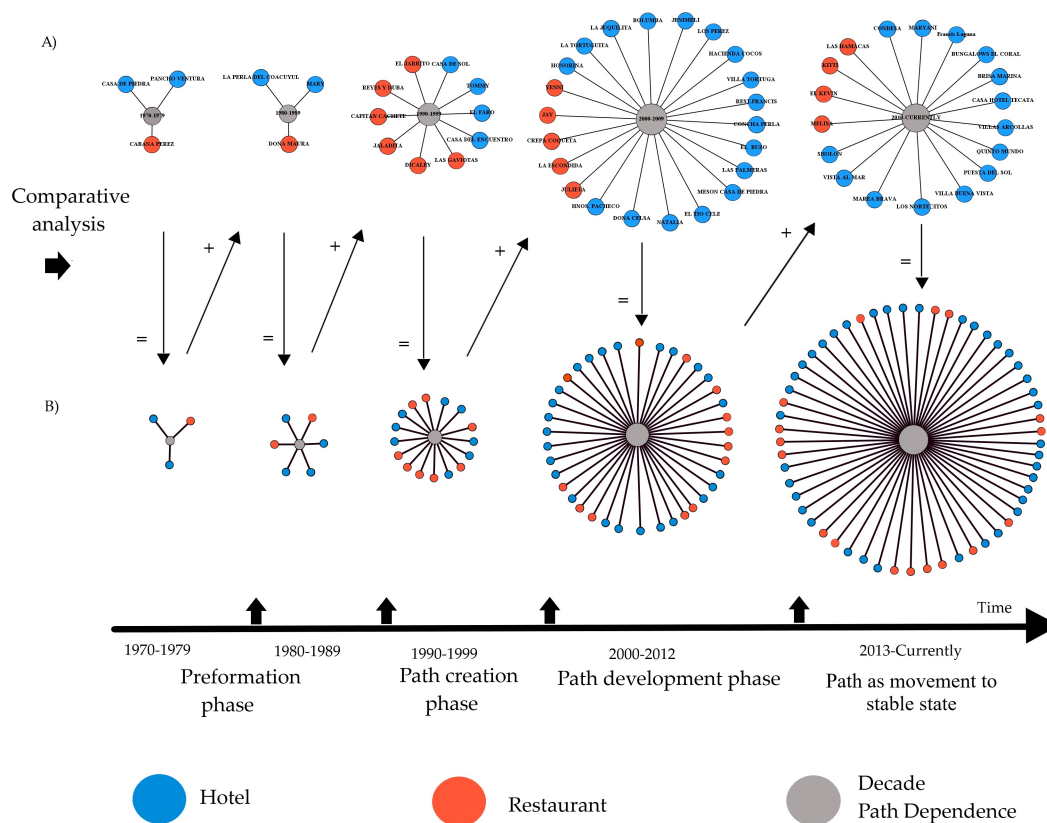

Figure 3. (**A**) Building ratio of tourist establishments of Playa Ventura per decade and (**B**) the list of establishments through the comparative analysis of Star S_k graphs.

At the time, the primary economic activity remained the first source of employment in the community. It was an era marked by fishing since most of the seafood was commercialized in the City of Acapulco, an international destination focused on the sun and beach segment, with a large flow of domestic and international tourist arrivals. Consequently, the demand grew, and this led to a large overexploitation of the community's fishing resources, mainly crustaceans, oyster and lobster.

> "Around the year '85, three tons of oyster and lobster were sold to hoarders in Acapulco."—Key informant

4.2. Path Creation: 1990–1999

At the beginning of the 1990s, the demand for lodging services increased, so some restaurants that provided camping services, as well as some homeowners, began to build rooms. The first of these establishments were the Tommy and Piedra del Coacuyul Hotels. That is, with an offer of rooms for tourists, the beginning of overnight stay had begun. Some of the factors that promoted tourist visitation to the CRC of Playa Ventura were, natural, cultural and gastronomic attractions: the paving of the road that connects the town to the Acapulco-Huatulco federal highway in 1995, the word-of-mouth advertising in the region and neighboring States (Morelos, Mexico City, State of Mexico), and the proximity to the main destination, Acapulco, as well. Another determinant was the decreasing in the

extraction of fishery resources and the abandonment of agriculture. This made some residents choose to work in tourism, either as employees or micro-entrepreneurs of hotels and restaurants. The above is taken as the turning point of the economic transition, that is, as the historical moment during which Playa Ventura's community starts to appropriate tourism and set aside primary activity as their second economic choice.

4.3. Current Stage: Path Development: 2000–2012

From the year 2000 on, the community began to consolidate its popularity as the new tourist spot in the State of Guerrero, within the Costa Chica Region. The arrival of more tourists meant new opportunities for the residents, who built more establishments and renovated the existing ones in order to expand the tourist infrastructure. This is the time when the arrival of international tourists begins. It is worth saying that some decided to settle down in the community and established tourist service businesses, mainly in the Laguna Zone, where the people who own some of the establishments are not natives, nor from the community or the region. The characteristic of these businesses is that they are small or Boutique hotels.

It is in this period of time that the Tourism Bureau of the Municipality of Copala was established, with the firm idea of supporting tourism. This office is also in charge of the institutional promotion of the destination. Finally, in mid-2010, tourism became the main economic activity in the community since most of its residents chose to open a business or work for one of the existing tourist establishments.

Following the historical context, the status of the first graphs, G_1, G_2, G_3 and G_4 that correspond to part (a) of Figure 3, have a growing behavior. However, graph G_5 indicates a decrease in the construction of establishments in the current period. Although, it is important to point out that it is not due to the lack of space availability to build establishments in the community. On the contrary, the negative internal and external lock-ins, in each one of the Path Dependence phases, have made the building of establishments more complicated. These negative lock-ins are addressed in the following section. However, considering the number of establishments of the previous decade and those of the subsequent decade, as it is indicated by the model, the community has not stopped growing, as it can be seen in part (b) of Figure 3.

4.4. Path as a Movement to Stable State: 2013–Currenty

The existing lock-ins allow inferring the current Path Dependence phase in which the community is located. At the present time, it is in a stable state of movement. This trend is due to the type of negative-immerse lock-ins and their influence upon the development of Playa Ventura's tourist activity. The k-core subgraphs give seven subgroups (k = 7) as an outcome, in which the most influential negative and positive lock-ins can be identified according to the connection between key informants. It should be noted that the degree of each lock-in also allows determining which one of them has been the most mentioned and in what sustainability dimension it is (Figure 4 and Table 2).

In the first 7-core subgroup, because of lack, inefficiency or shortage, the negative lock-ins that stand out are sewer system, drinking water, insecurity and external violence, telecommunication services, high cost of living, increase of natural phenomena and abandonment of agricultural land. These lock-ins are of the greater degree of negative influence in Path Dependence. It should be noted that the drainage and access to drinking water date from the preformation of the destination and are lock-ins that cannot yet be overcome.

On the other hand, insecurity and external violence, as well as the increase of natural phenomena are external lock-ins. Insecurity and violence began particularly in 2010. This is denoted by the drug trafficking events that have arisen in recent years in the main destinations of the State of Guerrero, Acapulco, Ixtapa-Zihuatanejo and Taxco de Alarcón, as well as in other Municipalities of the State, and this reality has caused the decreasing of external tourism. As a result of these events, the predominant visitor segment in Playa Ventura is mostly regional and national.

"Tourism has been declining since 2010. Insecurity and violence have affected us too much".—Key informant

In recent years, establishments have had serious impacts on their infrastructure, due to the increasing of natural phenomena like hurricanes, tropical storms, earthquakes and "ground swell" ("*mar de fondo*" in Spanish). The latter is characterized by long waves, simulating a mini tsunami and it is very common in the Mexican Pacific littoral [83].

"We had never seen such a thing like "ground swell" Now, it is something that recurrently happens during the year."—Key informant

In the 7-core subgroup, the abandonment of agricultural land stands out and in the 5-core, it is the decrease of fishing resources. These two-negative lock-ins play a decisive role for the economic income of residents. It should be noted that there is still agricultural and livestock activity, especially in rainy seasons since it is in that period of time when the number of visitors decreases.

Table 2. Positive and negative lock-ins from greater to lesser degree of influence on Path Dependence according to *K-core* subgroups.

Label	Negative (NB) and Positive (PB) Lock-Ins	Degree	*k*-Core
NB1-Environment	Lack of Sewer system	22	7
NB2-Sociocultural	Lack of Drinking water	17	7
NB3-Sociocultural	Insecurity and external violence's presence	16	7
NB4-Economic	Inefficiency in Telecommunication services	14	7
NB5-Economic	Raise in the cost of living	9	7
NB6-Environment	Increase of natural phenomena	9	7
NB7-Economic	Abandonment of agricultural land	8	7
NB8-Sociocultural	Lack of community organization and participation	6	6
NB9-Sociocultural	Roads and streets in poor condition	6	6
NB10-Environment	Decrease of fishery resources	6	5
NB11-Sociocultural	Low potential in electric light and street lighting	5	5
NB12-Economic	Increase in the cost of land and housing	5	5
NB13-Economic	Lack of training to improve quality service	5	5
NB14-Sociocultural	Lack of government support	4	4
NB15-Environment	Inefficient collection and disposal of municipal solid waste	4	4
PB1-Economic	Job and business opportunities	23	7
PB2-Economic	Better economic income	16	7
PB3-Sociocultural	Boosting of culture and crafts	14	7
PB4-Environment	Contribution to the care of the environment	11	7
PB5-Sociocultural	Creation of public infrastructure	9	7
PB6-Environment	Clean and well-maintained beaches	8	7
PB7-Sociocultural	Migration decrease	7	6
PB8-Economic	Encouragement of production and sale of local product	7	6
PB9-Sociocultural	Opportunities for a better education	6	6
PB10-Economic	Money stays in the community	4	4
PB11-Economic	More local investment	3	3
PB12-Sociocultural	Better public services	2	2
PB13-Economic	Exogenous investment increase	1	1

With regard to the resulting graph, the 6-core also highlights the lock-ins: poor community organization because of disagreements among residents, tourist service people, the government, and streets or roads in poor condition. In the 5-core subplot, low-potential electric light and street lighting, lack of training for the improvement of service quality and an increased cost of living resulting from the rise of household commodities. Finally, in the 4k-core subgroup, the absence of government support, as well as the inefficient collection and final disposal of solid waste, are the least significant negative lock-ins according to what it is shown on the network. Thus, all negative lock-ins are concentrated

between subgraphs 7, 6, 5 and 4-core, which means that they do influence upon the Path Dependence process, on the Path Dependence's current status.

Regarding positive lock-ins, these started since the very creation of the path with the government's investment of the paving of the main road that connects the community. This allowed the arrival of more visitors and the residents saw in the tourism activity a work and business opportunity as a new way to obtain better income, which is currently maintained. Tourism has also benefited the promotion of culture, the continuous, but slow, development of public infrastructure, the importance of caring for the environment, beach maintenance and cleaning, the production of local products, a higher educational level and a decrease in migration. These positive lock-ins are of the upmost importance and influence for tourism to remain as the community's main economic activity, See 7- and 6-core subgroups of Figure 4.
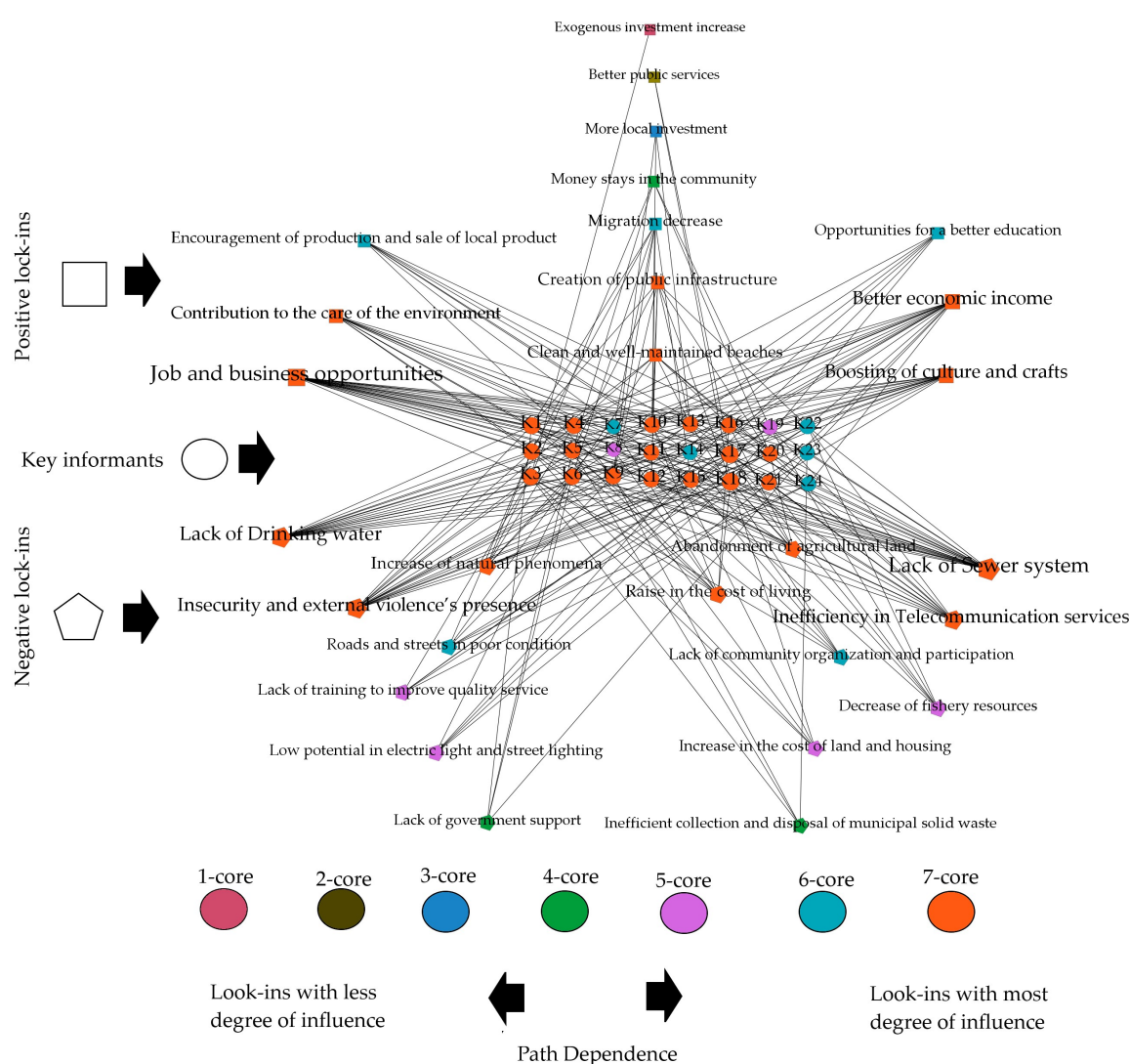

Figure 4. Relationships between key informants and positive and negative lock-ins of tourism in the CRC of Playa Ventura. The k-core subgroups determine the most influential blocks in Path Dependence.

"Tourism indeed has benefited some more than others, but it has allowed the generation of employment and there is more money."—Key Informant

"Now, we can send our children to study out of town. It is possible for them to go to university."—Key Informant

On the other hand, the positive lock-ins of minor influence or that were not mentioned by our key informants are: more local investment, better public services and exogenous investment increase, that are present in subgroups 3-, 2- and 1-core, respectively (see Table 2 and Figure 4). It is important to mention that although they do not have much influence in the main graphic, they are of importance for the community's path.

As it can be observed in Figure 4, the degree of the key informants varies, as well as the subgroup *k-core* to which they belong. We must also note that the difference in the degree in each informant is due to the number of lock-ins mentioned by each one of them, which in some way affects the subgroup they belong to, in this case the key informants are divided in three subgroups. However, it is observed that 17 of them correspond to the 7-core subgroup, which means that they are connected with one another, and therefore, related, according to the mentioned lock-ins.

5. Discussion

5.1. Path Dependence and SNA in the Evolution of Tourism in CRC

In the CRCs, very little attention has been given to important topics like transition and appropriation of tourism as a primary economic activity. Accordingly, Path Dependence makes a particular contribution to the model to explain and describe how, why and in which historical moment [16] the various transformations derived from the tourist inception in each sustainability area in a CRC take place. For instance, in the Playa Ventura CRC, tourism became the primary income-generating activity after dismissing primary activities (agriculture, livestock and fisheries), as a result, mainly, of the lack of governmental support situation that has been mentioned by other researchers in similar contexts [34]. The foregoing can represent an economic lock-in, given that tourism activity in these communities, like most of Mexico's destinations, is seasonal (high-low season) and has an impact on the continuous generation of income derived from tourism [84].

Comparing with other works that have used the Path Dependence research approach in CRCs [73], we can affirm that the model proposed in this article allows SNA to diagnose and describe through visual patterns which are the positive or negative lock-ins that most influence the route in the different areas of sustainability. It also allows for seeing how well the key informants are connected when mentioning the most influential lock-ins, which enables us to give an approximation to the outline of a future route.

In another context, according to the Path Dependence phases, Playa Ventura's processes have been slow and long, considering that its preformation began in 1970. It can be remarked that Playa Ventura's type of development is endogenous and, usually, the growth under this approach is slow, in counterpart of the exogenous that brings unleashed growth and with greater negative impacts [8,9].

5.2. The Role of Stakeholders in the Tourism Evolution of a CRC

In another perspective, tourism's success or failure depends on a synergy of factors [48,67]. Negative internal and external lock-ins inhibit the growth of any destination and affect the process of Path Dependence. It should be noted that not all tourist destinations evolve in the same way, therefore, the endogenous and exogenous elements are determinant [67,85]. However, stakeholders do not always adapt to the changes that have arisen in the destination, so the action and degree of intervention in agreement of all the stakeholders is decisive in the present and future route [73,86].

For instance, the CRC of Playa Ventura does not have a tourism development plan. Therefore, the Path Dependence begins with certain negative lock-ins that cause pressure on natural, sociocultural and economic resources. Thus, adaptation is more complicated in terms of resilience for this type of destination than in those with a plan [73]. So, based on a future projection of Playa Ventura, if the existing lock-ins are not addressed, the trend of the possible path might be static although leaning towards decline. But, if the stakeholders work together through organization and participation to modify the negative lock-ins, the route might foreseeably turn towards adaptation processes [45].

It should be noted that the lack of organization and participation among stakeholders was one of the most influential negative lock-ins in Playa Ventura.

In order to compensate for the negative lock-ins, adequate management among the different power groups associated with the stakeholders in charge of the CRCs is required. That is, according to the type of lock-in, which of the power groups would have to repair or manage such lock-in? Therefore, it is necessary to identify stakeholders based on their capacity and level of decision making [87,88]. Taking the case of the CRC of Playa Ventura, three power groups can be detected to manage the negative lock-ins, government (NB1, NB2, NB3, NB4, NB6, NB8, NB10, NB11, NB14, NB15), service providers (NB5, NB12, NB13, NB6) and residents (NB7, NB9, NB6) (See Table 2).

On the other hand, the CRC of Playa Ventura has two well-identified external negative lock-ins. Insecurity and external violence come in the first place (NB3), a lock-in that should be worked out among the three levels of government, and the second one is the increasing occurrence of natural phenomena (NB6), which is attributed to climate change and it corroborates that this type of communities is highly vulnerable to this phenomenon [46,89]. However, it should be remarked that particularly in Mexico, private and tourist home constructions are done without considering any respect for the coastline, a lack of sensitivity or judgement that in the end brings greater affectations in terms of disaster. Then, Path Dependence in these communities also depends on all stakeholders' adaptability towards climate change. This is why long-term urban planning that considers this phenomenon is fundamental. It should be taken into account that Soares, Ivars-Baidal and Gândara [29], in their study on the path dependence in a consolidated coastal destination, have identified urban planning in the early phases as a determinant of tourist destinations' evolution.

6. Conclusions

The model proposed here, based in the integration of Path Dependence and SNA for the evolutionary study of tourism in CRCs, allows us to conceive more clearly the dynamics of transformation that entails the appropriation of tourism at different temporary moments. The model also helps to fill in the existing theoretical gaps arising from the absence of methods to diagnose tourist evolution in small destinations such as CRCs. In the same way, something that stands out is that the generation of information is collected in situ.

The methodological construction of the model is one of a kind, as it is intended for destinations that do not have statistical information to dictate their evolutionary status. It should also be noted that the key informants are residents who live the community transformation processes closely, therefore, they have extensive knowledge of historical fundamental issues associated with tourism developments. It is important to mention even when the key informants in Playa Ventura are now immersed in the touristic sector, in the past, most of them used to have different occupations, like: farmers, housewives, and government officials, among others, which, in a way, allowed for getting different points of view when identifying positive and negative lock-ins, as well as the current stage of Path Dependence.

In this context, the theoretical foundation of the Path Dependence approach, which states that "initial conditions matter" for the success or failure of an economic industry, is verified [39,44].

This statement can be confirmed at Playa Ventura, a CRC whose tourist activity was not planned since its inception. The lack of a development plan, as well as the lack of organization and participation of stakeholders, makes the route already have important negative lock-ins, which if they are not taken care of, the community will hardly be able to move into sustainable processes. Additionally, the positive lock-ins found in the community show that tourism in a CRC can be very important in generating quality of life. However, in order for there to be a balance with the initial economic activities, the stakeholders have to regain the lost path. That is, by taking as an example the CRC of Playa Ventura, the stakeholders would have to compensate for the abandonment of the field so that the community does not only depend on one economic activity but be able to balance both initial and tourist activities.

In terms of sustainability, the model opens a new paradigm for the sustainable study of tourism developments in CRCs, since it also allows us to visualize the dimension in which both positive and negative lock-ins are located, as well as which area is most affected or benefited. In this case, the Playa Ventura CRC has slightly more negative lock-ins in the sociocultural dimension. In contrast, the positive lock-ins reflect a tendency towards the economic part to a lesser extent.

It should be noted that the model is still an approximation to the evolutionary study of tourism in CRC's, since, while it has worked to determine in depth the tourist genesis of Playa Ventura, it has to be replicated in other communities with similar characteristics.

On the other hand, while the model is designed for a CRC, we consider that it can also be adapted and applied to any destination. However, if the model is considered for an urban destination for large masses, we recommend that it be applied in tourist areas, since, unlike a rural destination, it may present different phases according to the Path Dependence. That is, one area may be in the preformation phase, while another may be in decline. In contrast, in a rural community with other realities, depending on its territorial size, it is more feasible to apply it in general, as it is proposed here in the model.

Finally, as a recommendation for future studies, the internal growth of establishments should be integrated into the model over time, that is to say the construction of the number of rooms to the lodging capacity since the beginning of operations. The indicator, for this work, was difficult to obtain at the Playa Ventura CRC due to the unwillingness of tourist service providers and government institutions to provide specific information and data of the destination.

Author Contributions: C.D.A.-B. brought the original idea for this research, participated in each of the stages of the project and carried out the field work. O.F.-M., H.A.-P. and M.R.U. participated in the design of the literature review, methodology, discussion and conclusions. J.J.P.-P. collaborated in the geometric representation of the phenomena shown here, the mathematical inferences, in the literature review, and in the concreteness of the model. Finally, J.C.S. worked as an expert in the application of the path dependence approach in the tourist area and in each of the stages of the work.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A. Formal Definitions of Social Network Analysis

Definition A1. *A network or a G (V, E) graph is an ordered pair of disjoint sets, where V is the set of vertices and E is the set of edges or relations. Each vertex is represented by a point and an edge by lines that join a pair of vertices of V* [90].

Definition A2. *The vertex degree v is the number of incident edges on it and denoted by d(v). The minimum degree, denoted by $\delta(G)) = (d(v)|v \in V)$, is the minimum number of incident edges at vertex v and the maximum degree, denoted by $\Delta(G) = (d(v)|v \in V)$, is the maximum number of incident edges at vertex v* [91,92].

Definition A3. *A bipartite graph G(V,E), is one whose set of vertices V can be divided into two subsets or partitions, A and B, so that any edge relates a vertex in A with a vertex in B, but there are no edges that connect vertices within the same partition* [93].

Definition A4. *A star graph, S_k, is a bipartite graph in which one vertex is adjacent to all of the others* [94].

Definition A5. *Let G be a graph. A k-core is a maximal subgraph of G in which each vertex is adjacent to at least other k-vertices, where all points of the k-core have degrees less than or equal to k* [76,78,95,96].

Definition A6. *Let A be a square matrix of n × n. A is an adjacency matrix, if all the entries in the matrix are 0 and 1, where 1 indicates that there is a relationship between two vertices and 0 in other cases* [64,93,97].

Appendix B. Tourist Inventory of Playa Ventura

Establishment	Type	Zone	Year	Decade
Pancho Ventura	Hotel	El Faro	1972	1970–1979
Casa de Piedra	Hotel	Casa de Piedra	1975	1970–1979
Cabana Perez	Restaurant	Centro	1975	1970–1979
La Perla Del Coacuyul	Hotel	Centro	1981	1980–1989
Mary	Hotel	El Faro	1984	1980–1989
Dona Maura	Restaurant	El Faro	1985	1980–1989
Tommy	Hotel	Centro	1990	1990–1999
Reyes Y Duba	Restaurant	Centro	1990	1990–1999
El Jarrito	Restaurant	Casa de Piedra	1992	1990–1999
Las Gaviotas	Restaurant	Casa de Piedra	1992	1990–1999
Dicaley	Restaurant	Centro	1992	1990–1999
El Faro	Hotel	El Faro	1993	1990–1999
Casa Del Encuentro	Hotel	El Faro	1994	1990–1999
Casa De Sol	Hotel	Centro	1994	1990–1999
Capitan Cachete	Restaurant	Casa de Piedra	1997	1990–1999
Jaladita	Restaurant	Centro	1998	1990–1999
Bolumba	Hotel	El Faro	2000	2000–2009
Las Palmeras	Hotel	El Faro	2000	2000–2009
Hnos. Pacheco	Hotel	Centro	2000	2000–2009
La Tortuguita	Hotel	Laguna	2000	2000–2009
Villa Tortuga	Hotel	Centro	2001	2000–2009
Jay	Restaurant	El Faro	2002	2000–2009
Crepa Coqueta	Restaurant	Centro	2002	2000–2009
El Tio Cele	Hotel	Laguna	2002	2000–2009
La Escondida	Restaurant	El Faro	2005	2000–2009
Dona Celsa	Hotel	Centro	2005	2000–2009
Concha Perla	Hotel	Centro	2005	2000–2009
Hacienda Cocos	Hotel	Laguna	2005	2000–2009
Meson Casa De Piedra	Hotel	Casa de Piedra	2007	2000–2009
Honorina	Hotel	El Faro	2007	2000–2009
La Juquilita	Hotel	Centro	2007	2000–2009
Natalia	Hotel	Centro	2007	2000–2009
Yenni	Restaurant	Centro	2007	2000–2009
Los Perez	Hotel	Centro	2008	2000–2009
El Buzo	Hotel	Laguna	2008	2000–2009
Rest.Francis	Hotel	Casa de Piedra	2009	2000–2009
Jenimeli	Hotel	Centro	2009	2000–2009
Julieta	Restaurant	Centro	2009	2000–2009
Melisa	Restaurant	Casa de Piedra	2010	2010–2018
Villas Arcollas	Hotel	El Faro	2010	2010–2018
Brisa Marina	Hotel	Centro	2010	2010–2018
Los Norteñiitos	Hotel	Centro	2010	2010–2018
Marea Brava	Hotel	Laguna	2010	2010–2018
Quinto Mundo	Hotel	Laguna	2010	2010–2018
Sholon	Hotel	Laguna	2010	2010–2018
Condesa	Hotel	Centro	2011	2010–2018
Puesta Del Sol	Hotel	Centro	2011	2010–2018
Maryani	Hotel	Laguna	2012	2010–2018
Villa Buena Vista	Hotel	Laguna	2012	2010–2018
El Kevin	Restaurant	Laguna	2012	2010–2018
Bungalows El Coral	Hotel	Laguna	2012	2010–2018
Las Hamacas	Restaurant	Casa de Piedra	2013	2010–2018
Kitti	Restaurant	Laguna	2013	2010–2018
Vista Al Mar	Hotel	El Faro	2017	2010–2018
Francis Laguna	Hotel	Laguna	2017	2010–2018
Casa Hotel Tecata	Hotel	Laguna	2018	2010–2018

Appendix C. Applied Interview Format

Universidad Autónoma de Guerrero

Centro de Ciencias de Desarrollo Regional
Doctorado en Ciencias Ambientales
Project: Tourism evolution in coastal rural communities. Instrument to determine the process of tourist evolution according to the community's key informants. Note: the information you provide will be exclusively used for the project's purposes and its use will be strictly confidential.
Date: ____/_____/_____/ Community: _____

Section A): Personal data of key informant:

A1. Place of birth: Community _____ City_____ State_____
Country:_____ A2. Age: _____ A3. Sex: 1□ Male 2□ Female
A5. Civil status: 1□ Married 2□Divorced 3□ Widower/Widow 4□ Free Union 5□ Single
A6. Schooling: 1□ No studies 2□ Elementary 3□ Junior High 4□ High School 5□ Bachelor Degree 6□ Master Degree 7□ Ph Degree
A7. Number of years of residence in the community: _____
A8. Current job: _____
A9. What was your former job? _____

Section B) Tourist evolution of the community:

1. Could you mention the main facts that helped the preformation of the community to become a site or tourist destination?	Preformation
2. What were the main facts that helped the take-off and appropriation of tourism as the main economic activity of the community?	Path Creation
3. Having the following stages: Path Development, trajectory as a dynamic process and static or declining route, on which route do you consider the community to be at present?	At this point, the interviewer explains each stage to the interviewee to determine the current stage
4. What were the main facts that helped the tourist activity to be at the stage you mentioned?	According to the stage mentioned by the key informant
5. Can you mention the positive lock-ins that help to keep tourism in the community as the main economic activity?	Positive lock-ins
6. Can you mention the negative lock-ins that inhibit the community's tourism development process?	Negative lock-ins

Appendix D. Sociodemographic Profile of Key Informants

	Frequency	Percentage
Age		
30–39	3	12.5
40–49	7	29.2
50 and more	14	58.3
Gender		
Male	12	50
Female	12	50

	Frequency	Percentage
Schooling		
Elementary school	5	20.8
Junior High School	8	33.3
High School	9	35.5
Graduate	1	4.2
Postgraduate	1	4.2
Years of residence in the CRC		
10–19	4	16.7
20–29	2	8.3
30–39	6	25
40–49	6	25
50 and more	6	25
Current job		
Worker in the tourist area	24	100
Previous job		
Farmer	6	25
Housewife	6	25
Diver	3	12.5
Tourist employee	3	12.5
Government employee	2	8.3
Taxi or bus driver	2	8.3
Immigrant	1	4.2
Businessman	1	4.2

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