

# Mayan Train: Social Representations Primarily Resulting from Mexican Students, Professionals, and Employees

## Tren Maya: representaciones sociales resultantes principalmente de estudiantes, profesionistas y empleados mexicanos

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**Abstract:** This research aimed to identify the social representations associated with the Mayan Train project, months before its inauguration, among Mexicans residing across in the country who reported having some level of knowledge about the project. For this purpose, quantitative, descriptive, and cross-sectional research was used, an electronic survey was employed with an instrument based on the hierarchical evocation technique, with non-probability sampling applied to 1,138 Mexicans. The results revealed that the elements of the central core were predominantly positive, and consisting of train, nature, and tourism, while the negative element identified was ecocide. The results from the contrast zone are also presented, along with the first and second peripheries of the social representations of the Mayan Train. It is concluded that discursive efforts emphasizing the progress associated with the project have permeated society, although concerns about the environmental damage it causes persist.

**Keywords:** social representations, Mayan Train, Mexico, tourism.

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**Resumen:** Esta investigación buscó identificar las representaciones sociales asociadas al proyecto del Tren Maya meses antes de su inauguración, entre mexicano(a)s que habitaran en cualquier lugar de la República y que manifestaron contar con algún nivel de conocimiento del proyecto. Para ello, se utilizó una investigación cuantitativa, descriptiva y transversal; se empleó una encuesta electrónica con un instrumento basado en la técnica de evocaciones jerárquicas y se aplicó un muestreo no probabilístico a 1,138.

mexicano(a)s. Los resultados mostraron que los elementos del núcleo central fueron predominantemente positivos y conformados por: tren, naturaleza y turismo, y un elemento negativo: ecocidio. Se presentan también los resultados de la zona de contraste, así como la primera y segunda periferia de las representaciones sociales del Tren Maya. Se concluye que los esfuerzos discursivos sobre el progreso asociado al proyecto han permeado en la sociedad, aunque prevalece también la preocupación por el daño ambiental producido. **Palabras clave:** representaciones sociales, Tren Maya, México, turismo.

## Introduction

In June 2020, the Mexican government began construction of a mega-project called “Tren Maya,” intended to operate as a tourist, passenger, and freight train. The project is expected to cover a total of 1,525 kilometers and is supposed that will benefit at least 44 municipalities, 64 localities, and more than 84 tourist attractions. Additionally, the development of 15 to 17 stations has been contemplated, which will be distributed among the states of Campeche, Chiapas, Tabasco, Quintana Roo, and Yucatan (Martínez Palacios, 2019). The train is also expected to travel between municipalities such as Palenque in Chiapas, to Cancun in Quintana Roo.

This investment is expected to contribute to land use planning and boost tourism in southeastern Mexico (Government of Mexico, 2023). Opinions about the project have been diverse and contradictory (Candelas *et al.*, 2023), given that it is home to Mayan archaeological sites, protected natural areas, and indigenous communities that will be exposed due to the passage of the train and tourism (Camargo and Vázquez-Maguirre, 2021).

Since its announcement, this project has generated uncertainty, opacity, and resistance (Flores *et al.*, 2019), but it also promised to improve the quality of life, minimize environmental impacts in the territories through which the train will pass, and preserve cultural assets (Candelas *et al.*, 2023). Therefore, this research aimed to identify the social representations associated with the Tren Maya project months before its inauguration, among Mexicans living in any part of the Republic and who claimed to have some knowledge of the project.

## Visions of the Tren Maya Project

The Tren Maya project has brought to light conflicting worldviews on how to approach modernity and development in southeastern Mexico (Casanova, 2021). On the one hand, the government promotes a discourse of development and progress, asserting that the construction and operation of the Tren Maya will represent an advance towards the future. On the other hand, opposing voices raise concerns about environmental damage, land dispossession, and the exclusion of diverse social actors, including local residents (Levet, 2022).

### *Government's View of the Project*

This is a mega-project that aims to interconnect several tourist areas and cities in southeastern Mexico, reorganizing the region, and encouraging economic development in areas that are not yet integrated into the economic and tourist circuits (Secretaría de Medio Ambiente y Recursos Naturales, 2020; Casanova, 2021). The federal government maintains that the operation of this project will have a significant economic impact and will efficiently connect the southeastern states (Government of Mexico, 2023), including Campeche, Chiapas, Tabasco, Quintana Roo, and Yucatán. The project began on December 17, 2018, and was expected to be completed in December 2023. The work consists of seven sections: the first covers 435 kilometers; the second, 234 kilometers; the third, 159 kilometers; the fourth, 239 kilometers; the fifth, 43.3 kilometers; the sixth, 255.8 kilometers; and the seventh, 287 kilometers (Espinosa Ovando *et al.*, 2023).

The government claims that the project will facilitate the connection between five southeastern states in an efficient manner and that it will be a cheap and convenient means of transportation for both locals and visitors (Espinosa Ovando *et al.*, 2023). Tourism in the region is expected to triple in the short term, which would increase investment, employment, and competitiveness in the southeast of Mexico (UN-Habitat, 2023).

The Secretariat of National Defense (Sedena) has been actively involved in the development of the project, as it is in charge of managing the construction of the train, airports, and six hotels

near the stations and tourist areas of Palenque, Tulum, Calakmul, Edzná, Chichen Itzá, and Uxmal (De la Rosa, 2023; Bellani, 2024). Additionally, the military safeguards archaeological and environmental remains under the governmental premise that their presence will help prevent crime and violence in the area (Pasillas López, 2023; Bellani, 2024).

### *Other Views on the Project*

Several academic experts, environmentalists, and communities in the Mayan region have questioned the planning of the project, the lack of transparency, and the impact on the ecosystem (Arriaga, 2019); some even argue that the way the project was designed, developed, and operated has generated distrust and points to historical-political corruption (Pasillas López, 2023). For example, it is considered that the main risks of the Sedena's participation in public works are (Instituto Mexicano para la Competitividad [IMCO], 2023): opacity in the use of budgetary resources, lack of transparency in its agreements, irregularities in the exercise of spending, withholding of information for national security reasons and lack of information on subcontracting for construction.

Some specialists have also expressed concerns about negative environmental effects: degradation of natural ecosystems and loss of biodiversity, as well as damage to cultural and archaeological heritage in the areas the train travels through, in addition to possible social impacts linked to gentrification in the communities (Ramírez Espín *et al.*, 2023). Given that the route of the Mayan Train will cross 15 protected natural areas especially the Calakmul Biosphere Reserve and the Sian Ka'an Biosphere Reserve, the project puts the habitat of many animal and plant species at risk (Centro Mexicano de Derecho Ambiental [CEMDA], 2018; Veiga, 2019).

Likewise, the Tren Maya project contributes a devaluation of cultural heritage in favor of a mercantilist and utilitarian vision, in which cultural assets are losing their harmony with the environment and environmental disasters are justified to promote the movement of goods and people, as well as the creation of job opportunities (Ceceña, 2019; Maya-Soto and Castillo-Nechar, 2022).

Levet (2022) identified that the discursive themes surrounding the Maya Train are mainly about political, social, and environmental

impacts. From a political perspective, the project is evidenced as a means of progress and development to promote social justice, while highlighting tensions between the government and environmentalists (Casanova, 2021; Levet, 2022). In contrast, environmental discourses primarily denounce deforestation, the ecocide of the jungle, contamination of aquifers, caves and cenotes, as well as the loss of biodiversity in the region (Arriaga, 2019). Regarding social impacts, the most important issues are concerns about tourism, urbanization, land eviction, violence, violation of human rights, and poverty; in this last dimension, Levet (2022) also includes the lack of protection of cultural heritage.

## **Social Representations**

According to Moscovici (1961 and 1988), social representations establish a connection to everyday life, setting expectations that help to express what a group of individuals lives, thinks, and feels about a specific topic that concerns them directly or indirectly. In order to achieve better dissemination and knowledge of social representativeness, it is necessary to establish a continuous communication that gives a life of its own to topics that converge in a context, achieving a greater identity for those who make reference to it (Kalampalikis and Apostolidis, 2021).

On the other hand, social representations have the peculiarity that they are shared in different social groups, which are generated from the experiences of a group of people, depending on the place where they live, their lifestyles, and the information to which they have access (Jodelet, 2011). This gives rise to the initiative to externalize different points of view, where subjective beliefs become something collective, and interpretations become something common, inside and outside the place where they are referred to (Moscovici, 1961).

Thus, social representations emerge from everyday conversations and continuously shared information within a group of individuals (Moliner and Bovina, 2021). This process occurs through anchoring and objectification, by which ideas are fixed and reduced to common categories that acquire real meaning for a majority, which refers to reflecting their feelings and thoughts (Gomes *et al.*, 2022; Jodelet, 2018).

For society, sharing knowledge grants the availability to know more about its environment with the purpose of constructing and conceiving thoughts that are fostered within a group; then, social representations help to understand and generalize ideas that have some kind of meaning, leading these conceptualizations to an increasingly stronger dynamic (Kalampalikis and Apostolidis, 2021). In summary, social representations are considered a fundamental process in action guides that express knowledge projections, which are integrated into institutional mechanisms (Bertoldo and Castro, 2019).

From Moscovici's contributions on social representations, several researchers continued to contribute new concepts to the subject, such is the case of Abric (1976), who assumed the structural approach to social representations; from his contribution, a greater understanding of the relationship of a social group was obtained, which, when in contact with cognitive processes, obtains an identity (Abric, 1996).

Abric (1987) described social representations as a set of structured and organized socio-cognitive elements that convey different meanings, distinguishing between central and peripheral elements. Thus, he proposes the model of the central core, which is characterized by playing a key role in the generation and assignment of meanings (Cristea *et al.*, 2020), whose elements are strongly shared and stable in the face of variations generated in the context (Abric, 1976). Therefore, they are indispensable for the recognition of the object of representation (Abric, 1976 and 1987), endorsing meanings, identities and coherence of what the majority of a collective wishes to transmit (Baptista *et al.*, 2023).

Also, according to the central core theory, there are: a contrast zone and two peripheries (Abric, 1987). The contrast zone identifies evocations that reinforce the elements found in the central core and are shared by one or more minority subgroups through evocations that are different from the majority but are important for this niche (Wakiuchi, 2019).

Conversely, the elements located in the periphery system are more individually modulated, context-dependent, flexible, and can easily change (Baptista *et al.*, 2023). The area of the first periphery encompasses the responses with high frequency, but which had low importance; that is, it represents the secondary evocations of the representation (Sabadini and Martins-Silva, 2023). In contrast, the second periphery contains elements that are not very prominent

in terms of frequency and importance; therefore, they do not affect the structure of the representation of a social group, but involve individualized elements (Abric, 1996) and constitute the frontier of social representation (Guerra-Reyes *et al.*, 2023).

## Methodology

The hierarchical evocation technique was employed to identify social representations, which is considered one of those of content collection (Abric, 2003; Flament and Rouquette, 2003). This technique is based on the prominence of the elements of the representation through the generation of free associations and their classification based on an importance criterion (Flament and Rouquette, 2003; Lo Monaco *et al.*, 2023).

For this purpose, quantitative, descriptive, and cross-sectional research was conducted on Mexican individuals of any gender, of legal age, and living in any state of the Mexican Republic between January and April 2023. In order to identify social representations through the central core model and its valences, we used Abric's (2001) proposal. This model obtains information through the lemmatization of words associated with a topic and its representativeness index, supported by interpretations and meanings. In this case, the purpose was for participants to share their perception of an infrastructure project being carried out in the south of the country, known as the Mayan Train.

To collect the data, we used an electronic survey and designed a questionnaire in which participants were asked to write down five words that came to mind when they read Tren Maya. From this, a series of lemmatizations<sup>1</sup> were generated to capture the feelings and thoughts associated with the project. Subsequently, an evaluation of the words emitted was requested in order of importance of the words written, on a scale from 5 to 1, where 5 is "very important" and 1 is "not important at all." To enhance the research's depth, each

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<sup>1</sup> A lemmatization refers to the process by which the cognitive elements that make up a social representation are grouped, organized and related to each other, facilitating the interpretation of the represented phenomenon (Abric, 1996).

cogneme<sup>2</sup> was also rated on a scale from +3 to -3, allowing us to determine whether the respondents' perceptions were positive or negative (Bisconsin-Júnior *et al.*, 2022; Patinho *et al.*, 2021).

A non-probabilistic convenience and snowball sampling method was employed, resulting in 1,138 valid surveys. The fieldwork was conducted in some public and private universities across the country, as well as in parks, public spaces, and commercial areas; it was also shared through social networks such as WhatsApp and Facebook. Surveys were obtained from 31 states, which were grouped into five zones (Centro de Estudios Espinosa Yglesias, 2017): North (Baja California, Sonora, Chihuahua, Coahuila, Nuevo León and Tamaulipas), North-west (Sinaloa, Nayarit, Durango and Zacatecas), North-central (Jalisco, Aguascalientes, Colima, Michoacán and San Luis Potosí), Center (Guanajuato, Querétaro, Hidalgo, State of Mexico, Mexico City, Morelos, Tlaxcala and Puebla) and South (Guerrero, Oaxaca, Chiapas, Veracruz, Tabasco, Campeche, Yucatán and Quintana Roo).

Regarding the demographic characteristics of the participants, 59.1% were women and 40.9% were men. Most respondents were from the North-Central region of the country (40.9%), followed by the Central region (30.4%). Additionally, 12.2% were from the South, 8.7% lived in the Northwest, and 7.7% in the North of the country.

In addition, 37.5% of the participants had an unfinished bachelor's degree, while 34.6% reported having completed a bachelor's degree; 10.3% had completed high school, 7.6% had a technical career, 7.3% had a postgraduate degree, 2.3% had completed secondary school, and 0.4% had only studied elementary school. Regarding occupation, 40.8% identified as students, 21.3% as professionals, 20.9% as employees, 6.8% as entrepreneurs, 6.6% were engaged in housework, 2.4% were technicians, and 1.2% reported being unemployed. On the other hand, the age range of the respondents was between 18 and 80 years old, while the average age of the participants was 29.7 years old.

Finally, regarding the intention to travel on the Mayan Train, 44.5% of respondents said they would travel on it, 33.5% said they did not know, and 22.1% said they would not travel. Therefore,

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2 A cogneme or element refers to an idea or basic cognitive unit of meaning; a social representation is formed by a set of cognemes shared by a group (González Palacios *et al.*, 2018).

when interpreting the social representations of this research, it is important to consider that 83% of the people who responded to the instrument were university students, professionals, or employees. Also, slightly more than half of the participants were women who lived mainly in the central-northern and central areas of the country.

## Results

The analysis followed four steps: 1) identification of the lemmatizations, 2) establishment of the cut-off points, 3) establishment of the concepts of the central core, first periphery, contrast elements, and second periphery, and 4) calculation of valences and polarity indices.

### *Identification of lemmatizations*

After coding the lemmatizations, those equivalent or similar to a particular category were grouped, resulting in 11 identified categories. The frequencies for each category were then summed. Table 1 presents the categories, the three most frequently evoked lemmatizations within each, and their respective frequencies.

### *Establishment of Cut-off Points*

Two cut-off points need to be calculated. The first is based on the categories, and the second on the importance of the lemmatizations. The cut-off point of the categories is determined by identifying the highest frequency associated with a respective category. Once identified, it is divided by two, resulting in the category frequencies' cut-off point. Thus, the cut-off point for the importance of the lemmatizations is established by calculating the median of the "importance" values that the participants gave to the words emitted. In this sense, the cut-off point for the frequencies of the categories was 36, while the cut-off point for the importance of the lemmatizations was 3.

All values above 36 (frequency) and 3 (importance) were qualified as high frequency-high importance, those above frequency (36) but

below importance (3) were qualified as high frequency-low importance; likewise, those with a frequency below 36 but importance above 3 were qualified as low frequency-high importance, and finally those with a frequency below 36 and importance below 3 were classified as low frequency-low importance.

#### *Establishment of the Concepts of the Central Core, First Periphery, Contrast Elements and Second Periphery*

Once the frequencies of the categories, their importance, and the cut-off points were identified, the quadrants of the central core, first periphery, contrast elements, and second periphery were established for the Mayan Train based on the cut-off points. Figure 1 shows the results found to shape social representations into an organized, hierarchical system within the structural framework of the central core theory. The upper-left quadrant represents the central core. This is constituted by a limited number of elements that make up the basis of the system of norms of the group studied (Abric, 2001). Thus, four evocations were identified as having high frequency and importance: train, ecocide, nature, and tourism.

Complementing this central core were identified the contrasting elements and two peripheries that are more diverse and flexible than the central core (Rateau *et al.*, 2023), being the basis of the findings that were issued by the group of respondents. This made it possible to identify that certain evocations expressed are malleable in terms of the perceptions found. The contrast elements are made up of evocations that had low frequency but high importance. Three elements were identified in this area: sustainability, anger, and ecology.

On the other hand, the peripheries represent the heterogeneity of the group's perceptions; in this case, the first periphery includes words that have high frequency but low importance. Only one evocation associated with the word economy was identified in this zone. Finally, the second periphery provides the elements with low frequency and importance, implying adaptation, heterogeneity, and contextualization of social reality (Phillips *et al.*, 2023); in this case, it is confirmed by three elements: Mexico, wastefulness, and capriciousness.

### *Calculation of Valences and Polarity Indices*

The polarity index of the 11 previously identified cognemes was calculated for this analysis. A negative result (between -1 and -0.1) indicates that participants have a negative attitude or emotion towards the evaluated lemmatization, whereas a positive result (between 0.1 and 1) reflects a positive attitude or emotion toward the cogneme. Tourism, train, and nature presented positive valences for the central core, ranging from 0.23 and 0.57; however, ecocide yielded a negative valence. Given that the central core defines the structure of the meanings within the social representation of the Mayan Train, it can be said that, in general, participants appreciate its value as a means of transportation, the promotion of tourism, and a way to connect with nature, although they also recognize that the project is the cause of ecocide.

The first periphery included only the economy cogneme which had a positive valence (0.48). This quadrant connects the central core with the reality of the group studied. In this research, it implies that associated with the cognemes already identified in the central core, the Mayan Train represents for the participants in the study a benefit for the country's economy. On the other hand, the contrast elements refer to subgroups with different representations of the Mayan Train; the elements that constitute this zone are susceptible to change. Thus, sustainability and ecology were identified with positive indexes, and anger with a negative index; therefore, it is likely that there are two subgroups, one that perceives the Mayan Train as associated with sustainability and ecology, while another subgroup associates it with a negative emotion, such as anger/rage/discontentment/indignation.

It is likely that, over time, these subgroups are susceptible to change to more positive or negative valences (Rodrigues *et al.*, 2015). Finally, the second periphery, composed of the least frequent and least important items, includes one positive item associated with the word Mexico (0.58) and two negative ones associated with wastefulness (-0.28) and capriciousness (-0.45). This periphery reflects the idiosyncrasy of the participants, with representations that tend to differ from the central core (Patinho *et al.*, 2021). Table 2 and Figure 2 present the valences obtained in the study.

## Discussion and Conclusion

This research sought to identify the social representations associated with the Tren Maya project months before its inauguration. The results showed that the central core is made up of four elements that are strongly shared by most of the study subjects. Three of them presented positive valence (train, nature, and tourism), and only one showed a negative valence (ecocide). These results show that communication about the benefits of the project (Camargo and Vázquez-Maguirre, 2021; Government of Mexico, 2023) has positively permeated the social representations of the Mayan Train in the sample studied.

However, it is also widely acknowledged that the construction and implementation of the Tren Maya have triggered an ecocide. This result coincides with the voices of activists, experts and institutions that have documented the felling of millions of trees, dozens of aquifer caverns drilled to place the piles, whose roofs have been filled with concrete to stabilize the structure of the train tracks, and concrete leaks inside several of them (Arriaga, 2024; López Puerta and Daen, 2024; Medrano, 2024; Toribio, 2024). Some experts (Ramírez Espín *et al.*, 2023) also argue that, in addition to ecological damage, archaeological and cultural heritage, and gentrification will negatively impact the area where the Tren Maya will operate.

The contrast zone is made up of two minority subgroups whose social representations of the project differ from each other. On the one hand, one subgroup considers that the Mayan Train represents sustainability and ecology, while another subgroup associates it with anger, rage, discontent or indignation. For instance, displeasure has been reported from populations whose infrastructure has deteriorated by the construction of the Mayan Train (Beytia, 2023), as well as anger from civil society groups, environmentalists, biologists, academics, and Mayan population groups (Estebanez, 2023).

On the other hand, the first periphery was constituted by the concept of “economy” which had a positive valence. This social representation represents a secondary evocation of the Mayan Train that is aligned with the hegemonic discourse of progress promoted by the Mexican government (Ansótegui, 2021), and the estimation of some international organizations (UN-Habitat, 2023) regarding a significant detonation of the tourism sector in the Mexican southeast.

Finally, the second periphery consisted of three elements: Mexico with positive valence, while wastefulness and capriciousness present negative valence. These evocations, however, do not significantly affect the core of the social representation of the Mayan Train but are individual elements on its periphery (Guerra-Reyes *et al.*, 2023).

This research has some limitations. The fieldwork was conducted months before the inauguration of the Campeche-Cancun stretch, and given that a non-probabilistic convenience and snowball sampling methods were used with participants primarily consisting of undergraduate students, professionals and employees from the Central-north and Central areas of the country, the results cannot be generalized to the Mexican population. Therefore, it is recommended that future work consider a stratified probability sample that proportionally covers randomly selected participants from all the states of the Mexican Republic. In addition, a longitudinal study could be considered to facilitate the comparison of social representations about the Mayan Train at different points in time among the Mexican population. Finally, it is advisable to explore the social representations of the Mayan Train among the inhabitants of cities, towns, and minority groups in southeastern Mexico.

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## Appendix

Table1

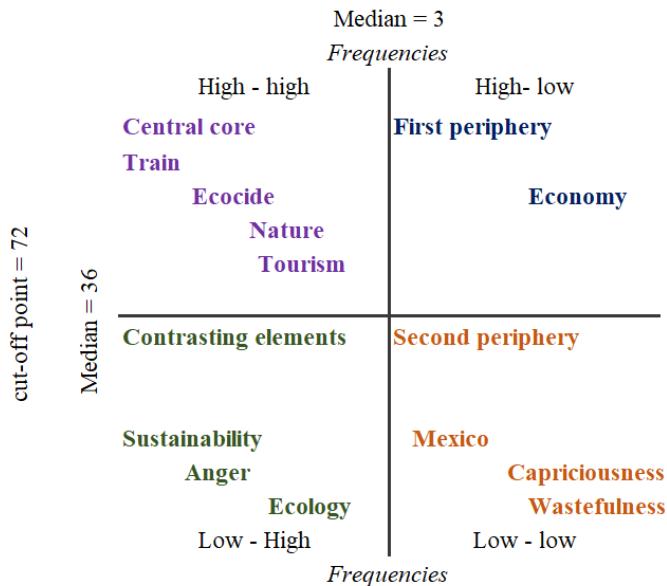
### Most Evoked Lemmatizations and Emitted Frequencies

Categories	The three most frequently evoked words in the category			Frequency
Train	Transportation	Mobility	Connection	72
Ecocide	Deforestation	Degradation	Extension	68
Nature	Jungle	Environment	Vegetation	38
Tourism	Travel	Adventure	Fun	36
Economy	Development	Work	Investment	39
Ecology	Habitat	Impact	Diversity	3
Anger	Rage	Discontent	Indignation	2
Sustainability	Sustainable	Renewable		1
Wastefulness	Greed	Injustice	Exploitation	5
Capriciousness	Recklessness	Foolishness	Counterproductive	4
Mexico	Country	Society	State	2

Source: Based on survey data.

Figure 1

**Central Core Model**



Source: Based on survey data.

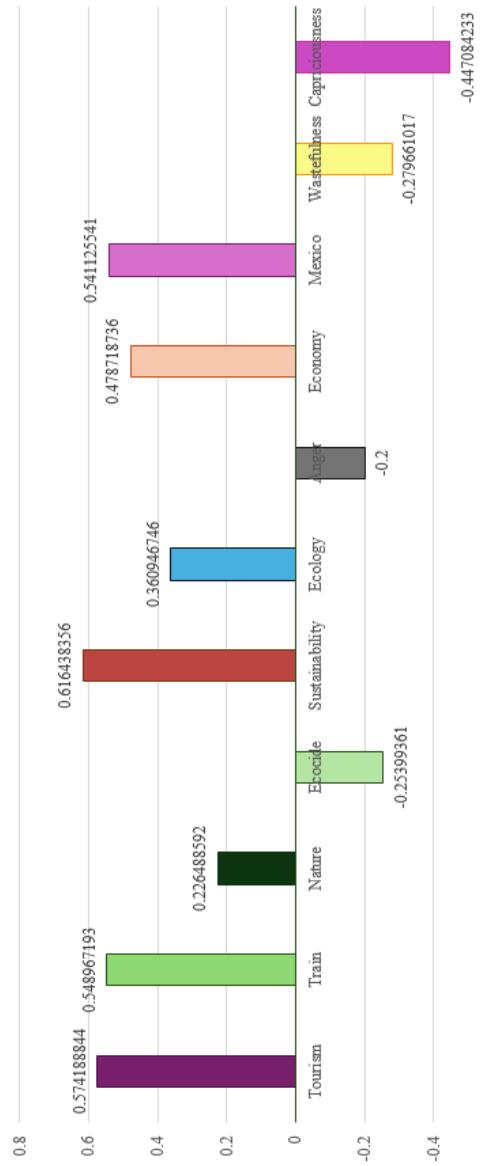
Table 2  
**Social Representations of the Mayan Train by Quadrant**

Elements	Valence	Quadrant
Tourism	0.57	Central core
Train	0.55	
Nature	0.23	
Ecocide	-0.25	
Sustainability	0.62	Contrasting elements
Ecology	0.36	
Anger	-0.20	
Economy	0.48	First periphery
Mexico	0.54	Second periphery
Wastefulness	-0.28	
Capriciousness	-0.45	

Source: Based on survey data.

Figure 2

Valences of Social Representations on the Mayan Train



Source: Based on survey data.

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