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Scientific articles

Diagnóstico del índice de desarrollo en la zona primaria, secundaria y periférica del mega proyecto del corredor interoceánico (CIIT) hacia el desarrollo regional

Diagnosis of the development index in the primary, secondary, and peripheral zones of the mega project of the interoceanic corridor (CIIT) towards regional development

Diagnóstico do índice de desenvolvimento na área primária, secundária e periférica do mega projeto corredor interoceânico (CIIT) rumo ao desenvolvimento regional

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Resumen

El desarrollo regional sustentable articula la oferta de bienes y servicios dirigida a mercados locales e internacionales, presenta una ventaja para atraer nuevas inversiones en el territorio que actúa, además facilita el intercambio de información entre los agentes económicos de diferentes regiones, se comparte experiencia que les permite la coordinación con diversos gobiernos y organismos internacionales con la finalidad de enriquecer el diseño, financiamiento y ejecución de las políticas públicas. En ese sentido, el objetivo del artículo es analizar el índice de desarrollo de los municipios que comprenden las zonas primaria, secundaria y periférica del Mega Proyecto del Corredor Interoceánico del Istmo de Tehuantepec (CIIT) y la posibilidad de alcanzar un desarrollo regional sustentable. La hipótesis planteada es que implementación del megaproyecto del corredor interoceánico tendrá un impacto positivo en el desarrollo regional de la zonas primaria, secundaria y periférica de la región del Istmo de Tehuantepec. Se utiliza el método científico hipotético-deductivo, con diseño mixto. Los resultados obtenidos son que la zona primaria cuenta con el mayor número de municipios con alto nivel de desarrollo. Se concluye que las disparidades en el desarrollo del Corredor Interoceánico requieren políticas específicas. El enfoque en la especialización productiva subraya su potencial para impulsar la economía regional. Considerar perspectivas locales y buscar un equilibrio entre desarrollo y preservación de recursos resalta la necesidad de un enfoque sostenible en proyectos regionales.

Palabras clave: Corredor Interoceánico, Desarrollo Regional, Sostenibilidad Regional, Zonas Primaria, secundaria, periférica.

Abstract

Sustainable regional development articulates the provision of goods and services aimed at local and international markets, offering an advantage in attracting new investments. It also facilitates information exchange among economic agents from different regions, sharing experiences to coordinate with various governments and international organizations to enrich the design, financing, and execution of public policies. In this regard, the article aims to analyze the development index of municipalities comprising the primary, secondary, and peripheral zones of the Mega Project of the Interoceanic Corridor of the Istmo of Tehuantepec (CIIT) and the possibility of achieving sustainable regional development. The

hypothesis posited is that the implementation of the interoceanic corridor megaproject will have a positive impact on the regional development of the primary, secondary, and peripheral zones of the Tehuantepec Isthmus region. The hypothetico-deductive scientific method is employed, with a mixed design. Among the findings, it is noted that the primary zone has the highest number of municipalities with a high level of development. It is concluded that disparities in the development of the Interoceanic Corridor require specific policies. The focus on productive specialization underscores its potential to drive regional economy. Considering local perspectives and seeking a balance between development and resource preservation highlights the need for a sustainable approach in regional projects.

Keywords: Regional Development, Interoceanic Corridor, Primary, Secondary, Peripheral Zones, Regional Sustainability.

Resumo

O desenvolvimento regional sustentável articula a oferta de bens e serviços dirigidos aos mercados locais e internacionais, apresenta uma vantagem para atrair novos investimentos no território onde opera, e também facilita a troca de informações entre agentes económicos de diferentes regiões, partilhando experiências que os ajudam. permite a coordenação com diversos governos e organizações internacionais para enriquecer a concepção, o financiamento e a execução de políticas públicas. Nesse sentido, o objetivo do artigo é analisar o índice de desenvolvimento dos municípios que incluem as zonas primária, secundária e periférica do Mega Projeto do Corredor Interoceânico do Istmo de Tehuantepec (CIIT) e a possibilidade de alcançar resultados regionais sustentáveis. desenvolvimento. A hipótese proposta é que a implementação do megaprojeto do corredor interoceânico terá um impacto positivo no desenvolvimento regional das zonas primárias, secundárias e periféricas da região do Istmo de Tehuantepec. Utiliza-se o método científico hipotético-dedutivo, com desenho misto. Os resultados obtidos são que a zona primária possui o maior número de municípios com alto nível de desenvolvimento. Conclui-se que as disparidades no desenvolvimento do Corredor Interoceânico exigem políticas específicas. A aposta na especialização produtiva sublinha o seu potencial para impulsionar a economia regional. Considerar as perspectivas locais e procurar um equilíbrio entre o desenvolvimento e a preservação dos recursos destaca a necessidade de uma abordagem sustentável nos projectos regionais.

Palavras-chave: Corredor Interoceânico, Desenvolvimento Regional, Sustentabilidade Regional, Zonas primárias, secundárias, periféricas.

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Literature review

Concept of regional development

The concept of development has been changing over time, adapting to the specific aspects assigned to it. For example, when we talk about economic development, we refer to progress in financial and productive terms; when we mention social development, we refer to improvements in the quality of life and well-being of people; and in the political sphere, to progress in governance and institutions. In all cases, development implies a process of change aimed at improving the area in question. In this sense, development can be understood as an effort to overcome difficulties or create favorable conditions in a region or space, encompassing the economic, social, political, ecological and cultural dimensions of human life. The region, seen as a system, integrates natural resources, flora, fauna, society and the environment, which constantly interact, and in this context we seek to promote improvements or ensure stability in all these aspects (Miguel, 2004).

In this research we will not address theoretical discussions on the concept of development, for the purpose of this work we will focus on the term regional development considered a national development process at a regional (subnational) scale, which encompasses the economic, social and physical characteristics of change in an area during a certain period of time (ONU, 1972).

Theoretical explanations on regional development

There are simplistic inactive, reactive, preactive and interactive theoretical explanations of regional development.

Inactive explanations hold that regional development and underdevelopment are social phenomena over which there is little room for action. These perspectives include approaches such as geographic determinism, which argues that the lack of regional development is due to the fact that the region does not have the appropriate geographic conditions to foster it. Genetic determinism considers that the white race is the most suitable for development, bureaucratic determinism argues that to achieve regional development it is enough to have a serious and efficient organization of public administration. Poverty determinism establishes

that development is difficult if there is no investment, if it does not increase neither does employment, if it does not increase productivity does not improve and without it wealth does not increase (vicious circle of poverty). Dependency determinism says that regional development of any kind causes dependency and domination of rich countries over poor ones, and ecological determinism considers that development of any kind threatens the ecology of the region.

For Miguel (2004), reactive explanations consider that regional development and underdevelopment are social phenomena that have very deep roots and depend on the innate demographic, geographic, economic, social, cultural and political qualities of the various regions. These explanations are grouped from a stage-based determinism called "Rostow's theory", which considers that regional development goes through various stages. Poor regions must limit themselves to rich regions in order to aspire to development. Traditionalist determinism argues that traditional cultures hinder regional development. Religious determinism mentions that the Christian religion is the most appropriate to promote regional development.

Following the same author, proactive explanations assume action as a way of achieving development and consider that regional development and underdevelopment are mutually linked phenomena. Service determinism indicates that regions only achieve their development through the provision of infrastructure and basic public services. Industrial determinism refers to the fact that regions only achieve their development through industrialization. Land use determinism alludes to the fact that regions only achieve their development through the optimal organization of their space, and this is only achieved when land uses provide utilities given by the land market. Big business determinism maintains that development depends on the existence or creation of big businesses in the regions. Planning determinism alludes to the fact that regions only achieve their development through adequate planning, both national and in accordance with the proposals of international financial organizations. Globalizing determinism states that regions can only achieve development if they are integrated into developed regions through globalization. Growth determinism states that regions can only achieve development through economic growth (increased GDP or investment). Business determinism states that regional development only occurs when there is a business culture , and market determinism considers that regions can only achieve development through the capitalist organization of the free market (Miguel, 2004).

As a result of the above, in Latin America there is a proposal for an interactive approach. This considers that development and underdevelopment are mutually linked phenomena, but not definitive but a permanent objective even in regions that are already considered developed. The difference is that some are at a more advanced level, but organization, cooperation and innovation tend to contribute to reducing the gaps between regions and within each of them.

On the other hand, there are more complex explanations than simplistic interpretations of regional development. Multi-causal theories of regional development are based on a systemic conception, where development is seen as the result of multiple interrelated factors. In these explanations, the regional system is considered a set of two or more elements of diverse nature that interact with each other. Where, the regional system and its development can be considered a system whose analysis can be carried out through its "subsystems", such as the economic, social, cultural, political and ecological-environmental. The subsystems can be broken down to favor a detailed analysis of the various elements that comprise them. The complexity of the systems must be understood as a result of the unity and interaction of diversity, which constitutes: the economic, social, ethnic, linguistic, ecological-environmental, political and cultural variety that the regions possess. In this sense, harmonious development can be proposed as the process that allows a nation, a region, local communities and the individuals residing in them to achieve optimal social well-being based on equitable, sustainable and harmonious human coexistence and in a process that is technically possible, economically viable and socioculturally acceptable.

Harmonious development

The proposal of harmonious development according to the author Miguel (2004) must have an impact on an equitable distribution of income and the eradication of poverty, the availability of public services and sustainable natural resources, as well as the adaptation of its legal and administrative norms in favor of security, social equity and human rights, in this way obtaining optimal levels of food, education, health, housing, environmental quality and the administration of justice in the population, gender equity and in favor of the most vulnerable groups.

Although sustainable regional development proposes the rational use of natural resources, respect for animal and plant life, it emphasizes technological development with responsibility for the well-being of all.

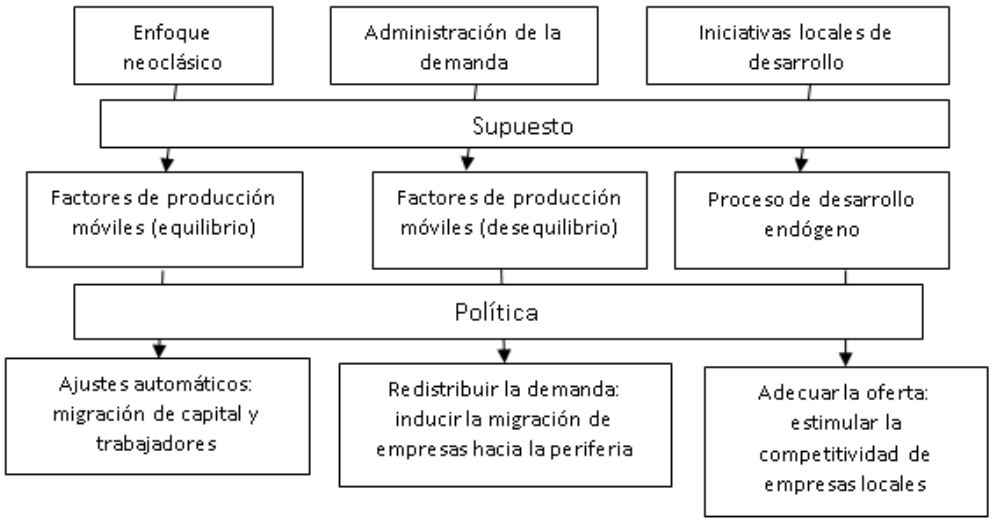
Sustainable development

Sustainable development requires certain key elements for its implementation. On the one hand, it implies recognizing diversity, where sustainability is understood as the balance between ecological and social diversity in the social, economic and environmental dimensions (Barkin, 1998). On the other hand, it includes the fight for social justice, human rights and cultural and environmental diversity, which highlights the importance of a social and economic change that promotes a pact for equitable distribution of wealth, together with political participation and democratic governance (Rivera et al., 2017). In this sense, sustainable development must be conceived as a new way of relating to the environment, which balances economic growth with the conservation of nature, integrating technological potential, culture and a society capable of satisfying the basic needs of humanity, while improving its quality of life (Gudynas, 2003).

Theory of local development initiatives

This theory mainly addresses the problem of collective action as a source of externalities and competitiveness. Its objective is to mobilize endogenous development factors by supporting the formation of industrial clusters and production chains. That is, to redirect demand towards more depressed regions in such a way as to promote a relocation of academic activity (Tamayo, 2000).

Figura 1. Modelos de política regional



Fuente: Retomado de Tamayo (2000).

In Latin America, territories do not have strong prior endogenous capacities or solid collaboration networks, and this is where public policy plays an important role in building an institutional framework for innovation, where actors connected to the local network and global innovation networks participate; that is, those actors who are strongly connected to the local network and, simultaneously, to global innovation networks (Galaso *et al*., 2023).

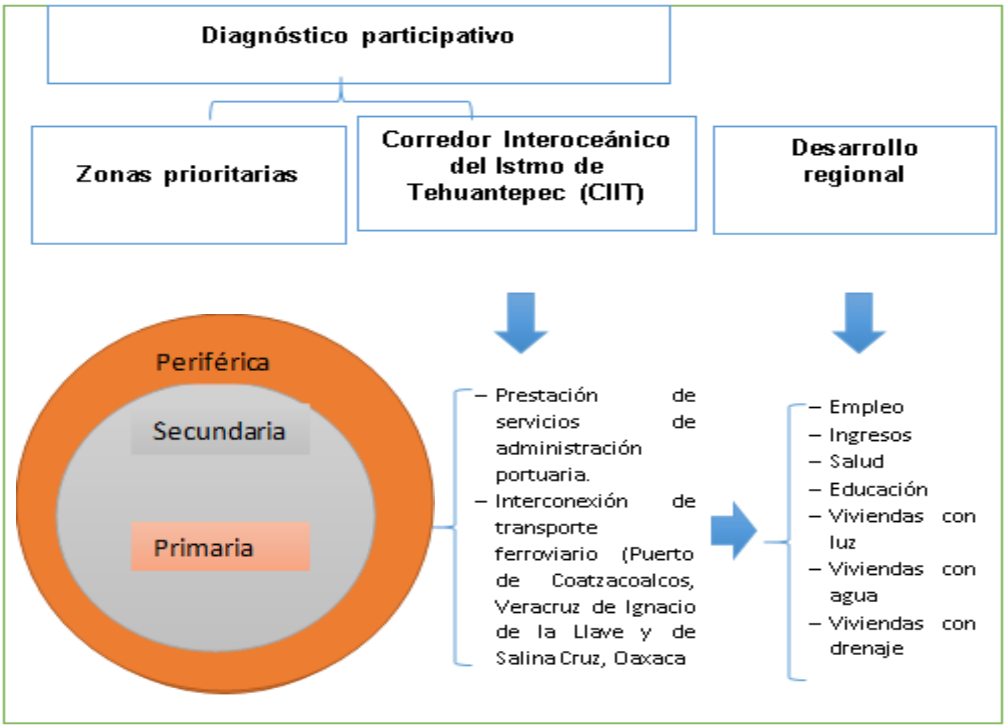
Regional development indicators

From a technical point of view, the measurement of development accepts as necessary conditions the greatest economic growth, the greatest well-being and the least or no marginalization of the region; that is, development implies the elimination of poverty through the creation of social well-being and economic wealth. Currently, development is measured or evaluated by the achievements or lack of satisfactions (material and non-material) that the regions, local communities or individuals residing in them possess.

To measure achievements, disposable income is taken into account, as well as the quantity (percentage) of natural resources and public services (water, drainage, paving, electricity, education, etc.) available in the areas analyzed; this approach uses quantitative indices of income, development, well-being and human development and, to a lesser extent, quality or standard of living. To measure deficiencies, the fundamental indicators are based on the lack of income, public services or scarce natural resources available in the areas and people analyzed , and, in this sense, the indices currently used are those of marginalization and poverty. From the perspective of achievements, the development index (DI) measures the process of improvement of the economic conditions and well-being of the population of the region.

For this study, the ID is integrated with the variables employment, income more than two salaries, health, education, homes with electricity, homes with water and homes with drainage in order to analyze the development index of the municipalities that comprise the primary, secondary and peripheral zones of the Mega Project of the Interoceanic Corridor of the Isthmus of Tehuantepec (CIIT).

Figura 2. Modelo teórico metodológico. Diagnóstico del índice de desarrollo de las zonas que comprenden el Corredor Interoceánico en el Istmo de Tehuantepec, Oaxaca, México hacia el desarrollo regional.



Fuente: Tomado y adaptado de Secretaría de Economía. (2023) y Miguel (2004).

Based on the theoretical review, it is hypothesized that the implementation of the interoceanic corridor megaproject will have a positive impact on the regional development of the primary, secondary and peripheral areas of the Isthmus of Tehuantepec region.

Methodology

The study was conducted in the Isthmus of Tehuantepec region, Oaxaca. The study areas were the primary, secondary and peripheral zones of the Corridor established by the Secretary of Economic Development. To determine the level of development, the main theoretical currents were reviewed, secondary information from the National Institute of Statistics and Geography (INEGI) was consulted and direct interviews were conducted.

To answer the hypothesis raised, the hypothetical-deductive scientific method is used. This method is based on a hypothesis formulated from the theoretical framework and allows to derive conclusions and make empirical predictions about the object of study (Hernández *et al*., 2010). The research design is mixed, first, books and articles were consulted in the main

search publishers; second, secondary information sources were analyzed INEGI, National Council for the Evaluation of Social Development Policy (CONEVAL), with a specialty in the subject of development indices at the municipal level and; third; direct interviews were applied to the general population.

Results

Primary zone

Municipalities with a high level of development

Salina Cruz

In the municipality of Salina Cruz, 84,437 people reside according to the 2020 Population and Housing Census conducted by the (INEGI, 2020). 75% of the total population has access to some type of medical care. Only 4.8% of people over 15 years of age do not have any level of education, and 4.59% of the population speaks an indigenous language. In addition, 96.60% of the inhabitants are employed, and more than 90% of homes have basic services, such as drinking water (90.93%), electricity (99.38%) and drainage (99.33%).

Santo Domingo Tehuantepec

This municipality has a population of 67,739 inhabitants. 98.10% of the residents are employed, and 22.81% receive more than two minimum wages. Nearly three-quarters of the population has access to medical services, while 65.06% of the inhabitants over 15 years of age have attained at least basic education. In terms of infrastructure, 98.50% of the homes have electricity, 94.57% have drinking water, and 98.14% have drainage.

San Pedro Huilotepec

With a population of 3,307 inhabitants, this municipality is small. 94.70% of its population is employed, and 19.22% earn more than two minimum wages. 83% of residents have access to health services. Regarding the 869 registered homes, 98.19% have electricity, 96.79% have access to drinking water and 96.19% have drainage.

Saint Mary Mixtequilla

This municipality has a population of 4,690 inhabitants, with a ratio of 94 men for every 100 women and 1,506 inhabited private dwellings. 98.9% of the population is employed, although only 20.90% receive more than two minimum wages. 85.80% of the inhabitants have access to health services, and 61.05% of people over 15 years of age have attained at least basic

education. In terms of infrastructure, 98.91% of the dwellings have electricity, 97.73% have drinking water and 97.52% have drainage.

Magdalena Tequisistlan

The total population of this municipality is 5,996 people, of which 98.80% are employed, although only 19.54% earn more than two minimum wages. 83.10% of residents have access to health care, and 57.45% of those over 15 years of age have completed basic education. Regarding the 1,887 registered homes, 96.63% have electricity, 96.11% have drinking water, and 97.09% have drainage.

Santa Maria Jalapa del Marquis

This municipality has a population of 11,735 inhabitants, of which 48.2% are men and 51.8% women. 97.90% of the population is employed, although only 20.89% earn more than two minimum wages. 75% of the inhabitants have access to health services, and 61.09% have studies. In terms of infrastructure, 97.46% of the homes have electricity, 96.90% have drinking water, and 97.50% have drainage.

Assumption Ixtaltepec

With a total population of 15,261 inhabitants, 49.5% are men and 50.5% are women. 98.60% of residents are employed, and 31.25% earn more than two minimum wages. 78.10% of the population has access to health services, and 58.11% has an education. In terms of infrastructure, 99% of homes have electricity, 97.60% have drinking water, and 98.69% have drainage.

Santo Domingo Chihuitan

This municipality has 1,618 inhabitants, of which 49% are men and 51% are women. The entire population is employed, although only 25.51% earn more than two minimum wages. 87% of the inhabitants have access to health services and 60.46% have attained some level of education. As for basic services, 98.48% of the homes have electricity, 98.67% have drinking water and 98.23% have drainage.

Santiago Laollaga

The total population of this municipality is 3,361 inhabitants, of which 48.5% are men and 51.5% are women. 99.20% of the population is employed, although only 21.38% earn more than two minimum wages. 81% of the inhabitants have access to health services, and 61.63% have received education. In terms of infrastructure, 99.46% of the homes have electricity, 95.28% have access to drinking water and 98.15% have drainage.

Saint Mary Xadani

This municipality has a population of 9,234 inhabitants, of which 49.9% are men and 50.6% are women. 97.70% of residents are employed, although only 21.38% earn more than two minimum wages. Access to health services is available to 84.30% of the population. Regarding education, 33.93% of the inhabitants have studies. Most homes (99.17%) have electricity, 94.05% have access to drinking water and 98.08% have drainage (INEGI, 2020).

Ixtepec City

This municipality has a total population of 28,082 inhabitants. 98.70% of the population is employed and 31.74% earn more than two minimum wages. 74.70% of the inhabitants have access to health services and 68.96% have some level of education. The homes that have electricity represent 99.30%, 98% of the homes have access to drinking water and 99.09% have drainage.

Magdalena Tlacotepec

In this municipality there are 1,297 people, of which 98% are employed. 34.24% of the population earns more than two minimum wages and 71.90% has access to health services. In addition, 57.03% of the inhabitants have some level of education. The homes have electricity service in 99.92%, 94.26% have drinking water and 96.51% have drainage.

Juchitan de Zaragoza

This municipality has a population of 113,570 inhabitants, of which 48.1% are men and 51.9% are women. 98.50% of the population is employed, and 34.10% earn more than two minimum wages. 57.50% have access to health services and 60.89% have studies. The homes with access to electricity represent 99.28%. 97.40% of the homes have drinking water and 99.35% have drainage.

The Espinal

El Espinal has a total population of 8,730 inhabitants. 97.80% of residents are employed and 53.27% earn more than two minimum wages. 79.90% have access to health services and 73.98% have access to education. 99.18% of homes have electricity, 98.06% have drinking water and 99.09% have drainage.

Hidalgo Union

This municipality has a population of 14,542 inhabitants. 98.10% of the population is employed, but only 26.62% earn more than two minimum wages. 59.30% have access to health services and 66.70% have some level of education. 99.39% of homes have electricity, 99.48% have drinking water and 99.36% have drainage.

Municipalities that comprise the primary zone with a medium level of development

San Blas Atempa

This municipality has a population of 19,696 inhabitants, which represents 0.5% of the state population. The gender ratio is 98 men for every 100 women. 98.70% of the population is employed, although only 15.51% earn more than two minimum wages. 78.70% have access to medical services and only 39.40% of the population over 15 years of age has completed basic education. There are 5,093 inhabited private homes, which represents 0.5% of the state total. Of these homes, 96.56% have electricity, 84.34% have drinking water, and 95.52% have drainage.

Saint Dionysius of the Sea

This municipality has a population of 5,180 inhabitants. 96.60% of the population is employed, but only 7.84% earn more than two minimum wages. 67.70% have access to health services and 43.90% have studies. 74.44% of homes have access to water, 92.32% have drainage and 95.61% have electricity.

Municipalities in the primary zone with a low level of development

Saint Matthew of the Sea

This municipality has a total population of 15,571 inhabitants, with a distribution of 50.0% men and 50.0% women. 89.70% of the population is employed, but only 9.94% earn more than two minimum wages. 84% of the inhabitants have access to health services and 43.95% have some level of education. 78.32% of the homes have drainage, 38.90% have access to drinking water and 85.79% have electricity.

Table 1 Development index of municipalities in the primary zone

	Municipalities	Employment	Income (more than two salaries)	Health %	Education %	Living with light %	Viv. with water %	Living with drainage %	Total	
1	Salina Cruz	96.60	32.94	75.50	71.99	99.38	90.93	99.33	2.52	
2	Santo Domingo Tehuantepec	98.10	22.81	74.10	65.06	98.50	94.57	98.14	1.15	
3	San Blas Atempa	98.70	15.51	78.70	39.40	96.56	84.34	95.52	-2.90	
4	San Pedro Huilotepec	94.70	19.22	83	54.38	98.19	96.79	96.19	-0.94	
5	Saint Mary Mixtequilla	98.20	20.90	85.80	61.05	98.91	97.73	97.52	2.26	
6	Magdalena Tequisistlan	98.80	19.54	83.10	57.45	96.63	96.11	97.09	0.84	
7	Santa Maria Jalapa del Marquis	97.90	20.89	75	61.09	97.46	96.90	97.50	0.34	
8	Assumption Ixtaltepec	98.60	31.25	78.10	58.11	99	97.60	98.69	2.51	
9	Santo Domingo Chihuitan	100	25.51	87	60.46	98.48	98.67	98.23	3.66	
10	Santiago Laollaga	99.20	21.38	81.00	61.63	99.46	95.28	98.15	2.36	

11	Saint Mary Xadani	97.70	21.38	84.30	33.93	99.17	94.05	98.08	-0.60	
12	Ixtepec City	98.70	31.74	74.70	68.96	99.30	98	99.09	3.38	
13	Magdalena Tlacotepec	98	34.24	71.90	57.03	99.92	94.26	96.51	1.30	
14	Juchitan de Zaragoza	98.50	34.10	57.50	60.89	99.28	97.40	99.35	0.75	
15	The Espinal	97.80	53.27	79.90	73.98	99.18	98.06	99.09	6.08	
16	Hidalgo Union	98.10	26.62	59.30	66.70	99.39	99.48	99.36	0.78	
17	Saint Matthew of the Sea	89.70	9.94	84	43.95	85.79	38.90	78.32	-16.37	
18	Saint Dionysius of the Sea	96.60	7.84	67.70	43.90	95.61	74.44	92.32	-7.10	
	Total	1755.90	449.08	1380.60	1039.96	1760.21	1643.51	1738.48		
	Average	97.55	24.95	76.70	57.78	97.79	91.31	96.58		
	Standard Deviation	0.02274216 09	0.10451591 43	0.08422029 936	0.1105 642598	0.032206 05482	0.14422516 77	0.0487 932559 9		

Source: Prepared by the authors using data from (INEGI, 2020)

Secondary zone

Municipalities with a high level of development

The neighborhood of Solitude

This municipality has a population of 13,474 inhabitants, with 48.3% men and 51.7% women. 98.50% of the population is employed and 25.47% earn more than two minimum wages. 80% have access to health services and 66.13% have access to education. 98.54% of homes have drainage, 97.75% have electricity and 90.78% have drinking water.

Assumption Ixtaltepec

This municipality has a population of 15,261 inhabitants, of which 98.60% are employed and 31.25% earn more than two minimum wages. 78.10% have access to health services and 58.11% have education. 98.69% of homes have drainage, 97.60% have access to drinking water and 99% have electricity.

Municipalities with medium level of development

Saint John Guichicovi

This municipality has a population of 29,802 inhabitants, with 46.8% men and 53.2% women. 99.10% of the population is employed, although only 7.65% earn more than two minimum wages. 79.70% have access to health services and 40.17% have access to education. 97.75% of homes have electricity, 96.12% have drainage and 90.78% have drinking water.

Matias Romero Avedano

The total population of this municipality is 38,183 inhabitants. 98.50% are employed and 20.38% earn more than two minimum wages. 66.40% have access to health services and 58.57% have access to education. 98.93% of homes have electricity, 87.43% have drinking water and 98.57% have drainage.

Municipalities with low level of development

Saint Mary Petapa

This municipality has a population of 16,706 inhabitants. 98.10% of the population is employed and 14.76% earns more than two minimum wages. 55.20% has access to health services and 54.95% has an education. Although almost all homes have access to basic services, only 88.15% have drinking water, 97.86% have drainage and 98.76% have electricity.

Santo Domingo Petapa

This municipality has a population of 9,027 inhabitants. 98.20% are employed, but only 14.20% earn more than two minimum wages. 72.80% have access to health services and 44.54% have access to education. 96.60% of homes have electricity, 97.96% have drinking water and 97.86% have drainage.

Saint Mary Chimalapa

This municipality has a population of 9,578 inhabitants, with an equal distribution of 50.0% men and 50.0% women. 98.50% of the population is employed, but only 3.99% earn more than two minimum wages. 56.50% have access to health services and 36.83% have education. 97.72% of homes have electricity, 95.94% have drainage and 80.33% have drinking water.

San Miguel Chimalapa

This municipality has a population of 6,711 inhabitants. 98.40% are employed and 9.71% earn more than two minimum wages. 71.60% have access to health services and 43.25% have education. 93.44% of homes have drainage, 80.20% have drinking water and 95.77% have electricity.

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Table 2 Development index of municipalities in the secondary zone.

Municipalities		Variables							Total	
		Employment	Income (more than two salaries)	Health	Education	Viv. light	Viv. with water	Viv. with drainage		
1	Saint John Guichicovi	99.10%	7.65%	79.70%	40.17%	97.75%	90.78%	96.12%	0.53	
2	The neighborhood of Solitude	98.50%	25.47%	80%	66.13%	99.40%	97.76%	98.54%	6.50	
3	Saint Mary Petapa	98.10%	14.76%	55.20%	54.95%	98.76%	88.15%	97.86%	-1.73	
4	Santo Domingo Petapa	98.20%	14.20%	72.80%	44.54%	96.60%	97.96%	97.86%	-1.03	
5	Saint Mary Chimalapa	98.50%	3.99%	56.50%	36.83%	97.72%	80.33%	95.94%	-6.07	
6	San Miguel Chimalapa	98.40%	9.71%	71.60%	43.25%	95.77%	80.02%	93.44%	-6.57	
7	Assumption Ixtaltepec	98.60%	31.25%	78.10%	58.11%	99%	97.60%	98.69%	6.25	
8	Matias Romero Avendano	98.50%	20.38%	66.40%	58.57%	98.93%	87.43%	98.57%	2.11	
	Total	787.90 %	127.41 %	560.30 %	402.55%	783.93 %	720.03 %	777.02 %		
	Average	98.49%	15.93%	70.04%	50.32%	97.99%	90.00%	97.13%		

	Standard Deviation	0.0029970223 32	0.0925579808 6	0.0988750112 9	0.1047810975	0.0128038428 9	0.0741700928 9	0.0183666429		

Source: Prepared by the authors using data from INEGI (2020)

It is worth mentioning that municipalities with a low level of development in the secondary zone present challenges to the implementation of CIIT in regional development. The challenges are mainly economic inequality, territorial and political problems. In light of this, social organization is necessary to link the project objectives for the benefit of all inhabitants of that region.

Peripheral zone

Municipalities in the peripheral area with a high level of development

San Pedro Comitancillo

This municipality has a population of 4,333 inhabitants, with a distribution of 47.7% men and 52.3% women. 97.40% of the population is employed, and 32.06% earn more than two minimum wages. 90.70% have access to health services and 74.43% have education. 99.19% of homes have electricity, 98.06% have water and 98.61% have drainage.

Municipalities in the peripheral area with a medium level of development

Chahuites

This municipality has a total population of 11,356 inhabitants, with a ratio of 96 men for every 100 women. 99.90% of the population is employed and 19.59% earn more than two minimum wages. 61.40% have access to health services and 48.81% have access to education. 98.05% of the homes have drainage, 76.33% have water and 99.44% have electricity.

Saint Francis Ixhuatan

This municipality has a population in which 98.60% is employed and 18.05% earns more than two minimum wages. 84.10% has access to health services and 50.82% has access to education. 95.13% of homes have water, 96.71% have drainage and 98.77% have electricity.

Pineda reform

This municipality has a population of 2,660 inhabitants, with a ratio of 93 men for every 100 women. 99% of the population is employed, although only 13.33% earn more than two

minimum wages. 83.20% have access to health services and 51.63% have access to education. 99.17% of homes have electricity, 98.07% have drainage and 99.43% have water.

Santiago Niltepec

This municipality has a population of 5,342 inhabitants, with a ratio of 95 men for every 100 women. 96.70% of the population is employed and 16.66% earns more than two minimum wages. 77.50% has access to health services and 49.63% receives education. 98.37% of homes have electricity, 96.54% have drinking water and 97.89% have drainage.

Santo Domingo Zanatepec

This municipality has a total population of 12,483 inhabitants, with a ratio of 97 men for every 100 women. 99% of the population is employed and 10.71% earns more than two minimum wages. 79.60% has access to health services and 50.89% has access to education. 87.50% of the homes have water, 96.06% have drainage and 99.18% have electricity.

Santo Domingo Sugar Mill

This municipality has 7,681 inhabitants, with a ratio of 96 men for every 100 women. 97.70% of the population is employed and 23.19% earn more than two minimum wages. 72.40% have access to health services and 55.36% have access to education. 99.53% of homes have electricity, 96.36% have water and 98.29% have drainage.

Santiago Ixcuintepec

This municipality has a population of 1,636 inhabitants, with a ratio of 90 men for every 100 women. 99.80% are employed, although only 4.49% earn more than two minimum wages. 89.80% have access to health services and 30.96% have access to education. 97.86% of homes have electricity, 100% have drinking water and 97.61% have drainage.

Nejapa de Madero

In this municipality, 99.20% of the inhabitants are employed, of which 11.63% earn more than two minimum wages. 74.20% have access to health services and 48.16% have access to education. 98.79% of the homes have drainage, 96.31% have water and 97.13% have electricity.

San Juan Cotzocon

This municipality has a population of 22,444 inhabitants, with a proportion of 48.3% men and 51.7% women. 99.30% of the population is employed, although only 11.58% earn more than two minimum wages. 77.40% have access to health services and 44.91% have access to education. 83.61% of homes have water, 98.62% have drainage and 97.86% have electricity.

San Lucas Camotlan

This municipality has a population of 3,187 inhabitants, with 99.60% employment. Only 8.09% of the population earns more than two minimum wages. 94% have access to health services and 38.17% have access to education. 91.87% of homes have electricity, 95.58% have water and 98.53% have drainage.

Municipalities in the peripheral area with low level of development

San Pedro Tapanatepec

This municipality has a population of 15,479 inhabitants, with 99.60% of the population employed and 17.01% of the people earning more than two minimum wages. 69.20% have access to health services and 47.04% have access to education. 98.45% of the homes have electricity and 96.35% have drainage, but only 10.89% of the homes have water.

San Francisco del Mar

This municipality has a total population of 8,710 inhabitants, with a ratio of 100 men for every 100 women. 98.90% are employed, although only 9.34% earn more than two minimum wages. 72.90% have access to health services and 45.39% have access to education. 94.32% of homes have drainage, 86.08% have water and 89.26% have electricity.

Saint Mary Chimalapa

This municipality has a population of 9,578 inhabitants, with 98.50% employed and only 3.99% earning more than two minimum wages. 56.50% have access to health services and 36.83% have access to education. 80.35% of homes have water, 95.44% have drainage and 97.92% have electricity.

San Miguel Chimalapa

This municipality has 6,711 inhabitants. 98.40% of the population is employed, and 9.71% has incomes above two minimum wages. 71.60% has access to health services and 43.25% has access to education. 95.77% of the homes have electricity, 80.02% have water and 93.44% have drainage.

San Juan Mazatlan

The population of this municipality is 19,032 inhabitants, with 99.40% of the population employed. Only 5.01% of the population earns more than two minimum wages. 71.70% have access to health services and 39.44% have access to education. 89.48% of the homes have water, 97.19% have drainage and 96.84% have electricity.

Santiago Lachiguirri

This municipality has a total population of 4,399 inhabitants. 99.40% are employed, but only 3.63% have incomes higher than two minimum wages. 82.70% have access to health services and 37.47% have access to education. 95.67% of homes have drainage, 99.24% have water and 95.33% have electricity.

Saint Mary Totolapilla

With a population of 812 inhabitants, this municipality has 95.30% employment and 8.51% earning more than two minimum wages. 89.90% have access to health services and 41.34% have access to education. 97.11% of homes have drinking water, 98.49% have electricity and 97.36% have drainage.

Santiago Yaveo

This municipality has 7,593 inhabitants, with a proportion of 49.9% men and 50.1% women. 99.20% are employed, and 5.88% have incomes above two minimum wages. 76.70% have access to health services and 40.84% have access to education. 55.18% of homes have water, 96.79% have drainage and 96.91% have electricity.

Table 3 Development index of municipalities in the peripheral area **.**

Municipalities		Variables							Total	
		Employment	Income (more than two salaries)	Health	Education	Live with light	Live with water	Living with drainage		
1	Chahuites	99.60%	19.59%	61.40%	48.81%	99.44%	76.33%	98.05%	1.51	
2	San Pedro Tapanatepec	99.60%	17.01%	69.20%	47.04%	98.45%	10.89%	96.35%	-2.84	
3	Saint Francis Ixhuatan	98.60%	18.05%	84.10%	50.82%	98.77%	95.13%	96.71%	2.69	
4	San Francisco del Mar	98.90%	9.34%	72.90%	45.39%	89.26%	86.08%	94.32%	-5.54	
5	Pineda reform	99%	13.33%	83.20%	51.63%	99.17%	99.43%	98.07%	3.66	
6	Santiago Niltepec	96.70%	16.66%	77.50%	49.63%	98.37%	96.54%	97.89%	0.77	
7	Santo Domingo Zanatepec	99.00%	10.71%	79.60%	50.89%	99.18%	87.50%	96.06%	0.96	
8	Saint Mary Chimalapa	98.50%	3.99%	56.50%	36.83%	97.92%	80.33%	95.94%	-5.13	
9	San Miguel	98. 40%	9.71%	71.60%	43.25%	95.77%	80.02%	93.44%	-4.72	

	Chimalapa									
10	Santo Domingo Sugar Mill	97.70%	23.19%	72.40%	55.36%	99.53%	96.36%	98.29%	3.31	
11	San Juan Mazatlan	99.40%	5.01%	71.70%	39.44%	96.84%	89.48%	97.19%	-1.53	
12	Santiago Ixcuintepec	99.80%	4.49%	89.80%	30.96%	97.86%	100%	97.61%	0.82	
13	Santiago Lachiguiri	99.40%	3.63%	82.70%	37.47%	95.33%	99.24%	95.67%	-1.94	
14	Nejapa de Madero	99.20%	11.63%	74.20%	48.16%	97.13%	96.31%	98.79%	1.89	
15	Saint Mary Totolapilla	95.30%	8.51%	89.90%	41.34%	98.49%	97.11%	97.36%	-1.46	
16	San Juan Cotzocon	99.30%	11.58%	77.40%	44.91%	97.86%	83.61%	98.62%	1.50	
17	San Lucas Camotlan	99.60%	8.09%	94%	38.17%	91.87%	95.58%	98.53%	0.50	
18	San Pedro Comitancillo	97.40%	32.06%	90.70%	74.43%	99.19%	98.06%	98.61%	8.33	
19	Santiago Yaveo	99.20%	5.88%	76.70%	40.84%	96.91%	55.18%	96.79%	-2.79	

	Total	1874.60%	232.46%	1475.50 %	875.37%	1847.34 %	1623.18 %	1844.29 %		
	Average	98.66%	12.23%	77.66%	46.07%	97.23%	85.43%	97.07%		
	Standard Deviation	0.0115624 4172	0.074089 4682	0.09873 720215	0.092685 10356	0.02665 16054	0.21196 3161	0.01492 539145		

Source: Prepared by the authors using data from INEGI (2020)

Discussion

The results showed the level of territorial development from a multidimensional perspective in relation to employment, income, health, education and housing with electricity, water and drainage in the Isthmus of Tehuantepec region, Oaxaca. These allowed us to identify territorial inequalities and existing gaps, although the importance of having basic services directly impacts the lives of those who live in a given territory and also the projects or initiatives that can be developed in this case the mega project of the interoceanic corridor (ciit). A similar example at the micro level was the Better Life Index initiative launched by the OECD in 2011 to measure well-being at the regional level and considered the dimensions of income and wealth, quality work and employment, housing, health, knowledge and skills, environmental quality, subjective well-being, security, work-life balance, social relations and civic commitment (Rodriguez y Vial, 2021). On the other hand, it is important to mention that the Regional Development Index for Latin America is a tool that measures development at the territorial level, from the approach of human and sustainable development that covers regions and countries such as Colombia in Latin America. The results of the study suggest that the implementation of projects such as CIIT can have a positive economic and social impact on the productive specialization of the regions involved. However, it is important to note that the analysis carried out does not cover the environmental and cultural axes (Cruz y Flores, 2022). (Cuganesan y Floris, 2020)

The impact of megaprojects on regional development, both in economic and social terms, is manifested at the federal level through the creation of a transportation network that favors interregional connectivity. This type of development is framed in a context where investments seek to benefit both the state at home and abroad (Kessel y Levy , 2022). In Mexico, regional development is planned in collaboration with federal government agencies and entities, which incorporate this approach in the definition and implementation of policies

and programs. An example of this is the Emerging and Sustainable Cities Program (PCES), a technical assistance initiative that provides direct support to the governments of intermediate cities in Latin America and the Caribbean with significant demographic and economic growth (BID, 2024). In Mexico, the PCES covers the states of Campeche, Coatzacoalcos, Hermosillo, La Paz, Lázaro Cárdenas, Salina Cruz, Tapachula and Xalapa, and is based on a comprehensive and interdisciplinary approach to identify, organize and prioritize urban interventions. This approach is based on three pillars: environmental sustainability and climate change, sustainable urban development, and fiscal sustainability and good governance.

Between 2016 and 2022, the state of Oaxaca experienced a reduction in poverty and extreme poverty levels, thanks to attention to five priority axes: well-being, economic development, state efficiency, security and environment, and the focus on women, girls, boys and indigenous peoples (Gobierno del Estado de Oaxaca, 2022).

Among the advances of the study is the diagnosis of the level of development of the municipalities that comprise the primary, secondary and peripheral areas of the Mega Project of the Interoceanic Corridor of the Isthmus of Tehuantepec (CIIT), however; the study only focused on the analysis of employment, income, health, education and housing with electricity, water and drainage, so it is important to expand the study and include the analysis of the cultural and environmental dimension of the region, which would allow a study with greater visibility of the area for later studies.

Conclusion

The study allowed to analyze the development index of the municipalities that make up the primary, secondary and peripheral zones of the Mega Project of the Interoceanic Corridor of the Isthmus of Tehuantepec (CIIT). According to the statistical analysis, in the primary zone, which includes the Interoceanic Corridor, 18 municipalities were identified: 15 with a high level of development, two with a medium level and one with a low level. In the secondary zone, out of a total of eight municipalities, two have a high level, two a medium level and four a low level. In the peripheral zone, of the 19 municipalities analyzed, one has a high level, 10 have a medium level and eight a low level. These results show that the primary zone houses the largest number of municipalities with a high level of development, while the peripheral zone has the lowest number of municipalities with this level, with the above the objective set for this research is met. Although; The implementation of megaprojects requires

a thorough assessment of infrastructure, housing and income conditions for decision-making. In this sense, regional development is manifested mainly through projects and programs included in departmental and municipal development plans. In the case of CIIT, the selection of the primary, secondary and peripheral zones was based on productive specialization and exchange facilities (production, information, resources) in each territory. The high level of development observed in the municipalities of the primary, secondary and peripheral zones of the Isthmus of Tehuantepec suggests that CIIT will have a positive impact on regional development by providing favorable conditions for production and trade activities. This conclusion validates the study's hypothesis, which maintains that the implementation of the megaproject will generate significant benefits in terms of employment, generation of economic resources, improved access to housing with basic services, and revitalization of marginalized neighborhoods. In addition, the project will contribute to inclusive and sustainable urbanization.

It is crucial that the partnerships between governments, the private sector and civil society involved in the project promote inclusion and efficient use of resources to minimize the impact of climate change and increase resilience to natural disasters. Although the study provided a descriptive diagnosis of the development index addressing the social and economic axes, it is recommended to carry out an additional analysis of the environmental and cultural axes. Therefore, the study suggests the following lines of research to address these aspects.

Future lines of research

Future lines of research should focus on two key aspects: environmental and cultural diagnosis. These studies will allow us to characterize the biocultural potential present in the region of the Interoceanic Corridor of the Isthmus of Tehuantepec (CIIT) and to seek strategies to optimize the use of resources that have been underutilized, especially in the communities affected by the projects.

The environmental diagnosis should assess how megaprojects impact local ecosystems and what measures can be implemented to mitigate negative effects. On the other hand, the cultural analysis should identify and value the cultural resources and traditional practices of local communities, promoting their recovery and reuse.

Both approaches must integrate the perspective of local communities, ensuring that projects respond to their needs and contribute to balanced development. In this way, strategies can be

designed that respect and enhance biocultural heritage, ensuring sustainable and equitable benefits for the populations involved.

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