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RESEARCH ARTICLE

THE SITUATION OF ENVIRONMENTAL MANAGEMENT OF ENCARNACIÓN MUNICIPALITY FROM THE PERSPECTIVE ON URBAN ECOSYSTEM.

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Abstract

Within the framework of the investigation environmental management analysis that allows to strengthen political-administrative decentralization in the municipality of Encarnación, the next question is posted: are municipal strategies adequate to environmental theories?

In this regard, the specific objective is to evaluate the situation of environmental management of Encarnación Municipality from the perspective on urban ecosystem. The investigation was developed in the analytical and propositive phases with documentation review of primary and secondary sources; the indicators of the urban ecosystem and the strategic axes of the sustainable development plan were used and a relation between both was established with a numerical assessment based on the Encarnación municipality diagnosis.

The results indicate that strategies are appropriate, but an average of 2.14 in an evaluation from 1 to 5 was found, which points out that there is much to be done in terms of management. Executed actions in the municipality are carried out in a framework of political-administrative decentralization with its own management, which is a strength. Main proposals for strengthening are: the adoption by ordinance of the Plan of Sustainable Development and a later implementation of it.

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Introduction:-

After more than two decades of the constitutional reform that introduced the political-administrative decentralization of the state, the process was limited in its progress, due to the convergence of causes of diverse nature (political, social, institutional, and cultural). This situation had a negative influence on territory management, in particular in the conservation of the environment and natural resources, before the physical transformation of Encarnación city. Up until 2015, Encarnación Municipality did not have a regulatory plan, Strategic plan nor a sustainable development plan. That year an international call was made and the awarded company Urban Ecosystem elaborated the Plan of Sustainable Development, the document is not yet approved but it was declared of municipal interest, it summarizes main opportunities and threats. The present investigation is made in this context.

In the theoretical framework, the objectives of sustainable development (UNESCO, 2015) and 2030 agenda of the economic commission for America and the Caribbean are reviewed (CEPAL, 2016) consultation on urban ecosystem was made in (Dimuro, 2008) y (Figueroa, 2006), about sustainable city (Herrera Calvo, 2008), environmental management (Gómez Orea & Gómez, 2013) and the sustainable development plan of Encarnación (Urbano, 2016) among others.

Methodology framework:-

Research approach

Investigation was conducted in the analytical phase during which literature was reviewed to obtain information from secondary sources (books, technical work documents and printed and online scientific articles, which were compiled and systematized in order to build a theoretical and conceptual framework, as well as for the situational diagnosis of environmental management in its strategic axis of Encarnación Municipality.

Chart 1:-Thesis variables and indicators

Variables	Indicators	Data recollection instruments
Environmental management situation	Estrategias del Plan de Desarrollo Sustentable Use of Urban Ecosystem principles. Strategies of the Sustainable Development Plan.	Documentary Analysis In situ observation

Board 1:-Line of actions based on 12 strategies done on base of information taken from the Sustainable Development Plan.

Strategies and actions of the Sustainable Development Plan
Description – reach
Ecological District: with responsive actions according to the environmental challenges of the district's biome.
Connected and integrated city: For creating a more inclusive and equitable city, it encourages urban balance and accessibility.
Compact and complex city: it defines the boundaries between urban, rural and natural domains and establishes scenarios of urban densification
New Landscaping center: Establishes the urban and environmental criteria which define the territory of opportunity in recovered zones
Fluvial City: It enhances and redefines nexus between the city and the river and discover the identity of the new river banks
Active rural environment: Identifies appropriate actions for the protection and sustainable exploitation of the district's rural environment.
Resilient and safe city: In response to challenges of climate change and creating public spaces for coexistence and social interaction
Productive city: It defines areas suitable for industrial development and enhances sustainable development of a sector of the economy.
City of commerce: It enhances and integrates a fundamental sector for local economy, creating new mixed-use environments that promote commercial development.
City of innovation and knowledge: It improves infrastructure that serve academic centers and foster public-private collaborative spaces for innovation and knowledge.
City of culture, Sport and tourism: It favors a more sustainable and integrated tourism in the city and creates new stimulating areas for leisure time and tourists.
Open and social urban government: Creates a transparent, participatory urban government with a goal plan that fosters social justice.

Board 2:-Definition, description and scope of the eco-systemic principles based on concepts of (Dimuro, 2008) (Figueroa, 2006)

Eco-systemic principles – definition – description – scope
Interdependence
It is a set of reciprocal relationships that are established between different elements, entities o variables, such as people, companies, organizations, nations, economic factors, interest groups, in a society. It can be positive or negative.
Dynamic Order
The city is an expression of dynamic nexus between ecosystem and the culture which builds it, there are conditions characteristic of the dynamism that generate cultural exchange and technologic adaption processes, and serve to

recognize that relation of conflict on the search for new dynamic balance.
Self-regulated balance
It is man who begins to regulate population balance of the new artificial systems, is trying to maintain a balanced relationship between nature and built space, and generating the least environmental impact and where infrastructure and activities efficiently use available resources.
Greater diversity greater stability
Diversity includes social, cultural, landscape and economic aspects. This principle, applied to the city, establishes that the greater the heterogeneity (of functions, cultures, building typologies and others) and the plurality (of ideas, religions, political and social organizations), the more stable an urban ecosystem will be.
Constant flux of information, matter and energy
The city is an ecological and social system, open and highly probabilistic, is a system of material (raw materials, manufactures and waste) and energy flows, governed by information and a set of socio-economic values.
Permanent recycling
On cities, this principle is breached, because waste is not reabsorbed. Pollution affects all environmental components (air, water, soil) by emissions of solid particles, gases, nuisance noises, solid waste, domestic and industrial effluents, etc.

Relation of strategic axes of the Sustainable Development Plan and urban ecosystem components

An analysis of strategic axes of the Plan of Sustainable Development of the municipality of Encarnación and the components of the urban ecosystem is carried out. For it, data of the diagnosis of the Plan of Sustainable Development of the municipality of Encarnación is considered, identifies strategies that correspond to each component of the urban ecosystem and is valued numerically to make a crossing and obtain averages.

Numerical valuation is established with the following scale:

1. 1 to 1.9: Little development
2. 2 to 2.9: Average development
3. 3 to 3.9: High development
4. 4 to 4.9: Very high development

The following describes the indicators used in strategic axes of the Plan of Sustainable Development and the urban ecosystem components, valuations were given according to diagnosis of Encarnación municipality of the Plan of Sustainable Development, and specifies averages of the summation:

Ecologic district

In the analysis of Interdependence component of the urban ecosystem economic indicators such as industry, commerce, services, primary, secondary and tertiary sectors, GDP, per capita income, UBN, housing, infrastructure, education, livelihood capacity, life expectancy, literacy, school years average, human development index were considered. The average of the sum of all these indicators is 2.75. Considering the strategic axis Ecologic district with the following indicators which are reforestation, primary ecologic corridors with natural connection, maintenance and growth of biodiversity, wetlands protection, define areas not suitable for cultivation; the sum of valuations yields an average of 1.8. The following indicators were considered in the analysis of Dynamic order component of the urban ecosystem: infrastructure and mobility, tourism and average is 2.2; of the self-regulated balance component of the urban ecosystem, the following indicators were considered: transport and safety, result of the average of evaluations is 2; the following indicators were considered in Greater diversity greater stability component of the urban ecosystem: level of youth population (15 to 29 years old), amount of universities, population level below the poverty line, population level below extreme poverty line, urban, suburban and rural density, economically active population level, level of unemployed population, population growth rate of the period 2002-2012, result of the average of evaluations is 3.14; the following indicators were considered in the Constant flux of information, matter and energy component of the urban ecosystem: connection to the electric grid (housing and services) industries, hotels, sanatoriums, big businesses and supermarkets (they count on their own transformers), installed potency, transformers, gas, electricity, firewood, carbon, cooking fuels, whose average of valuations of

analysis is 3; the following indicators were considered in Permanent recycling component of the urban ecosystem: waste, with the sum of valuations an average of 1 is obtained.

Connected and integrated city

In the analysis of Interdependence component of the urban ecosystem economic indicators such as industry, commerce, services, primary, secondary and tertiary sectors, GDP, per capita income, UBN, housing, infrastructure, education, livelihood capacity, life expectancy, literacy, school years average, human development index were considered. The average of the sum of all these indicators is 2.75. Considering the strategic axis Connected and integrated city with the following indicators which are inclusion, equity, accessibility, with the sum of valuations and average of 1.5 is obtained.

The others components of the urban ecosystem have the same above-described average.

Compact and complex city

In the analysis of Interdependence component, the average of the sum of valuations of indicators is 2.75, considering the strategic axis compact and complex city the next indicators were considered: definition of boundaries between the urban, rural and natural, compactness, environmental resources protection, use of public resources and basic services, completion and compacting of urban fabric, resilient and solid city, limit the growth of urban footprint; the average of the sum of valuations is 1.87.

New landscaping center

In the analysis of Interdependence component, the average of the sum of valuations of indicators is 2.75, in relation to the strategic axis new landscaping center the next indicators were considered: urban and environmental criteria on recuperated zone, public spaces and pedestrian paths network, mix of uses, incorporation and empowerment of citizen activities, sports and leisure use, social integration and inclusion, safe places and a quality public space, in which the average of the sum of the assessments is 2.14.

Fluvial city

In the analysis of Interdependence component, the average of the sum of valuations of indicators is 2.75, in relation to the strategic axis fluvial city the next indicators were considered: city-river relation; new uses for leisure, tourism, sport, navigation, etc.; own character by sectors; connected to green corridors network and with tourist routes; landscape intervention to improve water quality; beaches, touristic ports, real estate development; public equipment location, on which the average of the sum of valuations is 2.57.

Resilient and safe city

In the analysis of Interdependence component, the average of the sum of valuations of indicators is 2.75, in relation to the strategic axis resilient and safe city the next indicators were considered: public spaces for social interaction, natural absorption areas, integrated rain water management and public safety, in which with the sum of the valuations, an average of 2.25 is obtained.

Productive City

In the analysis of Interdependence component, average of the sum of the valuations is 2.75, in relation to the strategic axis Productive city, the following indicators were considered: industrial development with territorial harmonic development, new job positions, efficient road system and adequate infrastructure connected to residential areas; in which with the sum of the valuations, an average of 1 is obtained.

City of Commerce

In the analysis of Interdependence component, average of the sum of the valuations is 2.75, in relation to the strategic axis City of commerce, the following indicators were considered: It enhances and integrates a fundamental sector for local economy, creating new mixed-use environments that promote commercial development, in which with the sum of the valuations, an average of 2 is obtained.

City of innovation and knowledge

In the analysis of Interdependence component, average of the sum of the valuations is 2.75, in relation to the strategic axis City of innovation and knowledge, the following indicators were considered: It improves infrastructure

that serve academic centers and foster public-private collaborative spaces for innovation and knowledge, in which with the sum of the valuations, an average of 1.9 is obtained.

City of culture, Sport and tourism:

In the analysis of Interdependence component, average of the sum of the valuations is 2.75, in relation to the strategic axis City of culture, Sport and tourism, the following indicators were considered: A more sustainable and integrated tourism, sports encounters and cultural acts, Misiones joint history, enhance value of tangible and intangible heritage, in which with the sum of the valuations, an average of 1.75 is obtained.

Interdependence and Open and social urban government

In the analysis of Interdependence component, average of the sum of the valuations is 2.75, in relation to the strategic axis Open and social government, the following indicators were considered: transparent, participative urban government, encouragement of social justice, participation, transparency, social follow up, control and monitoring mechanisms capable of supervise progress, citizen initiative, skills development and creation of the innovation and thought space, in which with the sum of the valuations, an average of 1.7 is obtained.

Results and discussion:-

In order to evaluate the environmental management situation of the municipality of Encarnación from the urban ecosystem perspective, an analysis of the Sustainable Development Plan of the municipality of Encarnación and urban ecosystem components were made, the Encarnación Municipality diagnosis was considered, indicators that corresponded to each component of the urban ecosystem and to each strategic axis were identified. A crossing carried out to evaluate how the environmental management in the municipality of Encarnación based on these valuations was made, and resulting values reflect strengths and weaknesses by strategic axis. The following table shows a synthesis of this relation.

Board 3:-Synthesis of the strategic axes relation of the Sustainable Development Plan and the urban ecosystem components.

URBAN ECOSYSTEM COMPONENTS	Strategic Axes Of The Sustainable Development Plan Of Encarnacion											
	Ecological District	Connected and integrated city	Compact and complex city	New Landscaping center	Fluvial City	Active rural environment	Resilient and safe city	Productive city	City of commerce	City of innovation and knowledge	City of culture, Sport and tourism	Open and social urban government
Interdependence	2.27	2.12	2.31	2.44	2.66	2.37	2.5	1.87	2.37	2.23	2.25	2.22
Dynamic Order	2	1.85	2.00	2.17	2.38	2.15	2.22	1.6	2.1	2.05	1.9	1.95
Self-regulated balance	1.9	1.7	1.9	2.07	2.28	2	2.12	1.5	2	1.95	1.97	1.85
Greater diversity greater stability	2.47	2.32	2.50	2.64	2.85	2.57	2.7	2.1	2.57	2.52	2.44	2.42
Constant flux of information	2.4	2.25	2.43	2.57	2.78	2.5	2.68	2	2.5	2.45	2.37	2.35

on, matter and energy												
Permane nt recycling	1.4	1.25	1.43	1.57	1.2 8	1.5	1.62	1	1.5	1.45	1.37	1.35
MEAN	2,07	1,91	2,09	2,24	2,3 7	2,18	2,31	2,17	2,17	2,11	2,05	2,02
TOTAL	12.44	11.49	12.5 7	13.046	14. 23	13,09	13,8 4	13,04	13,04	12,65	12,3	12,14
TOTAL AVERA GE												

Source: Self-elaborated board based on the description of the situational assessment of environmental management grounded on strategies, lines of action and the diagnosis of the municipality of Encarnación extracted from the Plan of Sustainable Development and the analysis of the components of the urban ecosystem with numerical valuation.

In the results of the chart the relation between the diagnosis of strategic axes from the Plan of Sustainable Development of Encarnación municipality and the urban ecosystem, the sum of the numerals of the indicators considered and analyzed is visualized with the following results:

1. Interdependence and Ecologic District: Average of both valuations is 2.27, so this result shows that there is an average development.
2. Dynamic Order and Ecologic district: Average of both valuations is 2, so this result shows that there is an average development.
3. Self-regulated balance and Ecologic district: Average of both valuations is 1.9, so this result shows that there is little development.
4. Greater diversity greater stability and Ecologic district: Average of both valuations is 2.47, so this result shows that there is little development.
5. Constant flux of information, matter and energy and Ecologic district: Sum of both averages is 2.4, so this result shows that there is little development.
6. Permanent recycling and Ecologic district: Sum of both averages is 1.4, so this result shows that there is little development.
7. Interdependence and Connected and integrated city: Average of both valuations is 2.12, so this result shows that there is an average development.
8. Dynamic Order and Connected and integrated city: Average of both valuations is 1.85, so this result shows that there is little development.
9. Self-regulated balance and Connected and integrated city: Average of both valuations is 1.7, so this result shows that there is little development.
10. Greater diversity greater stability and Connected and integrated city: Average of both valuations is 2.32, so this result shows that there is little development.
11. Constant flux of information, matter and energy with Connected and integrated city: Average of both valuations is 2.25, so this result shows that there is little development.
12. Permanent recycling and Connected and integrated city: Average of both valuations is 1.25, so this result shows that there is little development.

According to (Verdaguer, 2014) in order to be sustainable, urban and territorial development must be planned with tools of holistic focus among them the Multi-scale: Connectivity between scales (from the building to the street and public space up to suburban and rural soil; also from eco-architecture and eco- neighborhood to bioregions) must be considered in its double meaning, that is to say does this statement match with results of the axis connected and integrated city in the sense on which little development should be work out by improving sustainable environmental management on this axis.

Interdependence with Compact and complex city:

1. Average of both valuations is 2.31, so this result shows that there is an average development.
2. Dynamic Order with Compact and complex city: Average of both valuations is 2.00, so this result shows that there is an average development.
3. Self-regulated balance with Compact and complex city: Average of both valuations is 1.9, so this result shows that there is little development.
4. Greater diversity greater stability with Compact and complex city: Average of both valuations is 2.50, so this result shows that there is little development.
5. Constant flux of information, matter and energy with Compact and complex city: Sum of both averages is 2.43, so this result shows that there is little development.
6. Permanent recycling with Compact and complex city: Sum of both averages is 1.43, so this result shows that there is little development.
7. Interdependence and New Landscaping center: Average of both valuations is 2.44, so this result shows that there is an average development.
8. Dynamic Order and New Landscaping center: Average of both valuations is 2.17, so this result shows that there is an average development.
9. Self-regulated balance and New Landscaping center: Average of both valuations is 2.07, so this result shows that there is little development.
10. Greater diversity greater stability and New Landscaping center: Average of both valuations is 2.64, so this result shows that there is little development.
11. Constant flux of information, matter and energy and New Landscaping center: Sum of both averages is 2.57, so this result shows that there is little development.
12. Permanent recycling and New Landscaping center: Sum of both averages is 1.57, so this result shows that there is little development

Interdependence and Fluvial City:

Average of both valuations is 2.66, so this result shows that there is an average development.

Dynamic Order and Fluvial City:

Average of both valuations is 2.38, so this result shows that there is an average development.

Self-regulated balance and Fluvial City:

Average of both valuations is 2.28, so this result shows that there is little development.

Greater diversity greater stability and Fluvial City:

Average of both valuations is 2.85, so this result shows that there is little development.

Constant flux of information, matter and energy and Fluvial City:

Sum of both averages is 2.78, so this result shows that there is little development.

Permanent recycling and Fluvial City:

Sum of both averages is 1.28, so this result shows that there is little development

Considering the Fluvial city axis, it had the best average because of its strengths but could be higher, in a similar situation the investigation of (Peña, 2012) concludes in one of the points that "Mixed management is given by allowing the government to grant the land, since city halls do not have financial capacity to cover this type of projects, therefore it is done in this way where the investors are in charge of providing the city in certain marked areas, of squares, lightning of zones, conditioning of the river to allow entry of cruises, among others, so that citizens and investor alike can benefit and an investor can develop his project.

1. Interdependence and Active rural environment: Average of both valuations is 2.37, so this result shows that there is an average development.
2. Dynamic Order and Active rural environment: Average of both valuations is 2.15, so this result shows that there is an average development.
3. Self-regulated balance and Active rural environment: Average of both valuations is 2, so this result shows that there is an average development.

4. Greater diversity greater stability and Active rural environment: Average of both valuations is 2.57, so this result shows that there is an average development.
5. Constant flux of information, matter and energy and Active rural environment: Sum of both averages is 2.5, so this result shows that there is an average development.
6. Permanent recycling and Active rural environment: Sum of both averages is 1.5, so this result shows that there is little development.
7. Interdependence and Resilient and safe city: Average of both valuations is 2.5, so this result shows that there is an average development.
8. Dynamic Order and Resilient and safe city: Average of both valuations is 2.22 so this result shows that there is an average development.
9. Self-regulated balance and Resilient and safe city: Average of both valuations is 2.12, so this result shows that there is an average development.
10. Greater diversity greater stability and Resilient and safe city: Average of both valuations is 2.7, so this result shows that there is an average development.
11. Constant flux of information, matter and energy and Resilient and safe city: Sum of both averages is 2.68, so this result shows that there is an average development.
12. Permanent recycling and Resilient and safe city: Sum of both averages is 1.62, so this result shows that there is little development
13. Interdependence and Productive city: Average of both valuations is 1.87, so this result shows that there is little development.
14. Dynamic Order and Productive city: Average of both valuations is 1.6, so this result shows that there is little development.
15. Self-regulated balance and Productive city: Average of both valuations is 1.5, so this result shows that there is little development.
16. Greater diversity greater stability and Productive city: Average of both valuations is 2.1, so this result shows that there is an average development.
17. Constant flux of information, matter and energy and Productive city: Sum of both averages is 2, so this result shows that there is an average development.
18. Permanent recycling and Productive city: Sum of both averages is 1, so this result shows that there is little development
19. Interdependence and City of commerce: Average of both valuations is 2.37, so this result shows that there is an average development.
20. Dynamic Order and City of commerce: Average of both valuations is 2.1, so this result shows that there is an average development.
21. Self-regulated balance and City of commerce: Average of both valuations is 2, so this result shows that there is an average development.
22. Greater diversity greater stability and City of commerce: Average of both valuations is 2.57, so this result shows that there is an average development.
23. Constant flux of information, matter and energy and City of commerce: Sum of both averages is 2.5, so this result shows that there is an average development.
24. Permanent recycling and City of commerce: Sum of both averages is 1.5, so this result shows that there is little development
25. Interdependence with City of innovation and knowledge: Average of both valuations is 2.23, so this result shows that there is an average development.
26. Dynamic Order with City of innovation and knowledge: Average of both valuations is 2.05, so this result shows that there is an average development.
27. Self-regulated balance with City of innovation and knowledge: Average of both valuations is 1.95, so this result shows that there is little development.
28. Greater diversity greater stability with City of innovation and knowledge: Average of both valuations is 2.52, so this result shows that there is an average development.
29. Constant flux of information, matter with City of innovation and knowledge: Sum of both averages is 2.45, so this result shows that there is an average development.
30. Permanent recycling with City of innovation and knowledge: Sum of both averages is 1.45, so this result shows that there is little development
31. Interdependence and City of culture, sport and tourism: Average of both valuations is 2.25, so this result shows that there is an average development.

32. Dynamic Order and City of culture, sport and tourism: Average of both valuations is 1.9, so this result shows that there is little development.
33. Self-regulated balance and City of culture, sport and tourism: Average of both valuations is 1.97, so this result shows that there is an average development.
34. Greater diversity greater stability and City of culture, sport and tourism: Average of both valuations is 2.44, so this result shows that there is an average development.
35. Constant flux of information, matter and energy and City of culture, sport and tourism: Sum of both averages is 2.37, so this result shows that there is an average development.
36. Permanent recycling and City of culture, sport and tourism: Sum of both averages is 1.37, so this result shows that there is little development
37. Interdependence with Open and social urban government: Average of both valuations is 2.22, so this result shows that there is an average development.
38. Dynamic Order with Open and social urban government: Average of both valuations is 1.95, so this result shows that there is an average development.
39. Self-regulated balance with Open and social urban government: Average of both valuations is 1.85, so this result shows that there is little development.
40. Greater diversity greater stability with Open and social urban government: Average of both valuations is 2.42, so this result shows that there is an average development.
41. Constant flux of information, matter and energy with Open and social urban government: Sum of both averages is 2.35, so this result shows that there is an average development.
42. Permanent recycling with Open and social urban government: Sum of both averages is 1.35, so this result shows that there is little development

According to (Posada, 2014) collective environmental management response is in the process of territorial environmental management. "The process, as a systemic process, is understood from the contemporary concerns that arise with respect to the concrete ways of linking the population efficiently and with continuity to its causes, problems and common solutions"; comparing to the open and transparent urban government axis that threw a low index and a certain parallelism is displayed, because of this point which requires inclusion, participation, citizen initiative, control mechanisms that have also received less attention in the municipality.

Conclusions:-

From the urban ecosystem approach the city's environmental management was evaluated, with the analysis board and ratio of averages of the considered indicators between the strategic axes of the Sustainable Development Plan and urban ecosystem components, a valuation of 1 to 5 was taken into account and obtained results yield a general average of 2.14, which indicates in general terms that environmental should be improved.

The highest average is that of fluvial city due to its very positive relation with the river, for all the investments made to achieve this connection that strengthened economic development. The highest average that follows it is resilient and safe city which analyzes public spaces for social interaction, areas of natural absorption, integrated rain water management and public safety, now what it refers to public spaces has a high result because of city investments on that regard, but ambient area and security must be strengthen.

The lowest average is that of Connected and integrated city, which reflects the centrality of infrastructure and construction services on urban center, this aspect should be improved, inclusion in terms of infrastructure and accessibility to services are found very centralized; on the other hand population mobility that occurred did not improve social cohesion.

The lowest average that follows is open urban government and this result is understandable because indicators are encouragement of social justice, participation, transparency, social follow up, control and monitoring mechanisms capable of supervise progress, citizen initiative, skills development and creation of the innovation and thought space; so in this regard the municipality should focus on strengthening.

Is important to note that the majority of actions performed on the municipality are carried out in a framework of political-administrative decentralization with its own management.

Main proposals for strengthening are: the adoption by ordinance of the Plan of Sustainable Development and a later implementation of it.

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