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ROLE AND ISSUES OF METRO RAIL PROJECTS IN INDIA

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ABSTRACT

Urbanization is a global activity, India is urbanizing rapidly in recent decades and the number of metropolitan cities has significantly increased from 35 Metropolitan cities in 2001 to 53 metropolitan cities in India in 2011. Those metropolitan cities are growing rapidly that cities are facing many problems, in that the major problem is traffic/congestion on roads therefore the metropolitan cities people need and demanding the good sustainable urban transport. Therefore, the government decide to adopt Metro system in metropolitan cities to solve traffic problems. Metro is a new rapid transit system for urban regions. In this article analyse the status, role and issues of metro rail projects in India based on secondary data. The first mass rapid transport system in India was Kolkata metro was stared in 1984 and now nine more cities have operational metro systems and five more cities metro is under construction stage and fifteen more cities are aproved stage by Government of India. The findings of this study will be of immense beneficial for urban related and urban public transport related studies in metropolitan cities as well as for the urban planners in India.

Keywords: Congestion, Metro, Rapid Transit, Transportation, Urbanization.

INTRODUCTION

The recent trends of urbanization in developing countries point towards alarming growth of megacities and other metropolitan areas and this true in the Indian context as well. Urban development wants to good sustainable transport. We need good public transport for four reasons that is, to control congestion on roads, to minimize energy consumption, to ensure health environment and to improve safety for all. In recent years increasing the private owned vehicles use, diminished the public transport therefore its negative effect on transport system, and create some problems. The people likes private owned vehicles to use because it's easy, starts from door step and it's faster, but it's creating some problems that is increased private vehicles have resulted in increased the accidents, traffic jams, parking difficulties, noise pollution, air pollution

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or emissions and inequity in society. The increased private vehicle ownership is had some costs that is health costs for self and others, environmental costs, fuel and insurance costs, maintenance costs, congestion costs etc., therefore we use public transport and control the our expensive and contribute to city's sustainable development. India is urbanizing very rapidly for the last two three decades. In generally, Urbanization is the increase in the proportion of people of living in towns and cities and the inflow of rural people to urban areas for non-agricultural sectors.

Table 1: Growth of Metropolises in India: 1951-2011

Census Years	Number of Metropolises	Population of Metropolises (in Millions)	Decadal Increase	Population of Metropolises as % of India's Total Population	Population of Metropolises as % of India's Urban Population
1951	5	11.8	21.3	3.3	18.8
1961	7	18.1	54	4.1	22.9
1971	9	27.8	53.8	5.1	25.5
1981	12	42.1	51.3	6.2	26.4
1991	23	70.7	67.8	8.4	32.5
2001	35	107.8	52.8	10.5	37.9
2011	52	159.6	48.9	13.2	42.3

Source: Computed from Census of India 1991, Part-II A, Towns and Urban Agglomerations classified by population in 1991 with Variation since 1951 and Census of India 2011.

According to the Census of India, the population growing rapidly in recent decades that shows 36.11 crore population in 1951 it increased 121.02 crore in 2011, and 17.6 per cent decadal growth rate of population in India for the 2001 to 2011 decade. In addition, urban population in 1951 was 6.24 crore it increased 37.71 crore in 2011. In 1951 urban population, 17.3 percent of total population in India and it was increased 31.16 percent in 2011. The number of towns and cities has significantly increased from 5161 towns/cities in 2001 to 7935 towns/cities and this includes 52 metropolitan cities in India in 2011. The increased population need well-developed basic infrastructure and sustainable transport therefore the government establishing metro MRTS in metropolitan cities. Urbanization along with motorization in India that shows the vehicle population in 1951 was 0.3 million it increased 55 million in 2001 and now 2011 it increased 141.8 million. The increased vehicles create road congestion, air pollution and social inequality therefore the people demanding public sector rapid transit system in urban areas increasing day by day that's why the government establishing new metro systems in metropolitan cities to solve them problems. Metro is a new rapid transit system for urban regions, the metro system includes

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electrified rapid transit systems and in some cases metro systems referred to as subways, undergrounds. As of December 2017, 178 cities in 56 countries around the world host the approximately 180 metro systems in around the world. The London underground metro first opened as an "underground railway" in 1863 and its first electrified underground line opened in 1890, making it the world's first metro system. The metro system with the longest route length is the Shanghai metro, the busiest one is the Beijing Subway and the one with the most stations is the New York City Subway. The metro rail system was first introduced in India in Kolkata by the Indian Railways and its operation began to commercials on 24th October 1984. After the Kolkata metro, the Delhi metro operation started in 2002, the Delhi metro is the Indian urban rapid transportation trendsetter.

OBJECTIVES OF THE STUDY

In this study objectives are,

- To study the status of metro rail projects in India.
- To analyse the role of metro rail projects in India
- To examine the issues of metro rail projects in India.

METHODOLOGY

Research methodology is a way to systematically solve the research problem and it may be understood as how research is done scientifically. This article has based on secondary data to study the status, role and issues of metro rail projects in India. The secondary data has collected from important sources like Census, articles in various Journals, Reports of Various Metro Corporation Limited's, Government reports and websites and the collected data is organised and evaluated.

STATUS OF METRO RAIL PROJECTS IN INDIA

The metro rail projects in India we have seen four types in based on their status, one is operational metro rail projects in India, second one is under construction metro rail projects in India, third one is under planning metro rail projects in India and fourth one is proposed but till not planned metro rail projects in India. In India, ten cities have already operational metro rail projects that shows table-2 and it are operational for commercial services to their respected cities and also this metros expanding their network. The five more cities metro rail projects are under construction and fifteen more cities are planned metro in India and it will come under construction very shortly. The many other metropolises are prepared DPR to establish metro system in their cities. The first mass rapid transport system in India was Kolkata metro, Kolkata metro is serving the city of Kolkata and the districts of South 24 Paraganas and North 24

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Paraganas. The Kolkata metro was stared in 1984. The Kolkata Metro Railway operational route length is 27.22 km between Noapara to Kavi Subhash with 24 operational metro stations (Underground-15, Elevated-7, Surface-2). And 17.025 km between Noapara to Barasat has been the construction line under Kolkata Metro Railway. The four lines under Rail Vikas Nigam Limited (RVNL) has been under construction stage in Kolkata. KMRCL is a Government of India enterprise implementing East-West metro corridor. KMRCL's Project upon completion will connect Salt Lake Sector-V in the east and Howrah Maidan in the west with 16.6 km route length and this line has 12 stations. Delhi Metro is located Delhi urban agglomeration in India and operator of Delhi metro is Delhi Metro Rail Corporation Limited. In 1984, the Delhi Development Authority and the Urban Arts Commission prepared a proposal for developing the rapid transit system in Delhi. Delhi metro operation began for commercial services on 24 December 2002. The Delhi metro system serving Delhi and its satellite cities of Gurgaon, Noida, Faridabad and Ghaziabad in the national capital region in India. The phase-1 of Delhi metro consists 58 stations and 65.0 km route length and phase-2 consists 124.6 km of route length with 85 stations fully completed and the completion cost of Delhi metro phase-1 was 10,571 crores and phase-2 completion cost was 18,783 crores. The Delhi metro phase-3 estimated cost is 41079 crores and it have 13 lines with 160.57 km and the construction work progress, 71.82 % of pysical work done by year end of the year 2015-16. Delhi metro phase-4 have 6 corridors having route length 103.93 km have been proposed under phase-4 of Delhi metro rail project. The present operational route length of Delhi metro is 313 km operational for commercial services in Delhi. The 8 different lines functioning in 3 different phases in Delhi Metro.

Table 2: Operational Metro Rail Projects in India

Operational Metro	First reach Opened Date	Operational Length in km	Construction Length (km)	No of Stations Operation
Kolkata Metro	24-Oct-1984	27.22	113.43	24
Delhi Metro	24-Dec-2002	313.70	66.00	195
Bangalore Metro	20-Oct-2011	42.30	34.37	41
Gurugram Metro	14-Nov-2013	11.70	0	11
Mumbai Metro	8-Jun-2014	11.40	139.00	12
Jaipur Metro	3-Jun-2015	9.63	2.40	9
Chennai Metro	29-Jun-2015	35.00	18.52	26
Kochi Metro	17-Jun-2017	18.40	25.61	16
Lucknow Metro	5-Sep-2017	8.50	33.00	8
Hyderabad Metro	29-Nov-2017	46.50	25.70	64

Source: www.mohua.gov.in/cms/Urban-Transport-Metro-Rail-Projects.php (Oct-2018)

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The Bangalore metro also called "Namma Metro" is a metro system for the city of Bangalore, Karnataka state. The Bangalore metro inauguration on 20th October 2011, operators of Bangalore metro is Bangalore Metro Rail Corporation Limited (BMRCL), this project phase-1 operaioned for commercial and phase-2 is under construction. The BMRCL is a joint venture of Government of India and Government of Karnataka. The length of Bangalore metro is 42. 3 km with 40 stations. The phase-1 Bangalore metro consists two lines one is East-West corridor with 18.10 km route length starting from Baiyappanahalli to Mysore Road terminal and North-South corridor commencing at Nagasandra to Puttenahalli. The construction of the Bangalore metro phase-1 commenced in April 2007 and it completed June 2017. The total estimated cost of Bangalore metro phase-1 is 13,865 crore. The first strech opened for commercials on 20th October 2011 – Baiyappanahalli to MG Road and 42.3 km phase-1 of Bangalore metro completely opned for commercials on 17th June 2017. Gurugram metro operating at the city of Gurugram, Haryana. The length of Gurugram metro is 11.7 km it completely operational for commercial services since 14 November 2013 with 11 stations. Gurgaon metro system is also known as Rapid Metro and consists of one metro line developed by Rapid Metro Rail Gurgaon led by Infrastructure Leasing & Financial Services Limited (IL&FS). Gurgaon metro has eleven stations in Gurugram with an interchange with yellow line of Delhi metro at Sikandarpur metro station. The Mumbai metro rail began operation on 8 June 2014, owner of Mumbai metro is Mumbai Metropolitan Region Development Authority (MMRDA) and operators of Mumbai metro is Mumbai Metro One Private Limited (MMOPL), Mumbai metro also 3- phases project, working and under construction in various stages, the line-1 is operational with 11.4 km consists 12 stations. The Chennai Metro located in Chennai, Tamilnadu. Chennai metro rail transport system construction started in 10th June 2009, the operators of Chennai metro is Chennai Metro Rail Limited and this project is under construction and operational for commercial. The project estimated cost is 14000 crore and the phase-1 of the project cosists 2 corridors with total length of 45.1 km. and the first reach began for commercials on 29th June 2015. The Chennai metro has 35.3 km operational route length with 26 stations are services to commercial services at present. The Jaipur metro is a rapid transit system serving the city of Jaipur, Rajasthan. The Jaipur metro project consists 2 Phases with 31 stations along with the 35.078 km. Physical construction work of Jaipur Metro phase-1 started on 24th February 2011. The Jaipur metro is under construction and operational for first phase. The operators of Jaipur metro is Jaipur Metro Rail Limited (JMRL). Jaipur metro phase-1 and phase-2 project estimated cost is 9732 crore (phase-1 is 3149 crore and phase-2 is 6583 crore). The Phase-I-A from Mansarovar to Chandpole is completed and opened for commercial operation on 3 June 2015. The Jaipur metro phase-1 has under operational line that is Pink Line-1A between Mansarovar to Chandpole with 9.6 km route length and this line has 9 stations. Hyderabad metro is a mass rapid transit system located in city of Hyderabad, Telangana state. Hyderabad metro started first phase construction on 2011. The

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Hyderabad metro phase-1 consists 3 lines with 66 stations and 72.16 km. The operator of Hyderabad metro is Hyderabad Metro Rail Limited (HMRL). The 30 km first stretch with 24 stations between Miyapur to Nagole was inaugrates Prime Minister Narendra Modi on 28th November 2017 and it operation for commercials on 29th November 2017. All three corridors of the Hyderabad metro will become operational by December 2018. The Hyderabad metro has 46.5 km operational route length with 64 stations are services to commercial services at present. The Kochi metro is serving in city of Kochi, Kerala state. The phase-1 Kochi metro consists 26 stations with total length of 25.61 km and the estimated cost for phase-1 is 5181.79 crore. The Kochi metro is under construction and operatinoal for commercial in phase-1, the construction work began on 7th June 2013 and Kochi metro phase-1 (13.4 km) operatinal began for commercil on 17th June 2017. The Lucknow metro system planed 22.9 km and it construction started in 2014. This Lucknow metro rail project phase1-A will cover a total distance of 22.878 km between Chowdhary Charan Singh Airport and Munshi Pulia with up to 22 stations. While the cost of this project would be supported by the Centre, it would be implemented by LMRC (Lucknow Metro Rail Corporation) which would further be reconstituted into a 50:50 jointly owned firm of the Uttar Pradesh Government and the Centre and the estimated cost of this project is Rs 6,928 crore. 06 Sep 2017 Charbagh – Transport Nagar (8.5 km and fully elevated).

Table 3: Under Construction Metro Rail Projects in India

Metro of Under Construction	City and State	Route Length	No of Stations
Ahmedabad Metro	Ahmedabad, Gujarat	39.25	35
Nagpur Metro	Nagpur, Maharashtra	43.00	42
Pune Metro	Pune, Maharashtra	31.25	35
Noida Metro	Noida, Uttar Pradesh	29.71	22
Navi Mumbai Metro	Navi Mumbai, Maharashtra	11.10	11

Source: www.mohua.gov.in/cms/Urban-Transport-Metro-Rail-Projects.php (Oct-2018)

In India, Ahmadabad metro, Nagpur metro, Pune metro, Noida metro and Navi Mumbai metro projects are the under constraction stage metro rail projects that shows table-3 and it will be opening for commercial services as soon as possible. The Ahmedabad metro system is MRTS being built by Metro link between Gandhinagar and Ahmadabad in Gujarat. The construction work for its 39.259 km first phase started in 2015 and is expected to be completed by 2023. The Nagpur meto being built by the Maharashtra Metro Rail Corporation Limited to serve the city of Nagpur in Maharashtra. The Nagpur metro 38.21 km first phase construction work started in 2015 and is expected to be copmleted in 2022. Pune metro systen approved to built in the city of Pune in Maharashtra and its 31.25 km length first phase is under constraction stage. Noida metro

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system built by Noida Metro Rail Corporation being built to serve Delhi's suburbs of Noida and Greater Noida. The Noida metro's construction work started in 2015 and expected to be completed in 2019. Navi Mumbai metro system is being built to serve the area of Navi Mumbai in Maharashtra. Construction work for its 11.10 km first phase started in 2011 and is expected to be completed by 2019.

In present, there are fourteen proposed metro projects in India that shows table-4. Kanpur Metro to planned Kanpur city in Uttar Pradesh with 32.38 km route length and 31 stations have planned in first phase. Vishakhapatnam Metro planned to Visakhapatnam city in Andhra Pradesh with route length 42.54 km and 31 stations. Vijayawada - Amaravati Metro planned to Vijayawada and Amaravati cities in Andhra Pradesh with route length 26.03 km and 25 stations. Surat Metro planned to Surat city in Gujarat with the route length 40 km and it has 38 planned stations. Guwahati Metro planned to Guwahati city in Assam and it planned with 61.40 km route length and 54 stations. Bhopal Metro planned to Bhopal city in Madhya Pradesh and it has 27.87 km planned route length with 23 stations. Agra Metro planned to Agra city in Uttar Pradesh and Agra metro planned approximately 30 km route length with 30 stations. Patna Metro planned to Patna city in Uttar Pradesh and it has 30.92 km planned route length with 26 stations. Meerut Metro planned to Meerut city in Uttar Pradesh and it has 35 km planned route length with 29 stations. Varanasi Metro planned to Varanasi city in Uttar Pradesh and it has 29.23 km planned route length with 26 stations. Kozhikode Metro planned to Kozhikode city in Kerala and it has 13.13 km planned route length with 14 stations. Indore Metro planned to Indore city in Madhya Pradesh and it has 31.60 km planned route length with 29 stations. Thiruvananthapuram Metro planned to Thiruvananthapuram city in Kerala and it has 21.82 km planned route length with 19 stations. Dehradun Metro planned to serve between Dehradun-Rishikesh-Haridwar in Uttarakhand and it has 58 km planned route length.

Table 4: Under Planning Metro Rail Projects in India

Metro in Under Planning	City and State	Length	Stations
Kanpur Metro	Kanpur, Uttar Pradesh	32.38	31
Vishakhapatnam Metro	Visakhapatnam, AP	42.54	31
Vijayawada - Amaravati Metro	Vijayawada, AP	26.03	25
Surat Metro	Surat, Gujarat	40.00	38
Guwahati Metro	Guwahati, Assam	61.40	54
Bhopal Metro	Bhopal, Madhya Pradesh	27.87	23
Agra Metro	Agra, Uttar Pradesh	30.00	30
Patna Metro	Patna, Uttar Pradesh	30.92	26

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Meerut Metro	Meerut, Uttar Pradesh	35.00	29
Varanasi Metro	Varanasi, Uttar Pradesh	29.23	26
Kozhikode Light Metro	Kozhikode, Kerala	13.13	14
Indore Metro	Indore, Madhya Pradesh	31.60	29
Thiruvananthapuram Metro	Thiruvananthapuram, Kerala	21.82	19
Dehradun Metro	Dehradun-Haridwar-Uttarakhand	58.00	-

Source: www.mohua.gov.in/cms/Urban-Transport-Metro-Rail-Projects.php (Oct-2018).

There are eight metro's proposed but till not planned in India that is, Greater Nashik Metro proposed to Nasik city in Maharashtra, Western railway elevated corridor proposed to Mumbai city in Maharashtra, Chandigarh Metro proposed to Chandigarh city in Punjab, Gorakhpur Metro proposed to Gorakhpur in Uttar Pradesh. Coimbatore Metro in Coimbatore, Tamil Nadu. Srinagar Metro in Srinagar, Jammu & Kashmir. Greater Gwalior Metro in Gwalior, Madhya Pradesh and Jabalpur Metro in Jabalpur, Madhya Pradesh. This metro projects under planning stage and it will be completed as soon as possible to implement.

ROLE OF METRO RAIL PROJECTS IN INDIA

The metro rail transport playing a significant role in India metropolitan cities. The metro rail transport saves the time of travel, it reduces journey time by 50% to 75% to compare other transport include public transit systems like Bus system, Light rail etc. and private owned vehicles like cars and two-wheelers. Ussually heavy traffic in metropoltan cities and the travell time takes lot but metro will reduces that and it saves travel time. The metro rail projects are the long term revenue source of the governments to improve the urban transport which is shows table-6, that is the Delhi metro earns annually 5387.98 crores in that large operational network, Bangalore metro earns 130.46 crores in that 42.3 km operational network, Kochi metro earns 6.79 crores without operations for commercial services and Lucknow metro earns 18.53 crores in that current small operational network in the year 2016-17 and this revenue includes operational for commercial and property development sources. Metro helps to increase social equality in metroploitan cities. The metro rail projects creates employment that shows table-6, in that the Delhi metro has 9864 employees, Bangalore metro has 2100 employees, Kochi metro has 444 employees and Lucknow metro has 467 employess in 2016-17.

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Table 6: No. of Employees and Annual Revenue of Selected Metro Projects in 2016-17

Operational Metro	No. of Employees	Annual Revenue in crores
Delhi Metro	9864	5387.98
Bangalore Metro	2100	130.46
Kochi Metro	444	6.79
Lucknow Metro	467	18.53

Source: www.mohua.gov.in/cms/Urban-Transport-Metro-Rail-Projects.php (Oct-2018).

The metro is reducing the fuel consumption and saving the fuel cost, if the metro began the operation number of vehicles off the road, there been a progressive reduction in daily vehicles for example buses, cars, two wheelers, auto and rickshaw demand due to the people. Reducing the fuel consumption, according to the Central Road Research Institute the Delhi metro saves 1,200 core rupees every year. The metro rail system has proven to be most efficient in terms of energy consumption, space occupancy and numbers transported. In a recent response to parliament, these were listed as that the metro's effects on Delhi is it reduces of 2.76 lakh tons of fuel (about 2 million barrels). Metro saves the fuel cost, India imports more than 70% of its petroleum requirements and oil is the single biggest reason for India's trade deficit. The Delhi metro saves 2 million barrels of fuel every year by taking petrol and diesel vehicles off the roads in Delhi. Given that the oil price averaged around $100 per barrel until a few months ago, Delhi metro saves annual 1200 core rupees. The another important of metro project is low land occupation, the metro train road or tracks are occupation low land of city that is two-meter width only for elevated rail. Metro reduces road accidents, more people die on roads in India than anywhere in the world it shows, 137,000 lakhs in 2013 and average 375 deaths every day. It will also reduce the road accident when metro operations in Delhi. In a recent response to parliament, they were listed that the Delhi metro reduction 125 deaths on roads in Delhi. The metro trains are also the emission cost saving and reducing the emission of greenhouse gasses. Metro contributing the new shopping centres across the cities and helps city expansion.

ISSUES OF METRO RAIL PROJECTS IN INDIA

Metro rail projects have some issues that is, traffic problem under construction time, when the project is over everything is fine but remember the sufferings that the commuters need to undergo during the construction phase they will face dust, heavy traffic, damaged road, risk of accidents etc. The roads leading to congestion and traffic jams during peak hours during the construction phase of the metro projects. noise pollution and vibration issues etc. under the construction of metro phase the use of heavy machinery and construction equipment may cause the vibrations and also increase the noise pollution. Accidents at construction area is also a

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critical issue, a few accidents have been reported in the Delhi, Mumbai and Bengaluru metros during the ongoing construction phase. The metro negatively impacts on city environment that is the many trees loses for the project it will reduces the air quality but when it operational for commercial services that time it reduces air pollution. The another issue of metro rail projects is environmental issues. The metro project losses of tree or green cover in city and it may cause micro-climatic changes and affects the construction area. According to the evaluations, the DMRC has felled 25,507 trees over Phase I and II of its construction in Delhi and the DMRC has carried out compensatory afforestation of 10 trees for every tree cut as per the provisions of the Delhi (Preservation of Trees) Act, 1994. Another issue is Large amount of project cost and low level of income; the metro rail projects need large amount of Capital cost but the revenue will very small to compare capital cost. The estimated cost will have doubled many times in Metro projects. And underground construction takes lot of time and large amount of capital cost to compare elevated route cost. Another issue of metro is Metro versus Other Transport. Metro negatively impact on other transportation, other transportation means Buss Rapid Transit System (BRTS), Auto and Cab service will be affected. Metro is easy for the people to move within the city therefore when better public transport system means metro establishes or provides services in cities that time the people moving from personal vehicles and other public transport to metro that will impact on other transport modes revenue especially public sector BRTS, auto and cab owners will losses their revenue due to people move towards metro. The almost all metro projects over-estimated of Traffic Demand Forecasts or Ridership Estimation but when we seen acctual ridership is very low to compare estimated ridership. Another issue of metro rail projects is Land/Property acquisition and resettlement and rehabilitation related issues. The issue of land/property acquisition is a pre construction phase activity and it projects for which proper socio-economic surveys need to be carried out to determine the project affected persons or families.

CONCLUSION

In this decade in India, the metropolitan cities majorly facing a lot of problems like congestion and most important problem is air pollution for example in Delhi the air quality is very low in last three four years therefore the government of Delhi banned old vehicles in Delhi roads to control air pollution. Therefore, I think that, the government of India should take action about these problems and adopt metro systems with large network in megacities and metropolitan cities in India. Then it will be control the congestion and reduces the air pollution. The metro will be solving these problems and providing sustainable development in urban public transport. This study will be of immense beneficial for urban related and urban public transport related studies in metropolitan cities as well as for the urban planners in the India, as no individual or agency has carried out any exclusive and intensive research so far for the country of India.

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