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BAHADUR SHAH ZAFAR MARG
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**EXECUTIVE SUMMARY OF
MAJOR RESEARCH PROJECT IN GEOGRAPHY**

- 1. Title of the Project** : Impact of Mhaisal Irrigation Project on the Drought Prone Region of Sangli District of Maharashtra: A Geographical Study
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- 4. UGC Approval Letter No. and Date** : F.No. 42-99/2013 (SR), Dated 12th March 2013

5. Executive Summary of Major Research Project:

**‘Impact of Mhaisal Irrigation Project on the Drought Prone Region of Sangli
District of Maharashtra: A Geographical Study’**

1. INTRODUCTION:

The Indian economy is an agrarian but the drought is one of the major and serious problems for it. Generally most of the times, drought creates the famine conditions in India and Maharashtra also. ‘Drought had always been a recurring phenomenon hitting the economy and creating famine conditions in ancient, medieval and Mughal and British India’, (Singh, 1978). The drought has been constantly experienced by the various parts of India in the post-independence period also.

The State of Maharashtra is also experienced frequent drought conditions. The number of districts of the state falls in the rain shadow area and they experienced and influenced through drought conditions frequently. The review committee of the Government of Maharashtra has identified about 35% geographical area of the

Maharashtra state as a drought-prone area in the year 1984 and this committee has included 94 Tahsils from 14 districts of the state in the drought-prone area.

Generally, any drought-prone areas of the world have to face two major problems i.e. low productivity and instability. These problems are also faced by the people of India as well as in Maharashtra so the Governments of India and Maharashtra have been taken several measures from time to time to mitigate the drought and minimizing the sufferings of the people specifically of the drought-prone areas as and when drought occurs. The planned efforts by the central and state governments have been made to solve the problems of droughts specifically in the post-independence period. However, in spite of all these efforts made by the government so far to mitigate droughts, the problem remains unchanged in the states. B. Arunachalam (1979) has pointed out that in spite of repeated measures to mitigate the impact of droughts on rural masses, droughts still pose a major problem demanding a more systematic approach in tackling them.

2. STUDY AREA:

The study area is located in the District Sangli which is southernmost districts of Maharashtra state. The study area is situated between the latitudes of 16°43' N and 17°22' N, and the longitudes of 74°33' E and 75°41' E. In the study area only Miraj, Tasgaon, Kavathemahankal and Jat Tahsils of the Sangli District are included. The study area has occupied an area 4842 sq.km. according to the geographical area. The study area is bounded by Khanapur Tahsil of Sangli District, Sangola and Mangalwedha Tahsils of Solapur District at Northern side. On the Eastern & South-Eastern side, it is bordered by the Vijaypur and Southern side is bounded by Belgavi Districts of Karnataka State. The South-Western part is bounded by Kolhapur District and Western side is bounded by the Walwa & Palus Tahsils of the Sangli District.

According to the census 2011, the total population of the study area is about 15,86,633 out of which 64.3% rural in nature and 35.7% is urban out of which 93.3% of the urban population are residing only in Miraj Tahsil due to the location Sangli-Miraj-Kupwad Municipal Corporation area. In the decade 2001-11 rural population growth rate of the study area is 9.53% and it is higher in comparison with the District Sangli i.e. 7.8%. The rural population density of the study area is about 262 persons per sq.km. The 69.6% rural population of the study area is observed literate but the male literacy is observed 75.7% and female literacy 63.1%. The sex ratio for the rural

population is 955 females per thousand males which is lower than the District Sangli i.e. 963.

The study area comprises a total 26 revenue circles out of which seven belong to Miraj, six from Tasgaon, five from Kavathemahankal and eight revenue circles are located in Jat Tahsil.

The total geographical area of the study area is 484206 hectares, out of which, near about 81.9% is net sown area and out of the net sown area only 16.33% of land is irrigated with various means of irrigation e.g. wells, tube wells, ponds and canals with the utilization of modern irrigation methods by the farmers in the study area as per the census, 2011.

Most of the research work is restricted only with the catchment zone of the Mhaisal Lift Irrigation Project by which 171 total villages of the 4 tahsils i.e. Miraj (41), Tasgaon (11), Kavathemahankal (35) and Jat (24) are included with the total 3091 sq.km. area, but out of this 817 sq.km. the area is benefitted by the water of Mhaisal Lift Irrigation Project in the District Sangli. Besides this, the 20 villages of Sangola (7) and Mangalwedha (13) Tahsils of Solapur Districts are also included in the catchment zone of this project, but they are excluded from the analysis.

The study region is mainly an agricultural region falls in Krishna, Yerala, Agrani and Bor River basins. The Industrial development in the study area is mainly restricted to Sangli-Miraj-Kupwad urban complex; however, the study area is devoid of major industries except for few agro-based industries. Farmers in some pockets use quite modern scientific technology and produce plenty of crops like sugarcane, seedless grapes, pomegranate, mangoes, etc. The development of the dairy industry has also a notable share in the economy of the study area.

3. OBJECTIVES OF THE PROJECT:

The following are the objectives of the study:

- To study the salient features of Mhaisal Lift Irrigation Project and identify the associated problems in the mechanism.
- To identify existing agricultural land use and examine the changes in land use after the implementation of Mhaisal Lift Irrigation Project.
- To study the changes in the cropping pattern in the study region with agricultural problems.

- To study the socio-economic status of the people and their transformation.
- To suggest the recommendations and solutions for the development of the study area.

4. DATABASE AND METHODOLOGY:

The following methodology is adopted in the study:

The primary data pertaining to the agriculture and socio-economic status is collected through conducting extensive fieldwork by using questionnaire and personal interviews with the farmers, village officers for the selected sample villages of the study area. The data regarding the Mhaisal Lift Irrigation Project is collected through observations in the field and interviews of the concerning irrigation project officers.

The relevant secondary data concerned with the agricultural land use is collected from the Tahasildar and Tahsil Agricultural Offices of Miraj, Kavathemahankal, Tasgaon and Jat Tahsils of the Sangli District, from the year 2001 to 2017. The required secondary data is also collected from different secondary sources such as Publications of Census of India, District Statistical Handbooks, District Gazetteers, Socio-Economic Abstracts of the Sangli District and various Governmental other reports e.g. Central Ground Water Board, Forest Department of Government of Maharashtra, MSME Government of India for the study period. The various websites also referred to in the collection of relevant required data.

The collected data is processed, tabulated and presented with the help of proper cartographic techniques, graphs, and maps.

The Statistical Techniques and Models are applied in the study e.g. percent and average method, Rafiullaha's Method of crop combination.

Rafiullahs method is applied to analyze and identify the changes in the crop combinations of the study area the tahsil as a unit has been considered for both the pre and post project period. An attempt has been also made to present the micro level study of the crop combinations of the study area only for the post-project period by considering the revenue circles as a unit.

For the study of socio-economic status and the transformation of the peoples in the study area the survey method is applied for concerning data and for the case study the selection of seven villages has been made and is mainly based on the criteria i.e. the availability of water from the Mhaisal lift Irrigation Project to the villages. In

the selected sample villages the total householders are 17,375 and the researcher has selected 15% householders from each sample village for collecting the information by following the simple random sampling method.

For the spatial data and information, the Toposheets are used and Satellite imageries of Sentinel-2A Satellite Sensor of October 2016 and January 2017 are also used to analyze land use and land cover of the study area for both the Kharip and Rabbi Seasons. The GIS techniques and software e.g. Arc GIS, QGIS, Erdass Imagine are used in the analysis of land use and land cover.

5. CHAPTER SCHEME:

The entire research work is organized in the seven chapters. In the first chapter, a broad introduction is given in relevance with the drought conditions of the Global, National as well as Local level. The definitions and types of droughts, occurrences of droughts in Sangli District and drought-induced problems are also discussed. This chapter aims with the selection of study area, the research problem, its significance along with the objectives of the study and methodology adopted. The chapter wise framework of the research is also presented in this chapter.

The second chapter deals with the entire physical factors of the study area which includes geology, relief and physiography, drainage pattern, soil, climate, natural vegetation and water resources available in the study area.

The third chapter is divided into two parts. The first part deals with the mechanism of the Mhaisal Lift Irrigation Project and the stage of project work. The second part of this chapter deals with the problems related to the mechanism of this irrigation project.

The fourth chapter aims to study the land use pattern of the study area in which general land use, irrigated & un-irrigated area and cropping pattern of the study area are included. The crop combinations of the study area have been studied for the pre and post period of lift irrigation project and identified the changes in the cropping pattern. The problems related to agriculture are also discussed and measures for the development of agriculture in the study area are suggested.

The fifth chapter deals with the socio-economic aspects of the people in the study area of Sangli District. In this chapter, all the dimensions of the population with households & types of houses as social attributes are taken into consideration and

attention also has been given to discuss the economic factors and the socio-economic facilities available in the study area.

The sixth chapter is devoted for case studies. In this chapter, an attempt has been made to identify and understand the socio-economic status of the people and their transformation as a micro level study. The special attention has been also given to analyze the agricultural scenario by considering agricultural land use and changes, irrigation development, and area under cash crops. For the comparative analysis of land use and land cover of the study area the satellite imageries based study have been also presented in the last phase of the chapter along with the expectations of the farmers of the study area.

The conclusions derived are given in the seventh chapter of the study along with the recommendations. The first phase of this chapter is devoted for the conclusions and in the second phase for the recommendations related to the Mhaisal Lift Irrigation Project and agriculture.

6. CONTRIBUTION TO THE SOCIETY:

The present work has given the authentic status report of the land use, cropping pattern and socio-economic status of the people of the study area and this will be helpful in the planning and policy-making for the development of the drought-prone area of the Sangli District. The recommendations which are given regarding the problems of the Mhaisal Lift Irrigation Project will also helps in the smooth and proper mechanism of this irrigation project and the recommendations regarding the agriculture will also helps in the agricultural development of the drought prone region.

7. SUMMARY OF THE FINDINGS:

The District Sangli comes in the rain shadow zone, causes the frequent drought conditions which is a major problem of this area. Due to frequent drought occurrences in the study area especially, eastern part of Miraj and Tasgaon, entire Kavathemahankal and Jat tahsil the scarcity conditions are created. This area is included in the drought-prone area of the District Sangli, where less fertile soil and poor productivity is observed. Generally, people from the villages located in the scarcity areas have to face several problems such as, shortage of drinking water, hamper the agricultural production, the shortage of food and fodder, losing the

livestock, deduction in the employment opportunities, increased migration of people for survival, financial indebtedness, peoples diverted to suicidal tendency, and shortage of raw materials for agro-based industries, etc. In short, the economy of this region is paralyzed in the drought years.

The climate of the study area is characterized by general dry and hot throughout the year except during the south-west monsoon season. The River Krishna & Warana are the major surface water resources in the Tahsil Miraj of the study area and only on this water resource the Mhaisal Lift Irrigation Project is based which providing the water to the other drought-prone Tahsils of the study area i.e. Eastern part of Miraj & Tasgaon, Kavathemahankal and Jat Tahsil.

Regarding the ground water table level fluctuations, it is concluded that, the most of the area is shifted deep to shallow water level with the fluctuation of 3-5 mbgl and some area shifted deepest to deep category of groundwater level with the 5-6 mbgl fluctuation of the study area.

Maharashtra Krishna Valley Development Corporation, Pune which is undertaken by the Govt. of Maharashtra had been proposed Mhaisal Lift Irrigation Project for the development of highly drought prone areas of Sangli and Solapur Districts of Maharashtra. For this irrigation project, water is lifted from River Krishna in the rainy season and from Koyana reservoir viz. Shivajisagar by releasing in river Krishna, as and when required. Besides this, the water is also released from the Vasant Sagar reservoir of Chandoli Dam through Warana River which is tributary of Krishna River.

Mhaisal lift irrigation scheme approved by the government of Maharashtra in 1986 for the basic value of Rs.101.00 crores has been much exaggerated and reached in 2017 up to RPA value of Rs.3656.95 in the span period of 30 years.

The proposed canal length of the Mhaisal Project part is of 477 km. and the requirement of electricity is of 102 mw to run this project properly. The utilization of water is made available for this project is of 17.44 TMC water; for irrigation purpose for the area about 81697 hectares of the 171 villages of the Miraj, Tasgaon, Kavathemahankal & Jat drought prone Tahsils of Sangli district and Sangola & Mangalwedha Tahsils of the Solapur district.

The Mhaisal Lift Irrigation Project comprises with 7 stages along with total lift height from river level to last distribution tank is about 206.84 meters. The names of the stages are Stage I & II (Mhaisal), Stage III (Bedag), Stage IV (Arag), Stage V

(Salgare), Stage VI-A (Ankale) and Stage VI-B (Khalati). Besides this, six Other Small Lift Irrigation Schemes under Mhaisal Lift Irrigation Project are included and they are Gavan Lift Irrigation Scheme, Extended Gavan Lift Irrigation Scheme, Banewadi Lift Irrigation Scheme, Dongarwadi Lift Irrigation Scheme, Agalgaon-Jakhapur Lift Irrigation Scheme and Agrani K.T. Weirs.

The 71% canals carving work and 72.49% distributaries work of the Mhaisal Lift Irrigation Project had been completed. The major works of Main & Branch Canals of this project are mostly completed up to the Vth Stage of this project, but the works of Main & Branch Canals in VIth Stage are either in progress stage or in budgetary work stage.

The actual activation of MLIP has been done since the year 2002-03. The current situation of the irrigated area through MLIP, it is observed that till in the year 2015-16, the irrigation capacity is created only of 34,862 ha and the actual irrigated area is only 15,085 ha of land under this scheme. The tahsil wise actual irrigated area irrigated in comparison with the created area for irrigation, the highest area (64.42%) is irrigated in Miraj tahsil, the second-ranking tahsil is Kavathemahankal with 28.60% area and about 7% area is in the villages of Tasgaon tahsil of the Sangli district actually. While, though the area created for irrigation is observed in Jat Tahsil, is not actually irrigated in the year 2015-16.

Since the project has been started the water cess arrears started to remain pending every year and today it becomes a huge amount of Rs. 4457.64 lakh as water cess arrears of the Mhaisal Project; and since the project has been started, 50.80 TMC of water has been lifted and for that 12,210.03 lakh rupees, electricity bill has been charged, out of that 2269.59 lakh rupees, the electricity bill is pending. Thus the problem of water cess and electricity has been created. However, from the year 2011-12, the project authorities have planned to schedule of averagely 3 recurrences and executed i.e. Kharip, Rabbi and Summer Recurrence in a year.

While studying the current situation and work of Mhaisal Lift Irrigation Project, some problems are identified and they are, less budgetary provision, delay in the project completion, high exaggeration in the cost of project, incomplete work of the projects, problem of regular power supply, reduction in the provision of electric pumps, issue of maintenance of pump houses, canals and outlets, problem of high water percolation through canals, inadequate distribution system causes increase non-beneficiaries, more wastage of water, non-accuracy in beneficiaries record,

irregularity in recurrences, problem of water cess includes, no fix charges, collection mechanisms, recovery & corruption; problem of energy charges and arrears, lack of administrative assistance, no proper coordination among civil, mechanical and electrical departments and socio-political influence, etc.

In the district total net sown area was roughly 6.60 lakh hectares; out of this 22.31% area is under irrigation. Comparatively less irrigated area is observed in the Jat, Kavathemahankal, Eastern parts of the Tasgaon & Miraj tahsils of the Sangli District.

The large area is brought under irrigation by wells & tube wells in comparison with the other sources i.e. 53.38% area to total irrigated area, and the dominance of these sources is observed in Kavathemahankal, Jat and Tasgaon tahsil of the study area while the dominance of other sources of irrigation is observed in the tahsil Miraj.

Rafiullahs method of crop combination is used for the study for both the pre & post-Mhaisa Lift Irrigation Project period. The tahsil wise crop combination analysis of the study area in both the Kharip and Rabbi Season together indicates that, the three tahsils i.e. Miraj, Tasgaon and Kavathemahankal have indicated mono-cropping pattern with oilseeds, Kharip jowar and rabbi jowar respectively and only a tahsil i.e. Jat have identified three crop combinations with rabbi jowar, bajra, and pulses in the pre-project period i.e. 2000-2010. An attempt has been made to analyze the circle wise crop combination analysis of the study area as micro level study for the post-project period i.e. 2011-2018 for both the Kharip & Rabbi Season separately. The circle wise crop combinations in Kharip Season indicates that, out of the total 26 circles of the study area, 9 circles are identified the mono cropping pattern, 14 circles are identified two crop combinations and 3 circles are showing three crop combinations in Kharip Season. However the circle wise crop combinations in Rabbi Season, indicates that in the study area, total 21 circles are identified mono cropping pattern in which 16 circles with rabbi jowar and 5 circles with fruits is a major crop. The two crop combinations are observed in the remaining 5 circles of the study area with rabbi jowar is a major crop in association with fruits.

While analyzing the changes in the cropping pattern of the study area considering the pre and post-MLIP period, it is concluded that all the tahsils of the District which comes under Mhaisa Lift Irrigation Project show the increasing area under fruits cultivation. Fruits are cultivated in all the tahsils of the study area and gradually area under fruit crop is increasing enormously. Massive change has

identified in Miraj tahsil i.e. from 2.04 to 10.34%. The Tasgaon, Kavathemahankal and Jat tahsils have increased the double area under fruit crops i.e. from 3.17 to 7.39%, 1.15 to 3.19% and 1.02 to 1.99% respectively. Like fruit crops area under other cash crops also increased on large scale specifically in Kavathemahankal and Miraj tahsil i.e. from 1.79 to 7.12% and 2.66 to 8.75% respectively. Betel gardens, turmeric, tobacco, ginger, various vegetables, cotton, etc. cash crops are also cultivated in this tahsil. The area, which comes under Mhaisal Lift Irrigation Project has marked a massive change in cropping pattern. All these tahsils are transforming from traditional crops to cash crops such as maize, fruits (grapes, pomegranate, mango, guava etc.), and other cash crops. But the area under sugarcane is gradually decreasing because this crop is requiring a perennial and large amount of water; the soil is becoming gradually saline and infertile which resulted in a decrease in the yields. Yet the work of MLIP is not completed and the water is not provided to the Far East zone but when it will be completed and water will be provided to entire catchment zone of this project the area will be definitely transferred to the cash crops from the traditional crops in the study area.

Agriculture of the study area is plagued by several problems which are identified and some of them are natural or manmade. The natural problems are badly affecting the agriculture which is related to terrain, climate, soil properties and soil water as physical problems; fragmentation of land holdings, traditional methods of cultivation, superstitious mind of the farmers, suicidal tendency of the farmers & excessive dependence on agriculture as social problems; poverty of the farmers, lack of productive investment, lack of infrastructure, lack of adequate finance, lack of marketing facilities, market fluctuations, declining profit ratio & indebtedness as economic problems; and lack of high yielding seeds, traditional irrigation methods, inadequate use of manures & fertilizers, limited mechanization, and lack of agricultural research, education & training as technological problems are identified in the study area.

Regarding the male-female ratio, 51% male and 49% female population in the District is observed and which is found in the study area also with slight variations. The entire population of the tahsil Kavathemahankal and Jat is observed rural in nature while the tahsil Miraj and Tasgaon of the study area are indicating concentration of urban population with very high concentration only in Miraj Tahsil. The decreasing trend in growth rate of rural population of the study area is observed.

The Miraj tahsil of the study area is indicating highest (414 persons per sq.km.) density of rural population while the lowest (147 persons per sq.km.) density is indicated by the Tahsil Jat. Generally, the rural population has a higher proportion of females than the urban population, but in the District Sangli as well as in the Tahsil Miraj of the study area, it is seen that the higher proportion of females is observed in urban population rather than the rural. Regarding the rural literacy rate, the Tahsils Miraj and Tasgaon of the study area are indicating more percentage of total, male and female literacy rates in the study area which is higher than the district. While observing the religious structure of the population of the study area, it is concluded that about 96.2% population of the study area is constituted by Hindus & Muslims and 2.4% is by Jain population. Remaining all the religions contributes together only 1.4% population of the study area.

Regarding the rural households of the study area, all the tahsils of the study area together possessed about 48% total households of the District with the dominance of pucca houses.

While going through the analysis of workers-non workers ratio for the rural population of the study area, the lower workers ratio is observed for Miraj and Kavathemahankal Tahsil, while higher ratio is found in Tasgaon and Jat tahsils. The more percentage of cultivators and agricultural laborers than the District is observed in three Tahsils of the study area i.e. Tasgaon, Jat and Kavathemahankal, on the contrary the Tahsil Miraj is indicating a very high percentage of other workers categories which is also more than the District.

The primary, secondary, junior, degree colleges, and vocational centers are available in all the Tahsils of the study area with vary in numbers. All levels of educational facilities are available only in Miraj Tahsil with the highest in number in comparison with the other Tahsils of the study area.

While concluding the Tahsil wise distribution of health facilities in the study area it is observed that, hospitals, primary health centers, primary health sub centers, maternity & child welfare centers, dispensaries, veterinary hospitals as governmental facilities and medicine shops & private medical practitioners are available in all the Tahsils of the study area with more numbers in Miraj and Jat Tahsils of the study area and Community health center facility is observed only in above Tahsils.

While analyzing the drinking water facilities available in the study area, it is found that the 100% villages of the Tasgaon Tahsil have developed tap water schemes

for drinking, while in Miraj Tahsil 98%, in Kavathemahankal 97% and in Jat Tahsil 82% villages are getting water from tap water schemes.

Regarding the credit facilities in the study area, it is concluded that, the higher percentage of villages is observed in Miraj and Tasgaon Tahsil which have possessed commercial & co-operative banks more than the District and along with these two Tahsils the Jat Tahsil is also indicates a higher percentage of villages which are enjoying the facility of agricultural credit societies.

The Miraj Tahsil followed by Tasgaon Tahsil with more number of villages possessing regular markets and both these Tahsils also indicating 2 agricultural marketing societies each. The Jat Tahsil is observed with more number of villages possessing weekly haat facility.

For the in detail study to understanding the socio-economic impact of Mhaisil Lift Irrigation Project in the study area, the seven beneficial villages selected as sample villages. This case study represents the entire picture of the study area. The growth rate of the population in the study area is decreasing while the density, literacy, sex ratio is increasing. So far as concern to the religious structure of population it is observed that, the huge percentage of population belongs from Hindus and Muslims together and more population is observed in from the open category in study area. The educational status of the study area has been also increasing.

The increasing trend in the ownership status of the houses and pucca & RCC type of houses is observed in the study area. The category of house built up area i.e. 101-400 sq.ft. and 401-800 sq.ft. both together possess about 62% of houses of the study area. The remarkable increase is observed in the households possessing 3 or more dwelling rooms in the sample villages of the study area.

The higher development of tap water facilities is observed in the villages of Tasgaon, Kavathemahankal and Jat Tahsil. The electricity is the main source of lighting in the study area and the percentage of electrified households is increasing. In spite of the efforts by the government regarding the latrine facilities large number householders in most of the sample villages are using open surroundings for the latrine purpose. So the separate action plan should be implemented in this area for the development of latrine facility in the premises in the future. The percentage of householders having all the amenities is also increased considerably in the post MLIP period in the study area. The education, health, credit and market facilities are observed satisfactory.

In the post MLIP period the irrigated area is considerably increased in the sample villages of the study area and remarkable changes are observed in the cropping pattern by replacing the traditional crops to various cash crops and the grapes & pomegranate are emerged as major fruit crops in the study area. Thus the remarkable transformation in agriculture and socio-economic status of the people is observed.

The following important recommendations have been made regarding the Mhaisal Lift Irrigation Project such as, the arrangement of the required budget should be made by the Government to this MLIP as early as possible by making a special case for the drought-prone area so far as to complete remaining works of this project early. The recurrences of the MLIP should be made regularly which will inject to increase the area under perennial crops by the beneficiaries in the study area. The crop wise proper and precise method of water cess collection mechanism should be implemented by the project authorities for solving the problem of recovery and to avoid the corruptions in the water cess collection which will help to put the project in functioning regularly. For solving the problem of energy charges and arrears it is recommended that, the establishment of special solar energy plant is essential for MLIP because abundant sunlight is available in the study area throughout the year which will provide regular power supply to the irrigation project in low cost comparatively. Advance crop techniques, application of technological measures, economic measures and some other measures regarding the agriculture of this drought prone area are also recommended for the agricultural development.

The Mhaisal Lift Irrigation Project is undertaken by the Govt. of Maharashtra through the Krishna Valley Development Corporation (KVDC), which is the only lifeline for the drought-prone area of Sangli District of Maharashtra for the survival and the overall development.

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