Policy Brief

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Jal Jeevan Mission (JJM) Database: From Monitoring to Decision Support Tool

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Introduction

Policy Brief No. 1 established that India's Jal Jeevan Mission represents a paradigmatic shift toward "digital federalism" in rural water governance, where sophisticated Management Information Systems (MIS) enable unprecedented coordination across multiple government levels, while creating new tensions between the urgency of implementation and the imperatives of sustainability. Our analysis revealed that while the JJM MIS advances significantly beyond its predecessor through household-level monitoring and integrated financial tracking, critical gaps persist, particularly the elimination of "slip-back" tracking and weakened sustainability indicators that constrain the system's utility for long-term service assessment.

This analytical foundation raises a fundamental question: if digital governance systems are designed primarily to capture implementation progress rather than service sustainability, how can they be leveraged to support evidence-based decision-making for improved functionality and water service delivery? The challenge extends beyond mere data collection to encompass how monitoring systems can transition from compliance-oriented reporting toward active governance tools that enable responsive management and adaptive policy implementation.

Policy Brief No. 2 addresses this challenge by examining the concept of functionality within the broader framework of water service sustainability. While the JJM's digital infrastructure provides unprecedented data granularity, our investigation reveals significant disconnects between the system's technical capabilities and its practical utility for assessing service delivery quality. We develop a comprehensive framework for functionality assessment that moves beyond the programme's current focus on Functional Household Tap Connections (FHTCs) as mere infrastructure provision toward a multidimensional understanding of service sustainability encompassing environmental, institutional, financial, and technical indicators.

Our overarching objective is to demonstrate how the JJM database can evolve from a monitoring platform into a decision support system that enables improved functionality assessment and responsive water service delivery. Through systematic analysis of the JJM's Integrated Management Information System (IMIS) and dashboard capabilities against functionality indicators, we identify critical data gaps and propose pathways for enhancing the system's utility for evidence-based governance. This analysis establishes the foundation for subsequent policy briefs that will examine state-level implementation processes and source sustainability challenges within the digital governance framework established in our opening brief.

Understanding Functionality: Conceptual Frameworks and Measurement Challenges

The JJM operational guidelines (2019) define functionality through a quantitative lens as "water supply of 55 lpcd to rural households as per the Bureau of Indian Standards (BIS) norms" (Government of India, 2019; p23). This definition, while providing clear measurement criteria, reflects a predominantly technical approach to service assessment that may inadequately capture the multidimensional nature of sustainable water service delivery.

Empirical evidence demonstrates substantial progress in infrastructure expansion under the JJM framework. According to JJM MIS data, 76% of rural households had achieved piped connection access by March 2024, representing a remarkable increase from the baseline of 18% recorded in 2019. This quantitative advancement signifies considerable achievement in expanding physical access to improved water sources across rural India. However, a critical analytical gap emerges between the programme's stated objective of providing Functional Household Tap Connections (FHTC) and the practical reality of implementation, which frequently emphasizes infrastructure deployment over sustained service delivery quality.

The past implementation experience reveals a persistent tendency to conflate physical connectivity with functional service provision. While the JJM conceptually aims for service delivery encompassing quantity, quality, and reliability dimensions, operational practice often translates this objective into infrastructure extension activities that prioritize connection establishment over post-installation performance monitoring. This implementation-functionality disconnect has been extensively documented in rural drinking

Figure 1 Meaning of Functionality of Household Tap Connection (FHTC)

water literature, with numerous studies highlighting the limitations inherent in target-driven approaches that emphasize coverage metrics over service sustainability indicators (Hutchings et al., 2016; Narayanan et al., 2023; Singh, 2014).

Evolution of Functionality Assessment in Rural Water Supply in India

Figure 2 presents a comprehensive synthesis of key water service delivery assessment indicators documented across multiple evaluation studies in India's rural drinking water sector. These studies, undertaken for programme evaluation, efficacy assessment, and sustainability analysis, reveal both the evolution of analytical approaches and persistent conceptual challenges in functionality measurement.

The analytical literature demonstrates considerable diversity in assessment frameworks, each emphasizing particular dimensions of service delivery. The TISS (2015) analysis prioritized social equity considerations, incorporating gender equality and socioeconomic profiling as fundamental determinants of reliable water supply access. The IITB and UNICEF (2018) collaboration focused on scheme performance evaluation, emphasizing technical and institutional factors influencing service delivery outcomes. The World Bank's iterative approach evolved from affordability analysis and supply model review (2008) toward more integrated frameworks incorporating institutional capacity

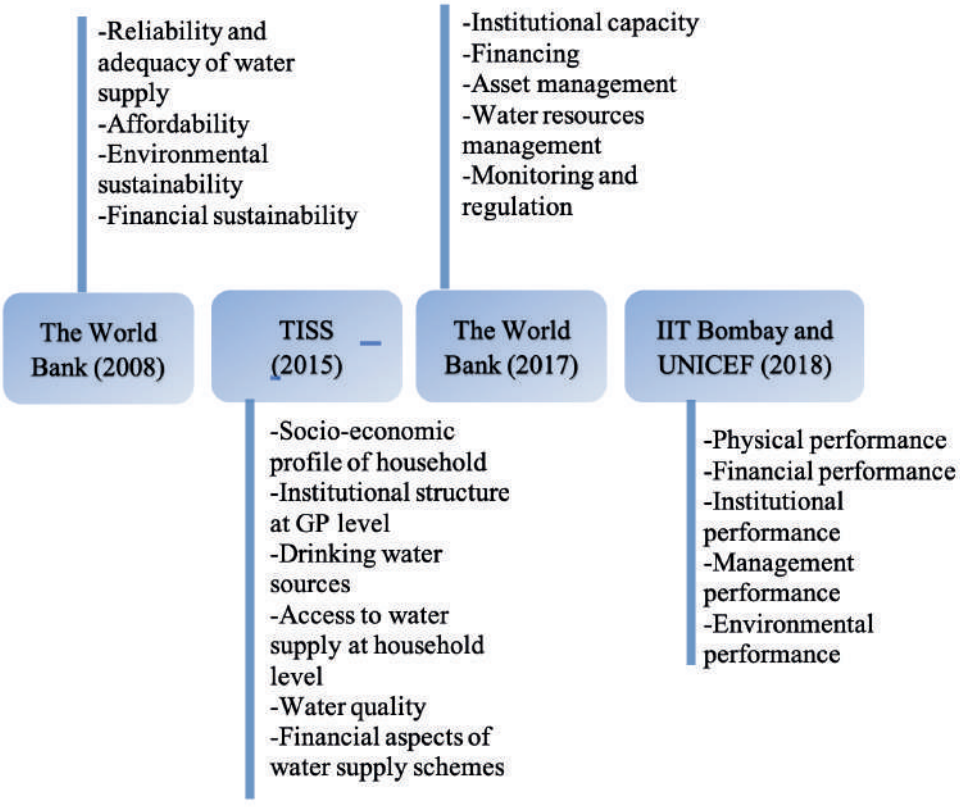

Figure 2 Indicators used in different frameworks for water supply functionality

and asset management considerations for sustainable service provision (2017).

Despite methodological diversity, these studies converge around several critical themes, though articulated through different analytical lenses: ensuring sustainable and reliable water source management, considering social equity dimensions, establishing secure funding mechanisms for asset development and maintenance, developing effective institutional governance frameworks, and implementing robust monitoring systems for asset performance and service delivery quality.

Paradigmatic Shift from Exclusion to Functionality Assessment

The transition from previous targeted coverage programmes to the JJM's universal coverage mandate necessitates fundamental reconceptualization of assessment approaches. Earlier programmes operated within coverage expansion paradigms, utilizing evaluation metrics designed to assess physical and financial progress while analyzing equity, performance, and improvement opportunities based on partial household coverage patterns. The primary analytical concern focused on identifying excluded households based on socioeconomic profiles, developing what may be characterized as "exclusion-based" evaluation frameworks.

This exclusion-focused approach reflected the programmatic reality of selective coverage strategies, where resource constraints necessitated targeting mechanisms that inevitably left substantial populations without access. Evaluation frameworks consequently emphasized gap analysis and equity assessment to inform subsequent targeting decisions and resource allocation strategies.

The JJM's universal coverage objective fundamentally alters this analytical landscape, shifting focus from coverage expansion toward functionality optimization for connected households. This paradigmatic transition creates opportunities for developing more sophisticated assessment frameworks that examine service quality, reliability, and sustainability dimensions rather than simply documenting access provision. The JJM database architecture provides unprecedented analytical possibilities for functionality evaluation, enabling multidimensional assessment approaches that transcend traditional coverage-focused metrics.

Integrated Functionality Indicators Framework

The JJM Functionality Report 2022 (Government of India, 2022) represents an important step toward systematic functionality assessment, utilizing specific indicators for evaluating FHTC performance at both household and village-level public institution scales, as detailed in Box 1. The report incorporates service delivery parameters and institutional arrangement indicators that, while not directly determining functionality, play crucial roles in overall water service delivery effectiveness.

I. **Working tap connections (%)** - HHs that received water through a tap connection at least once in the last 7 days
II. **Quantity of water received by households (%)**
    A. Adequate quantity (>55 LPCD)
    B. Partially adequate quantity (> 40 LPCD - < 55 LPCD)
    C. Inadequate quantity (<40 LPCD)
III. **Regularity of water received by households (%)**
    A. Fully Regular Supply (as per schedule)
    B. Partially Regular Supply (not as per schedule)
    C. Irregular Supply (less than 9 months' supply)
    D. Potable (Quality) water received by households

Box 1 Indicators in Functionality Assessment Report 2022

Table 1 Indicators for monitoring the RDW functionality

Indicator	Sub Indicator	Explanation
Environmental	Source of water supply	Sustainability of water source throughout the year
	Quantity of Water Supply	Water supply of 55 lpcd
	Quality of Water Supply	Water quality as per the defined BIS standards
Institutional	ISA (Implementation support agency)	The presence of a supporting agency in the design and implementation of schemes
	VWSC Formation	Formation of village water and sanitation committees
	Composition of members	Details about the VWSC members who are key stakeholders in decision making
	Training of Members	The capacity building of VWSC members and operator as per the modern infrastructure requirements
	Complaints Redressal	Details of complaints raised by the households/other stakeholders and the status of their complaints
Financial	Source of O&M Expenditure	Details about the O&M funds
	Percentage of HH paying for O&M	Details number of HHs contributing towards the O&M charges
	Total O&M fund available against expenditure	Utilisation status of O&M funds
	Source of payment to operators	The fund available for the operator's payment
Technical	Frequency of service breakdown	The average time duration of any disruption in water services
	The average duration of repairing	The average time interval to restore the pipe network
	Nature of service breakdown	Details of the components that cause breakdown
Social	Category-wise Coverage	Socio-economic category-wise details on HH tap connection
	Community participation	Socio-economic category-wise detail of participants in key meetings

Drawing from this existing literature base (Figure 2), the JJM Functionality Report 2022 (Box 1), and official programme guidelines, this analysis develops a integrated indicator framework for assessing functionality dimensions within water service delivery systems. Table 1 presents a systematic categorization of indicators requiring continuous monitoring to achieve genuine 'functionality' in FHTC implementation, organized hierarchically from primary indicators through sub-indicators to detailed explanatory parameters.

This multidimensional framework recognizes that functionality represents a temporal snapshot of sustainability conditions rather than a long-term sustainability assessment at a particular time (Lockwood & Smits, 2011). Consequently, systematic monitoring of these indicator categories becomes essential for minimizing post-implementation service failures that can undermine sustainable water service delivery objectives (Narayanan et al., 2023; Whaley & Cleaver, 2017).

The framework's four-dimensional structure reflects the interconnected nature of sustainable service delivery, where environmental resource availability, institutional governance capacity, financial sustainability mechanisms, and technical system reliability must function coherently to ensure consistent functionality outcomes.

This integrated approach enables more sophisticated analysis of service delivery challenges and targeted intervention development based on specific dimensional weaknesses rather than generic programme modifications.

Aligned with the JJM's universal coverage mandate, this analytical approach explores factors impacting tap functionality within the assumption of basic connectivity provision. The subsequent section examines how the JJM database architecture aligns with this integrated framework for functionality and evaluates its capacity to support evidence-based decision-making for enhancing sustainable service delivery.

Analytical Assessment: JJM Database Capacity for Water Service Delivery Evaluation

The JJM database represents a sophisticated information architecture comprising an Integrated Management Information System (IMIS) and complementary dashboard infrastructure. The IMIS encompasses over 50 standardized reporting formats incorporating approximately 200 distinct parameters, with analytical capabilities extending to village-level granularity. This comprehensive data architecture theoretically enables the identification of partially or non-functional service schemes and supports evidence-based intervention strategies. To evaluate the system's practical utility for functionality assessment, we conducted a systematic analysis comparing JJM dashboard capabilities against the multidimensional indicator framework established in Table 1.

Dashboard Visualization Capabilities and Limitations

The JJM dashboard provides real-time visualization infrastructure (with daily update cycles) enabling multi-scalar monitoring across national, state, district, panchayat, and village administrative levels (refer to Figures 3 and 4). The platform incorporates clear categorical demarcations that facilitate rapid identification of geographical areas experiencing performance deficits in physical infrastructure deployment and financial utilization metrics. These visualization capabilities enable straightforward analysis of both annual and cumulative progress patterns for scheme implementation at national and state scales (refer to Figure 4). Despite these visualization capabilities, systematic analysis reveals significant limitations in the dashboard's capacity to provide functionality assessment. While the JJM dashboard demonstrates careful design optimization for user-friendly programme progress monitoring and proves highly valuable for overall implementation oversight, it provides constrained analytical perspectives on water service functionality dimensions that extend beyond basic coverage metrics.

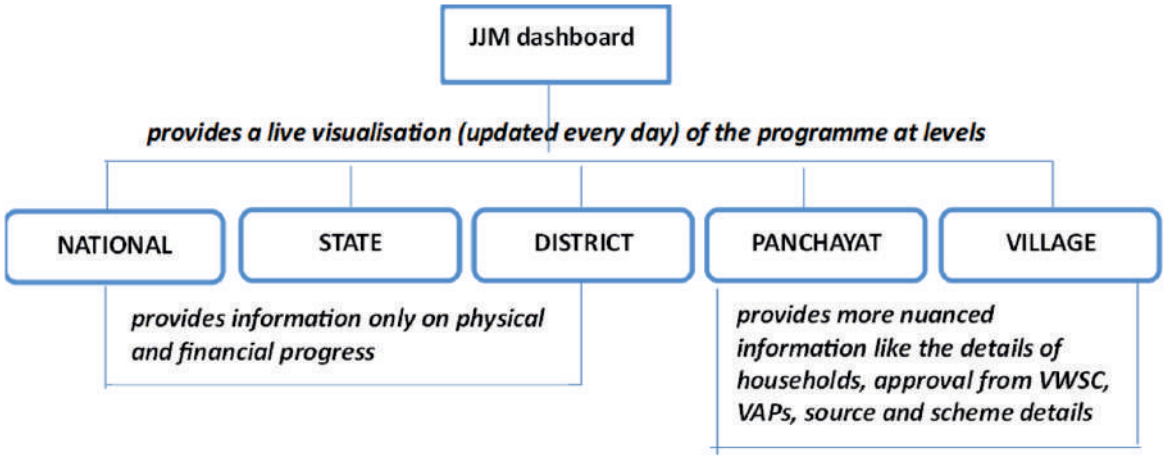

Figure 3 Information provided by the JJM dashboard at various levels

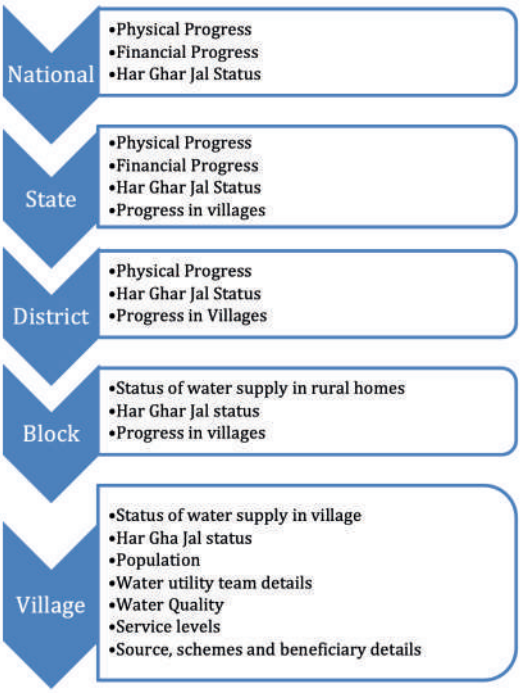

Figure 4 Data availability at different levels in the JJM Dashboard

Systematic Gap Analysis: IMIS Data Availability Assessment

An evaluation of JJM IMIS data architecture against the functionality indicator framework reveals substantial variations in data availability across administrative scales and indicator categories. Table 2 presents a systematic analysis comparing IMIS format availability with the functionality indicators established in our analytical framework.

Critical Data Architecture Deficiencies

The systematic analysis presented in Table 2 illuminates two fundamental limitations constraining the JJM database's utility for functionality assessment.

Visualization-Data Integration Gaps: Several indicators documented within the IMIS architecture remain absent from dashboard visualization capabilities. For instance, water source typology data, while systematically geotagged within the IMIS infrastructure, lacks dashboard representation. This visualization deficit significantly constrains rapid geographical gap analysis and impedes efficient identification of spatially distributed service delivery challenges. Enhanced visualization of such indicators would substantially improve the capacity for flagging location-specific issues (particularly the source failure, which has been a major issue in the past for many schemes) and enabling targeted intervention strategies.

Comprehensive Data Availability Constraints: More significantly, the analysis reveals a systematic absence of data across multiple critical functionality dimensions beyond village level, including service level benchmarking, supply water quality monitoring, detailed VWSC institutional arrangements, and operator management systems. These data gaps represent fundamental analytical constraints, as these indicators serve as primary determinants of service delivery sustainability and can provide diagnostic insights into the underlying causes of scheme performance failures.

The data architecture reveals particular limitations in financial and technical monitoring dimensions, where operation and maintenance expenditure tracking, household contribution documentation, and service reliability metrics remain systematically absent across all administrative levels. These omissions severely constrain understanding of the financial sustainability mechanisms and technical performance patterns that fundamentally determine long-term service delivery outcomes.

Multi-Level Integration Requirements and Policy Implications

While certain institutional and technical data elements are documented at panchayat levels, their integration into state-level analytical frameworks would enable more integrated perspectives essential for broader policy analysis and strategic decision-making. Critical data categories requiring enhanced integration include institutional arrangement typologies, operation and maintenance challenge classifications, grievance mechanism effectiveness, governance capacity assessments, and technical performance indicators at the state level.

The analysis suggests that effective service delivery and functionality assessment require systematic implementation at state and district administrative levels, where policy formulation and resource allocation decisions occur. Such multi-level analytical approaches would simultaneously identify existing data architecture gaps while providing intervention opportunities for targeted functionality enhancement strategies.

Table 2 Analysis of JJM IMIS against the Functionality Indicators

Indicator	Sub Indicator	Data Availability in IMIS			
		Village	District	State	National
Environmental	Source of water supply	Type of source	Type of source	Type of source	Type of source
	Quantity of Water Supply	Available	DNA	DNA	DNA
	Quality of Water Supply	Available	Data for number of testing, safe and unsafe sources available		
Institutional	ISA (Implementation support agency)	DNA	Data for number of ISA involved available		
	VWSC Formation	Details of VWSC members available	Data for number of VWSC formed available		
	Composition of members	Details of VWSC members	DNA	DNA	DNA
	Training of Members	DNA	Data on number and types of training		
	Complaints Redressal	DNA	DNA	DNA	DNA
Financial	Source of O&M Expenditure	DNA	DNA	DNA	DNA
	Percentage of HH paying for O& M	DNA	DNA	DNA	DNA
	Total O&M fund available against expenditure	DNA	DNA	DNA	DNA
	Source of payment to operators	DNA	DNA	DNA	DNA
Technical	Frequency of service breakdown	DNA	DNA	DNA	DNA
	The average duration of repairing	DNA	DNA	DNA	DNA
	Types of service breakdown	DNA	DNA	DNA	DNA
Social	Category-wise Coverage	DNA	DNA	DNA	DNA
	Community participation	DNA	DNA	DNA	DNA
DNA: Data not available in JJM Dashboard					

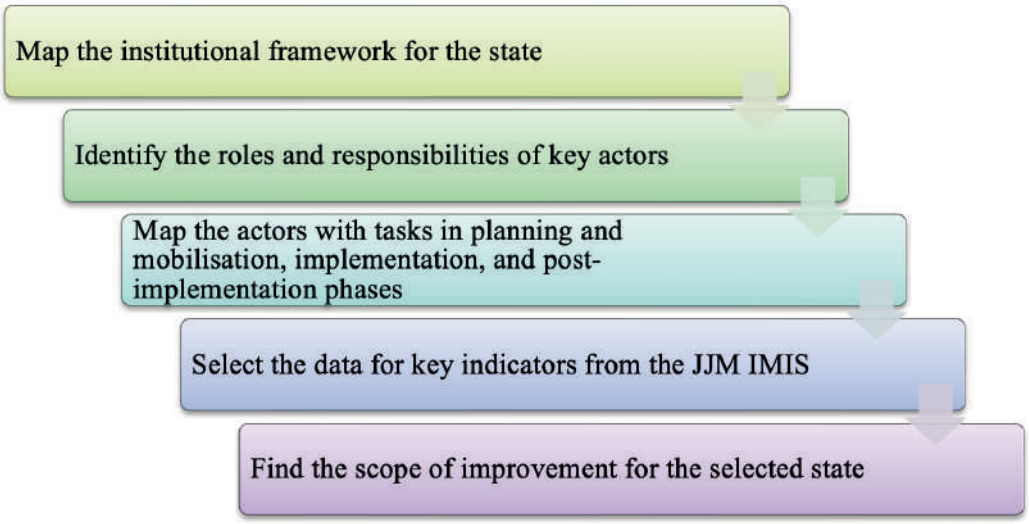

Figure 5 Standardized process to gain insight into service delivery

This systematic evaluation reveals that while the JJM database architecture represents significant advancement over previous monitoring systems, substantial enhancements in data collection, integration, and visualization capabilities are necessary to support functionality assessment and evidence-based policy development for sustainable water service delivery improvement.

Way Forward: Toward Integrated Digital Governance for Sustainable Water Service Delivery

This policy brief's functionality assessment framework reveals critical misalignment between the JJM's digital capabilities and sustainable service delivery requirements. Combined with Policy Brief No. 1's digital federalism analysis, three fundamental challenges emerge that must be addressed for effective water governance transformation.

System Architecture Deficiencies: The gap analysis in Table 2 demonstrates a systematic absence of sustainability-oriented indicators across financial, technical, and institutional dimensions. While the JJM database captures infrastructure deployment effectively, it lacks operation and maintenance tracking, service reliability metrics, and institutional capacity indicators essential for long-term functionality. The elimination of slip-back tracking from previous systems exemplifies this implementation bias, preventing early identification of service deterioration patterns necessary for preventive intervention.

Federal Coordination Tensions: The current system strengthens central oversight through standardized reporting but constrains local adaptation and innovation. Household-level monitoring capabilities remain underutilized due to absent socio-economic integration, while sophisticated data requirements create administrative displacement where local institutions focus on compliance rather than service improvement. This reflects the broader digital federalism challenge of balancing coordination benefits with contextual responsiveness.

Accountability Mechanism Gaps: Enhanced transparency through dashboards has not translated into responsive governance mechanisms. The system excels at identifying performance gaps but lacks protocols ensuring functionality problems trigger corrective actions. Decision-makers across administrative levels require differentiated analytical tools and clear intervention pathways linking monitoring insights to improved service outcomes.

Strategic Requirements: Addressing these challenges requires three integrated interventions: digitizing functionality indicators while restoring sustainability tracking capabilities eliminated from previous systems; restructuring data collection and visualization processes to balance standardization with contextual adaptation needs; and developing multi-level decision support templates that transform monitoring platforms into active governance tools enabling

responsive management.

Research Priorities: Subsequent policy briefs will examine how states can document granular functionality data while preserving local context for analytical synthesis, and assess database architecture refinements to support multi-level decision-making processes. Source sustainability will serve as a critical case study for understanding how digital governance systems can evolve beyond compliance monitoring toward adaptive management supporting sustainable service delivery.

The JJM experience demonstrates that digital governance effectiveness requires alignment between technical capabilities, institutional capacity for multi-level coordination, and political commitment to responsive mechanisms. Realizing transformative potential depends on addressing fundamental governance challenges rather than relying solely on technological capabilities.

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