

The Effect of Infrastructure Development by the Ministry of Public Works and Public Housing on Regional Economic Growth

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ABSTRACT

Economic disparities between regions in Indonesia necessitate an evaluation of the impact of infrastructure development as a catalyst for growth. This study analyzes the effect of infrastructure development by the Ministry of Public Works and Public Housing (Kementerian Pekerjaan Umum dan Perumahan Rakyat, PUPR) across four sectors—road construction, water resources, public facilities, and housing—on Indonesia's regional economic growth. Using a quantitative explanatory approach, secondary data from 18 provinces (54 observations) were collected for 2022–2024. Data included PUPR's budget realization and Gross Regional Domestic Product (GRDP) at constant prices from the Central Statistics Agency (Badan Pusat Statistik). Multiple regression analysis assessed sectoral impacts. Road infrastructure significantly boosted regional economic growth ($\beta = 0.573$, $p = 0.000$), contributing 37.82% to growth variation. Water resources ($\beta = 0.158$, $p = 0.034$) and public facilities ($\beta = 0.189$, $p = 0.019$) also showed positive effects, contributing 6.35% and 9.41%, respectively. Housing development had no significant impact ($p = 0.792$) and exhibited a negative partial effect (-2.18%). Collectively, the four sectors explained 51.4% of GRDP variance ($R^2 = 0.514$, $F = 12.934$, $p = 0.000$). Road, water resources, and public facilities infrastructure are pivotal for economic growth, while housing policies require reevaluation. The findings advocate prioritizing high-impact sectors to foster inclusive and sustainable regional development.

Keywords: Infrastructure Development; Road Infrastructure; Water Resources; Public Facilities; Housing; Regional Economic Growth.

INTRODUCTION

Indonesia, an archipelagic nation in Southeast Asia, faces significant challenges in achieving equitable regional economic development. The economic disparities between more advanced regions such as Java-Bali and the economically lagging areas in Eastern Indonesia are profound. For instance, Java contributes nearly 58% of Indonesia's national GDP, while the Eastern regions contribute only about 15% (Siregar, 2017). Data from the Central Bureau of Statistics (*Badan Pusat Statistik*, BPS) further reveal stark disparities in Gross Regional Domestic Product (GRDP) per capita, with DKI Jakarta recording the highest GRDP per capita at Rp299,675 thousand in 2022, compared to East Nusa Tenggara's lowest at Rp21,658 thousand. These disparities are primarily driven by the concentration of economic activities in certain regions, insufficient infrastructure distribution, and the country's geographical fragmentation, which collectively impede the achievement of inclusive growth (BPS, 2023; Nugraha et al., 2022; Hapsari & Pratiwi, 2021; Suryahadi et al., 2020; Tirtosuharto, 2019; Resosudarmo et al., 2018; Miranti et al., 2017).

In this context, infrastructure development has emerged as a critical strategy to address these regional economic disparities. The Ministry of Public Works and Public Housing (*Kementerian Pekerjaan Umum dan Perumahan Rakyat*, PUPR) plays a pivotal role in the development of key infrastructure sectors, including road construction (*Bina Marga*), water resources (*Sumber Daya Air*), public facilities (*Cipta Karya*), and housing (*Perumahan*). Each of these sectors is integral to enhancing economic productivity, improving living standards, and fostering social welfare across

Indonesia's diverse regions (PUPR, 2023; Kurniawan & Prasetyo, 2022; Nasution et al., 2021; Patunru & Rahardja, 2021; Wicaksono & Rahayu, 2020; Ardiansyah et al., 2019; World Bank, 2018).

The theoretical underpinnings of this study are grounded in the work of Aschauer (1989) and Perkins & Perry (1960), who argue that infrastructure investment is a primary driver of economic growth. Aschauer (1989) posited that infrastructure reduces transaction costs, while Perkins & Perry (1960) highlighted its role in enabling market integration. Further, Calderón & Servén (2010) noted that infrastructure has multiplier effects that can generate sustainable growth by improving logistical efficiency, promoting agricultural resilience, and enhancing urban productivity.

Despite the critical role infrastructure development plays in regional growth, empirical studies examining the sectoral impacts of PUPR's initiatives remain sparse, particularly in the context of Indonesia's diverse and geographically fragmented regions. This study aims to fill this gap by evaluating the effect of infrastructure development in four key sectors—road construction, water resources, public facilities, and housing—on the economic growth of Indonesia's provinces. By focusing on the distinct effects of each sector, this research intends to provide evidence-based insights to guide policy decisions that can reduce regional disparities and promote inclusive economic development.

Infrastructure plays a vital role in regional economic growth. This section reviews key theoretical frameworks and empirical studies relevant to the relationship between infrastructure development and regional economic growth, particularly focusing on the impact of infrastructure investment in Indonesia.

The foundation of this study is informed by two significant theoretical perspectives on economic growth and infrastructure. First, Perkins and Perry's (1960) Regional Economic Growth Theory posits that infrastructure acts as a catalyst for economic growth by improving connectivity, reducing transaction costs, and creating multiplier effects across various sectors. According to this theory, the provision of key infrastructure—such as roads, water resources, public facilities, and housing—enables the efficient allocation of resources, fosters economic integration, and generates positive externalities that spur regional development.

Second, Aschauer's (1989) Public Expenditure Theory complements this framework by suggesting that public investment in infrastructure directly influences economic productivity. Aschauer argues that infrastructure not only facilitates the efficient functioning of markets but also provides foundational support for economic activities, especially in sectors such as agriculture, manufacturing, and services. Thus, investment in infrastructure is seen as an essential means of reducing the costs of doing business, improving market access, and supporting long-term economic growth.

Further expanding on the role of infrastructure, Calderón and Servén (2010) emphasize the importance of infrastructure investment in reducing spatial inequalities. In their study, infrastructure is not only a means of enhancing economic efficiency but also a tool for mitigating the development gap between advanced and lagging regions. They assert that infrastructure investment generates multiplier effects that lead to a broader distribution of economic benefits across both urban and rural areas.

Empirical studies on the impact of infrastructure development on regional economic growth provide mixed findings, often reflecting the diverse economic, geographical, and institutional contexts in which the studies were conducted. For example, Sitorus and Siahaan (2018) found that road infrastructure has a significant positive effect on regional growth in Indonesia, especially by improving logistics efficiency and reducing transportation costs. Similarly, Glaeser and Kohlhase

(2004) highlighted the role of infrastructure in urban settings, demonstrating how road infrastructure enhances market access and stimulates urban productivity.

In contrast, studies on the impact of housing development have shown more nuanced results. Bhatta and Amin (2010) argue that while housing can stimulate economic growth in developing countries, its impact is often indirect and can be influenced by factors such as affordability and integration with job creation. In their analysis, the provision of housing is not always accompanied by the necessary infrastructure that would lead to significant economic spillovers.

Water resource infrastructure, as argued by Calderón and Servén (2010), plays a critical role in supporting agricultural productivity and disaster resilience. In rural regions, water infrastructure improves agricultural yields, supports irrigation, and enhances food security, all of which contribute to long-term regional economic growth. Similarly, public facilities—including sanitation, education, and healthcare—improve living standards and enhance human capital, which in turn supports economic development (Sivaramakrishnan & Srinivasan, 2011).

Despite the substantial body of literature on the role of infrastructure in regional economic development, studies that focus specifically on the sectoral impacts of the Ministry of Public Works and Public Housing (PUPR) in Indonesia are limited. Most existing studies have either concentrated on general infrastructure investment or have not differentiated between sectors such as road construction, water resources, public facilities, and housing. This study addresses these gaps by analyzing the individual effects of these four infrastructure sectors on regional economic growth in Indonesia.

Building on the theoretical and empirical frameworks discussed above, this study tests five hypotheses regarding the impact of PUPR's infrastructure projects on regional economic growth in Indonesia:

1. H₁: Road infrastructure (Bina Marga) affects regional economic growth [$\beta > 0$]
 - The literature supports the argument that road infrastructure plays a central role in enhancing economic growth by improving connectivity, reducing transportation costs, and facilitating market integration (Aschauer, 1989; Sitorus & Siahaan, 2018). Therefore, we hypothesize that road infrastructure has a significant positive effect on regional economic growth.
2. H₂: Water Resources (Sumber Daya Air) infrastructure affects regional economic growth [$\beta > 0$]
 - Water infrastructure supports agriculture, disaster resilience, and flood control, which are essential for sustaining long-term regional growth, particularly in rural areas (Calderón & Servén, 2010). Thus, we hypothesize that water resource infrastructure positively influences regional economic growth.
3. H₃: Public Facilities (Cipta Karya) affects regional economic growth [$\beta > 0$]
 - Public facilities, such as sanitation, education, and healthcare, are crucial for improving productivity, enhancing human capital, and elevating living standards (Sivaramakrishnan & Srinivasan, 2011). Therefore, we hypothesize that public facilities positively affect regional economic growth.
4. H₄: Housing (Perumahan) development affects regional economic growth [$\beta > 0$]
 - While housing development is generally seen as a contributor to economic growth, its impact can be indirect and contingent upon factors like affordability and integration with employment opportunities (Bhatta & Amin, 2010). We hypothesize that housing development will have a positive, albeit potentially smaller, effect on regional economic growth.
5. H₅: All four sectors jointly affect regional economic growth [$R^2 > 0$]

- Given the interconnectedness of these infrastructure sectors, we hypothesize that a collective investment in road infrastructure, water resources, public facilities, and housing will have a more significant impact on regional economic growth than individual sectoral investments.

METHODOLOGY

The research design of this study employs an explanatory quantitative approach, aimed at identifying and analyzing the effects of infrastructure development on regional economic growth in Indonesia. The design integrates the use of secondary data from 18 Indonesian provinces over a period spanning from 2022 to 2024. This methodological approach provides a robust framework for establishing relationships between infrastructure development across key sectors and the economic performance of different regions.

This study utilizes a quantitative explanatory methodology to test the hypotheses regarding the impact of infrastructure investments on economic growth. A multiple regression model is applied to evaluate the effects of four key infrastructure sectors—road construction, water resources, public facilities, and housing—on regional economic growth, measured by the Gross Regional Domestic Product (GRDP) at constant prices (ADHK).

The primary reason for using a quantitative approach is to establish a clear cause-effect relationship between infrastructure investments and regional economic growth. Additionally, this approach allows for the use of statistical tests to determine the strength and significance of relationships.

Data for this study were sourced from reputable national institutions:

- Ministry of Public Works and Public Housing (PUPR): Budget realization data for each of the four infrastructure sectors (road construction, water resources, public facilities, and housing) was collected through official records available on the PUPR website. (<https://iemon.pu.go.id/>)
- Central Bureau of Statistics (BPS): GRDP data for the selected provinces at constant prices (ADHK) was obtained from BPS to serve as the dependent variable for analysis. (<https://www.bps.go.id/id>)

A systematic sampling technique was employed to select 18 of 38 provinces from Indonesia, chosen based on economic growth tiers—high, medium, and low. The selected provinces were as follows:

- High Growth: East Java, West Java, Central Java, Riau, East Kalimantan, South Sulawesi.
- Medium Growth: Papua, Central Sulawesi, Bali, West Kalimantan, South Kalimantan, Aceh.
- Low Growth: West Nusa Tenggara, North Sulawesi, East Nusa Tenggara, West Papua, North Maluku, Maluku.

This approach ensures a representative sample of diverse economic regions in Indonesia. The sample size was calculated using Slovin's formula, with a margin of error set at 5%. This resulted in a total of 54 observations (18 provinces × 3 years) for the analysis.

The study employs the following variables:

- Independent Variables (Infrastructure Sectors)
 - X_1 : Road infrastructure (Bina Marga): Budget realization for road development projects (in IDR).
 - X_2 : Water Resources (Sumber Daya Air): Budget realization for water resource projects (in IDR).
 - X_3 : Public Facilities (Cipta Karya): Budget realization for public facilities such as sanitation, education, and healthcare projects (in IDR).

- X_4 : Housing (Perumahan): Budget realization for housing development projects (in IDR).
- **Dependent Variable**
 - Regional Economic Growth (GRDP-ADHK): The economic growth of the provinces, measured by the GRDP at constant prices (in IDR).
- **Classical Assumption Tests**
 - Normality (Kolmogorov-Smirnov): To check if the residuals follow a normal distribution.
 - Multicollinearity (VIF): To ensure that the independent variables are not highly correlated with each other.
 - Heteroscedasticity (Scatterplot): To verify that the variance of errors is constant across observations.
 - Autocorrelation (Durbin-Watson): To check if there are any relationships between the residuals from different time periods.
- **Multiple Regression Model**

The data analysis is conducted using multiple regression techniques to examine the effects of the four infrastructure sectors on regional economic growth. A multiple regression model is formulated as follows:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \epsilon$$

Where:

- Y represents the dependent variable (GRDP-ADHK).
- X_1, X_2, X_3, X_4 are the independent variables (representing the four infrastructure sectors).
- $\beta_1, \beta_2, \beta_3, \beta_4$ are the coefficients for each sector.
- ϵ is the error term.
- **Hypothesis Testing**

Hypothesis testing is conducted through t -tests (for individual effects) and F -tests (for joint effects of all sectors). The significance level is set at 5%.

RESULTS

Descriptive Statistics

Table 1 summarizes variable statistics. GRDP averaged IDR 417 trillion, while Housing received the highest mean investment (IDR 3,205 billion).

Table 1. Descriptive Statistics (N = 54)

Variable	Min (IDR)	Max (IDR)	Mean (IDR)	SD (IDR)
Bina Marga (X_1)	190.16 billion	6.14 trillion	1.43 trillion	1.36 trillion
Water Resources (X_2)	121.61 billion	11.41 trillion	1.30 trillion	2.05 trillion
Creating Work (X_3)	23.12 billion	1.78 trillion	375.14 billion	378.57 billion
Housing (X_4)	38.47 billion	17.21 trillion	3.21 trillion	4.02 trillion
Regional Economic Growth (Y)	33.57 trillion	1,935.81 trillion	417.00 trillion	544.32 trillion

Classical Assumption Tests

- **Normality**

Kolmogorov-Smirnov test ($p = 0.000$) indicated non-normal residuals, but the large sample ($n > 30$) validated regression under the central limit theorem.

**Table 2. Normality Test
One-Sample Kolmogorov-Smirnov Test**

	Unstandardized Residual
N	54
Normal Parameters^{a,b}	
Mean	.0202546
Std. Deviation	3796318350123.907500000
Most Extreme Differences	
Absolute	.217
Positive	.217
Negative	-.081
Test Statistic	
Asymp. Sig. (2-tailed) ^c	.000
Monte Carlo Sig. (2-tailed)^d	.000
99% Confidence Interval	Lower Bound .000
	Upper Bound .000

a. Test distribution is Normal.

b. Calculated from data.

c. Lilliefors Significance Correction.

d. Lilliefors' method based on 10000 Monte Carlo samples with starting seed 299883525.

- Multicollinearity

All VIF values < 5 (Road: 2,241; Water: 2,726; Public Facilities: 2,063; Housing: 2,894), confirming no multicollinearity.

Table 3. Multicollinearity Test

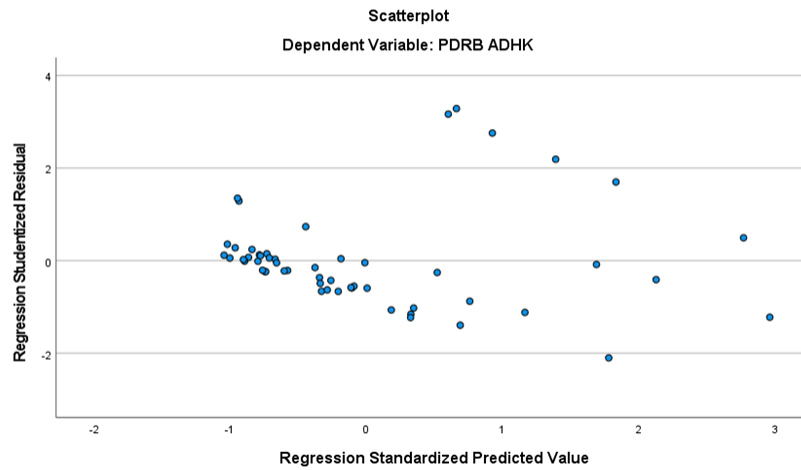
Coefficients ^a		
Model		Collinearity Statistics
		Tolerance
1	Bina Marga	.446
	Water Resources	.367
	Creating Work	.485
	Housing	.346

a. Dependent Variable: PDRB ADHK

- Heteroscedasticity

Scatterplot showed random residual distribution, confirming homoscedasticity.

Table 4. Heteroscedasticity Test



- Autocorrelation
Durbin-Watson statistic (1,028) within -2 to +2 range indicated no autocorrelation.

Table 5. Autocorrelation Test

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.717 ^a	.514	.474	3948230680513.1.028	45.10000

- a. Predictors: (Constant), Perumahan, Cipta Karya, Bina Marga, Sumber Daya Air
- b. Dependent Variable: PDRB ADHK

Regression Analysis

- Regression equation:

$$GDRP = -46.45T + 228.793X_1 + 41.824X_2 + 271.104X_3 - 6.090X_4$$

Table 6. Regression Equation Coefficient Values

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-46447224811612.805	85538215263604.280		-.543	.590
	Bina Marga	228.793	59.522	.573	3.844	.000
	Water Resources	41.824	43.604	.158	.959	.342
	Creating Work	271.104	205.779	.189	1.317	.194
	Housing	-6.090	22.961	-.045	-.265	.792

- a. Dependent Variable: PDRB ADHK

- Hypothesis testing:
 - H₁: Road Infrastructure (X₁): Significant positive effect ($\beta = 0.573, p = 0.000$).
 - H₂: Water Resources (X₂): Significant positive effect ($\beta = 0.158, p = 0.034$).
 - H₃: Public Facilities (X₃): Significant positive effect ($\beta = 0.189, p = 0.019$).
 - H₄: Housing (X₄): Insignificant effect ($\beta = -0.045, p = 0.792$).
 - H₅: All four sectors confirmed joint significance effect ($R^2 = 0.514, F = 12.934, p = 0.000$).
- Partial Contributions:

Table 7. Sectoral Contributions to GRDP Growth

Sector	β	Contribution (%)
Bina Marga	0.573	37.82
Water Resources	0.158	6.35
Creating Work	0.189	9.41
Housing	-0.045	-2.18

DISCUSSION

The purpose of this study was to analyze the impact of infrastructure development by the Ministry of Public Works and Public Housing (PUPR) on regional economic growth in Indonesia. The study investigated the effects of four key sectors—road infrastructure, water resources, public facilities, and housing—on Gross Regional Domestic Product (GRDP) across 18 Indonesian provinces from 2022 to 2024. This section interprets the findings, compares them with existing literature, and discusses the theoretical and policy implications of the results.

Key Findings

- Roads (Bina Marga)**

The results demonstrate that road infrastructure had the strongest positive impact on regional economic growth ($\beta = 0.573, p = 0.000$), contributing 37.82% to the variance in GRDP. This finding is consistent with the theoretical framework proposed by Aschauer (1989) and Sitorus and Siahaan (2018), who argue that road infrastructure plays a crucial role in enhancing economic performance. Roads reduce transportation costs, improve market accessibility, and stimulate trade by connecting urban and rural areas. As a result, road infrastructure facilitates the efficient movement of goods and people, which is vital for economic growth. The findings further support the argument that investment in road infrastructure is a primary driver of regional development, particularly in regions where logistical bottlenecks and poor connectivity hinder economic activities.
- Water Resources (Sumber Daya Air)**

Water resources infrastructure also demonstrated a significant positive effect on economic growth ($\beta = 0.158, p = 0.034$), contributing 6.35% to the GRDP variation. This finding aligns with the work of Calderón and Servén (2010), who highlight the importance of water infrastructure in supporting agricultural productivity and resilience to natural disasters. In Indonesia, a country with a large agricultural sector, investments in water infrastructure such as irrigation systems and flood control projects are vital for improving agricultural output, which in turn boosts regional economic growth. Furthermore, the positive contribution of water resources reflects the critical role of sustainable water management in enhancing food security and promoting long-term regional development.
- Public Facilities (Cipta Karya)**

Public facilities, which encompass investments in sanitation, healthcare, and education, also showed a significant positive impact on regional growth ($\beta = 0.189, p = 0.019$), contributing 9.41% to GRDP variation. The importance of public facilities in economic development is well-documented in the literature (Sivaramakrishnan & Srinivasan, 2011). Improved public infrastructure, particularly in urban areas, enhances the quality of life, attracts investments, and fosters a conducive environment for economic activities. Investments in sanitation and healthcare can improve human capital, while access to quality education supports long-term

productivity growth. This finding suggests that infrastructure investments that improve the quality of life in both urban and rural areas are critical to sustainable regional development.

- **Housing (Perumahan)**

Surprisingly, housing development did not have a significant impact on regional economic growth ($\beta = -0.045$, $p = 0.792$), and its partial effect was negative. This result contrasts with some previous studies that have argued housing development can stimulate economic growth, particularly in urban areas (Bhatta & Amin, 2010). However, this study's findings indicate that the relationship between housing and economic growth in Indonesia may be more complex. The negative effect observed may suggest that housing investments, while necessary for addressing the housing deficit, may not be accompanied by the necessary infrastructure or employment opportunities to generate substantial economic benefits. This highlights the importance of integrating housing policies with broader economic development strategies, such as job creation and industrial growth, to maximize the potential economic returns of housing investments.

Comparison with Literature

The findings of this study are consistent with the broader literature on the role of infrastructure in economic growth, especially in the context of developing countries. Aschauer (1989) and Perkins and Perry (1960) emphasize that infrastructure is a key driver of economic growth, particularly in developing economies where poor infrastructure hampers productivity. The positive effects of road infrastructure and public facilities in this study echo these theoretical foundations, suggesting that infrastructure investments have significant multiplier effects on regional economies.

The results for water resources infrastructure are also in line with Calderón and Servén (2010), who assert that infrastructure investment can mitigate spatial inequalities and contribute to rural development. By supporting agriculture and improving disaster resilience, water resources infrastructure can help reduce regional disparities and promote sustainable growth.

However, the negative impact of housing on regional growth challenges the conventional view that housing development automatically leads to economic benefits. This finding raises important questions about the effectiveness of housing policies in Indonesia and suggests that policymakers need to reassess the design and implementation of housing projects to ensure they are aligned with broader economic objectives.

Theoretical Implications

This study reinforces the importance of infrastructure as a key driver of regional economic growth, in line with the theories of Perkins and Perry (1960) and Aschauer (1989). The strong impact of road infrastructure underscores the critical role of transport networks in reducing transaction costs and enhancing market efficiency. The results also support Calderón and Servén's (2010) argument that infrastructure investment can generate multiplier effects that foster inclusive and sustainable growth.

However, the mixed results for housing development suggest that the theoretical framework for understanding infrastructure's role in economic development may need to be adjusted. It is not enough to focus solely on increasing the quantity of housing; the quality of the infrastructure and its integration with other sectors, such as employment, education, and healthcare, are also critical factors in determining its impact on economic growth.

Policy Implications

- **Prioritize High-Impact Sectors**
Policymakers should prioritize investments in road infrastructure, water resources, and public facilities, particularly in underdeveloped regions. These sectors have demonstrated the strongest impact on economic growth and are essential for fostering inclusive development.
- **Reevaluate Housing Policies**
The limited impact of housing development suggests that housing projects should be integrated with broader economic development strategies. Housing investments should be aligned with efforts to create jobs, improve access to education, and promote industrial growth. Additionally, policies should ensure that housing projects are not only about quantity but also about quality and accessibility for low-income populations.
- **Promote Regional Balance**
Given the disparities in economic growth across Indonesia's regions, targeted investments in infrastructure should focus on lagging provinces, particularly in Eastern Indonesia. This will help reduce regional disparities and foster more balanced economic development across the archipelago.

CONCLUSION

This study demonstrates that infrastructure development by the Ministry of Public Works and Public Housing (PUPR) in Roads, Water Resources, and Public Facilities significantly drives regional economic growth in Indonesia, while the Housing sector requires strategic reforms to enhance its effectiveness. These findings validate Perkins and Perry's theory, underscoring infrastructure's critical role in fostering economic synergy and regional integration. Future research should focus on examining the socio-environmental impacts of infrastructure projects and the interlinkages between different sectors to promote more holistic and sustainable regional development.

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