

An Integrated RTRW-Based Financing Model for Regional Infrastructure Development in Teluk Wondama Regency, Indonesia

Amiruddin^{1*}, Ibnu Sasongko², Maria Christina Enderwati³

^{1,2,3} Department of Urban Planning and Design, Institut Teknologi Nasional, Malang, Indonesia – 65140

*Corresponding Author: Amiruddin

ABSTRACT: This study develops an integrated financing model based on the Regional Spatial Plan (RTRW) for implementing regional infrastructure in Teluk Wondama Regency, Indonesia. It examines whether infrastructure programs mandated by the RTRW have been accommodated within the regional planning and budgeting hierarchy, the degree of alignment between normative and actual financing sources, and whether financing synchronization is associated with the effectiveness of budget realization. An explanatory quantitative design was employed, with sequential document analysis covering twelve infrastructure sectors. Programs were traced from the RTRW through the RPJPD, RPJMD, OPD Strategic Plans, OPD Annual Work Plans, DPA, and LRA. Financing synchronization was measured using the Financing Synchronization Index on a scale of 0-1, whereas financing effectiveness was measured based on budget realization. Pearson correlation and simple linear regression were then applied to sector-level observations. The road sector recorded the highest synchronization index (0.86), whereas disaster evacuation routes and spaces recorded 0.00. The relationship between synchronization and effectiveness was positive and moderate ($r = 0.491$), but not statistically significant ($p = 0.105$). The regression explained 24.1% of the variation in effectiveness ($R^2 = 0.241$), with the equation $Y = 54.551 + 62.913X$. The findings indicate that financing synchronization is important but insufficient to explain implementation performance. The resulting model integrates planning alignment, empirical financing evidence, program characteristics, fiscal capacity, and regulatory provisions to guide the selection of primary, supporting, and long-term alternative financing.

KEY WORDS: Regional spatial planning, regional infrastructure, financing synchronization, regional infrastructure, fiscal capacity, integrated financial model.

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I. INTRODUCTION

Sustainable regional development requires spatial plans to be translated into implementable programs, clearly assigned institutional responsibilities, and credible financing arrangements. In Indonesia, the Regional Spatial Plan (RTRW) provides the spatial framework for settlement systems, transportation networks, public utilities, environmental infrastructure, and disaster risk reduction. However, its developmental function depends on consistency with long- and medium-term development plans, sectoral strategic plans, annual work plans, and budgeting documents. When spatial mandates and financing architecture are disconnected, infrastructure priorities may remain declarative, projects may become fragmented across regional agencies, and budget realization may fail to address the most urgent spatial needs [1,2,3,4,5,6,7].

Financing challenges are particularly severe in geographically dispersed regions with high fiscal dependence. Infrastructure in coastal, island, and mountainous areas generally requires higher capital and operating expenditure because settlements are separated by sea, logistics are costly, construction seasons are limited, and service networks must reach small populations scattered across extensive areas. Intergovernmental transfers can safeguard basic service provision, but heavy reliance on transfers also reduces regional flexibility when national allocations change and when infrastructure responsibilities are distributed across multiple levels of government [8,9,10]. Alternative instruments, such as public-private partnerships (PPPs), corporate social

responsibility (CSR), grants, regional loans, green financing, and blue financing, can broaden the funding base; however, their suitability must be assessed against project characteristics, fiscal capacity, institutional readiness, and applicable regulations.

TelukWondama Regency in West Papua provides a relevant case. The regency covers 484,776.61 ha and comprises 13 districts, 75 villages, and one urban village. Its coastal, island, and mountainous morphology creates major constraints on connectivity and service delivery. The RTRW mandates infrastructure for roads, bridges, ports, irrigation, drinking water supply, energy, telecommunications, solid waste, wastewater, drainage, and disaster mitigation. At the same time, the regional fiscal structure is dominated by the General Allocation Fund, Special Allocation Fund, Revenue Sharing Fund, Special Autonomy Fund, and other central government transfers. The capital expenditure ratio declined from 30.17% in 2023 to 21.08% in 2024 and 18.36% in 2025, indicating increasingly constrained fiscal space for physical development [11,12,13,14]. Recent empirical evidence from Batu City also indicates that infrastructure is an important component of regional economic development, although its empirical effects may differ across sectors [15].

Previous studies have examined spatial planning implementation, regional fiscal capacity, infrastructure financing, and planning-budgeting consistency as separate domains. Limited attention has been devoted to a measurable framework linking RTRW infrastructure mandates, their accommodation within the planning hierarchy, the normative and actual financing sources used, and the effectiveness of budget execution. This gap is important because a program may be well synchronized across planning documents yet lack adequate funding, while another may achieve high budget realization once funded even though its connection to the broader RTRW financing framework remains weak. An integrated assessment is therefore needed to distinguish planning consistency, financing diversity, implementation capacity, and expenditure performance [3,8,16,17,18,19].

This study has three objectives: (1) to identify the degree of synchronization between the infrastructure indications in the RTRW and the programs and financing frameworks contained in the RPJPD, RPJMD, OPD Strategic Plans, OPD Annual Work Plans, DPA, and LRA; (2) to analyze the relationship between financing synchronization and financing effectiveness; and (3) to formulate an RTRW-based integrated financing model for regional infrastructure development in TelukWondama Regency. The contribution of this study lies in converting document consistency and financing-source alignment into a sector-level index and subsequently using the results to construct an adaptive financing architecture for a fiscally constrained coastal regency.

II. LITERATURE REVIEW

2.1. Integration of Spatial Planning and Development Programming

Spatial planning determines where development should occur, which functions must be protected, and how settlement systems and infrastructure networks should be organized. Development planning establishes priorities, programs, performance targets, responsible regional agencies, and implementation schedules. Budgeting then provides legally authorized resources for these programs. The three systems are complementary: the RTRW provides the spatial basis; the RPJPD and RPJMD establish long- and medium-term priorities; OPD Strategic Plans and OPD Annual Work Plans translate priorities into sectoral actions; and the DPA authorizes annual expenditure. Integration is achieved when infrastructure programs maintain substantive continuity across these documents and are supported by financing sources consistent with their functions and the relevant governmental authority [2,3,5,6,7].

Planning consistency is not merely textual similarity. Program names, locations, outputs, implementation periods, and institutional responsibilities may differ among documents, requiring substantive review to ensure that the same spatial objectives are retained. For example, a road-network mandate may appear as network development in the RTRW, connectivity enhancement in the RPJMD, road maintenance in a Strategic Plan, and several construction or maintenance sub-activities in the DPA. Assessment should therefore trace the program chain rather than count identical nomenclature. In this study, the RTRW indicative program is treated as the basic unit and traced throughout the planning and budgeting hierarchy [11,16].

2.2. Regional Infrastructure Financing and Fiscal Dependence

Regional infrastructure may be financed through own-source revenue, general transfers, earmarked transfers, revenue sharing, special autonomy funds, fiscal incentives, and budget surpluses. Each instrument differs in predictability, discretion, sectoral eligibility, and reporting requirements. Own-source revenue provides autonomy but is often limited in remote regions. General transfers can finance various regional functions, whereas special allocations are more closely tied to national service priorities and technical criteria. Revenue-sharing and special autonomy funds reflect fiscal arrangements and particular resource or territorial characteristics. The composition of these sources determines the regional government's capacity to respond flexibly to the infrastructure portfolio mandated by the RTRW [8,10,12,13].

Fiscal dependence does not automatically imply ineffective spending. Transfer-dependent governments may efficiently realize allocated budgets, yet their investment portfolios remain vulnerable to external policy changes and may not cover all infrastructure sectors. This distinction supports separating financing synchronization from financing effectiveness. Synchronization represents the breadth and appropriateness of financing sources relative to the normative options available to a sector, whereas effectiveness represents the capacity to realize approved allocations. Both dimensions are required to assess whether regional infrastructure planning is financially implementable [10,17].

2.3. Partnership and Sustainable Financing Instruments

Public-private partnerships (PPPs) can mobilize capital and managerial expertise for infrastructure with measurable service outputs and suitable payment mechanisms. CSR can support small-scale community facilities, environmental improvements, or complementary infrastructure around corporate operating areas. Grants can finance projects serving the public interest without increasing debt, whereas regional loans can accelerate capital investment when repayment capacity and legal requirements are satisfied. Green financing is suitable for renewable energy, low-carbon transportation, water efficiency, sanitation, and climate resilience. Blue financing is particularly relevant to coastal and marine economies, including sustainable ports, coastal protection, wastewater control, and ecosystem-based infrastructure [9,19,20,21,22].

These instruments should not be applied uniformly. Projects with low cost-recovery potential and strong public-service obligations remain primarily dependent on government financing. Projects with identifiable users, revenue streams, availability-payment potential, or economic value may support partnership structures. Environmental and disaster-resilience projects may qualify for grants or thematic financing but still require robust safeguards and monitoring. Financing selection should therefore be based on program characteristics, governmental authority, fiscal capacity, project maturity, economic potential, environmental contribution, and regulatory feasibility rather than solely on infrastructure type [9,18,21].

2.4. Analytical Framework: Synchronization and Effectiveness

This study operationalizes financing synchronization as the alignment between realistic normative financing sources and the sources actually used for an RTRW infrastructure sector. Normative sources are those legally and practically relevant to the sector. Actual sources are verified through the DPA and LRA. The index produces a standardized value from zero to one, allowing comparison among sectors with different programs and budgets. Values of 0.00-0.33 are categorized as unsynchronized, 0.34-0.66 as partially synchronized, and 0.67-1.00 as synchronized. This index is an evaluation instrument, not a measure of absolute funding adequacy [16,23,24].

Financing effectiveness is measured through budget realization, namely the proportion of the approved budget actually spent on the relevant infrastructure sector. Following the regional-government performance framework used in the thesis, realization of 0-60% is categorized as ineffective, 61-80% as less effective, 81-90% as moderately effective, and 91-100% as highly effective [17]. Conceptually, a positive relationship is expected: stronger synchronization should increase the likelihood that planned infrastructure receives financing and can be implemented. Effectiveness may also be influenced by procurement, administrative readiness, technical capacity, geographical conditions, policy changes, and transfer-disbursement timing. Statistical testing therefore evaluates the observed relationship without assuming that synchronization is the sole determinant.

III. RESEARCH METHODS

3.1. Study Area

The study was conducted in TelukWondama Regency, West Papua, from April to June 2026. The regency was selected because of its substantial infrastructure needs, dispersed coastal and island settlements, difficult terrain, conservation areas, and limited fiscal capacity. Data were collected from the regional planning agency; regional financial and asset management agency; public works agency; transportation agency; communication and information agency; environmental agency; industry and cooperatives agency; and disaster management agency.

Variable	Indicator	Measurement	Scale
Financing synchronization (X)	Financing Synchronization Index	0-1	Ratio
Financing effectiveness (Y)	Allocated budget and realized budget	Indonesian rupiah	Ratio
Financing effectiveness (Y)	Realization rate and financing gap	Percentage	Ratio

3.3. Variable Measurement

The Financing Synchronization Index (FSI) was calculated as the ratio between the number of actual financing sources verified for a sector and the number of realistic normative sources relevant to that sector. Partnership and long-term alternative instruments were evaluated during model formulation but were not included as a compulsory basis for the index because they had not yet been widely applied in the 2025 budget structure.

$$FSI = \text{Number of relevant actual financing sources} / \text{Number of realistic normative financing sources}$$

Financing effectiveness was based on the realization of the sector allocation. The financing gap expresses the unrealized portion of the budget. These indicators evaluate implementation of the allocation already approved; they do not indicate that all RTRW infrastructure requirements have been fully financed.

$$\text{Financing effectiveness (\%)} = (\text{Realized budget} / \text{Allocated budget}) \times 100$$

$$\text{Financing gap (\%)} = 100 - \text{Financing effectiveness}$$

3.4. Analytical Procedure

The analysis comprised five stages. First, each RTRW infrastructure program was traced through the RPJPD, RPJMD, OPD Strategic Plans, OPD Annual Work Plans, and DPA to identify program accommodation and continuity. Second, the legal and practical relevance of seven main public financing sources was assessed for each sector. Third, actual financing sources and budget performance were extracted from the DPA and LRA. Fourth, synchronization and effectiveness indicators were calculated for twelve sectors. Fifth, Pearson correlation and simple linear regression were applied to the sector-level values to test the direction and magnitude of the relationship. The regression specification was $Y = a + bX$, where Y denotes financing effectiveness and X denotes the Financing Synchronization Index.

The integrated financing model was not derived solely from the regression results. It was formulated by synthesizing the synchronization results, effectiveness results, financing gaps, sectoral characteristics, fiscal capacity, allocation of governmental authority, regulatory feasibility, cost-recovery potential, environmental contributions, and evidence from the financing literature. This approach allows the model to remain useful even though the inferential test was based on a limited number of infrastructure sectors.

IV. RESULTS AND DISCUSSIONS

4.1. Regional Fiscal and Infrastructure Context

TelukWondama's infrastructure portfolio is extensive relative to its fiscal capacity. The RTRW covers primary transportation, port connectivity, water resources, public utilities, environmental services, and disaster-resilience infrastructure. The region's topography and settlement distribution increase unit costs and complicate routine maintenance. Budget analysis shows very high fiscal dependence on central transfers. Although the capital-expenditure ratio reached 30.17% in 2023, it fell to 21.08% in 2024 and 18.36% in 2025. This decline reduces the room available for infrastructure expansion and increases competition among sectors for annual appropriations [12,13].

The documentary review also indicates that infrastructure financing in 2025 remained dominated by government sources. DAU, DAK, DBH, Special Autonomy Funds, fiscal incentives, and SILPA were present in different combinations across sectors, while systematic use of KPBU, CSR, grants, regional loans, green financing, and blue financing remained limited. This condition does not mean that alternative finance is automatically feasible for every project. It demonstrates, however, that the existing financing portfolio is narrower than the set of instruments that could be considered under appropriate institutional and regulatory conditions.

4.2. Financing Synchronization and Effectiveness by Sector

The synchronization results show substantial variation. Roads recorded the highest index (0.86), followed by the drinking water supply system (SPAM) at 0.71; both were categorized as synchronized. Bridges, ports, energy, telecommunications, drainage, and disaster-mitigation infrastructure were partially synchronized, with values ranging from 0.43 to 0.57. Irrigation, solid waste, wastewater, and evacuation routes and spaces were categorized as unsynchronized. The zero value for evacuation infrastructure reflects the absence of actual financing sources in 2025, although all seven main public financing sources were normatively relevant.

Table 2. Financing synchronization and effectiveness across infrastructure sectors.

No	Infrastructure Sector	FSI	Synchronization Category	Effectiveness (%)
1	Roads	0.86	Synchronized	95.32
2	Bridges	0.57	Partial	93.52
3	Port	0.57	Partial	54.10
4	Irrigation	0.28	Unsynchronized	99.94
5	SPAM	0.71	Synchronized	83.34
6	Energy	0.57	Partial	100.00
7	Telecom	0.43	Partial	97.24
8	Solid waste	0.29	Unsynchronized	90.58
9	Wastewater	0.29	Unsynchronized	96.47
10	Drainage	0.43	Partial	96.87
11	Mitigation	0.43	Partial	88.85
12	Evacuation	0.00	Unsynchronized	0.00

Budget realization presents a different pattern. Energy reached 100%, irrigation 99.94%, telecommunications 97.24%, drainage 96.87%, wastewater 96.47%, roads 95.32%, and bridges 93.52%. Solid waste, disaster mitigation, and SPAM were fairly effective at 90.58%, 88.85%, and 83.34%, respectively. The port sector was ineffective at 54.10%, while evacuation routes and spaces recorded 0% because no budget was allocated. These results confirm that high realization after allocation is not identical to broad financing synchronization. Irrigation, for example, was unsynchronized (FSI = 0.28) but realized 99.94% of its approved budget. Conversely, the port sector had partial synchronization (FSI = 0.57) but low realization. The contrast reflects the difference between the diversity and suitability of financing sources and the administrative capacity to execute an approved allocation.

From a policy perspective, the two indicators should be interpreted jointly. A sector with high effectiveness but low synchronization may be operationally capable yet financially vulnerable because it relies on a narrow set of sources. A sector with higher synchronization but low effectiveness may have several funding channels but face procurement, technical, or implementation constraints. A sector with both low synchronization and low effectiveness, as in evacuation infrastructure, requires priority attention because the RTRW mandate is neither adequately financed nor implemented.

4.3. Correlation and Regression Analysis

Pearson analysis produced a correlation coefficient of 0.491, indicating a moderate positive association between synchronization and effectiveness. The significance value of 0.105 exceeds 0.05; therefore, the relationship is not statistically significant at the 95% confidence level. The simple regression equation is $Y = 54.551 + 62.913X$. The positive slope is consistent with the conceptual expectation that improved synchronization tends to be associated with higher realization, but the coefficient should be interpreted cautiously because the analysis contains only twelve sector-level observations.

Table 3. Summary of the correlation and simple regression results.

Component	Value
Pearson correlation (r)	0.491
Significance (p)	0.105
Regression constant (a)	54.551
Regression coefficient (b)	62.913
Coefficient of determination (R^2)	0.241
Regression equation	$Y = 54.551 + 62.913X$

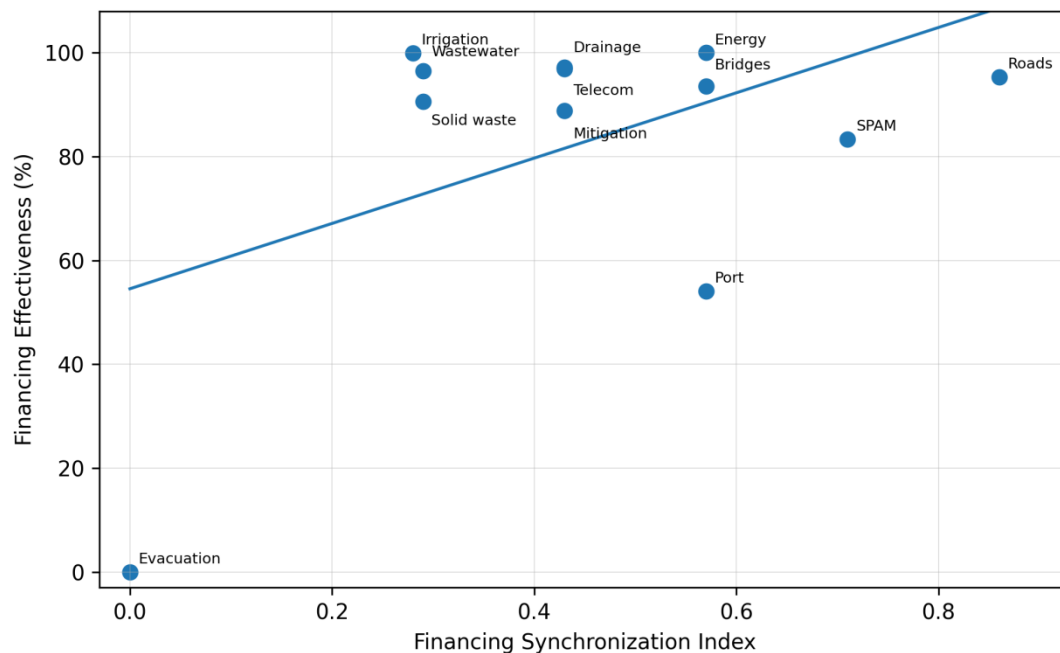


Figure 2. Relationship between the Financing Synchronization Index and financing effectiveness.

The coefficient of determination ($R^2 = 0.241$) indicates that synchronization accounts for 24.1% of the sector-level variation in effectiveness, while 75.9% is associated with factors outside the model. The thesis identifies fiscal capacity, allocation size, government policy, agency implementation capability, and source-specific characteristics as important external influences. Additional operational factors may include procurement timing, technical design readiness, contractor availability, inter-island logistics, land acquisition, weather, and delays in transfer disbursement. The non-significant result therefore does not eliminate the importance of synchronization; it shows that synchronization is necessary but insufficient for explaining execution performance.

The outlying observations also matter. Evacuation infrastructure is located at the origin because it had neither synchronization nor an allocation, while irrigation combines a low IS with near-complete realization. With a small sample, these sector-specific conditions strongly influence the regression. Future studies should expand the unit of analysis to individual programs or multiple fiscal years and add variables representing project readiness, fiscal capacity, institutional quality, and procurement performance.

4.4. Integrated RTRW-Based Financing Model

The proposed model begins by integrating the RTRW with the regional development-planning and budgeting hierarchy. Empirical evidence in the form of financing-synchronization levels, financing-effectiveness levels, RTRW financing gaps, and the dominance of government financing is then assessed alongside program characteristics, regional fiscal capacity, and regulatory provisions. Based on this synthesis, financing instruments are grouped into primary financing, supporting financing, and long-term alternative financing. The combination of instruments by sector is presented in Table 4.

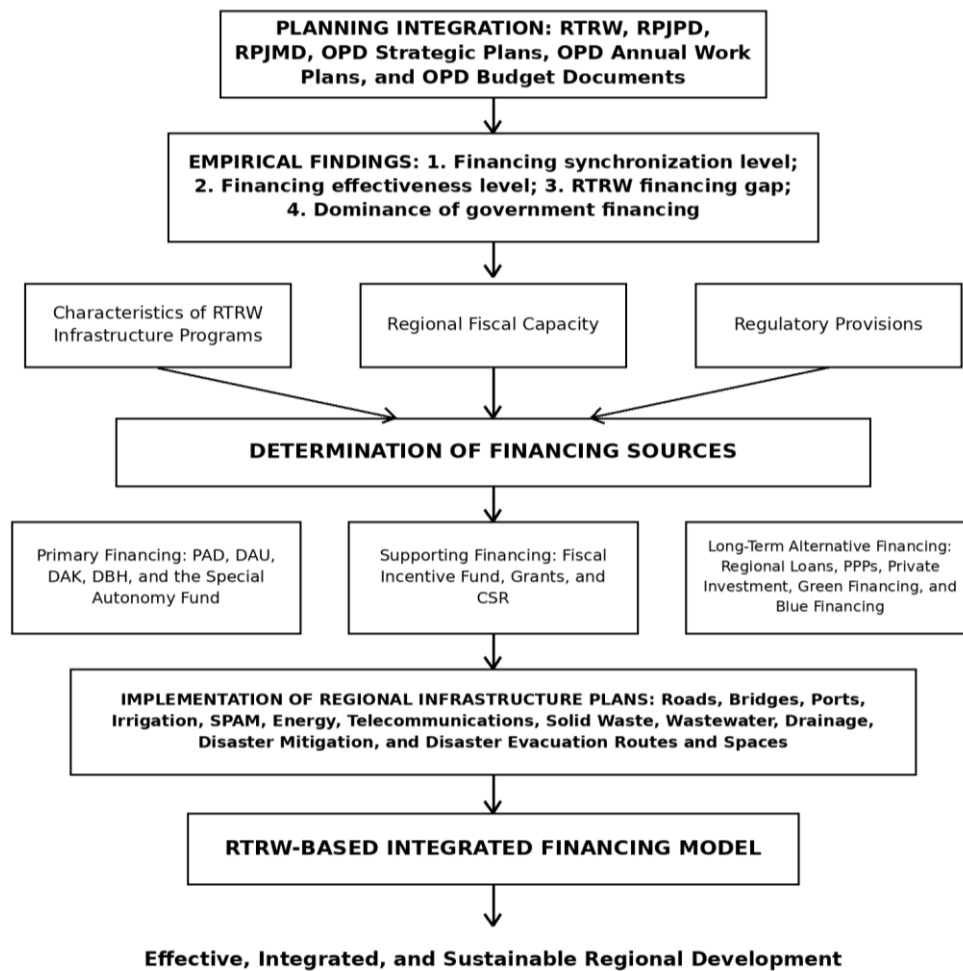


Figure 3.Diagram of the RTRW-based integrated financing model for Teluk Wondama Regency.

Table 4.Integrated financing model for implementating RTRW infrastructure in Teluk Wondama Regency.

No	RTRW Infrastructure Sector	Primary Financing	Supporting Financing	Long-Term Alternative Financing
1	Roads	PAD, DAU, DAK, DBH, Special Autonomy Fund	Fiscal Incentive Fund, Grants	Regional Loans, PPPs
2	Bridges	PAD, DAU, DAK, DBH, Special Autonomy Fund	Fiscal Incentive Fund, Grants	Regional Loans, PPPs
3	Ports	PAD, DAU, DAK, DBH, Special Autonomy Fund	CSR, Grants	Regional Loans, PPPs, Private Investment, Blue Financing
4	Irrigation	PAD, DAU, DAK, DBH, Special Autonomy Fund	Grants	Regional Loans, Green Financing
5	Drinking Water Supply System (SPAM)	PAD, DAU, DAK, DBH, Special Autonomy Fund	CSR, Grants	Regional Loans, PPPs, Green Financing
6	Energy Network System	PAD, DAK, Special Autonomy Fund	Grants	Regional Loans, Private Investment, Green Financing

No	RTRW Infrastructure Sector	Primary Financing	Supporting Financing	Long-Term Alternative Financing
7	Telecommunication Network System	PAD, DAU, DAK	Grants	Regional Loans, Private Investment
8	Solid Waste	PAD, DAU, DAK, Special Autonomy Fund	CSR, Grants	Regional Loans, PPPs, Green Financing
9	Wastewater Treatment	PAD, DAU, DAK, Special Autonomy Fund	CSR, Grants	Regional Loans, PPPs, Green Financing
10	Drainage	PAD, DAU, DAK, DBH, Special Autonomy Fund	Grants	Regional Loans, Green Financing
11	Disaster-Mitigation Infrastructure	PAD, DAU, DAK, DBH, Special Autonomy Fund	CSR, Grants	Regional Loans
12	Disaster Evacuation Routes and Spaces	PAD, DAU, DAK, DBH, Special Autonomy Fund	Grants	Regional Loans

Financing-instrument selection is based on the characteristics of each program rather than solely on sector type. Primary financing remains the foundation of government financing. Supporting financing complements government financing, whereas long-term alternative financing is considered selectively based on project feasibility, fiscal capacity, institutional readiness, governmental authority, and regulatory provisions. The table presents a strategic architecture for financing selection rather than a list of sources that were all realized in the 2025 regional budget.

The model is implemented in stages. First, the regional government should institutionalize a cross-document infrastructure matrix linking each RTRW program to the RPJMD, OPD Strategic Plans, OPD Annual Work Plans, DPA, financing sources, responsible regional agencies, outputs, and locations. Second, annual synchronization and effectiveness scores should be reviewed before budget preparation. Third, sectors with low synchronization should undergo a financing-options assessment, beginning with optimization of government financing and proceeding to supporting or alternative financing only when feasibility requirements are satisfied. Fourth, alternative instruments must be supported by project preparation, safeguards, procurement capacity, and multiyear monitoring. This sequence ensures that financing decisions remain grounded in the RTRW.

For TelukWondama Regency, the model is particularly relevant to connectivity, drinking water supply, environmental infrastructure, energy, telecommunications, and disaster resilience. Government financing sources remain essential for roads, bridges, irrigation, basic water supply, solid-waste services, and evacuation facilities. PPPs, private investment, green financing, and blue financing are not automatic substitutes for government financing but long-term options to be selectively applied in accordance with program characteristics and regulatory feasibility.

V. CONCLUSIONS

Implementation of the TelukWondama Regency RTRW is supported by uneven levels of financing synchronization across infrastructure sectors. Of the twelve sectors assessed, only roads and drinking water supply were categorized as synchronized; six sectors were partially synchronized and four were unsynchronized. This pattern indicates that the translation of spatial infrastructure mandates into actual financing sources is not yet comprehensive. Budget realization was high in most funded sectors, but low realization in the port sector and the absence of allocations for evacuation routes and spaces reveal critical gaps in specific sectors.

Financing synchronization has a moderate positive relationship with effectiveness ($r = 0.491$), but the relationship is not statistically significant ($p = 0.105$). The regression explains 24.1% of the variation in effectiveness. Synchronization should therefore be viewed as one component of infrastructure performance alongside fiscal capacity, project readiness, implementation capability, procurement, policy, and transfer-disbursement timing. High realization does not necessarily mean that RTRW needs have been adequately financed, and a broader financing portfolio does not guarantee implementation without operational readiness.

The RTRW-Based Integrated Financing Model responds to these findings by combining planning integration, empirical assessment, program characteristics, fiscal capacity, and regulatory provisions. The model retains public financing as its foundation; uses the Fiscal Incentive Fund, grants, and CSR as supporting

financing; and selectively positions regional loans, PPPs, private investment, green financing, and blue financing as long-term alternative financing options. The sectoral combinations in Table 4 provide guidance for selecting instruments while safeguarding public accountability and sustainable regional-development objectives.

The findings are contextual and based on twelve sector-level observations and one principal fiscal year. Future research should test the model using multiyear program-level data, incorporate institutional and fiscal variables, and compare regions with different geographical and fiscal characteristics.

ABBREVIATIONS

The following abbreviations are used in this manuscript:

RTRW	<i>Rencana Tata Ruang Wilayah</i> (Regional Spatial Plan)
RPJPD	<i>Rencana Pembangunan Jangka Panjang Daerah</i> (Regional Long-Term Development Plan)
RPJMD	<i>Rencana Pembangunan Jangka Menengah Daerah</i> (Regional Medium-Term Development Plan)
OPD	<i>Organisasi Perangkat Daerah</i> (Regional Government Agency)
DPA	<i>Dokumen Pelaksanaan Anggaran</i> (Budget Implementation Document)
LRA	<i>Laporan Realisasi Anggaran</i> (Budget Realization Report)
KPBU	<i>Kerja Sama Pemerintah dengan Badan Usaha</i> (Public-Private Partnership)
CSR	Corporate Social Responsibility
DAU	<i>Dana Alokasi Umum</i> (General Allocation Fund)
DAK	<i>Dana Alokasi Khusus</i> (Special Allocation Fund)
DBH	<i>Dana Bagi Hasil</i> (Revenue-Sharing Fund)
SILPA	<i>Sisa Lebih Perhitungan Anggaran</i> (Budget Surplus)
FIS	Financing Synchronization Index
SPAM	<i>Sistem Pengadaan Air Minum Drinking</i> (Drinking-Water Supply System)

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