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Research Article

Financial Governance Model Village Based Digital For Realize Smart and Green Village

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Abstract: This research aims to develop a digital-based governance model for village finance to support the realization of a Smart and Green Village. The study analyzes how digital transformation in village finance management can increase transparency, accountability, and efficiency, while promoting sustainability-oriented budgeting and environmental practices. A Systematic Literature Review (SLR) was used to identify, evaluate, and synthesize scientific publications from 2022 to 2025, accessed through reputable databases such as ScienceDirect, Springer, Wiley, Taylor & Francis, SAGE, ACM, and IEEE. The review focused on topics including digital governance in villages, digital public finance, smart village development, green budgeting, environmental sustainability, and rural digital transformation. Findings indicate that digital-based village finance governance enhances administrative efficiency, strengthens budget transparency through real-time monitoring, minimizes financial deviation risks, and boosts public participation in fiscal accountability. Integrating digital systems with green budgeting features enables the prioritization of sustainable programs, such as renewable energy, waste management, climate change mitigation, and green infrastructure development. The study suggests a comprehensive digital-based governance model that includes e-budgeting, e-accounting, digital payment systems, public transparency dashboards, and environmental performance indicators to support the implementation of a Smart and Green Village. This research offers strategic insights for village governments, policymakers, and practitioners on the importance of adopting digital governance tools to improve financial management and strengthen sustainable development at the local level.

Keywords: E-Budgeting; Governance Finance Digital; Green Village; Smart Village; Transformation Digital.

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1. Introduction

Improvement Village Fund allocation since implementation Constitution Number 6 of 2014 concerning Village put government village in position strategic in implementation development local and implementation service public so that demand strengthening governance mechanisms modern, accountable and participatory finance as developed in discourse *digital governance* and transformation service public at the level rural [6] , [23] , [29] . Settings and guidelines technical related management finance village confirm principle transparency , accountability and engagement society , but existence gap between regulations and practices in the field that are realized through manual recording , delays reporting , low literacy *digital* apparatus village as well as vulnerability to deviation budget so that cause need urge For mechanism supervision and systems information integrated finance [2] , [5] , [20] .

Digitalization process rural implications positive to quality life and inclusion economy public village through improvement access information , services finance *digital* as well as opportunity entrepreneurship local facilitated by digital *platforms* , but also challenges like gap infrastructure , inequality access and capacity source Power heterogeneous humans interregional [3] , [11] , [13] , [30] , [31] . Transformation *digital* business micro and chain economy local , including transformation stalls and *e-commerce* rural , showing that interaction between factor socio-technical and wisdom local become determinant success adoption technology at

the level village [5] , [26] , [27] . Besides that , initiative *smart village* and *climate-smart village* show potential digitalization For strengthen resilience village and access to service finance as well as instrument green , but also demanding design policy fiscal and explicit green budgeting mechanisms so that allocations budget truly supporting the sustainability agenda [21] , [24] , [28] , [33] .

Digital governance serve runway conceptual explanation How integration human-machine-organization affect administrative processes , decision making decisions and accountability public , while literature about *smart* and *green village* underline the need synergy between innovation technology , management operational and policy environment For reach development sustainable rural areas [1] , [6] , [16], [17], [18]. Productivity green and digital orientation in sector agriculture also strengthens argument that digitalization can increase efficiency use source Power at a time push practice friendly environment if accompanied instrument appropriate policies and incentives [25] , [15] . Development of governance models finance village based *digital* must consider No only aspect technical system information finance like *e-budgeting* and *e-accounting* , but also dimensions socio-institutional , human resource capacity , and mechanisms budgeting measurable green so that the management of Village Funds capable supporting *the Smart and Green Village* agenda [4] , [12] , [19] , [22] .

Development of governance model finance village digital- based that integrates module transparency public , tracking *real-time* transactions , *audit trail* electronics , mechanisms *green budgeting* and improvement strategies digital capacity of civil servants and society with objective strengthen accountability fiscal , efficiency administration and sustainability environment at the village level , this model design is also directed For close gap identified research the need integration between governance *digital* and indicators performance environment revitalization rural [7] , [14] , [17] , [34] .

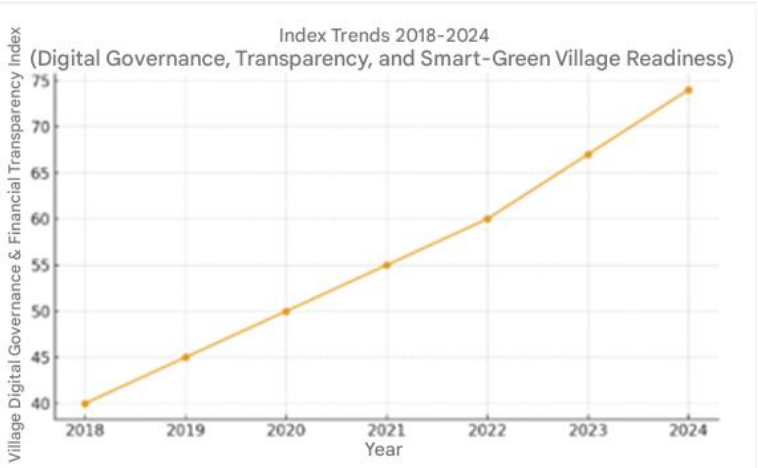

Figure 1. Trends Improving *Digital* Governance and Transparency Finance Village 2018–2024.

Based on trend governance index *digital* and transparency finance villages in the 2018–2024 period , it can be seen existence improvement consistent that reflects strengthening capacity administrative village in adopt mechanism management more modern , accountable and based finance technology. The increase index from 40 in 2018 to 74 in 2024 indicates that integration system information finance , improvement digital literacy of civil servants as well as expansion access infrastructure *digital* contribute significant to repair quality of governance village. Effectiveness *digital governance* in support transparency fiscal , accelerate reporting budget and encourage participation public in the development process. Development index the as reflection from progress implementation of the *Smart–Green Village* agenda demand synergy between innovation technology , management efficient operations as well as strengthening accountability public in order to achieve development sustainable and responsive villages to dynamics modern socio-economic.

2. Methodology Study

Methodology study This use approach Review Literature Systematic (*Systematic Literature Review* / SLR) designed For identify , evaluate and synthesize literature scientific discussion digitalization of governance finance village , development *Smart Village* and *Green Village* as well as governance integration *digital* with development sustainable at the level rural so that produce understanding comprehensive about development concept , practice implementation as well as gap study in transformation *digital* village. The SLR approach was chosen Because provide systematic , transparent and reliable analysis replicated so that allows mapping comprehensive to trend related global research *digital village* [1] , technology finance for governance village [2] , development village *digital* and quality life public [3] , implementation *smart village* in Indonesia [4] as well as transformation *digital* in the ecosystem business micro village [5] , including development theory increasingly *digital* governance relevant in sector modern public [6] .

Research process started with formulation question research that focuses on how digitalization capable increase transparency , accountability and efficiency of governance finance village , how implementation technology *digital* can strengthen mechanism *smart* and *green development* in development village as well as How integration *digital finance* and *green budgeting* can forming a governance model finance village appropriate digital based with principle sustainability environment and inclusion social [7] , [8] , [9] , [10] , [11] . For answer question said , researchers do search literature on international databases reputable like *ScienceDirect, SpringerLink, SAGE Journals, Wiley Online Library, Taylor & Francis Online* , ACM *Digital Library* and IEEE *Xplore* with period publication three year final so that articles obtained represent development latest in research digitalization rural and governance public based technology [12] , [13] , [14] , [15] , [16] . Search strategy done use keyword combination like *digital village, village financial governance, smart village, green village, e-governance, green budgeting, digital inclusion and public digital transformation* so that all over incoming articles in stage beginning search relevant with governance context *digital* village [17] , [18] , [19] , [20] .

Articles analyzed fulfil criteria inclusions that include : publications in journal reputable international , conformity theme with digitalization village , finance village or development sustainable use methodology scientific that can accountable as well as availability *full-text* that allows analysis in-depth. Articles that are not fulfil criteria methodological , no relevant in a way thematic , no indexed journal reputable or show limitations quality academic Then issued through two stage screening , namely screening the title and abstract as well as review full to content article [21] , [22] , [23] , [24] .

From the search the beginning that produces hundreds publication , a selection process is carried out gradually until only quality literature and provide contribution significant to theme research that is maintained , including studies about transformation *smart village* [20], distribution benefit from *climate-smart villages* [21] , design sustainability village [22] , *digital governance* in sector developing country public [23] , transformation village intelligent in facing emission targets carbon [24] , digitalization agriculture and productivity green [25] , adoption technology *digital* in rural areas [26] , strengthening governance through empowerment *digital* [27], mitigation change climate through agriculture intelligent [28] until role service *digital* government in strengthen resilience village [29] as well as various study about growth village *digital* and its impact to inclusion economic and social [30] , [31] , [32] , [33] , [34] .

Extracted data from every article covers objective research , conceptual model used , method applied analysis , impact digitalization towards governance or development village as well as contribution empirical to understanding about smart and green villages. Next done analysis thematic For grouping findings study to in a number of core dimension , namely governance *digital* village , *digital inclusion* , system finance *digital* , technology For empowerment society , budgeting green , governance environment and implementation model *smart village* data- based [1] , [3] , [6] , [10] , [16] . Synthesis literature show that digitalization village play a role significant in building governance more finances transparent , accountable and efficient as well as support integration principle sustainability through financial model development village based *digital* that facilitates planning based evidence , mitigation risk deviation and reinforcement supervision public.

Through this SLR approach , research No only summarize and analyze contribution relevant scientific information , but also identify gap research that shows the need development of governance models finance village based *digital* capable integrate *smart governance* , *green budgeting* and *community digital empowerment* as framework strategic in realize *Smart and Green Village* in the era of increasingly digital transformation complex [5] , [8] , [12] , [20] , [34] .

Question Study

a. *digital-* based village financial governance improve transparency, accountability, and effectiveness of village budget management in accordance with applicable regulatory principles?
b. To what extent does the use of integrated information systems contribute to improving the quality of public services, community involvement and efficiency of village government administration processes?
c. *Green Village* principles into a *digital- based village financial system* support the implementation of sustainable development programs, including energy efficiency, waste management and natural resource conservation?

Search Strategy

The databases used include *Scopus, Web of Science* , *ScienceDirect* , *SpringerLink* , *SAGE* , *Wiley* , JSTOR, DOAJ, and *Google Scholar*. Inclusion criteria: articles published between 2022 and 2025, representing the latest developments in rural digitalization and technology-based public governance research.

Inclusion/Exclusion Criteria

a. Includes: Publication in internationally reputable journals, theme relevance to village digitalization, village finance or sustainable development, use of accountable scientific methodology and *full-text availability* that allows for in-depth analysis.
b. Excluded: Articles that do not meet methodological criteria, are not thematically relevant, are not indexed in reputable journals or show limited academic quality.

3. Findings Thematic and Synthesis

Financial Governance Village

Governance finance village is a series of mandatory budgeting , implementation , administration , reporting and accountability processes fulfil principle transparency , accountability and participation public as in regulations national , at the same time demand modernization through system integrated information [19] . Digitalization village show that implementation technology finance and systems information capable increase accuracy recording , speeding up reporting as well as strengthen supervision public , although Still constrained human resource capacity and infrastructure unequal *digital* interregional [3] , [5] , [11] . *Digital governance* and *Smart Village* emphasize that digitalization in cycle finance village No only strengthen audit trail and internal controls , but also to be prerequisite for implementation *green budgeting* that supports energy programs clean , management waste and sustainability environment [6] , [16] , [25] . Modernization of governance finance village through system *digital* become foundation strategic For increase effectiveness fiscal village at a time support transformation going to *Smart and Green Village.*

Smart Village

Draft *Smart Village* emphasize utilization technology information For increase quality service public , efficiency administration and involvement public through system information integrated village as part from practice modern *digital governance* [1] , [6] . Digitalization village increase access services , strengthening participation inhabitant as well as push growth economy local through adoption *digital platforms* although Still face obstacle infrastructure , literacy *digital* and readiness various institutions interregional [4] , [5] , [11] , [26] . Approach *Smart Village* as transformation *digital* that places data integration , inclusion *digital* and governance based proof as foundation main For realize service more public adaptive and sustainable [16] , [20] , [29] . Strengthening *Smart Village* No only need investment technology , but also improvements human resources and institutional capacity For ensure that digitalization truly support taking decisions , transparency fiscal and development more villages responsive.

Green Village

Approach *Green Village* emphasize development sustainability - oriented villages environment through efficiency energy , reduction waste and utilization source Power in a way responsible responsibilities that require governance accountable finance and *green budgeting* for green programs can measurable and transparent [7] , [15] . Villages that implement technology friendly environment , practice agriculture green as well as access financing sustainable capable increase resilience climate and productivity public [21] , [25] , [28] , [33]. System integration *digital* in reporting finance and monitoring environment strengthen accountability , minimizing risk deviation budget and increase effectiveness management sustainability at the level village [6] , [20] , [29] . Therefore that , *Green Village* need combination technology , capacity institutions and governance finance integrated *digital* so that development sustainable environment can realized in a way consistent and able accountable.

Principle *Smart and Green Village* in Management Finance

Integration of principles *Smart Village* and *Green Village* in governance finance village rooted in *digital governance* that emphasizes transparency , accountability , sustainability and utilization technology information as instrument modernization management public. Regulation national about management finance village mandate utilization system reliable information For ensure openness budget , efficiency distribution funding as well as improvement accountability of development programs. *Digital governance* show that transformation *digital* in sector public require existence system integrated capable bridge interaction human – machine – organization so that the budgeting , monitoring and evaluation processes budget can done in a way open and data -driven [6] , [23] . Principles *green budgeting* confirm that every allocation finance village must in harmony with objective sustainability and efficiency environment through budgeting project green like energy renewable , reduction waste and conservation source Power natural [7] , [15] .

Digitalization village through draft *Smart Village* in a way significant increase effectiveness and accountability management budget based technology. Implementation system information finance village , application service public as well as proven internet -based data integration increase quality transparency and participation inhabitant in supervision budget , especially in villages that have adopt infrastructure *digital* in a way comprehensive [3] , [11] , [20] . In Indonesia and developing countries other show that digitalization increase ability village in map priority investment , identifying need development green and monitor environmental program performance in a way *real-time* [4], [26]. In addition that , *digital inclusion* is also proven push participation public rural in utilization technology new as well as increase capacity government village in utilize data as base planning development sustainable [8] , [16] .

Approach *Green Village* give proof about How managed financing in a way transparent and accountable can ensure success of mitigation and adaptation programs environment. *Green finance* and development based energy clean show that access funding the right green target capable speed up transition to energy renewable , repair management waste as well as increase productivity and resilience environment village [7] , [21] , [28] . Digitization proven strengthen green program implementation the through tracking budget , evaluation impact environment and integration indicator sustainability to in system reporting finance village [25] , [29] . Implementation technology environment like system energy solar , processing rubbish *digital* and quality monitoring environment based *sensor* requires governance credible finance in order to be able to adopted in a way sustainable [15] , [24] , [32] .

Integration of *Smart Village* and *Green Village* in management finance village built on runway theory transformation rural *digital* governance modern public as well as theory sustainability that emphasizes interdependence between technology , institutions and ecosystems social. Concept *digital village* confirm that digitalization No only modernize service , but also form return connection socio-economic as well as pattern use budget through data and application utilization based technology [1] , [10] , [12] . Meanwhile that , theory sustainability emphasize the need integration aspect ecological in the entire fiscal process village For ensure sustainability term long [15] , [28] , [33]. Governance models finance based *Smart and Green Village* functioning as a system that combines *e-budgeting* , indicators performance environment and mechanisms *digital audit* For strengthen transparency , effectiveness and legitimacy of development programs village [6] , [20] , [29] , [34] . This model No only support efficiency

management budget , but also strengthen position village as center innovation at a time agent development sustainable.

Financial Governance Model Village Based *Digital*

Governance model finance village based proposed *digital* based on the principle *digital governance* and *good governance* which emphasizes transparency , accountability , data interoperability and participation public as prerequisite implementation effective fiscal management at the local level , implementation system information finance integrated must in harmony with rule technical management finance village so that cycle budget from planning until accountability can implemented in a way documented and audited , while integration the refers to the relationship human – machine – organization in administrative reform public and transformation *digital* rural. [6] , [19] , [23] , [29] .

Component First , System Information Finance Village Integrated (SIKD-T), designed For manage all over cycle finance village through module *e-planning* , *e-budgeting* , *e-monitoring* , *e-reporting* and *dashboard* transparency public so that allows planning based evidence , allocation budget that can traced as well as access public to information finance village from *Smart Village* and SLR show that integrated digital *platform* increase accuracy of planning data and speed up the administrative process , although its implementation need interoperability between institutions and capacities technical adequate local. [20] , [3] , [4] , [16] .

Component Second , Mechanism Participation *Digital* Based Community , refers to the mechanism participatory that utilizes village portals and applications mobile For convey aspirations citizens , do supervision social to use budget and provide bait come back to priority development , approach This consistent with findings that inclusion *digital* and *capacity-building* community is determinant main success *smart village* and empowerment local , so the improvement program digital literacy and channels participation must become an integral part of design system. [4] , [11] , [27] , [8] .

Component Third , Allocation Budget for the Green Program (*Green Budgeting*), placing module planning budget that categorizes and marks shopping green (eg. energy renewable , conservation , processing waste , agriculture organic and mitigation disaster) so that funding environment can prioritized , tracked and evaluated , studies about *green finance* and *climate-smart villages* show that financing model structured , combined with instrument policies that support , improve adoption technology clean and results measurable environment. [7] , [15] , [21] , [28] .

Component Fourth , System *Digital Audit* and Tracking *Real-Time* , emphasize implementation of electronic audit trail , control access based *real-time* roles and monitoring For detect anomaly transaction more early and accelerated action carry on internal supervision and external , *digital governance* and review *smart village* recommend automated audit mechanisms and analytics anomaly as tool mitigation risk deviation. [6] , [20] , [29] .

Component Fifth , Utilization *Big Data* and Analytics , proposes use technique analytic For processing financial data , program performance and indicators environment so that can prioritize intervention , projecting need budget as well as evaluate impact environment in a way quantitative , digitalization rural areas and productivity green confirm that data analytics improves accuracy policy and effectiveness investment , but need policy data protection , analytical human resource capacity and reliable data infrastructure. [25] , [33] , [34] , [20] .

This model must implemented with attention to context local including readiness infrastructure , literacy *digital* apparatus and society as well as mechanism financing term long Because literature show that failure take into account dimensions institutional and social can hinder effectiveness system *digital* although technology available , therefore That integration module technical (SIKD-T, *digital audit, big data*) and non- technical (*capacity building* , policy) incentive For *green budgeting* , framework regulations interoperability) will determine success transition going to Accountable and sustainable *Smart and Green Village.* [16] , [8] , [31] , [2] .

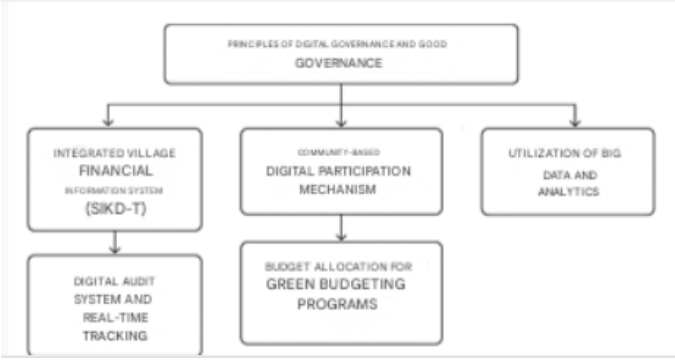

Figure 2. Financial Governance Model Village Based *Digital* Going to *Smart and Green Village*.

Governance model finance village based *digital* the represent fiscal reform framework local blend principle *digital governance* and *good governance* through integration system information , mechanism participatory , budgeting green , *digital audit* as well as utilization *big data* For support accountability and sustainability development village. Every component in this model functioning as interconnected subsystems complete : SIKD-T ensures all over cycle finance documented and can audited , participation *digital* community strengthen legitimacy policy and supervision social , *green budgeting* direct shopping village to be more responsive to issue environment , *digital audit* speed up detection anomalies and increase internal control , whereas data analytics produces projection and evaluation based proof For taking more decisions precision. Technical and socio-institutional integration the allows village move towards *a Smart and Green Village* model that does not only transparent and accountable , but also adaptive to challenge development sustainable in the *digital era.*

Implications Policies for Strategic Recommendations

Implementation of governance models finance village based *digital* own implications significant policies , especially in strengthening framework regulations and standards operational management finance village. Government central and regional need strengthen regulations related integration system information finance villages , including standardization *e-planning, e-budgeting* , *e-reporting* and *digital audit* For ensure uniformity quality of governance throughout village. Policies are also needed push interoperability between *digital platforms* village with system finance area so that fiscal data flow become more efficient and can supervised in a way *real-time.* Besides that , the government must set guidelines *green budgeting* at the village level For ensure that village funds directed at energy programs clean , conservation environment , management waste and infrastructure green as part from national strategy transition energy and development sustainable. Strengthening regulations This No only increase transparency and accountability fiscal village , but also accelerate adoption principle *Smart and Green Village* in a way systemic.

This model demand policies that focus on improving capacity *digital* , infrastructure technology and literacy public village. Government need designing policies that expand village internet access , providing device supporters as well as build secure and reliable data center For support implementation system *digital* village. Policy development capacity apparatus village through training sustainable about finance *digital* , data analytics and electronic auditing become a necessity for digital transformation to work effective and not only become project technology without sustainability. Policy must push participation public through channel *digital* participatory , including room complaint , deliberation *digital* , and monitoring budget based application so that created supervision an inclusive and empowering public legitimacy development green. Implications policy from this model covers shift paradigm management village towards data - based , transparent , participatory and aligned governance with a development agenda sustainable.

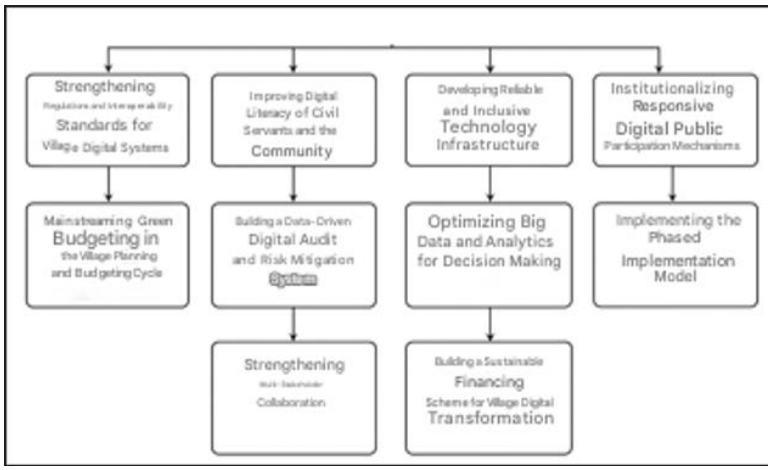

Figure 3. Recommended Strategy.

Recommended strategies for strengthening governance finance village digital- based demands comprehensive approach through synergy regulation , strengthening capacity , development infrastructure as well as utilization technology intelligent in a way gradual and measurable. Strengthening regulations and standards interoperability become foundation it is important that various application start from System Finance Village Integrated until module *green budgeting* can connected in a way safe and accountable. Efforts This need followed improvement literacy *digital* apparatus and society so that all over actor local capable participate in a way effective in ecosystem *digital* village. Availability infrastructure reliable technology as well as mechanism participation responsive digital public ensure the process of supervision , transparency and empowerment inhabitant running optimally. Implementation *digital audit* , integration *big data* and implementation gradually strengthen system detection risk at a time increase quality taking decision based evidence. This whole process need collaboration *multi-stakeholder* and scheme financing sustainable so that the transformation going to *Smart and Green Village* No only innovation - oriented technology , but also sustainable in a way institutional , social and ecological.

4. Conclusion

Strengthening governance finance village based *digital* is foundation strategic For realize *Smart and Green Village* that is transparent , adaptive and oriented sustainability. Integration of SIKD-T, mechanism participation *digital* , *green budgeting* , *digital audit* and analytics *big data* capable increase accuracy reporting , strengthening supervision public as well as speed up the administrative process finance village. Besides that is , digitalization proven expand access to information , strengthening empowerment public as well as direct shopping village to measurable environmental programs. However , the effectiveness of this model is highly dependent on the readiness infrastructure *digital* , quality of village human resources , interoperability system as well as consistency supporting regulations transformation *digital* rural areas. Therefore that , governance *digital* village No only become tool administrative , but also an instrument transformative that forms repeat ecosystem development local to be more accountable , inclusive , and sustainable.

For ensure that governance finance village based *digital* can develop more well in the future , necessary step systematic and adaptive strategy. Government village need strengthen interoperability system through regulations clear technical , expanding *capacity* building programs apparatus and society as well as ensure availability equitable digital infrastructure , including internet network and devices supporters. Implementation gradually started from digitalization basic , integration participation public , strengthening data analytics to *digital audit* must done in accordance readiness every village. On the other hand , mainstreaming green budgeting and mechanisms financing sustainable , including *blended finance* , *digital grants* and funding environment , need institutionalized so that the sustainability agenda No nature temporary. Collaboration *multi-stakeholder* with college high , industrial technology , donor agencies and organizations public civil become key in provide innovation , mentoring technical

and evaluation independent. With approach this village will own capacity For lead transformation going to A resilient , participatory and sustainable Smart *and Green Village* in a way term long.

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