

Dynamics and Challenges of Green Accounting for Sustainable Development Goals in Karst Area, Rongkop Subdistrict, Gunungkidul Regency

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Abstract

This research aims to analyzed in comprehensifely, the dynamics and challenges on green accounting practiced, to support Sustainable Development Goals, in the high environmental risk area, as qualitative and, studies of the document about LRA, DPA, Renstra,Renja,and LKJiP on 2025. Rongkop is an karst area that have high risk of environmental climate, in Gunungkidul Regency, Yogyakarta, Indonesia, This regency located in Sewu mountains karst, that accepted as Geopark Global UNESCO, this area have more than 40.000 cone shaped hills with high limestone porosity as a exocarst, Some problems in the karst area there are drought during the dry seasons and landslides and floods during the rainy seasons, Rongkop represent karst area with agricultural and coastal location, it is a rural area that having a uneven distribution of water channels, the official of government reports show that 295 water tanks has shared to the drought area for save the poor inhabitant at this area. The Government as an public sector having an responsibility to reach the Sustainable Development Goals 2030 [1]. The state commitment of Indonesia about SDGs has realized in president regulations number 59 of 2017, this regulation needs, the local government to combine the goals, indicators, and targets of the SDGs, Green Accounting not only the reporting system, but also ecological control mechanism in agricurtural karst area, this research aims to explore the dynamics and challenges of green accounting practice from the Local Government rongkop subdistrict in karst area with an high risk of environmental, Technically of green accounting will served with the Financial data, adopt the framework of Environmental Management accounting,with Document Deconstruction, and the Operational aspect served basic of directly observation, to get the objective factual research, The result showed that significanlly of the buying utility 42,53% more efficient , that's indicated eco efficient practiced. Water dropping of some tank represent that, any some cost of environmental value, altought the performance of the office has very good report from the public service index of 97% (community satisfaction survey) and the AKIP score of 81.77 [2] based on the evaluation of the government agency performance

accountability system, conducted by the ministry of administrative and bureaucratic, but any limited of the reporting system make the green accounting not fully accommodated dimension of environmental sustainability report, as an explicated, gap in practiced environmental program, as an basically crucial to known the dynamics and the challenge of green accounting practiced in the high risk environmental area, this research having novelty that integrated the performance of public sector, environmental risk Environmental Management Accounting, and the SDGs in one Framework. This research has showed that the green accounting relate to contribute in the achievement of the SDGs 2030 targets.

Keywords: *Green Accounting, SDGs, Local Government, Karst Area, Environmental Risk ,Dry Agricultural area , Coastal Area.*

Introduction

Transformation of the Development to be Sustainability Konsep, has made Sustainable Development Goals as an main framework in the public policy [1], Green accounting improved as an method that integrated environmental aspect, in the information system of accounting, Exploring the dynamics and challenges of green accounting practice for SDGs 2030 in high risk environmental becomes crucial, to known clearly about important of green accounting in governance that, cant studied in other area, how to contrast the role of green accounting in it, Rongkop area is an site that represented extremely environmental risk, as drought at dry seasons, landslides and floods at rainy seasons, rural character and having specific attention from the Local Government about their problem, it make the crucial, the research has taked in the area, is to serve the contrast and sharp result about the role of the green accounting, in the governance of karst area, the local government as an public sectors having some programs about enviromental practice in the parts of green accounting in operational prespective, and have the records in technical cost of accounting for SDGs, beside that's, at the actually this research wil analyze and shows how about the dynamics and challenges in the karst area for Sustainable Development Goals, there are some SDGs, for the example SDG 6 (Clean Water and Good sanitation), SDG 11 (Environmental sustainable city) , SDG 12 (Rensponsibillity of production and consume) SDG 13 (Control about the climate) SDG 15 (Land Ecosystem), Rongkop Sub District has represent, the first role of local government birocrate, that located in geological vulnerability for serve the civil society in the karst area. In the 2025 the government shared 295 tanks of water to covered about the drought family in the dry

seasons on some local area in Rongkop based on LJKiP Kapanewon Rongkop, 2025[2], it shows how the local government plays the role on their governance in the seriously environmental vulnerability for Sustainable Development Goals 6. Spatial Geologic caused disfunction drainage, because the wet of the rain absorbed extremely on the underground river, it make the extremely hydrologic crisis repeated. In the technical of accounting the local government has integrated with SIPD to report the financial record for the Gunungkidul Regency, problem on the SIPD software, sometimes error en masse with other Governments. In the budget Function The office is supervised in internally of sub-district head, and externally of regional financial inspectorate, the regent, Audit Board of the Republic Indonesia.

The research hasn't only on the technical of green Accounting, but also observed the operational aspect on the green accounting implementation, in the technical the Financial Report observed by the data of DPA, LRA, and the Calk, LKJiP, on 2025 [2] with adopt an teoritical framework of Environmental Management Accounting [3], used Deconstruction of documents to evaluated factual basic. The Operational aspect will presented based on directly observed of the researcher to shows the dynamic an the challenge's about the green accounting practiced in the more of reality experience, In the environmental program the local government has monitored by environmental services office, and the Government of Gunungkidul Regency directly

The novelty and contribution. The novelty of the research showed an prespective that the green accounting has improve as an adaptive mechanism about ecological pressure, that's hidden in operational buying structural. The research Integrated some aspect, SDGs, EMA, Environmental Risk, and The Performance of Public Sectors

Literature Review

Green Accounting. Green accounting is a accounting system that's integrated environmental aspect on the recorded process, measurement, and reporting, this method aims to increased the transparency and accountability, on the resources management [4]., in the public sector, green accounting as tools for supporting the policy of the development

goals [5]. Organizations, including the government keep striving to ensure, the operations on the norm that's accepted on the community [6]. Environmental information disclosure is government strategy to get the public legitimacy of the resources management [7]

Environmental Management Accounting (EMA) .The environmental management accounting, is an integrated between the management and accounting system that's aims to identified and allocated the cost in accurately [4] On the public sectors, the implementation of the EMA faced the challenges, through complexity of bureaucracy, the rigid budget system characteristic but the EMA functioned as transparently to manage the resources such as water, energy and the impact, of the cash expenditure [8], the categories of budget of the Rongkop sub district there are preventive and failed external, the relevant is EMA give the analytical framework for the researcher to analyzed the financial documents on the environmental practices, on the eco efficiency.

Karst Eco system & the challenges. Karst has complex hydrologic water underground dominated and limited surface water [9]. The unique characters of the karst, on vertical drainage system and underground river, the most critical components is an epikarst zone, fissure of the stone as a filter and save the dry water before entered the long aquifer system [9] In the Rongkop sub district area agricultural depend on the resilience of the farmer ability on faced the limited of water [10] Community that's didn't have water drainage must buy the water from the tank, during the dry seasons, in the dry seasons some areas in the Rongkop sub district faced landslides, flood

Dryland agricultural. Agricultural system of karst area depend on the efficient of the using of water, and the adaptive of environmental condition, agricultural resilience determined by the ability of the system to face on environmental pressure [10] FAO present the Climate Smart Agriculture (CSA) that synchronic with green accounting goals, increased the productivity, support the adaptation and decrease the emission.[10] in the karst context, CSA implemented by land conservation, rainwater harvesting that's documented on the local management information system.

Connectivity of land and coastal eco system. Karst system play a roles as connector behind the land and sea, because of that, environmental management of the karst area, have

implication on the marine ecosystem.[11]. Karst system drain water into the sea, therefore environmental quality in a land influence marine ecosystem [11], Rongkop subdistrict area located near from the south of marine coastal. (blue horizon). Connectivity behind the area is on the SDGs Framework 15 (land eco system) and 14(marine) green accounting play a role as an environmental reporting, investment in the land having contribute to the marine ecosystem.

SDGs and Environmental management. On the Sustainable Development Goals 2030 [1] localizing, Green Accounting support some of the target there Are : SDG 6 (Clean water and sanitazion): on the SDG 13 (Control of climate) SDG 15 (Land Ecosystem), Green Accounting not only functioned as an reporting system for the SDGs, but also as mechanism that bring operational policy in the reality, therefore SDGs measurable on the cost by the local government [12]

The Environmental risk of rongkop area. This area drought potentiality more than 21 days [12] 24.137 person of gunungkidul potentiality critical of water include the rongkop area [15], this area having environmental risk of flood and landslides, sinkhole because of the karst characteristic, climate variability, the limited of water drainage, sosial economical pressure, the environmental paradox of rongkop area is the conditions of the simultaneity behind the excess and the scarcity, the risk influenced by the drought, and unstable hydrological conditions.

Theorytical foundation of Green Accounting and Environmental Disclosure. Stakeholder theory, organizations not only responsible to the owner, but also to all stakeholder, there are community, government, environmental, and the next generations [15]. Legitimacy Theory, Organizations seek alignment with societal norms and expectations to maintain legitimacy [6]. Institutional theory, Organization determined by the institutional pressure, there are social, regulation, and good practice [16] Public value theory, the goals of the public management is to make a value for the community [17].

Research Methods

This Research use the qualitative method, and implemented of document study on the LRA, DPA, RENSTRA, RENJA, and LJKiP, of the 2025 [3], the research showed directly observed result about the Dynamic and The challenges of the green accounting in high of environmental risk in the karst area, The analyzed of financial documents, there are identification of environmetal shopping, cost ronstruction of environmental budget, With EMA and the efficiency effect.

Design of the research. The research design is descriptive-exploratory, aims to study the current dynamics and inherent challenges within green accounting practice in the karst area in the rongkop sub district office on the government. The descriptive method aims to identified and represent the fact about the green acoounting practice on the karst area, and the exploratory explained about the dynamic and the challenges on the green accounting practices on the unstable environmental characteristic on the rongkop sub district, based on the design the research will represent the result actually explore the dynamics and the challenges, to give an knowledge in contrastly the role of the green accounting for supporting the Sustainable development Goals 2030 [1], the fact actually direct studied by the researcher on the observation in the rongkop sub district, on the local government and in the community to get the complicated of the data, this research is expected to provide contribution in terms of insight and an overview with a sharp analysis on the dynamics and the challenges of green accounting in rural regions with high environmental vurnerability.

Analytical Focus. The research, will be focused actually on the dynamics and the challenges of green accounting practice on the rural regions with extremely environmental risk, karst area, the operationality of the green accounting practice will be more explored to known the impact on the enviromental, and shows contribution by the local government on doing the Sustainable Development Goals 2030 [1] based on the direct fact on the rongkop sub district.

Data collection techniques. The data collection techniques use of the method by :

Observation, the researcher going directly into the field to known directly the fact, on the rongkop government office in the rongkop sub district, observation also integrated on the rongkop environmental condition in the nature to synchronize the fact, and the

researcher also doing observation on the rongkop community directly to known the another factual data.

Literature Study, the research also on literature study based to explore the relevance's factual data to support the complicated study, the study based on the financial data by the local government directly on the office, another fact also studied by the internet on the government website, and another references such as relevance's research about the Green Accounting and the implementation challenges, to build a relevant and up to date theoretical foundation.

Case study, this research based on case study method, this study aims to known in contrast the dynamics and the challenges on green accounting practice in rural area, the researcher investigated the fact directly and analyzed on the field, in the rongkop government office and the community, also investigated on the internet data and the natural situation, the method has implemented on the research because of to explore the contextual phenomena with the green accounting practical, on the high environmental unstable condition, local government performance, and the reality based factual data.

Data analysis techniques.

The method of this study actually have analyzed by interactive on Miles and Huberman [18] for relevant characteristic for the research, The analytical techniques of the study based on:

Data reduction. the researcher sort the data obtained from the field based on relevant conditions, from observations, as well as informations from employees, literature studies in the field and from the internet, the community of the rongkop's people. The researcher conducts investigations to ensure the relevance of the data to the study and to confirm the relevant.

Data display. the researcher compile on the systematic narrative, table, explanation and analysis to show the result of the dynamics and challenges on green accounting practices by the rongkop government for support the Sustainable Delopment Goals 2030 based on directly factual data actually

Conclusion drawing. by the triangulations, the relevant fact will explore by the researcher to identified the dynamics and the challenges' and the role to sustainable development goals

Confirmability of the data. The validity of the data confirmed by the triangulations. Triangulations is strategyc validation on the qualitative, combine some of source's ,method's and prespective to increase the result credibility [19]. On the research the source of the result, data, and observation is the major method, the source triangulations doing by compare of the sources of data by the office, internet, and community of the rongkop's people. The observations play a role to verified data actually on the field directly conditions. The trustworries of a study is esthabilished by ensuring credibility, transferability, dependability, and confirmability". [20].

Results and Discussion

The result of the research on the dynamics and the challenge on green accounting in the karst area there are :

Ecological Pressure as the determinant of budgeting structure. Drought Conditionality forced the clean water distribution as an local government intervented, in the EMA, it has categorized as an cost of environmental failure, as an natural situation of climate, High of environmental risk influence here, the characteristic of karst area, climate vurnerability, make the serious effect in the community life, that need attention from the government budgeting to solving the problem in the office and the external problem.

Efficiency of ecological based budgeting.

Table 1. Efficiency of Expense utility of the rongkop sub district [3]

Shopping Component	Budget Cap [Rp]	Realization [Rp]	Efficiency
Electricity Cost	12.506.500	7.986.672	36,14%
Water Cost	6.630.000	3.011.572	54,58%
Aggregate	19.136.500	10.998.244	42,53%

(Source : Rongkop Sub District Office, on the 2025 DPA and LRA) [2]

The total of efficiency reach of 42,53 % showed efficiency of consume without decline in the quality, on the LRA and DPA showed significantly from the expenditure of the Office (table 1), based on the result of Table 1 the data represent that the government has doing efficiency of the resource through the good basically management of utility, in depth the efficient of the water 54,58 % give contribute to the SDG 6, the efficient of the electricity 36,14% supporting the targets of SDG 12 and 13, the result show that the green accounting of the record, play a role to evaluation in sustainability performance on the local government.

The Operational and material efficiency. Paper supplies in rp.130.000 indicated the digitalization of administration that influenced on the decrease of trash and material consumption, in the practice from the observation in the fact, the office implemented the SRIKANDI application, that integrated to the government system to manage the consumption for the paper to make an formal letter.

Performance of the government on sustainability prespective. Achievement of the office, on the public survey index reach of 97,13% , and the AKIP 81,77% (good category) [2] showed that the efficiency not make disfunction of performance in the government. The rongkop sub district office is the first line government on the local bureucrates, in the karst area with the environmental risk the office show good performance. in the contemporary environmental accounting, eco efficiency is an methods to increased the value, with less environmental risk of impact [21] The result show that the government do the stable performance on the efficient operationality and the effective service, it represented the characters of eco efficiency on the green accounting. The public surfey index of the community, represent the satisfied of the rongkop's community, and the AKIP score show's the effective of the governance and economic's of the public sectors on the accountability. The efficient indicated the eco efficiency effect on the local government.

Reconstruction of environmental cost. The expenditure, has deconstructed as preventive cost, and expenditure of external risk on environmental climate. Preventive cost include's the activity that increased the efficiency of the resource and decrease the waste [21], interpreted of the government there are show from the less stationery shopping

because of the digitalization effect, electronical administration system based, electricity and water efficiency of the rongkop sub district office, outreach program's for improved service efficiency.

The Challenges of the green accounting in the karst area. Rongkop is a rural character regency, that located in the gunungsewu karst area. The challenges of the green accounting in the high environmental risk area there are, the human capacity of the green accounting literacy, the method need competence in the accounting, environmental, data analytic, the central government of Indonesia republic should give the training of the employee about the green accounting, actually in the accounting and finance department, the central must be train in the environmental cost identification, reporting, recording, and the understanding of green accounting, in the rongkop office the competence of the employee at a basic level of understanding, the training by the central government can increase the employee skill, that can support the green accounting report quality at overall. In the environmental measurement, green accounting determined by the quantitative data about the environmental, the challenge there are the local government should be compile environmental baseline, land and water quality, level of pollution, the local must build the measurement system in precision on the unstable environmental characters, In the technically The apps of government SIPD sometimes error, SIPD is an software app to reported data from the rongkop sub district, to the gunungkidul regency, the central should be increased the quality of the system, integrated non financial data about the environmental in the financial system, entered the environmental disclosure in reporting, The government must increased the system to actualized green accounting in public sector, the classified of the account should be increased.

The monetary valuation of the environmental impact, in the local the government must adaptation the karst environmental characters, rongkop is the drought area, the government should identified the value of the water land as an critically asset. The environmental indicator must be improved by the government, the challenges the government should to increased more indicator, such as water quality, infiltration level, and water conservation. In the operational, the challenges is the limited of budget on the

government to doing the environmental program, in the green accounting the local government of rongkop need more financial support from the central government it can make the effectivity of the program increased to cover at overall for the environmental problem from the community to implemented the Sustainable Development Goals. The delay in public respon from the community about give the complaints, feedback make the delay on the planning from the local government, the local will easier to identify and take a action if the community give an feedback to the office about environmental risk in the rongkop area, the local government actually, it has already been open about community feedback from the direct contact and the discussion, but the community sometimes delays to report , the unpredictable challenges there are the high environmental vurnerability, the karst area having unstable condition exteremely, some problem such as droughted, sinkhole, landslide, earthquake, flood, erotion and some environmental pressure from the rongkop community, the complicated problem of the environmental extremely condition make the challenges to the local government to manage the environmental program on the budget constraint make the local must be smart and skillfull to lead the area, in the practice the local government integrated to the another agency and the private sector, donor, to complemen the budget if the program perceived as insufficient by the rongkop community, the office integrated with Baznas, Gunungkidul Family Association, Community leaders, PKH office , and PLKB office, the rongkop sub district office will give an proposal to the affiliated to get the assistance if the cost insufficient.

The relatedness of green accounting and Sustainable development goals. In the technical and operational prespective, the green accounting at the rongkop sub, district play a role that relatedness on the target of Sustainable development goals [1], there are SDG 6, Good Sanitazion and clean water, the green accounting practice in operationally the office give an 295 of tanks water to help the community on the dry seasons, the practice help the needs of community, people and the droughted area in rongkop subs distict, SDG 7 in the target s of clean energy, the electricity efficiency of rongkop sub distric help to saving the energy on the operational office in the everyday, SDG 11 the management of the environmental mitigation of the karst area, like a drought, landslise, flood and the other of

disaster, this role support the target of environmental sustainability that only extremely happen in the high risk of potential area, SDG 12 the efficiency that showed on the document study represent result that the efficiency increased reach as 42,53% , its support the target of the responsibility of consumption and production by the local government on do their bureuacrates, SDG 13 the office do the environmental program, such as dropping clean water, help the flooded area in wet seasons and doing the Public sector social responsibility about environmental risk in the climate, indicated that the practiced giving support about climate management. SDG 15 the office facilitate green and conservating karst, the rongkop subdistrict facilitate the proposal by the 8 villages of government, in the meeting forum to prorpore a greening program, to be proposed to the Gunungkidul Regency, and granted, then distributed some avocado seeds, teak seeds to the society. It help the Land of ecosystem to save the land from the landslide, environmental program showed the support the land ecosystem by the disaster.

The relate factual about green accounting and SDGs is Green accounting measure and manage the efficiency of the budgeting, it caused the efficiency has increased, the efficiency influenced good management by the office of rongkop sub district, the good management support environmetal program practice, and the achievement contributed to aims of target SDGs 2030 by the United Nations. Green accounting play a role as an control and evaluate to realized an support the implementations of SDGs targets in Local government.

The Dynamics of the green accounting in the karst area. The integrated dynamics of the green accounting, ecological architecture between the rongkop sub district and the village government, the analytical aims to presents the environmental policy in a narrative and the accounting, in the dialectics policy the rongkop sub district office play a role as an supervisor to the village government, the rongkop sub district functioned as gatekeeper to confirmed in 8 village government, the rongkop sub district validates the biological asset and the infrastructure on the SPJ, the green accounting practical in the karst area doing by the accounting systematic that integrated with environmental aspect, in the envinronmental identification the environmental burden because of the need of the rongkop people

community, such as 295 water dropping on the dry seasons. In the recognition step to decide the categories of the ecological impact for record on the cost or the assets on the financial reports, the dynamics is the cost will be accepted as green cost if aims to mitigations, water dropping and activities on the environmental support for the rongkop community. On the measurement step the rongkop sub district use the economical method to give the rates on the number for the environmental intangible asset , such as the price of water of tanks to measure the value of the loss of water in the lake, on the presentation the method somewhat rigid, to entered the relevant account in the apps of the SIPD on the rongkop sub district and on the Siskeudes on the village government. On the disclosure the rongkop sub district and the villages government presented on the financial report on the CaLK, the dynamics becomes validity confirmed by the minister regulations of Permendagri 20/ 2018 by the use of the CaLk as an Green disclosure is an accounting practical that accepted in international. In the conclusion of the dynamics the karst government, the green accounting is the ecological responsibility that's determined by the performance of the rongkop government to optimized the performance of the 8 village government, didn't only on the physic of the cost, but the optimalization on the ecological assets, the integrated shows that the green accounting didn't only on the administration, and the techniques but also give attentions on the environmental problem on the droughted area, such as water dropping and another environmetal practices.

The synthesis of the dynamics and challenge. The green accounting, on the rongkop sub district has adaptive improved as operationally and technical implementation on the office in supporting the SDGs 2030, the method contribute to measure the environmetal budgeting, manage the environmental program in reporting. In the operational prepective the environmental programme help the needs of community in karst area, such as the shared 295 Tanks of water on rongkop area [2], facilitate the village government to propose their idea to get the help from Gunungkidul regency, precised as their problem priority environmental problem, on the internal office the rongkop sudistrict show efficient practice on 42,53% , and cost paperless on rp 130.000, the research showed that green accounting improved by ecological pressure in karst area [3].

In the technical practice needs an increasing support of accounting system to integrated the cost of accounting and the indicators of SDGs, The central government of Indonesian republic must improve the skill of green accounting in practical to the subdistrict government, and the village government to increase the performance of the environmental management on the accounting in the local government on supporting Sustainable Developments Goals 2030 in the local government.

Conclusion

Green accounting, in the office of rongkop sub district has improved in adaptive as an response of the ecological pressure, environmental risk, altought integrated in the operational practiced, but in the technical needs an increasing of the system in the SIPD, training to improve the skill of the employee about an green accounting, optimalization on the facility of software as an technological aspect to support the green accounting and Sustainable Development Goals on the specified and comprehensified actually integrated, In the operational prespective the local government give the specified program that solved the envinronmental risk, such as dropping water in dry seasons and facilitated manymore envinronmental program in an discussion forum, that involve the village government and public figure, for propose the Gunungkidul Regency, Green Accounting play a role to control and and evaluate to realized an support the implementation of SDGs target in Local Government.

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