Insurance and Performance of Hydroelectric Energy Projects in Kenya

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Abstract: **Renewable energy investment has been underexploited in Kenya in specific due to investor's negative perception of the regions high investment risk which retards the degree of private capital penetration. The purpose of the study was to examine how Insurance influence performance of hydroelectric energy projects in Kenya. The study adopted pragmatism paradigm and descriptive survey design while questionnaires and interview guide were used to collect quantitative and qualitative data from a census of 94 participants. A Validity coefficient of 0.775 and reliability coefficient of 0.781 obtained after pretest among 10% of the un-included respondents. Analysis involved descriptive statistic and inferential statistic of Correlation and Regression at a significance level of 0.05. The result of the hypothesis: H$_0$: Insurance does not significantly influence performance of hydroelectric energy projects in Kenya was rejected since P=0.000<0.05. Therefore the study concluded that there is significant influence of Insurance on performance of hydroelectric energy projects in Kenya. It is recommended that Project management and policy makers should integrate Insurance products to improve performance of hydroelectric energy projects besides developing targeted policies for strengthening adoption of Insurance products to boost investors and lenders confidence. Further research should be carried out on the influence of insurance on other renewable energy projects in Kenya**

I. INTRODUCTION

In spite of Kenya having an estimated hydropower potential of about 6,000MW for large hydros (above 10MW) and over 3,000MW for small hydros, only 823.8 MW of large hydros and less than 25MW of small hydros has been exploited (Ministry of Energy, 2020). For this massive infrastructural investment to be realized the financial markets must play critical role in stimulating private investments into the renewable energy development to bridge the scarce resources at disposal of the public sector (Rezec and Scholtens, 2017).But due to investors negative perception of Kenya's high investment risk and low creditworthiness, the degree of private capital penetration has generally remained low (OECD, 2013). Thus, utilization of Insurance to de-risk renewable energy infrastructure projects is essential for reducing private investment cost.

Insurance companies as the paramount financial organizations in any surviving economy, underwrites the unwanted risks by the insuring public, thus acting as a financial security tool and economic protection in situations of risks (Soye, Adeyemo and Ayo, 2017). Insurance companies charge premiums for accepting various risk types with the expectation of generating adequate return on capital even after indemnifying the insured upon claim in case of any loss eventuality. Insurance is defined as a mechanism of transferring risk where by individuals or corporate organization shift some life uncertainties to other business enterprises' shoulders and in return pay premiums for the risk transfer (Soye, Adeyemo and Ayo, 2017). Although insurance companies underwrite the risks of the insured companies, mitigating their own risk is a real challenge that requires reinsurance. The reinsurance decision is a specialized form of risk finance that may further lead to the relaxation of regulatory constraints on capital ratio threshold to insurance companies, improve underwriting capacity, expected bankruptcy costs, and capital management decision (Garven and Tennant, 2003) with the net impact of broader securitization capacity of hydroelectric projects at cheaper cost.Munich Reinsurance America (2010) sees Reinsurance as transaction whereby the reinsurer agrees to indemnify the cedant company comprehensively or in part in a circumstance of loss against an issued policy while this study defines re-insurance as an agreed upon contract between the cedant company and the reinsurer to indemnify the cedent partially or in part as per the policy document when a loss is incurred thus increasing the underwriting capacity of the cedent company, reduces their cost of capital and ensures distribution of risks.

Since renewable energy projects major hindrance to growth is difficulty in access to finance, financial risk management becomes a key element, however minimal attention has been paid to the appropriate mitigate instruments especially in developing countries (Mutua, Waiganjo and Oteyo, 2014). The purpose of the study is to examine how Insurance influence performance of hydroelectric energy projects in Kenya. The study provides a reference for other scholars, policy makers and investors besides contributing valuable knowledge on appropriate utilization of Insurance in reducing the inherent risks in hydroelectric energy projects thereby attracting securitized financing pools. The study was organized into introduction, literature review, findings and discussion, and conclusion.

II. LITERATURE REVIEW

2.1Performance of Hydroelectric Energy Projects

Performance of Hydroelectric energy projects can be defined as the success in meeting predefined measurable standard objective indicators of quality electricity supply, project cost reduction, increased generation capacity or scope, affordable electricity supply, implementation within schedule, operational efficiency, customer satisfaction, positive environmental effect and increased profitability.Previous studies precision and convergence in the measurement of performance in hydroelectric power projects in terms of quality electricity supply, project cost reduction, increased generation capacity or scope, adherence to implementation time schedule, operational efficiency, customer satisfaction, environmental safety and increased profitability (Pramangioulis*et al.,* 2019; Waweru and Rambo, 2017; and Elbatran*et al.,* 2015) did not focus on how the performance of hydroelectric energy projects can be influenced by insurance, a gap which the current study intends to fill through descriptive survey design and descriptive and inferential statistical analysis.

2.2 Insurance and Performance of Hydroelectric Energy Projects

Insurance companies as the paramount financial organizations in any surviving economy, have the prime business function of accepting and underwriting unwanted risk on insuring public's behalf at a premium (Soye, Adeyemo and Ayo, 2017). To underwrite their own financial risk resulting from market imperfection and increase the risk acceptance capacity, insurance companies have to be reinsured (Swiss Reinsurance Company, 2002).Reinsurance enable primary insurance companies with underwriting assistance andtechnical aid in new business lines (Patrik, 2001); increasing under writing capacity of the cedant(Obonyo, 2016); reducing financial distress in the phase of rapid premium growth on the cedant's surplus; facilitating stabilization of insurance companies by smoothening overall operating results created by socio-economic and natural factors annually; acting as a marketing tool through insurance companies expanded capacity to accommodate more risks (Swiss, 2002); provides a buffer for catastrophecontrolwhich require huge sums of money for indemnification (International Association of Insurance Supervisors, 2012) and reduces the load of high premiums usually paid to compensate the insurer's bankruptcy cost due to large policies in the absence of reinsurance(Outreville, 2002; Mayers and Smith, 1981) besides acting as a specialized form of risk finance with the capability to substitute the regulatory constraint on theinsurance's capital ratio (Lee and Lee, 2012). These findings converge to the fact that reinsurance significantly leads to risk diversification among policy holders such as renewable energy investors hence leading to reduced cost of project capital. However, Choi and Elyasiani (2011) held a divergent opinion that views reinsurance as negatively related to ceding companies revenue flow since they will be sharing the would be sole profits of the cedant, thus drawing down their operational cost of revenue which cascades into higher charges of insurance premiums (Adebowale and Adebayo, 2018).

In the context of renewable energy projects, Gatzert and Kosub(2015) and Swenja (2013) studies standout. Gatzert and Kosub (2015) through desk review sought to establish the current risks and mitigate for offshore and onshore renewable wind energy projects in European market. Results revealed that technical risks are comprehensively covered by modern insurance products while construction, operation and policy and regulatory risks coverage by such insurance products remain limited and this would require a collaboration with international financial institutions like World Bank that have already developed a partial risk guarantee for certain policy risks. Renewable energy as a new technology remains a challenge to the insurance companies due to the difficult in their pricing and demand for a higher underwriting capacity, hence requiring innovative insurance instruments to mitigate the emerging risk classes (Gatzert and Kosub, 2015).

On the other hand, Swenja (2013) through a desk review explored the capability of insurance risk transfer in harnessing investment for environmental protection in developing nations, a case of climate change. Findings showed that to provide environmental protection insurance risk transfer can aid in incentivizing risk reduction efforts, transfer investment risks and compensate victims and funding of clean-up process. The transfer of investment risk has the ability to stimulate private funding of climate change while existing insurance products have managed common project risk as well as political risks relating to adaptation and mitigation investments. Insurance risk transfer application in climate change investment remains relatively nascent and its efficiency and effectiveness remains grey.

In Kenya, Macharia and Caleb (2018) investigated the effects of risk transfer strategy on performance of construction projects in public Secondary schools in Murang'a County through descriptive survey design withstructured questionnaires for collecting data from a sample size of 136 respondents while analysis involved both descriptive and inferential techniques of regression. Findings confirmed the existence of a positive significant relationship between risk transfer and performance of construction projects in the form of time schedule, implementation cost, quality production and customer satisfaction. Though the study proves the existence of a significant positive relationship between insurance and performance of projects, there is the obvious gap to the renewable energy projects.

III. RESEARCH METHODOLOGY

The study adopted pragmatism paradigm, descriptive survey design and mixed method approach for collecting qualitative and quantitative data (Creswell, 2013). A census of 94 participants consisting of84 respondents and 10 Key

Informants were involved in the study while questionnaireand Interview Guide were used for data collection. The data collection instruments were pre-tested in 10 unselected participants and a validity coefficient of 0.775 and reliability coefficient of 0.781 obtained. Analysis involved descriptive statistics and inferential statistics of correlation and regression at a significance level of 0.05 while qualitative data was analyzed manually through descriptive statistics of thematic content analysis. A simple regression model took the form: H_0:There is no significant relationship between Insurance and performance of hydroelectric energy projects in Kenya

Performance=f(Insurance, random variable)

$Y= \beta_0 + \beta_1 X_1 + \alpha$

IV. FINDINGS AND DISCUSSION

The study realized a 100% questionnaire return rate. The study sought toexamine how Insurance influence performance of hydroelectric energy projects in Kenya. Participants were requested to give their opinions on their level of agreement or disagreement with the statements of contingent capital on a Likert scale of 1-5 where Strongly agree(SA) =5, Agree (A)=4, Neutral(N)=3, Disagree(D)=2 and Strongly disagree (SD)=1. The results are presented in Table 4.27

Table 4.1: Insurance and Performance of Hydroelectric Energy projects

	Statements	SA	A	N	D	SD	Mean	Std. dev
1.	Insurance increases debt equity ratio without increasing level of risk	18(21.4%)	63(75%)	3(3.6%)	0(0.00%)	0(0.00%)	4.18	0.470
2.	Insurance reduces debt service coverage ratio	8(9.6%)	70(83.3%)	6(7.1%)	0(0.00%)	0(0.00%)	4.02	0.410
3.	Insurance reduces cost of capital due to the risk coverage	78(92.9%)	6(7.1%)	0(0.00%)	0(0.00%)	0(0.00%)	4.93	0.259
4.	Insurance facilitates timely indemnification of a project to its normal operation in the occurrence of a risk event	1(1.2%)	81(96.4%)	2(2.4%)	0(0.00%)	0(0.00%)	3.99	0.190
5.	Insurance reduces financial distress through efficient claim duration	39(47%)	42(49.4%)	3(3.6%)	0(0.00%)	0(0.00%)	4.43	0.567
6.	Insurance provides risk securitization through acceptance	76(90.5%)	8(9.5%)	0(0.00%)	0(0.00%)	0(0.00%)	4.90	0.295
7.	Insurance improves project reputation	1(1.2%)	78(92.8%)	5(6.0%)	0(0.00%)	0(0.00%)	3.95	0.265
8.	Reinsurance of risk increases insurance underwriting capacity	0(0.00%)	58(69%)	25(29.8%)	1(1.2%)	0(0.00%)	3.32	0.624
9.	Insurance cushions projects from political risks	1(1.2%)	31(36.9%)	46(54.8%)	6(7.1%)	0(0.00%)	3.68	0.495
10.	Insurance reduces the duration to project's positive cash flow	0(0.00%)	22(26.2%)	53(63.1%)	9(10.7%)	0(0.00%)	3.15	0.591
	Composite mean and Composite standard deviation						3.92	0.223

NB. INS1-10 is the statements of Insurance

Ten statements measured the extent to which Insurance influence performance of Hydroelectric Energy projects. Statement (1) that 'Insurance increases debt equity ratio without increasing level of risk' had a mean of 4.18 and 0.470standard deviation. This finding indicate that from 84 respondents, 18(21.4%) strongly agreed that Insurance increases debt equity ratio without increasing level of risk, 63(75%) agreed that Insurance increases debt equity ratio without increasing level of risk, 3(3.6%) were neutral that Insurance increases debt equity ratio without increasing level of risk. This resultsindicate that the line statement mean score of 4.18 was above composite mean score of 3.92; implying that insurance increases debt equity ratio without increasing level of risk and hence positively influencing performance of Hydroelectric Energy projects.The higher line item standard deviation of 0.470 than the composite standard deviation of 0.223 implies that there was divergence of opinion among respondents.The finding supports Lee and Lee (2012) observation that insurance acts as a specialized form of risk finance with the capability to substitute the regulatory

constraint on the insurance's capital ratio of debt to equity requirements.

Statement (2) that 'Insurance reduces debt service coverage ratio' had a mean of 4.02 and 0.410standard deviation. This finding indicate that from 84 respondents, 8(9.6%) strongly agreed that Insurance reduces debt service coverage ratio, 70(83.3%) agreed that Insurance reduces debt service coverage ratio, 6(7.2%) were neutral that Insurance reduces debt service coverage ratio. This result indicate that the line statement mean score of 4.02 was above composite mean score of 3.92; implying that insurance reduces debt service coverage ratio and hence positively influencing performance of Hydroelectric Energy projects.The higher line item standard deviation of 0.410 than the composite standard deviation of 0.223 implies that there was divergence of opinion among respondents. The findings support Soye, Adeyemo and Ayo (2017) observation that insuring a project reduces the intensity of the period required to repay borrowings as the project remains securitized.

Statement (3) that 'Insurance reduces cost of capital due to the risk coverage' had a mean of 4.93 and 0.259standard deviation. This finding indicate that from 84 respondents, 78(92.9%) strongly agreed that Insurance reduces cost of capital due to the risk coverage and 6(7.2%) agreed that Insurance reduces cost of capital due to the risk coverage. This result indicate that the line statement mean score of 4.93 was above composite mean score of 3.92; implying that insurance reduces cost of capital due to the risk coverage and hence positively influencing performance of Hydroelectric Energy projects.The higher line item standard deviation of 0.259 than the composite standard deviation of 0.223 implies that there was divergence of opinion among respondents. The finding is similar to Macharia and Caleb (2018) observation that risk coverage by insurance company reduces the quantity of premium charges imposed on principle capital hence reducing the cost of capital for project implementation.

Statement (4) that 'Insurance facilitates timely indemnification of a project to its normal operation in the occurrence of a risk event' had a mean of 3.99 and 0.190 standard deviation. This finding indicate that from 84 respondents, 1(1.2%) strongly agreed that Insurance facilitates timely indemnification of a project to its normal operation in the occurrence of a risk event, 81(96.4%) agreed that Insurance facilitates timely indemnification of a project to its normal operation in the occurrence of a risk event, and 2(2.4%) were neutral that Insurance facilitates timely indemnification of a project to its normal operation in the occurrence of a risk event. This resultsindicate that the line statement mean score of 3.99 was above composite mean score of 3.92; implying that insurance facilitates timely indemnification and restoration of a project to its normal operation in the occurrence of a risk event and hence positively influencing performance of Hydroelectric Energy projects.The lower line item standard deviation of 0.190 than the composite standard deviation of 0.223 implies that there was convergence of opinion among respondents. The finding support Gatzert and Kosub (2015) argument that insured projects experience faster recovery due to timely indemnification in instances of risk occurrence.

Statement (5) that 'Insurance reduces financial distress through efficient claim duration' had a mean of 4.43 and 0.567standard deviation. This finding indicate that from 84 respondents, 39(47%) strongly agreed that Insurance reduces financial distress through efficient claim duration, 42(49.4%) agreed that Insurance reduces financial distress through efficient claim duration, and 3(3.6%) were neutral that Insurance reduces financial distress through efficient claim duration. This resultsindicate that the line statement mean score of 4.43 was above composite mean score of 3.92; implying that insurance reduces financial distress and loss through efficient claim duration which improves liquidity flow and hence positively influencing performance of Hydroelectric Energy projects.The higher line item standard deviation of 0.567 than the composite standard deviation of

0.223 implies that there was divergence of opinion among respondents. The finding is similar to Soye, Adeyemo and Ayo (2017) observation that Insurance acts as a financial security tool and economic protection for projects by underwriting risks and enabling continuous liquidity flow during financial distress.

Statement (6) that 'Insurance provides risk securitization through acceptance' had a mean of 4.90 and 0.295standard deviation. This finding indicate that from 84 respondents, 76(90.5%) strongly agreed that Insurance provides risk securitization through acceptance and 8(9.5%) agreed that Insurance provides risk securitization through acceptance. This results indicate that the line statement mean score of 4.90 was above composite mean score of 3.92; implying that insurance provides risk securitization through acceptance and retention and hence positively influence performance of Hydroelectric Energy projects.The higher line item standard deviation of 0.295 than the composite standard deviation of 0.223 implies that there was divergence of opinion among respondents.The study results support finding by Gatzert and Kosub (2015) and Swenja (2013) that Insurance schemes in renewable energy projects aid in incentivizing risk reduction efforts, transfer investment risks and compensate victims and this has the ability to stimulate private funding for climate change.

Statement (7) that 'Insurance improves project reputation' had a mean of 3.95 and 0.265standard deviation. This finding indicate that from 84 respondents, 1(1.2%) strongly agreed that Insurance improves project reputation, 78(92.8%) agreed that Insurance improves project reputation, and 5(6.0%) were neutral that Insurance improves project reputation. This results indicate that the line statement mean score of 3.95 was above the composite mean score of 3.92; implying that insurance improves project reputation and credit profile thus positively influencing performance of Hydroelectric Energy projects.The higher line item standard deviation of 0.265 than the composite standard deviation of 0.223 implies that there was divergence of opinion among respondents. The study results support finding by Outreville (2002) that insuring a project ensures that they are always financially sound and stable thus providing confidence for private sector investors.

Statement (8) that 'reinsurance of risk increases insurance underwriting capacity' had a mean of 3.32 and 0.624standard deviation. This finding indicate that from 84 respondents, 58(69%) agreed that reinsurance of risk increases insurance underwriting capacity, 25(29.8%) were neutral that reinsurance of risk increases insurance underwriting capacity and 1(1.2%) disagreed that reinsurance of risk increases insurance underwriting capacity. This results indicate that the line statement mean score of 3.32 was below composite mean score of 3.92; implying that reinsurance of risk does not increase insurance underwriting capacity and hence negatively influence performance of Hydroelectric Energy projects.The higher line item standard deviation of 0.624 than the composite standard deviation of 0.223 implies that there was

divergence of opinion among respondents. The study results support finding by Choi and Elyasiani (2011) that reinsurance has a negative effect on ceding companies revenue flow since they will be sharing the would be sole profits of the cedant, thus driving down their operational cost which cascades into higher charges of insurance premiums to undertake underwriting function for renewable energy projects but contradicts finding by Garven and Tennant (2003) and Outreville (2002) that reinsurance decision is a specialized form of risk finance that improves underwriting capacity, reduces expected bankruptcy costs, and improves capital management decision.

Statement (9) that 'Insurance cushions projects from political risks' had a mean of 3.68 and 0.495standard deviation. This finding indicate that from 84 respondents, 1(1.2%) strongly agreed that Insurance cushions projects from political risks, 31(36.9%) agreed that Insurance cushions projects from political risks, 46(54.8%) were neutral that Insurance cushions projects from political risks and 6(7.2%) disagreed that Insurance cushions projects from political risks. This result indicate that the line statement mean score of 3.68 was below composite mean score of 3.92; implying that Insurance does not cushions projects from political risks and hence negatively influence performance of Hydroelectric Energy projects.The higher line item standard deviation of 0.495 than the composite standard deviation of 0.223 implies that there was divergence of opinion among respondents. The study results contradicts finding by Swenja (2013) that existing insurance products have managed political risks relating to environmental protection and mitigation investments.

Statement (10) that 'Insurance reduces the duration to project's positive cash flow' had a mean of 3.15 and 0.591standard deviation. This finding indicate that from 84 respondents, 22(26.2%) agreed that Insurance reduces the duration to project's positive cash flow, 53(63.1%) were neutral thatInsurance reduces the duration to project's positive cash flow and 9(10.7%) disagreed that Insurance reduces the duration to project's positive cash flow. This resultsindicate that the line statement mean score of 3.15 was below composite mean score of 3.92; implyingthat Insurance does not reduce the duration to project's positive cash flow and hence negatively influencing performance of Hydroelectric Energy projects.The higher line item standard deviation of 0.591 than the composite standard deviation of 0.223 implies that there was divergence of opinion among respondents. The finding contradicts Mayers and Smith (1981) observation that insurance reduces the duration of positive cash flow in a project.

The overall composite score of all indicators of insurance had a mean of 3.92 with a standard deviation of 0.223 and further indicated that a majority 62(73.8%) of participants at least agreed that insurance influence performance of Hydroelectric Energy projects. The study results corroborates with similar findings by Macharia and Caleb (2018); Soye, Adeyemo and Ayo (2017); Halwatura (2015) and; Gatzert and Kosub (2015) who found that insurance influence performance of Hydroelectric Energy projects.

These findings were further supported by qualitative data and this is what the participant had to say on influence of insurance on performance of Hydroelectric Energy project.The participant from KenGen said that

> *"...insuring the hydroelectric energy projects has made investors to have increased confidence in the investments and this has also enabled access to borrowings from Multilateral financial institutions and local commercial market to be cheaper since the debt liquidity ratio threshold requirement is lowered due to the security item provided by the insurance."*

The Insurance Regulatory Authority has equally managed to bring order in the insurance market to avoid transactions by insolvent entities through implementation of its mandate as captures by IRA participant who alluded that

> "…*the Authority regulate, supervise and develop the insurance industry in Kenya by promoting consumer education and protection, promoting an inclusive, competitive and stable insurance industry; and Offer quality customer service. The insurance industry contributes to the economy by providing financial security, mobilizing savings, creating liquidity, releasing pressure on public sector finance and promoting direct and indirect investments at a lower cost."*To strengthen the capacity of insurance companies in undertaking bigger risksIRA respondent said that *"...so far we have licensed five reinsurance business in Kenya including Kenya Reinsurance Corporation Limited, East Africa Reinsurance Company Limited, Continental Reinsurance Company Limited, Ghana Reinsurance Company Kenya Limited and Waica Reinsurance Kenya Limited that aids in the provision of reinsurance or guarantees against political, commercial and non-commercial risks."*

Generally, insurance act as a financial security tool and economic protection by underwriting risks.

4.2 Correlation Analysis of Insurance and Performance of Hydroelectric Energy Projects

The study sought to examine the relationship between Insurance and Performance of Hydroelectric Energy projects. Pearson correlation coefficient was used to test the relationship between Insurance and Performance of Hydroelectric Energy projects; this was done at 95% level of confidence. To test the extent of the relationship between Insurance and Performance of Hydroelectric Energy projects; all indicators of Insurance and Performance of Hydroelectric Energy projects were analyzed based on the following hypothesis 5. H_0: There is no significant relationship between Insurance and Performance of Hydroelectric Energy projects.

The corresponding mathematical model for the hypothesis was identified as follows: Performance of Hydroelectric Energy projects = f(Insurance). The research study found that out of the ten statements of Insurance three statements namely; Statement 8(Reinsurance of risk increases insurance underwriting capacity; r= -0.417, P-value=0.211>0.05), Statement 9(Insurance cushions projects from political risks; r= -0.419, P-value=0.107>0.05) and Statement 10(Insurance reduces the number of years to positive cash flow in the project, r= -0.648 P-value=0.08<0.05)did not have significant correlation whereas seven statements namely; Statement 1(Insurance increases debt equity ratio without increasing level of risk; r=0.478, P-value=0.000<0.05), statement 2(Insurance reduces debt service coverage ratio; r=0.356, P-value=0.001<0.05), Statement 3(Insurance reduces cost of capital due to the risk coverage; r=0.313, P-value=0.004<0.05), statement 4(Insurance facilitates timely indemnification of a project to its normal operation in the occurrence of a risk event; r=0.540, P-value=0.000<0.05), Statement 5(Insurance reduces financial distress and loss through efficient claim duration which improves liquidity flow; r=0.274, P-value=0.012<0.05), Statement 6(Insurance provides risk securitization through acceptance and retention;r=0.324,P-value=0.003<0.05), Statement7(Insurance improves project reputation and as such enhances its credit profile; r=0.276, P-value=0.011<0.05) had significant correlation. Similarly the overall correlation coefficient for Insurance and Performance of Hydroelectric Energy projects was found to be r=0.819 with a p-value of 0.000<0.05, implying that there is a significant relationship between Insurance and Performance of Hydroelectric Energy projects leading to rejection of the null hypothesis (5. H_0: There is no significant relationship between Insurance and Performance of Hydroelectric Energy projects) and acceptance of the alternative hypothesis, and hence the research findings conclude that there is significant relationship between Insurance and Performance of Hydroelectric Energy projects.

The correlation results are in tandem with the descriptive overall composite mean scores of 3.92 and standard deviation of 0.223 which indicated that the participants agreed that Insurance influence Performance of Hydroelectric Energy projects. This finding is in agreement with studies done by Macharia and Caleb (2018); Soye, Adeyemo and Ayo (2017); Halwatura (2015); Gatzert and Kosub (2015) and; Swenja (2013) that there is significant relationship between Insurance and Performance of Hydroelectric Energy projects. The correlations results obtained are shown in Table 4.28

Table 4.2: Correlations of Insurance and Performance of Hydroelectric Energy Projects

Insurance indicators		Performance of hydroelectric energy projects
Insurance increases debt equity ratio without increasing level of risk	Pearson Correlation	0.478*
	Sig. (2-tailed)	0.000
Insurance reduces debt	Pearson Correlation	0.356*

	service coverage ratio	Sig. (2-tailed)	0.001
Insurance reduces cost of capital due to the risk coverage	Pearson Correlation	0.313*
	Sig. (2-tailed)	0.004
Insurance facilitates timely indemnification to its normal operation in the occurrence of a risk event	Pearson Correlation	0.540*
	Sig. (2-tailed)	0.000
Insurance reduces financial distress through efficient claim duration	Pearson Correlation	0.274*
	Sig. (2-tailed)	0.012
Insurance provides risk securitization through acceptance	Pearson Correlation	0.324*
	Sig. (2-tailed)	0.003
Insurance improves project reputation	Pearson Correlation	0.276*
	Sig. (2-tailed)	0.011
Reinsurance of risk increases insurance underwriting capacity	Pearson Correlation	-0.417*
	Sig. (2-tailed)	0.211
Insurance cushions projects from political risks	Pearson Correlation	-0.419*
	Sig. (2-tailed)	0.107
Insurance reduces the number of years to positive cash flow in the project	Pearson Correlation	-0.648*
	Sig. (2-tailed)	0.08
Overall correlation for Hedging derivatives	Pearson Correlation	0.819*
	Sig. (2-tailed)	0.000
NB * Correlation significant at 0.05 level (2-tail)		

4.3. Regression Analysis of Insurance on Performance of Hydroelectric Energy Projects

Simple linear regression was adopted to investigate how Insurance influence Performance of Hydroelectric Energy projects. The rational of using the simple regression model was to establish how Insurance as a predictor significantly or insignificantly predicted Performance of Hydroelectric Energy projects.

The model summary table suggest that there is a positive correlation (R=0.819) between Insurance and Performance of Hydroelectric Energy projects and those predicted by the regression model. In addition, 67.1% (R^2=0.671) of the variance in the Performance of Hydroelectric Energy projects is explained by Insurance. The results are consistent with the findings by Macharia and Caleb (2018); Soye, Adeyemo and Ayo (2017) and;Halwatura (2015)that suggest significant relationships between the Insuranceand Performance of Hydroelectric Energy projects. The regression model summary is presented in Table 4.29.

Table 4.3: Regression Model Summary table of Insurance and Performance of Hydroelectric Energy Projects

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.819[a]	0.671	0.667	0.409
a. Predictors: (Constant), aggregated score of Insurance Indicators				

The study sought to establish if the regression model is best fit for predicting Performance of Hydroelectric Energy projects after use of Insurance. The ANOVA results indicated that (F-statistics $(1,82)=167.109$) is significant at P value $=0.000<0.05$; implying that the regression model results is significantly better prediction of Performance of Hydroelectric Energy projects. The regression ANOVA output statistics results are shown in Table 4.30

Table 4.4: An ANOVA of the Regression of Insurance and Performance of Hydroelectric Energy Projects.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	28.007	1	28.007	167.109	0.000[b]
	Residual	13.743	82	0.168		
	Total	41.750	83			
a. Dependent Variable: aggregated Performance of Hydroelectric Energy Projects.						
b. Predictors: (Constant), aggregated score of Insurance						

The study sought to establish whether there was influence of Insurance on Performance of Hydroelectric Energy projects. The simple linear regression coefficients results indicated that there was significant influence of Insurance on Performance of Hydroelectric Energy projects given P-Value $=0.000<0.05$. The regression model for contingent capital was $Y= 1.490 + 0.705X_5$; implying that for each unit of Insurance use, Performance of Hydroelectric Energy projects marginally changed by 0.705 units. The results are consistent with the findings by Macharia and Caleb (2018)that there is significant influence of Insurance on Performance of Hydroelectric Energy projects. The regression coefficients results are in table 4.31

Table 4.5: Coefficients for the Regression of Insurance and Performance of Hydroelectric Energy Projects

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.490	0.218		6.834	0.000
	Hedging derivatives	0.705	0.055	0.819	12.927	0.000
a. Dependent Variable: Performance of Hydroelectric Energy Projects						

V. CONCLUSIONS

The simple linear regression coefficients p-values $(0.000<0.05)$as well as the Pearson correlation p-values $(0.000<0.05)$results indicated that there was significant influence of Insurance on Performance of Hydroelectric Energy projects; leading to rejection of the null hypothesis H_0: There is no significant relationship between Insurance and Performance of Hydroelectric Energy projects; and so it was concluded that there is significant relationship between Insurance and Performance of Hydroelectric Energy projects. The findings of this study thus provide significant contributions to the body of knowledge as it establishes the relationship between Insurance and performance of hydroelectric energy projects. Insurance increases debt equity ratio without increasing level of risk, reduces debt service coverage ratio, reduces cost of capital due to the risk coverage, facilitates timely indemnification and liquidity of a project to its normal operation in the occurrence of a risk event, provides risk securitization through acceptance and retention,and improves project reputation for enhanced credit profile. However, Insurance leaves projects with certain risks such as political risk andrevenue risk. The study recommends targeted policy enactment for listing of insurance companies in stock market to ensure that the Capital Markets Authority can assess their credit strength in underwriting of huge of huge risks in Mega- hydroelectric energy projects. Further research should be done on internationalization of Insurance companies for improved access to capital markets for additional financing of infrastructure projects.

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