

**FOREIGN CAPITAL ON SUSTAINABLE DEVELOPMENT: THE
MODERATING INFLUENCE OF INSTITUTIONAL QUALITY**

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IMPACT OF FOREIGN CAPITAL ON SUSTAINABLE DEVELOPMENT: THE
MODERATING INFLUENCE OF INSTITUTIONAL QUALITY IN AFRICA

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I further declare that I have not previously submitted this work, or part of it, for
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DEDICATION

To God and my family

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ABSTRACT (ENGLISH)

Over the past decades, the continent of Africa has significantly depended on foreign capital flows to propel growth; however, concerns remain about their environmental and food security consequences in vulnerable contexts. Although foreign capital can either worsen environmental degradation or enhance ecological transition, empirical evidence remains limited, especially in Africa. Again, few studies have examined how institutional structures and partnerships condition these relationships. This creates a theoretical and empirical gap regarding the moderating role of institutional quality and partnerships in shaping the environmental and food security outcomes of foreign capital in Africa. Hence, this thesis examines the effect of foreign capital on ecosystem conditions and the moderating role of institutional quality in Africa, while also exploring how foreign capital influences food security when conditioned on Partnerships for the Goals. Covering the period from 2000 to 2022, the study is structured around three main objectives. The study employed a two-step system Generalised Method of Moments (GMM) for the econometric estimation and complements it with dynamic panel threshold techniques to capture nonlinearities. The first objective assesses the effect of foreign capital on ecosystems; again, the study investigates the moderating role of institutional quality in foreign capital-ecosystem contagion. Building on this, the second objective investigates the moderating role of political institutions in the relationship between economic institutions and ecosystem contagion. The third objective shifts focus to food security, examining how the impact of foreign capital on food security changes when conditioned on partnership for the goals. The results provide several important insights. First, the findings indicate that the impact of foreign capital indicators, including external debt, remittances, FDI, and portfolio investment, on ecosystems is more pronounced above the threshold. These thresholds suggest that beyond certain levels, foreign capital inflows contribute meaningfully to ecosystem improvement. Second, the analysis shows that stronger

political and economic institutions significantly enhance ecosystem transitions, highlighting the importance of governance quality. Third, the study reveals that the conditional effect of foreign capital on food security becomes positive when moderated by partnership for the goals. This implies that while the unconditional effect of foreign capital on food security is negative, effective partnerships can reverse this outcome and strengthen food security. The study extends the ecological modernization theory by revealing how international capital supports ecosystem and food security sustainability in Africa. The study recommend that foreign capital reforms should be done in a manner to enhance ecosystem and food security financing in Africa. The study made the first attempt to link foreign capital to ecosystem and food security in Africa.

Keywords: Foreign Capital; Institutional Quality; Sustainable Development; SDG 15; SDG; SDG 17; SDG 2; Sub-Saharan Africa; Threshold Effects; GMM; Ecosystem Sustainability

ABSTRACT (ISIZULU)

Emashumini eminyaka edlule, izwekazi lase Afrika lithembele kakhulu ekungeneni kwezimali zakwamanye amazwe ukuze liqhubekele phambili ekukhuleni komnotho; nokho, ukukhathazeka kusaqhubeka mayelana nendawo yazo ezungezile kanye nemiphumela yokuphepha kokudla ezimweni ezingozini. Nakuba izimali zakwamanye amazwe zingalimaza kakhulu ukucekelwa phansi kwemvelo noma isekela uguquko lwezemvelo, ubufakazi obunamandla buhlala bunomkhawulo, ikakhulukazi e-Afrika. Ngaphezu kwalokho, ucwaningo olumbalwa luye lwaphenya ukuthi izinhloko zezikhungo kanye nokusebenzisana kubeka lobubudlelwano ukuthi bube Nezinjongo Zokuthuthukiswa Okusimeme. Ngenxa yalokho, kunegebe le-theory kanye nokusebenza mayelana nezindima zokulinganisa zekhwalthi yesikhungo kanye nobudlelwano ekubumbeni imiphumela yezemvelo kanye nokuvikeleka kokudla kwezimali zakwamanye amazwe e-Afrika. Le-thesis ihlola umthelela wemali yangaphandle ezimeni ze-ecosystem, ngokubheka ikakhulukazi indima yokulinganisa izinga lesikhungo e-Afrika. Iphinde ihlole ukuthi izimali zakwamanye amazwe zikuthinta kanjani ukuvikeleka kokudla uma kuncike ebudlelwaneni bezinjongo. Ihlanganisa isikhathi kusuka ku-2000 kuya ku-2022, ukuhlaziya kuhlelwe ngokwezinjongo ezintathu ezibalulekile. Ukulinganiswa kwe-Econometric kwenziwa kusetshenziswa indlela yezikhathi yezinyathelo ezimbili ezijwayelekile (SGMM), kuhambisana namasu e-panel e-dynamic threshold ukuze ithwebule okungeyona imigqa. Ihloso yokuqala yokwenza uhlolo, imiphumela yemali yangaphandle ezimweni ze-ecosystem, kanye nendima yokulinganisa ikhwalthi yesikhungo ebudlelwaneni be-capital-ecosystem yangaphandle. Ukwakhela phezu kwalokhu, inhloso yesibili ukuhlola indima yokulinganisa izikhungo zezombusazwe ebudlelwaneni phakathi kwesikhungo nezombusazwe ebudlelwaneni kwesikhungo sezomnotho nezimo ze-ecosystem. Inhloso yesithathu ukuhlola umthelela wezimali zakwamanye amazwe ushitsha kanjani ekuvikeleleni ukudla. Okutholakele kunikeza iminingwane eminingana ebalulekile.

Okokuqala, okutholakele kubonisa ukuthi umthelela wezinkomba zemali yangaphandle, njengesikweletu sagaphandle, izimali ezamukelwayo, utshalomali oluqondile lwangaphandle kanye nokutshalwa kwezimali kwe-portfolio, ezimweni ze-ecosystem zigqama kakhulu ngaphezu kwemikhawulo ekhonjiwe. Lemikhawulo ikhombisa ukuthi, ngale kwamazinga athile, imali engenayo yamazwe angaphandle inegalelo elibonakalayo ekuthuthukisweni kwe-ecosystem. Okwesibili, ukuhlaziya kukhombisa ukuthi izikhungo eziqinile zezepolitiki nezomnotho zithuthukisa kakhulu uguquko lwe-ecosystem, egqamisa ukubaluleka kwekhalithi yokubusa. Okwesithathu, okutholakele kukhombisa okuthalakele kukhombisa ukuthi umthelela onemibandela wemali yangaphandle ekuvikelekeni kokudla kuba kuhle uma wengamela ubudlelwane nezinjongo. Loku kuphakamisa ukuthi, nakuba umthelela ongenamibandela wemali yakwamanye amazwe ekuvikelekeni kokudla mubi, ubudlelwano obusebenzayo bungawuhlehliisa lomphumela futhi uqinise ukuvikeleka kokudla. Ucwangingo lunweba I-theory yesimanje yezemvelo ngokukhombisa ukuthi imali yamanye amazwe ingasekela kanjani ekusimameni kwe-ecosystem kanye nokuvikeleka kokudla e-Afrika. Ngokusekela okutholakele, Kunconywa ukuthi kwenziwe uguquko lwezimali zakwamanye amazwe ngendlela ezothuthukisa ukusimama kwe-ecosystem kanye nokuxhaswa ngezimali kokutholakala kokudla e-Afrika. Lolucwangingo lunegalelo langempela ngokuxhumanisa imali yakwamanye amazwe nezimo ze-ecosystem kanye nokuvikeleka kokudla e-Afrika.

Amagama angikhiye: Imali yangaphandle; Ikhwalithi Yesikhungo; Ukuthuthukisa kokungashabalali; SDG 15; SDG; SDG 17; SDG 2; I-Sub-Saharan Africa; I-Threshold Effects; GMM; I-Ecosystem Sustainability

ABSTRACT (ISINDEBELE)

Esikhathini esingangetjumi leminyaka edlulileko, ikhontinenti ye-Afrika bekade ithembele khulu ekungeneni kwemali yangaphandle ukuthuthukisa umnotho; nofana kunjalo, ukutshwenyeka kuragela phambili mayelana nemiphumela yokuvikeleka kwebhoduluko nokudla ebujameni ebusengozini. Nalokha imali yangaphandle ingaragisela phambili ukuwohloka kwebhoduluko nofana isekele ukutjhuguluka kwemvelo, ubufakazi obubonakalakho busese buncani, khulukhulu e-Afrika. Ngaphezulu kwalokho, ziimbalwa iimfundo ezenze irhubhululo lokobana amaziko nokubambisana okunqophene nemiNqopho yokuThuthuka okuNzinzileko kunamuphi umthelela ebudlelwaneni lobu. Ngalokho-ke, kunesikhala sethiyori nobufakazi mayelana neendima zokulinganisa ikhwalithi yamaziko nokubambisana ekubumbeni imiphumela yokuvikeleka kwebhoduluko nokudla okulethwa yimali yangaphandle e-Afrika. Ithisisi le ihlolisisa umthelela wemali yangaphandle ebujameni behlelo lemvelo, ngokutjhejisisa indima yokulinganisa ikhwalithi yamaziko e-Afrika. Ihlolisisa nokobana imali yangaphandle inamuphi umthelela ekuvikelekeni kokudla lokha nayilawulwa budlelwana bemiNqopho le. Ukuhlaziya kwakhiwe ngokuqala iminqopho emithathu, kufakwa isikhathi ukusukela ngomnyaka we-2000 ukuya kowe-2022. Ukulinganiswa komnotho kwenziwe ngokusebenzisa ihlelo elinamagadango amabili le-SGMM, ngokurhelejwa mathekhnikhi wephaneli yomkhawulo enamandla ukubona ukungalingani. Umnqopho wokuthoma bekukuhlola umthelela wemali yangaphandle ebujameni behlelo lemvelo, kunye nendima yekhwalithi yamaziko yokulawula ubudlelwana bemali yangaphandle nehlelo lemvelo. Ngokwakhela phezulu kwalokhu, umnqopho wesibili bekukuhlhluba indima yamaziko wezepolitiki ekulawuleni ubudlelwana phakathi kwamaziko wezomnotho nobujamo behlelo lemvelo. Umnqopho wesithathu bekukuhlhluba umthelela wemali yangaphandle ekutjhugulukeni kweviveleko lokudla lokha nalisame ebudlelwaneni bemiNqopho ehlosiweko. Imiphumela inikela ngelwazi eliqakathekileko elinengana. Kokuthoma, imiphumela itjengisa bonyana iinkomba zomthelela wemali yangaphandle, njengeenkolodo zangaphandle, ukuthunyelwa kwemali, isisomali yangaphandle ebunqopho nesisomali yephothofoliyo, ebujameni behlelo lemvelo ubonakala khulu ukudlula imikhawulo ebekiweko. Imikhawulo le itjengisa bonyana, ngale kwamazinga athileko, ukungena kwemali yangaphandle kuyasiza ekuthuthukiseni ihlelo lemvelo. Kwesibili,

imiphumela le itjengisa bonyana amaziko wezepolitiki newezomnotho aqinileko athuthukisa ukutjhuguluka kwehlelo lemvelo, kuveze ukuqakatheka kwekhwalithi yokubusa. Kwesithathu, imiphumela le itjengisa bonyana umthelela onemibandela wemali yangaphandle ekuvikelekeni kokudla uba ngomuhle lokha nawulawulwa budlelwana bemiNqopho ehlosiweko. Lokhu kuveza bonyana, nanyana umthelela onganamibandela wemali yangaphandle ekuvikelekeni kokudla ungaba ngomumbi, ukubambisana kungawubuyisela emuva umphumela lo begodu kuqinise nevikeleko lokudla. Irhubhululo leli linabisa ithiyori ye-*mordenisation* yehlelo lemvelo ngokutjengisa bonyana imali yamazwe wangaphandle ingakusekela njani ukunziza kwehlelo lemvelo nevikeleko lokudla e-Afrika. Ngokusekelwa miphumela yerhubhululo leli, kuphakanyiswa bonyana amatjhuguluko wezangaphandle enziwe ngendlela ezakuthuthukisa ukunziza kwehlelo lemvelo nesekelomali levikeleko lokudla e-Afrika. Irhubhululo leli lenza umnikelo wokuthoma ngokuhlanganisa imali yangaphandle nobujamo behlelo lemvele kunye nevikeleko lokudla e-Afrika.

Amagama aqakathekileko: Imali yangaphandle; Ikhwalithi yamaziko; Ituthuko enzinzileko; SDG 15; SDG; SDG 17; SDG2; I-Afrika engenzasi kweSahara; Imithelela yemikhawulo; GMM; Ukunziza kwehlelo lemvelo

LIST OF TABLES

<i>Table 2.1: Foreign capital flows to Africa from 2018-2025</i>	51
<i>Table 3.1: Summary of Variables, Measurement and Data Sources</i>	143
<i>Table 3.2: Alignment of Research Hypotheses and Empirical Models</i>	155
<i>Table 4.1: Descriptive statistics</i>	158
<i>Table 4.2: Correlation Part 1</i>	159
<i>Table 4.3: Correlation Part 2</i>	159
<i>Table 4.4: Model Selection Between Difference-and-System-GMM</i>	161
<i>Table 4.5: Foreign Capital on Sustainable Ecosystem in Africa</i>	167
<i>Table 4.6: Threshold effect of foreign capital on Sustainable Ecosystem in Africa</i>	170
<i>Table 4.7: Interaction between institutions on foreign capital and sustainable ecosystem in Africa</i>	172
<i>Table 4.8: Moderating role of institutions on foreign capital, and sustainable ecosystem in Africa</i>	174
<i>Table 4.9: Model Selection Between Difference-and-System-GMM</i>	177
<i>Table 4.10: Economic and Political Institutions on ecosystem in Africa</i>	181
<i>Table 4.11: Conditioning effect of political institutions on the relationship between Economic institutions and ecosystem – two step system GMM</i>	183
<i>Table 4.12: Conditioning effect of political institutions on the relationship between Economic institutions and ecosystem – two step system GMM</i>	185
<i>Table 4.13: Descriptive statistics</i>	189
<i>Table 4.14: Correlation matrix</i>	190
<i>Table 4.15: Model Selection Between Difference-and-System-GMM</i>	191
<i>Table 4.16: Foreign capital and sustainable food security in Africa</i>	196
<i>Table 4.17: Foreign capital, sustainable food security and partnership with the goals</i>	198
<i>Table 4.18: Role of the partnership of the goal on the nexus between foreign capital and sustainable food security in Africa</i>	201
<i>Table 4.19: Role of institutional quality on the nexus between foreign capital and sustainable food security in Africa.</i>	204

<i>Table 4.20: Role of the partnership for the goal in the nexus between foreign capital and sustainable food security in Africa.</i>	205
<i>Table 5.1: Key findings</i>	212

LIST OF FIGURES

<i>Figure 2.1: Conceptual framework of the study</i>	133
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ABBREVIATIONS

EI	Economic Institutions
ES	Ecosystem
FC	Foreign Capital
FDI	Foreign Direct Investment
FS	Food Security
GEA	Government Expenditure on Agriculture
GMM	Generalised Method of Moments
GNI	Gross National Income
GDP	Gross Domestic Product
HCE	Household Consumption Expenditure
PGs	Partnership for the Goals
PI	Political Institutions
PG	Population Growth
PORT	Portfolio Investment
RM	Remittances
SDGs	Sustainable Development Goals
UB	Urbanization

TABLE OF CONTENTS

DECLARATION.....	ii
DEDICATION.....	iii
ACKNOWLEDGEMENT	iv
ABSTRACT (ENGLISH).....	v
ABSTRACT (ISIZULU)	vii
ABSTRACT (ISINDEBELE)	ix
LIST OF TABLES	xi
LIST OF FIGURES	xiii
ABBREVIATIONS	xiv
TABLE OF CONTENTS.....	xv
1 CHAPTER ONE: INTRODUCTION AND BACKGROUND.....	21
1.1 Background	21
1.2 Research Problem and Rationale.....	24
1.2.1 The impact of foreign capital on ecosystems in African countries: role of institutional quality 26	
1.2.2 Economic Institutions and Ecosystem in Africa: The Moderation role of Political Institutions 31	
1.2.3 Foreign capital, Food Security and partnership for the Goals	34
1.3 Specific Objectives.....	37
1.4 Research Hypotheses.....	38
1.5 Significance of the Study	38
1.6 Scope and Limitation.....	40
1.6.1 Geographical Scope	40
1.6.2 Temporal Scope	41
1.7 Structure of the thesis	41
2 CHAPTER TWO: LITERATURE REVIEW.....	42
2.1 Introduction	42
2.1.1 Foreign capital in Africa	42
2.1.2 External debt.....	43
2.1.3 Foreign Capital	44
2.1.4 Trend in foreign capital flows to Africa.....	46
2.2.4.1 Foreign Direct Investment	46
2.2.4.2 External debt.....	47
2.2.4.3 Remittances.....	48
2.2.4.4 Portfolio investment.....	49
2.1.5 Foreign Capital and Economic Development.....	51

2.1.6	Impact of foreign direct investment (FDI) on economic growth.....	52
2.1.7	Role of external debt in development.....	53
2.1.8	Portfolio investments and their implications	54
2.2	Institutions and Governance.....	55
2.2.1	The Global Environment Facility (GEF).....	56
2.2.2	International Union for Conservation of Nature (IUCN)	56
2.2.3	The Green Climate Fund (GCF).....	59
2.2.4	The World Bank.....	59
2.3	Ecosystem finance and ecosystem	61
2.3.1	Ecosystem Finance	61
2.3.2	Terrestrial Ecosystems.....	62
2.3.3	Forests.....	63
2.3.4	Desertification.....	64
2.3.5	Land degradation	65
2.3.6	Sustainable Land Management (SLM).....	66
2.3.7	Combatting Illegal Wildlife Trade	66
2.3.8	Climate Change Mitigation.....	67
2.3.9	Understanding African ecosystems.....	67
2.3.10	Benefits of the ecosystem	68
2.3.11	Why has Africa not benefited much from the ecosystem?	68
2.3.12	Life on land as it relates to the ecosystem	68
2.4.12.1	Sustainable Development Goal 15 (SDG 15): Life on Land and Its Ecosystem Focus	69
2.4.12.2	Sustainable Development Goal 2 (SDG 2): Zero Hunger and Its Connection to Food Security	70
2.3.13	Importance of SDGs for Economic Growth and SDG 15	70
2.4.13.1	SDG 1: No Poverty	71
2.4.13.2	SDG 2: Zero Hunger.....	71
2.4.13.3	SDG 8: Decent Work and Economic Growth.....	72
2.4.13.4	SDG 12: Responsible Consumption and Production.....	72
2.4.13.5	SDG 13: Climate Action.....	73
2.4.13.6	SDG 17: Partnerships for the Goals.....	73
2.3.14	Measurement of sustainable development progress	74
2.4	Food security in Africa and challenges	74
2.4.1	The Concept of Food Security.....	75
2.5.2	Current State of Food Security in Africa	75
2.5.3	Determinants of food security	76
2.5	The Role of Foreign Direct Investment in Agriculture	77
2.5.1	Political Stability and Governance	78

2.5.2	The Impacts of Climate Change on Food Security.....	79
2.5.3	The Role of Remittances in Supporting Food Security.....	80
2.6	Theoretical Literature Review.....	80
2.6.1	Ecological Modernization Theory	80
2.6.2	New Institutional Theory.....	84
2.6.3	Hierarchy of Institutions Hypothesis.....	86
2.6.4	The New Growth Theory.....	89
2.6.5	Resource Curse Theory.....	91
2.6.6	Pollution Haven Hypothesis Theory.....	93
2.6.7	Dependency Theory.....	96
2.6.8	Sustainable development theories (e.g., Brundtland Commission, SDGs)	98
2.7	Institutional Quality and Its Dimensions.....	100
2.8.1	Critical Role of Institutions in Development.....	103
2.8	Hypothesis Development	104
2.8.1	External debt, FDI, Portfolio Investment, Remittances and Ecosystem.....	105
2.8.2	Foreign capital threshold and ecosystem.....	107
2.8.3	Economic Institutions and ecosystem.....	111
2.9.3.1	Regulation of the credit market, business sector labour market and ecosystem	111
2.9.3.2	Legal System and Property Rights (LSPR) and Ecosystem	114
2.9.3.3	Integrity of Legal System and Ecosystem	115
2.9.3.4	Government Effectiveness and Ecosystem.....	117
2.9.3.5	Political institutions and ecosystem.....	119
2.8.4	Role of Political Institutions in the Economic Institutions and Ecosystem Nexus.....	120
2.9.4.1	Foreign capital and food security	122
2.9.4.2	Partnership for the Goals and foreign capital	127
2.9.4.3	Foreign capital, Food Security and Partnership with the Goal.....	129
2.10	Conceptual framework.....	131
2.11	Summary of the Chapter.....	134
3	CHAPTER THREE: RESEARCH METHODOLOGY.....	135
3.1	Introduction	135
3.2	Research Philosophy	135
3.3	Population.....	136
3.4	Research Design.....	136
3.5	Data Sources.....	138
3.6	Sampling.....	139
3.7	Data Collection.....	140
3.8	Robustness check	141

3.9	Model Specification and Estimation Strategy	141
3.9.1	Data Sources and Measurement of Variables	142
3.10	Model Specifications and Hypothesis Testing	144
3.10.1	Foreign Capital and Ecosystem Sustainability: H1a	144
3.10.2	Moderating Role of Institutional Quality: H1b	146
3.11	Economic Institutions, Political Institutions and Ecosystem Sustainability: H2	147
3.12	Foreign Capital, Partnership for the Goals and Sustainable Food Security: H3	148
3.13	Estimation Strategy	150
3.13.1	Two-Step System Generalised Method of Moments	150
3.13.2	Dynamic Panel Threshold Estimation	151
3.14	Diagnostic and Specification Tests.....	152
3.14.1	Multicollinearity	152
3.14.2	Endogeneity	153
3.14.3	Arellano-Bond Serial-Correlation Tests	153
3.14.4	Hansen and Sargan Tests of Instrument Validity	153
3.14.5	Threshold and Linearity Tests.....	154
3.15	Interpretation of Moderating Effects	154
3.16	Alignment of Objectives, Hypotheses and Empirical Models	155
3.17	Ethical Considerations.....	155
3.18	Chapter summary	156
4	CHAPTER FOUR: FINDINGS AND INTEPRETATION.....	157
4.1	Introduction	157
4.2	Correlation.....	159
4.3	Cross-section Dependency Test (CD)	160
4.4	Heterogeneous Panel Unit Root Test.....	160
4.5	Pre-Estimation Diagnostic Tests.....	161
4.6	Model Selection – DGMM/SGMM	161
4.7	Effect of Foreign Capital on Sustainable ecosystem in Africa.....	162
4.8	Threshold level of foreign capital on sustainable ecosystem in Africa.....	168
4.9	Moderating role of institutions on the nexus between foreign capital and ecosystem in Africa. 171	
4.10	Robustness.....	173
4.10.1	Moderation role of foreign capital and ecosystem Nexus	174
4.11	Economic institutions and ecosystem: role of political institutions	176
4.11.1	Pre-Estimation Diagnostic Tests.....	176
4.11.2	Model Selection – DGMM/SGMM.....	176
4.12	Economic Institutions and Ecosystem in Africa: The Moderation role of Political Institutions 178	

4.12.1	Effect of Economic and Political Institutions on Ecosystem in Africa.....	178
4.12.2	The conditional effect of political institutions on the relationship between economic institutions and ecosystem	182
4.13	Role of partnership of the goals on the relationship between foreign capital and sustainable food in Africa	186
4.14	Descriptive statistics.....	186
4.15	Correlation matrix	189
4.16	Model Selection – DGMM/SGMM	190
4.16.1	Pre-Estimation Diagnostic Tests.....	192
4.16.2	Foreign capital and sustainable food security in Africa.....	192
4.16.3	Foreign, capital, sustainable food security and partnership with the goals	197
4.17	Role of the partnership of the goal on the nexus between foreign capital and sustainable food security in Africa.....	199
4.18	Robustness check	203
4.19	Summary of the Chapter.....	206
5	CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS	208
5.1	Chapter Introduction.....	208
5.2	Thesis Summary	208
5.3	Summary of Main Findings by Research Objective	209
5.4	Chapter Conclusion	213
5.5	Contribution of the study.....	214
5.5.1	Theoretical contribution.....	214
5.5.2	Contribution to Methodology	215
5.5.3	Contribution to Empirics	216
5.6	Recommendations	217
5.6.1	Policy Implications	217
5.6.2	Practical Implications	218
5.6.2.1	Implications for Governments and Public Policy.....	219
5.6.2.2	Implications for Development Finance Institutions and Multilateral Agencies.....	219
5.6.2.3	Implications for Private Sector Investors	220
5.6.2.4	Implications for Agricultural and Food Security Practitioners	221
5.6.2.5	Implications for Civil Society and Environmental Organisations.....	221
5.6.2.6	Implications for Regional Economic Communities and Continental Policy Frameworks ..	222
5.6.2.7	Practical Contribution of the Study	222
5.7	Limitations of the study.....	223
5.8	Suggestions for future studies	223
6	REFERENCES.....	225
7	APPENDICES	243

7.1	A: Editor Report	243
7.2	B: Similarity Report	244
7.3	C: Variance Inflation Factor	245
7.4	D: Du-Wu-Hausman Test for Endogeneity	245
7.5	E: Variance Inflation Factor	245
7.6	F: Du-Wu-Hausman Test for Endogeneity	246
7.7	G: Variance Inflation Factor	246
7.8	H: Du-Wu-Hausman Test for Endogeneity	247
7.9	I: Panel Cross-Sectional Dependency Test.....	247
7.10	J: Second Generation Panel Unit Root Test	248
7.5	K: POLICY BRIEF: Leveraging Foreign Capital for Ecosystem Sustainability and Food Security in Africa:.....	248
7.5.1	Executive Summary.....	249
7.5.2	The Policy Challenge.....	250
7.5.3	Key Research Findings.....	251
7.5.4	Policy Recommendations	252
7.5.4.1	Recommendation 1: Introduce Sustainable Foreign Capital Screening Frameworks.....	252
7.5.4.2	Recommendation 2: Strengthen Institutional Quality	252
7.5.4.3	Recommendation 3: Promote Green Foreign Investment	253
7.5.4.4	Recommendation 4: Establish SDG Partnership Platforms	254
7.5.4.5	Recommendation 5: Mobilise Remittances for Sustainable Agriculture	255
7.5.4.6	Recommendation 6: Scale Debt-for-Nature and Debt-for-Climate Swaps	256
7.5.5	Implementation Roadmap.....	256
7.5.6	Expected Impact	257
7.5.7	Key Message.....	258
7.6	L: Ethics Clearance Certificate.....	259

1 CHAPTER ONE: INTRODUCTION AND BACKGROUND

In this chapter, the thesis offers a broad overview of its content. The thesis begins by discussing the study's context in section 1.1, followed by an examination of the research problem in section 1.2. Section 1.3 outlines the research objectives, while section 1.4 delves into the research hypotheses. The significance of the study is detailed in section 1.5, and section 1.6 explores the scope and limitations of the study. Lastly, section 1.7 discusses the structure of the thesis.

1.1 Background

The World Bank Group (2020) estimates that poverty rates in the Middle East and Northern Africa have seen an extreme rise from 2.3% in 2013 to 3.8% in 2015; which in 2018 almost doubled to 7.2%, with conflicts in Syria and the Republic of Yemen being the main drivers of the increase. Sub-Saharan Africa has also been noted by the organisation as a hotspot region of concern with between 26 million to 40 million people predicted to be pushed into extreme poverty. Worldwide, over 71 million people are expected to be pushed into poverty especially due to the impact of the COVID-19 pandemic, thus threatening to wipe out the progress that has been made so far in the achievement of the Sustainable Development Goals (SDGs) and essentially setting the continent back from attaining sustainability by 2030 (World Bank, 2023).

After concerted efforts over the last decades have been made to raise the standard of living of individuals through industrialisation, many countries are still dealing with extreme poverty and environmental degradation (Estes & Sirgy, 2019; Hickel & Sullivan, 2024). Approaches put in place after the Second World War to boost industrialization and reduce poverty in the early stages did as expect but fell short in the long run. Specific problems emanating from the implementation of some of these approaches to development included the

over-exploitation of the world's resources; the phenomenon of mass consumerism, especially in industrialized countries; pollution; and the mountains of domestic and industrial waste (Boon, 2016). The desire to counter these issues has necessitated the need for sustainable development, as popularized by the United Nations (Bernstein, 2017). This has given rise to research in the area of financial development and sustainable development, with particular emphasis on foreign capital and the effect it has on sustainability sustainability (Ntow-Gyamfi, Bokpin, Aboagye & Ackah, 2020; Rehman & Ahmad, 2016).. Most papers, however, heavily focus on foreign direct investments (Aust, Morais & Pinto, 2020; UNCTAD, 2020) as a source of foreign capital thus ignoring the other sources of foreign capital i.e., external debt and portfolio investments.

FDI has always been cited as a preferred source of foreign capital for developing nations (Oke and Ruth, 2021) However, recent trend analysis from the World Bank Group (2020) shows that external debt currently contributes more funds to low-and-middle-income countries. Debt accounted for \$734.4 billion and \$528.7 billion in 2017 and 2018 respectively, with FDI contributing \$475 billion and \$468.6 billion and portfolio investments, \$68.9 billion and \$34.9 billion in 2017 and 2018. It is therefore evident that debt and foreign portfolio investments together currently contribute about 55% of net foreign capital to less developed areas and, as such, should not be ignored (World Bank, 2023).

To this end, this study will review the various components of foreign capital in Africa and their impact on sustainable development as an aggregate, because external debt, FDI, and FPI are not used in isolation and affect an economy in different ways. The dual gap theory posits that an economy's development is a function of the total investment inflows recorded within it (Bosede Adegboye, Femi Adesina, Aanu Ojeka, Abosede Akinjare & Omowunmi Olokoyo, 2020). Accordingly, examining the impact of total foreign investments within an economy on sustainable development can help explain why African countries have been unable

to fully harness the diverse benefits of these inflows, while also informing policy recommendations to better leverage their combined advantages.

Chung (2010) In his research titled “Foreign debt, foreign direct investment and volatility”, he stipulated that foreign debt accelerates the growth of domestic wealth by lowering the cost of physical capital even with an inelastic, positively sloped foreign debt supply curve. The author further explained that FDI, on the other hand, improves a host country’s welfare by raising the domestic labour’s permanent income. Literature is rich on the relationship between foreign capital and economic growth (Aust, Morais and Pinto, 2020; Adegboye *et al.*, 2020) (Qayyum and Haider, 2012; Zhang and Liu, 2022; Rakhmat, Warjiyo and Sadli, 2022; Rakhmat, Warjiyo and Sadli, 2022). The conclusions from these empirical works point to the fact that the impact of foreign capital on economic outcomes is contingent on local factors – specifically, institutions.

In the case of external debt for instance, even with huge flows of capital from loans with cheaper interest rates and sustainably regulated international frameworks, development can still be stifled with mismanagement and inappropriate local regulations (Abed, Gupta, & Washington, 2002). Some studies have also shown that having a higher external debt threshold tends to have a negative impact on economic growth (DiPeitro and Anoruo, 2012; Eberhardt and Presbitero, 2015; Megersa, 2015; Panizza and Presbitero, 2014; as cited by Mensah *et al.*, 2018) and, as such, having the right institutions set in place to determine the appropriate borrowing level and the proper management of these funds is very necessary.

Other researchers have also cited that high levels of corruption discourage FDI within the continent as, in some cases, these investors are expected to pay bribes which adds to their costs of establishment (Luu *et al.*, 2019; Zangina and Hassan, 2020; Bouchoucha and Benammou, 2020; Thi Cam Ha *et al.*, 2023). As such, introducing a moderating variable- institutional quality- is necessitated to mitigate some of these issues. Researches on institutional

quality have been able to link the inflow of foreign capital into countries to the presence of good institutional frameworks (Bose, Lim, Minnick & Shams, 2023; Adegboye et al., 2020; Aust et al. 2020). Adegboye *et al.* (2020) also posited that the attainment of sustainable development is realizable in Sub-Saharan Africa through the building of efficient human capital and a good institutional framework or good governance.

The researcher therefore believes that strong institutions and institutional frameworks could reduce the long-run negative effects of using foreign capital to achieve sustainable development. This assumption is supported by Elobeid (2012), who noted that, in Sudan's drive for sustainability, what mattered was not the quantity but the quality of government institutions and government intervention in providing quality institutions.

In addition, the race-to-the-bottom theory hypothesis suggests that national governments relax their environmental laws to attract foreign investors and stimulate growth (Dasgupta, 2002). On the other hand, the race to the top hypothesis contends that advancing economies have little incentive to weaken environmental regulations to attract foreign capital; instead, by strengthening the institutional framework and enforcing environmental laws, these economies can attract cleaner industries, promote competitiveness, and encourage sustainable economic growth (Zhang and Zhou, 2016). Hence, when the quality of institutions is strong, environmental policies are more likely to be robust, well-enforced, and effective. In the light of the contrasting perspectives, it becomes essential to examine how foreign capital and quality of institutions impact ecosystem sustainability in the African context.

1.2 Research Problem and Rationale

African countries are increasingly striving to transform their environments into sustainable ecosystems by promoting the responsible use of natural resources (Wang & Uctum, 2024). Despite these efforts, the continent continues to face mounting environmental threats,

as degradation persists and ecological resources steadily decline (Asche et al., 2021; Johansen & Vestvik, 2020). For instance, Africa's ecological footprint has increased by about 35% since 2000, while forest cover continues to shrink at an annual rate of 0.5%, largely due to industrial activities and the unsustainable exploitation of natural resources, often linked to foreign direct investment (World Bank, 2022; Global Footprint Network, 2024).

According to the United Nations Environment Programme (2023), Africa loses approximately 3% of its GDP each year to environmental degradation, with deforestation, pollution, and land degradation posing the most severe threats. Similarly, the Food and Agriculture Organization estimates that the continent loses nearly four million hectares of forest annually, contributing significantly to biodiversity loss and carbon imbalance. Furthermore, over 65% of Africa's land area is affected by desertification, while water scarcity impacts more than 400 million people (World Bank, 2022). These alarming statistics underscore that the economic and social costs of inaction far exceed the investments required to restore and sustain ecosystems. Consequently, foreign capital is an essential alternative source of capital to support and implement deliberate strategies to mitigate environmental damage and promote long-term ecological sustainability.

Despite the pressing need for action, funding for ecosystem protection remains insufficient (World Bank, 2023; Clark, Reed & Sunderland, 2018). Significant financing gaps persist: global biodiversity conservation requires an estimated additional \$300-\$400 billion annually, sustainable forest management faces a shortfall of \$150-\$200 billion per year, and ecosystem conservation overall needs an extra \$10-\$30 billion annually to meet current demands (World Bank, 2023). Shiiba, Wu, Huang and Tanaka (2022) report that SDG-15 currently receives the lowest impact investment of all SDGs. However, SDG-15, which focuses on land ecosystems and biodiversity, also struggles with low funding, especially in developing

regions, where deforestation, desertification, and biodiversity loss are rampant but often lack the financial backing needed for effective mitigation (Beckmann, 2021).

The World Bank (2022) estimates that ecosystem restoration and conservation will require approximately \$1.3 trillion to \$1.5 trillion annually (World Bank, 2022). The UN predicts that sustainable land use and ecosystem restoration will need \$700 billion to \$1 trillion yearly. Recently, most funding came from donations and grants, which is not nearly enough (World Bank, 2022).. With a shaky global economy and limited funding sources, it is hard to rely on current financing for ecosystems (World Bank, 2023). Domestic capital from different sources, like credit from the local market, as well as tax and other government revenue, is not used much for SDG 15. There is the need to improve how countries fund ecosystems. Most conservation funding has focused on land areas, but the ecosystems have unique challenges. Given all these issues, African economies need to create strong finance and governance plans to tackle ecosystem decline. This study suggests that effectively blending foreign capital with ecosystem activities, based on national rules, is key for protecting these resources. Therefore, it is important to examine how foreign capital and institutions work together in managing ecosystems.

The following sections outline the motivations and gaps identified for each of the three empirical essays, which are based on the study's objectives:

1.2.1 The impact of foreign capital on ecosystems in African countries: role of institutional quality

In recent years, ecosystems have attracted global attention. Across the globe, particularly in advanced economies like Africa, conventional economic growth and development have stagnated (Diao et al., 2017; Lin & Rosenblatt, 2012). In response to the constraints posed by natural resources for economic development, several countries are

increasingly shifting focus towards the ecosystem as an alternative source of resources to support sustainable development (Singh, Sharma, Radulescu, Balsalobre-Lorente and Bansal, 2024; Amare, Mulugeta and Mencha, 2024; Effiong & Asuquo, 2017). The ecosystem, as recognised by international bodies including the United Nations, serves as the vital pillar for global sustainable development. This is especially true in developing regions like Africa (Creel, Dantzer, Goymann, and Rubenstein, 2013). Specifically, the African Union described the ecosystem as the New Frontier of African Renaissance (AU-IBAR, 2019). Indicating its significant contribution to sustainable development through economic growth, social well-being and environmental protection, commonly referred to as the triple -bottom-line of the ecosystem.

Despite the relevance of ecosystems, the sector is constrained by serious sustainability concerns (Nham and Ha, 2023). The pursuit of sustainability and the conversion of ecosystems are globally acknowledged and, as such, enshrined in SDG 15; which explains a community of living organisms interacting with each other and their physical environment, functioning as a system that sustains energy flow and nutrient cycles, is termed an ecosystem (Jacobides, Cennamo and Gawer, 2018).

However, achieving and promoting ecosystem demands adequate financial resources (Nham & Ha, 2023). However, until now, ecosystem financing has largely depended on public sector funding and, more recently, the voluntary carbon market (Zu Ermgassen & Löfqvist, 2024). However, these mechanisms often fall short of counterbalancing the environmental harm by private investment in nature-degrading practices (Beverdam, Hubacek, Scholtens & Sijtsma, 2025; Poyser, 2025). Given the limited time to achieve SDG 15, developing countries in Africa need to begin shifting focus toward an international ecosystem financing system. International or foreign investment can ensure stable, sustainable ecosystem financing, attract innovation and impact investments into the ecosystem (Slimani, Omri & Abbassi, 2024)

International capital flows, including external debt, portfolio investment, remittances, and foreign direct investment (FDI), can promote ecosystem transition by providing financial resources, enabling technology transfer, stimulating green investments, and supporting sustainable development efforts (Sarabdeen, 2025; Slimani, Omri & Abbassi, 2024). African countries can work towards achieving ecological modernisation in their ecosystem.

Ecological Modernisation Theory (EMT) proposes that ecological crises can be remedied by engaging market structures, including reforming the financial system and technology (Hector, 2023). The theory argues the role of technological innovation and foreign markets in responding to sustainability crises. Africa faces an enormous annual climate financing gap of over \$100 billion, with projected needs rising to \$2.8 trillion by 2030, intensifying ecosystem degradation and heightening vulnerability to climate change (Schumacher, Cavanagh, Eriksen, Kharrazi, Ahmed, Cisneros-Montemayor & Wong, 2024; Bennie, 2022). This funding shortfall limits investments in sustainable land management and renewable energy, compelling continued dependence on carbon-intensive and environmentally harmful economic practices (Schumacher et al., 2024; Bennie, 2022). African countries can transition from unsustainable ecosystem practices, including environmental pollution and overexploitation of natural resources, to sustainable ecosystem management, such as ecosystem-based aquaculture systems, responsible biodiversity conservation and renewable energy generation derived from natural ecosystem resources (Fonjong, Matose & Sonnenfeld, 2024). Foreign capital support is vital for funding research and development efforts related to ecosystem technological innovation (Slimani, Omri & Abbassi, 2024). Access to international capital flows and adoption of eco-friendly practices and technologies in sustainable transportation systems, water management, green building, and water conservation projects are key to resolving the ecological crisis (Shiiba, Wu, Huang & Tanaka, 2022). Ecological Modernisation Theory emphasises the importance of policy instruments, including

environmental regulations, incentives and market mechanisms, to propel sustainable practices. Foreign capital flows, such as FDI, can play a role in implementing such policies (Ndikumana & Sarr, 2019). For example, sustainable practices including reforestation, pollution control, sustainable agriculture, biodiversity conservation, renewable energy development and effective natural resources management for sustainable ecosystems would require sustained foreign capital flows (Wang & Uctum, 2024).

However, the extant literature on ecosystems has focused on halting deforestation, combating desertification, reversing land degradation, and preserving biodiversity, while overlooking the sustainability of life on land and within ecosystems. Previous studies have examined the relationship between foreign capital and ecosystems in other regions, such as Asia and the USA (Garg & Arora, 2024; Liu, Guo, Lei & Feng, 2017; Liu, Li, Jiang & Zhang, 2024; Zafar et al., 2019), with limited attention given to the sustainability of the ecosystem. Thus, these empirical studies paid scant focus to Africa, where foreign capital flows remain persistently inconsistent, and the ecosystem faces several destructive activities, including pollution, deforestation, and land degradation. Despite a few studies having examined the ecosystem (Garg & Arora, 2024; Liu, Guo, Lei & Feng, 2017; Liu, Li, Jiang & Zhang, 2024; Zafar et al., 2019), they primarily focused on land degradation, forest depletion and environmental pollution, largely overlooking the role of foreign capital on the sustainability of the entire ecosystem. Given the current ecological risks and insufficient funding for SDG 15, there is an urgent need to reconsider the ecosystem's financing structure from a foreign-capital perspective.

In this context, the study adopts a sustainability perspective to examine the impact of foreign capital on ecosystems in Africa. This perspective is imperative because the core focus of the SDG 15 as highlighted by the World Bank (2020), is to protect, restore, and promote the sustainable use of terrestrial ecosystems, manage forests sustainably, combat desertification,

halt and reverse land degradation, and stop biodiversity loss the ecosystem framework emphasizes on conserving land-based ecosystems while ensuring they continue to provide economic, social, and environmental benefits. The study is timely, as policy discussions in Africa often prioritise ecosystems with little or no importance placed on the conservation aspect of the ecosystem.

In addition, existing studies on foreign capital often rely on composite or single measures, such as FDI and foreign remittances (Ndikumana & Sarr, 2019; Slimani, Omri & Abbassi, 2024), to assess overall foreign capital flows in a given country or region. While this index provides valuable insights into the state of foreign capital flow, it typically lacks granularity. They do not distinguish between the specific dimensions of short-term, long-term, and support, which are essential in understanding the nuanced relationship between foreign capital and the ecosystem. Decomposing foreign capital into FDI, remittances, external debt, and foreign portfolio investment allows policymakers and ecosystem stakeholders to identify specific areas that require attention.

Moreover, this study acknowledged that foreign capital could exert a non-linear effect on the ecosystem. Consequently, the direct impact of foreign capital on the ecosystem in Africa's economy might not always be positive. For example, an increase in foreign capital to support environmental activities could, in some instances, result in deforestation, environmental pollution, and depletion of ecosystem resources, suggesting that marginal foreign capital flows might be counterproductive and harm the ecosystem (Aminu & Alabi, 2024). Consequently, given that foreign capital flows to Africa are still in their early stages, initial allocation to the ecosystem may not optimally promote ecosystem objectives. However, as foreign capital flows progress, more efficient allocations could support sustainability. This implies that the relationship between foreign capital and the ecosystem may be non-linear and exhibit a threshold effect (Aminu & Alabi, 2024). Therefore, it is imperative not only to

examine the direct linear effects of foreign capital but also to identify the sustainable threshold of foreign capital required to advance the ecosystem in Africa.

Again, scholars posit that quality governance can promote the attractiveness of foreign capital flows to the ecosystem by fostering political trust, encouraging participation in the political system and promoting democratic institutions (Abbas et al., 2017; Nord, 1990; Kurul and Yalta, 2017). Again, strengthening governance structures can reduce transaction cost and encourage the inflow of remittances through formal financial channels (Effiong and Asuquo, 2017). Despite existing studies highlighting the role of institutions in attracting foreign capital flows, a major gap remains concerning the moderating effect on the relationship between foreign capital and ecosystem.

The presence of strong institutional structures assists to ensure that foreign capital supports sustainable practices within the ecosystem. This is because foreign capital flow expands funding needs for ecosystem activities. However, evidence suggests that improved access to finance sometimes results in ecological damage due to rent-seeking behaviour (Yao et al., 2021). Consequently, as countries promote foreign capital flows and financial systems, they may face a trade-off between improving standards and preserving ecological quality. Thus, the narrative above underscores the vital role of robust institutional frameworks to govern the allocation and use of funds (Gustavsson et al., 2021; Nagy & Nene, 2021).

This study attempts to fill these gaps and examine the effect of each foreign capital indicator on ecosystem sustainability rather than growth, specifically in African economies.

1.2.2 Economic Institutions and Ecosystem in Africa: The Moderation role of Political Institutions

Inadequate governance structures can hinder the ecosystem transition drive in developing countries, especially in Africa (Benzaken, Adam, Virdin & Voyer, 2024; Bax et al.,

2022; Fagbemi, Nzeribe, Osinubi & Asongu, 2021). Institutions shape business conduct in the ecosystem. Economic and political institutions are the core drivers of sustainable development, especially in developing economies (Benzaken et al., 2024; Acemoglu, Johnson & Robinson, 2005). A common limitation of previous studies is that they predominantly, but briefly, discuss the possible effect of institutions on ecosystem growth while neglecting ecosystem sustainability. Moreover, the few studies on institutional structures in the ecosystem economy largely used a qualitative approach to develop an ecosystem governance framework. None of these studies uses a quantitative research approach, despite the limitations of qualitative research methods. Furthermore, the previous studies on institutional structures in ecosystems do not consider the impact of 1) sub-economic and political institutional indicators and 2) the hierarchy of institutions hypothesis.

The current study fills this gap by examining the interaction between economic and political institutions and ecosystem sustainability within the framework of the hierarchy of institutions hypothesis put forward by Acemoglu, Johnson, and Robinson (2005). This study examines how variations in institutional quality across African nations influence foreign capital's ability to support sustainable environmental practices, such as reducing deforestation rates and enhancing water resource management.

Institutions occupy a significant position in shaping the decisions and behaviour of economic actors in the environment. Acemoglu et al. (2025) observed the vital role of both economic and political institutions as preconditions for sustainable development. In advanced countries, such institutions are assumed important not only for broader economic development but also for supporting environmental sustainability (Abid, 2016; Ahmad et al., 2022; Olaoye and Aderajo, 2020; Prasad, 2003). Therefore, in light of rising land degradation, deforestation, and environmental pollution in Africa, this thesis examines how the interaction between

economic and political institutions influences ecosystem sustainability in Africa, drawing on the hierarchy of institutions hypothesis.

Although Africa remains the second largest continent in the world, coupled with serious environmental challenges, little is known concerning the link between institutional structures and ecosystems in African settings. In addition, according to Abeka et al. (2022), economic institutions across Africa have continued to strengthen in the current years. In essence, this improvement has eased on the engagements of the economic agents, contributing to a notable expansion of economic engagement within the ecosystem. As Acemoglu et al. (2005) noted, economic institutions shape outcomes by providing both incentive that regulate the doing business of economic agents. Economic institutions tend to be stronger in providing where individuals can make economic decision on their own, engage in free exchange and compete in open market with the country guided by the protection of property right (Gwarney & Lawson, 2003). In the context analysed above, the thesis argue that stronger economic institutions are associated with greater market performance which also carries significance implications on the sustainability of the environment (Ren et al., 2023).

Therefore, examining the nexus of this influence of this progress on the ecosystem is timely. In addition, as restriction are eased and economic institutions continue to get better, it becomes imperative to investigate the circumstance under which greater economic freedom can be expanded without undermining efforts to promote the ecosystem in the economies across Africa. In addition, because Africa is largely constrained by poor political institutions, strengthening these institutions will be imperative in preventing any unintended consequences that could ensue from enhancing economic institutions.

The study draws inspiration from North's (1990) argument and draws theoretical insight from Acemoglu et al.'s (2005) hierarchy of institutions, extending the role of institutions in promoting ecosystem sustainability. Robust economic institutions enable agents including

foreign investors, banks and stock exchange to provide funding, insurance and innovative services to actors within the ecosystem (Aminu & Alabi, 2024). Thus, the long run implication of the scenario above that it supports actors' capacity to invest in and adopt technology and practices that support environmental sustainability. However, reduced restrictions and heightened competition could further promote rent-seeking behavior among economic actors in the ecosystem, which could undermine sustainability. This underscores the essence for more understanding of the specific economic institutions that support a sustainable ecosystem. Furthermore, the study argues that the effectiveness of economic institution in fostering an ecosystem is dependent on the strength and functioning of political institutions. This reasoning is grounded in Acemoglu et al.'s (2005) hierarchy of institutions hypothesis, which suggests that the performance of economic institutions in delivering economic outcomes is contingent on the strength and quality of political institutions. Based on the argument above, the study primarily investigates whether political institutions influence or moderates the nexus between economic institutions and the sustainability of the ecosystem in Africa.

The current study departs from existing literature in several notable ways. First, it is the first to the best of my understanding to employ a range of sub-indicators of economic institutions to show how different institutional dimensions affects the ecosystem. In addition, the study integrates the hierarchy of institutions hypothesis into the examination of the institutions-ecosystem nexus, a perspective largely neglected in previous empirical works.

1.2.3 Foreign capital, Food Security and partnership for the Goals

Food security remains a major challenge in Africa and refers to people's ability to access sufficient, affordable, and nutritious food (Sogah, Mawutor & Gborse, 2024). The continent faces higher levels of food insecurity than other regions; in 2021, nearly 20% of Africa's population over 250 million people were undernourished, compared to the global

average of 9.8%, meaning Africa accounts for more than 30% of the world's food-insecure population (Food and Agriculture Organization, 2024).

Several factors drive this problem. Climate change disrupts agriculture through droughts and irregular rainfall (Sogah, Mawutor & Gborse, 2024). For instance, the Horn of Africa experienced its worst drought in 40 years in 2022, putting 36 million people at risk of hunger in Ethiopia, Somalia, and Kenya. Conflicts also worsen food insecurity, as violence in Sudan and South Sudan in 2022 displaced many people and reduced food access (World Bank, 2023). Although Africa has vast arable land, food production remains inadequate due to outdated farming methods, limited access to tools and fertilisers, and weak infrastructure. In addition, about 40% of food produced is lost annually due to poor storage and transport, representing over \$4 billion in losses enough to feed nearly 48 million people (World Bank, 2023). Economic challenges further intensify the crisis. Around 40% of Africans live in poverty, while rising food prices driven by inflation in countries such as Nigeria and Ethiopia in 2022 make nutritious food less affordable. The consequences are severe: 45 million children under five are malnourished, accounting for 40% of the world's stunted children. Food insecurity also costs African economies between \$3.5 billion and \$5 billion annually in lost productivity and healthcare expenses, and has contributed to social unrest in countries like Kenya and Tunisia.

Foreign investment can play a crucial role in improving food security by providing financial resources, modern agricultural technologies, and better infrastructure (Dhahri & Omri, 2020; Wardhani & Haryanto 2020). Investments in irrigation, storage facilities, and improved farming techniques can increase productivity and reduce food losses, while partnerships and training programmes can help farmers access larger markets and adopt more efficient practices. Such investments are essential for strengthening food systems and building long-term resilience. Again, foreign capital flows have been recognized as a key source of financing

agriculture and strengthening food system and building long-term resilience (Dhahri & Omri, 2020; Wardhani & Haryanto, 2020).

In addition to foreign capital flows, several scholars argued that partnership for the goals has the potential to influence the attractiveness of international capital flows by strengthening international cooperation, improving institutional credibility and facilitating coordinated policies that create a stable and trustworthy environment for foreign investors (Kingombe & Saner, 2018; Kurul & Yalta, 2017; (Doppen, Calcara & De Bièvre, 2024; Ghufuran et al., 2024; Cassimon, Fadare & Mavrotas, 2023). In spite several previous literatures indicate the effectiveness of partnership in attracting foreign capital flow, there still gaps in prior research concerning the moderating role of partnership for the goals in foreign capital and food security contagion (Doppen, Calcara & De Bièvre, 2024; Ghufuran et al., 2024; Cassimon, Fadare & Mavrotas, 2023).

Again, several studies investigated the impact of foreign capital on the availability, accessibility, affordability, and utilisation of food (Aloui & Maktouf, 2024; Hasudungan, Raeskyesa & Fromm, 2024; Sogah, Mawutor & Gborse, 2024; Dhahri & Omri, 2020; Wardhani & Haryanto, 2020), ignoring the sustainability of food security in the sub-region, which is the focus of SDG 2. The Zero Hunger aims to end hunger, achieve food security and improved nutrition, and promote sustainable agriculture by 2030.

The study fills these gaps by offering the first attempt to present new evidence on the relationship between foreign capital and the sustainability of food security. In addition, apart from unveiling the direct effects of foreign capital and partnership of the goals on sustainable food security, the study unearths how the interaction term between foreign capital and partnership with the goals affects sustainable food security in Africa.

This is imperative as it reveals whether the effect of foreign capital on sustainable food security fluctuates with the level of partnership with the goals. Acquaintance with how partnership with the goals influences the foreign capital and sustainable food security nexus is fundamental for policy formulation. Improvement in the flows and management of foreign capital flows alone cannot enhance sustainable food security unless the level of partnership with the goals is sufficiently sound. Partnerships with the goals ensure that state officials do not divert resources meant for agricultural production for selfish usage. Also, partnerships with governments, businesses, and civil society organisations can attract foreign capital investments in the agricultural sector, promote sustainable agricultural practices and improve food security. Partnership can also strengthen institutional quality in various economies. An economy with high governance quality would enjoy a sense of commitment, efficiency, and accountable government (Kaufmann, Pajoro & Angenent, 2010; Kaufmann, Kauppi, Mann & Stock, 2011; Acemoglu et al., 2005). The essence of partnership with the goals in solving food insecurity is indispensable; partnership with the goals will create synergies that drive systemic change, enhance food systems, and contribute to achieving global food security. Secondly, it reveals the magnitude effect of foreign capital on sustainable food security; hence, it reveals whether the magnitude effect is positive or negative.

1.3 Specific Objectives

Specifically, the study aims to:

1. ascertain the impact of foreign capital on ecosystem sustainability and also investigate the moderating role of institutional quality in foreign capital-ecosystem contagion.
2. examine the moderating role of political institutions in the relationship between economic institutions and ecosystem sustainability in Sub-Saharan Africa (SSA)

2. investigate the moderating role of partnership for the goals on the relationship between foreign capital and sustainable food security.

1.4 Research Hypotheses

H1a: Foreign capital influences ecosystem sustainability in African economies.

H1b: Institutional quality positively moderates the link between foreign capital and ecosystem sustainability in SSA economies.

H2: Political Institutions positively moderate the relationship between economic institutions and ecosystems in SSA economies.

H3: Partnership for the Goals acts as a moderator and significantly affects the relationship between foreign capital and sustainable food security.

1.5 Significance of the Study

This thesis contributes to theory and practice in several ways. The finance-led sustainability theories like Ecological Modernization Theory, Dependency Theory, Resource Curse Theory, and the Pollution Haven Hypothesis highlight risks associated with weak institutions in managing foreign capital and environmental sustainability. This thesis emphasises and provides empirical evidence to support the theoretical observation of earlier sustainability theorists. Ecological modernization theory emphasizes that financial markets and technological innovation are key to addressing ecological crises, and this study contributes by reinforcing their central role in promoting environmental sustainability.

Furthermore, the institutional theory provides frameworks for understanding how strong institutions can leverage foreign capital to achieve SDG 15. As one of the pioneering studies in the field of the ecosystem, both environmental sustainability finance and institutional theorists would find an extension of the theory as it applies to the ecosystem.

In terms of empirical literature, this thesis, to the best of the author's knowledge, contributes as follows: This is the first study to empirically, through a quantitative approach, provide evidence on the relationship between foreign capital and sustainability of ecosystem (Life on Land), particularly in Africa. Previous studies (Liu, Guo, Lei & Feng, 2017; Liu, Li, Jiang & Zhang, 2024; Zafar et al., 2019) on ecosystem and foreign capital nexus are found in other regions including Asia and USA. In addition, several studies investigated the impact of foreign capital on availability, accessibility, affordability, and utilization of food (Aloui & Maktouf, 2024; Hasudungan et al., 2024; Sogah et al., 2024; Dhahri & Omri, 2020; Wardhani & Haryanto, 2020), ignoring the sustainability of food security. The current study contributes in filling the identified gaps in the scholarship literature.

This thesis to the best of my knowledge is the first to provide empirical evidence regarding the relationship between specific institutional structures and the ecosystem transition, on the one hand, and one of the few studies to provide empirical evidence on the hierarchy of institutions hypothesis within the ecosystem transition debate. This study investigates the relationship between foreign capital and the ecosystem conditioned by the strength of institutional structures. In addition, the thesis provides empirical evidence on the nexus between foreign capital and the sustainability of food security conditioned on partnership with the goals (SDG 17).

In terms of social and practical relevance, this thesis provides scientific information for regulators and governments to emphasise the need to balance foreign capital in a manner that is an ecosystem enhancer. Additionally, the thesis provides evidence supporting the necessity of partnerships with relevant goals, institutions, and other stakeholders to effectively deploy foreign capital resources for the sustainable use of ecosystem resources. This approach aims to ensure accessibility, availability, affordability, and utilisation of food, which in turn contributes to achieving SDG 15 and SDG 2. Finally, the thesis provides information for governments and

other stakeholders to strengthen institutions while protecting foreign investors to ensure a sustainable ecosystem and food security. In doing so, the thesis moves beyond existing literature by linking foreign capital, institutional quality, and ecosystem and food security sustainability, presenting guidance for attaining SDG 15 and 2 in the context of Sub-Saharan Africa.

1.6 Scope and Limitation

1.6.1 Geographical Scope

The study employed panel data on 48 countries over 22 years (2000-2022). The reason for the time period is due to the fact that this was the time government and policymakers-initiated policies to ensure sustainable life on land; hence, the study seeks to investigate how these policies have helped in achieving this aim over the long period of time. In addition, the selected timeframe, 2000-2022, encompasses significant global financial shifts, providing a dynamic context to explore how these changes impact foreign capital's role in sustainable development across different governance frameworks in Africa."

The selection of sub-Saharan African countries is justified due to the reason that sub-Saharan Africa encompasses a vast and diverse geographical region with different countries, each offering unique economic, social, and environmental conditions. Also, the study seeks to align the progress of sub-Saharan African countries with the United Nations' Sustainable Development Goals, and it reveals areas where foreign capital may impact these goals positively or negatively. Furthermore, the region exhibits a wide range of economic development levels, from resource-rich nations with growing economies to those facing challenges such as poverty and underdevelopment. Additionally, the overall quality of institutions in many sub-Saharan African nations is subpar, with corruption prevalent across various levels of governance.

1.6.2 Temporal Scope

For the purpose of the first, second, and third objectives, data was collected from the 48 sub-Saharan African countries from 2000 to 2023.

1.7 Structure of the thesis

The thesis consists of five chapters. The chapter one detailed background problems, objectives, research hypotheses, the significance of the study, and the scope and limitations of the study. Chapter two discussed the forensic literature underpinning the study. These include the definition of concepts, theories underpinning the study, and the empirical studies in relation to the studied variables. Chapter three consists of the econometrics methods employed in answering the objectives of the study. These include the research philosophy, the research design, the sampling techniques, data analysis, econometric model specifications, and ethical considerations. Chapter four consists of results and discussions of the findings in literature. Chapter five looks at summary, conclusions, and recommendations for policy implications based on the econometrics findings.

2 CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Foreign capital and sustainability of the ecosystem and food security in Africa, like most other regions, are interrelated. Improved foreign capital flows coupled with sustainable ecosystem and food security would be a better driver of the region's economic growth and conservation of the ecosystem environment. Surrounded by vast resources, the ecosystem could become a significant driver of economic development in Africa. This section discusses the key considerations and theories for harnessing the ecosystem potentials of the region for long-term economic sustainability. The section also discusses empirical studies related to the studied variables, including hypotheses development. The theories discussed here lend weight to the role of foreign capital and institutional structures in the sustainability of ecosystems as related to the Africa region. The literature is in three subsections: The first section reviewed the key concepts, the second section reviewed theories of the study, and the third section reviewed existing studies in relation to the studied variables.

In this chapter, the thesis discusses the key concepts of the study. It tackles the concepts and elucidates their relevance to the studied variables. These concepts are crucial to the study and highlight how well it aligns with the field. The section discusses concepts such as foreign capital, institutions and environmental governance, and ecosystems.

2.1.1 Foreign capital in Africa

Foreign capital refers to the investment of financial resources from one country into another country. Bakhsh, Yin and Shabir (2021) demonstrate that cross-country foreign capital differences depend largely on institutional quality, where countries with robust institutions get rewarded with more efficient foreign capital flows. While arguing that institutional intermediation lends support to the varied nature of foreign capital resources, the study revealed

that institutional attributes that facilitate financial intermediation are instrumental in the process of foreign capital flows. Given that the indicators of foreign capital are varied, some researchers have fashioned a relationship between changes in institutions and their effects on foreign capital. For instance, Islam, Khan, Tareque, Jehan and Dagar (2021) investigate foreign capital, globalisation and growth on environmental performance conditioned on institutional quality. They found that by changing institutional functions, such institutions have become vital to the inflows of foreign capital and environmental performance of a given country in the long run. This proves in part that foreign capital depends on many variables, which must be altered in a way to ensure the necessary effect is applied to foreign capital. Other variables affect foreign capital, including macroeconomic variables like inflation, savings, and trade openness, among others, (see Naceur, Cherif & Kandil, 2014). Foreign capital comprises several elements (external debt, FDI, Remittances, and portfolio investment), which are discussed in turn as follows:

2.1.2 External debt

External debt is the money a country owes to people and organisations outside its borders. This can include other countries, banks, or private companies. When it comes to protecting the environment, external debt is important (Mensah et al., 2018; Qayyum & Haider, 2012). It can help countries pay for projects like renewable energy, saving wildlife, and cleaning up pollution. It also helps them stick to global agreements, like the Sustainable Development Goals and the Paris Agreement. External debt can create both chances and problems for countries. If managed well, it can boost green projects. For example, green bonds and low-interest loans provide cash for eco-friendly programmes, like planting trees and building solar farms. Some countries even do debt-for-nature swaps, where they pay less if

they promise to protect the environment. Groups like the World Bank and the Green Climate Fund also help with money for these kinds of projects.

Conversely, excessive external debt can pose significant challenges. When countries owe a lot, they might have to spend money paying off debts instead of investing in the environment. Sometimes, they might need to overuse their natural resources, like cutting down forests or mining, just to make money. Also, the rules tied to some loans can make it harder to invest in green projects, especially if they involve cutbacks. It is clear that there's a strong link between external debt and protecting the environment. For many poorer countries, especially in the Global South, external debt can help them pay for large environmental projects. If loan agreements include goals for sustainability, they can encourage countries to invest in green initiatives. But if the debt is not managed well, it can hurt the environment even more. Projects to pay off debt may focus on quick money instead of caring for nature. Relying on extraction industries can lead to a loss of wildlife and make climate change worse.

To make sure that external debt helps the environment, smart management is key. Green debt tools, like bonds tied to specific eco-friendly goals, can steer funds towards reducing carbon and restoring ecosystems. Restructuring debt can also provide countries more room to invest in climate action. It is essential for countries to work together, as reducing debt and agreeing to protect ecosystems can help those struggling with high debt loads.

2.1.3 Foreign Capital

Foreign investment is a key driver of economic growth, particularly for developing countries that lack sufficient domestic savings for large projects. Different forms of foreign capital such as foreign direct investment (FDI), foreign aid, and portfolio investments are often seen as catalysts for development (Borensztein, De Gregorio & Lee, 1998). Traditional economic theory posits that foreign capital fills financial gaps, transfers technology, creates

jobs, and improves infrastructure, helping economies modernize (Solow, 1956). Empirical studies show that foreign investment generally boosts GDP, industrial output, and employment. For example, Oke and Ruth (2021) note that FDI enhances productivity and capital accumulation, while Burnside and Dollar (2000) argue that foreign aid supports growth, particularly in countries with sound economic policies.

However, the benefits of foreign investment are not automatic and depend on institutional capacity and the country's ability to absorb capital. Asiedu (2002) shows that FDI favors countries with strong property rights and political stability, reducing its impact in nations with weak institutions. Hiep, Trung and Van Chien (2022) highlight that the sector of investment matters, with manufacturing and services generally yielding more benefits than extractive industries. Resource-focused investments can also lead to economic imbalances and governance challenges, as suggested by Ndikumana and Sarr (2019). Similarly, short-term capital, like portfolio investments, can increase financial volatility, as seen in the 1990s Asian Financial Crisis (Radelet & Sachs, 1998).

Environmental considerations are also critical. Without robust regulations, foreign investments especially in resource extraction can harm ecosystems and undermine sustainability goals (Khan & Ikram, 2010; Makoni, 2021; Asongu & Odhiambo, 2020). Governance further mediates the impact of foreign capital: political risks and corruption can deter investment, emphasizing the importance of institutional quality for converting foreign capital into tangible economic and social gains (Amoh, Nsor-ambala & Amenyitor, 2024).

Despite these insights, many studies still generalize the effects of foreign investment, overlooking differences in investment type, sector, governance, and country context. There remains a need for more nuanced analyses that consider how foreign capital interacts with institutional quality, sectoral dynamics, and regional disparities within countries.

2.1.4 Trend in foreign capital flows to Africa

2.2.4.1 Foreign Direct Investment

Over the past decade, foreign direct investment (FDI) in Africa has fluctuated in response to global and regional dynamics. Between 2018 and 2025, Foreign Direct Investment (FDI) flows to Africa exhibited significant fluctuations, reflecting the region's sensitivity to global economic conditions (UNCTAD, 2023). In Table 1, FDI decreased from \$46 billion in 2018 to \$39 billion in 2020, primarily due to COVID-19 disruptions, a global economic slowdown, and reduced investor confidence. However, this trend reversed sharply in 2021, with inflows rising to \$80 billion, driven by post-pandemic recovery and renewed investment in sectors such as energy, telecommunications, and infrastructure (UNCTAD, 2023; Githaiga & Kilong'i, 2023). By 2024, FDI reached a peak of \$97 billion, largely fueled by mega projects in renewable energy, tech hubs, and mining, before a slight projected dip to \$95 billion in 2025 (UNCTAD, 2023; Githaiga & Kilong'i, 2023; Ali, Jehan & Sherbaz, 2022; Ndikumana & Sarr, 2019)

Compared to Asia and Latin America, Africa receives substantially lower FDI. Asia, led by China and India, attracted roughly \$500 billion in 2022, while Latin America received about \$140 billion, due to higher industrialisation, stronger governance, and better infrastructure (Zangina & Hassan, 2020; Li, 2009; UNCTAD, 2023). Africa's slower FDI growth is attributed to infrastructure deficits, political instability, corruption, and overreliance on extractive industries, which limits diversification in sectors like manufacturing, services, and agriculture (Ali et al., 2022; World Bank, 2023). FDI remains concentrated in countries like South Africa, Kenya, and Nigeria, while many others remain underinvested.

Despite challenges, FDI can advance Sustainable Development Goals (SDGs), particularly SDG 15 (Life on Land) and SDG 2 (Zero Hunger) (Luu et al., 2019). For SDG 15,

FDI in agriculture and forestry supports sustainable land use, soil conservation, and climate-smart practices. In Ethiopia and Ghana, investments have funded irrigation systems, land reclamation, and forest conservation, enhancing productivity and resilience to climate change (African Development Bank, 2023). However, risks such as land grabbing and displacement highlight the need for strong regulatory frameworks to ensure sustainable land management. FDI also contributes to SDG 2 by increasing agricultural productivity, strengthening supply chains, and promoting innovation.

In Kenya, for instance, FDI has introduced high-yield crops, modern farming techniques, and better market access for smallholders (Luu et al., 2019; Sabir, Rafique & Abbas, 2019; Li, 2009). Investments in agribusiness and food processing have grown by 8% annually, reducing food waste and improving availability (FAO, 2023). FDI can further support infrastructure such as storage and transport, reducing post-harvest losses. Nonetheless, prioritisation of export-oriented crops over local staples may threaten food security, underscoring the importance of aligning FDI with local agricultural and nutrition goals.

2.2.4.2 External debt

Over recent decade, external debt has played a major role in shaping Africa's economic landscape (World Bank, 2023). External debt has shown a steady upward trajectory, increasing from \$690 billion in 2018 to an estimated \$980 billion in 2025 as reported in Table 1 (Mensah et al., 2018; Qayyum & Haider, 2012; World Bank, 2023). This rise reflects African governments' growing reliance on external borrowing to fund infrastructure, social services, and post-pandemic recovery programs. Unlike FDI, debt accumulation has been relatively stable, with annual increases of approximately \$30-40 billion, indicating consistent borrowing strategies rather than sudden spikes. While external debt provides short-term financing opportunities, it raises concerns about debt sustainability, particularly for countries with limited

fiscal space or high FDI inflows, where debt servicing can compete with critical development expenditures Mensah et al., 2018; Qayyum & Haider, 2012; World Bank, 2023; World Bank, 2020).

Unlike Latin America and Asia, where stronger financial systems provide resilience, Africa faces higher vulnerability to external shocks, uneven economic growth, commodity dependence, and political instability, which heightens debt distress risks (Qayyum & Haider, 2012; Mensah, Bokpin & Boachie-Yiadom, 2018). Institutional capacity, governance, and market access explain regional differences, with Africa's weaker structures leading to higher borrowing costs and occasional unsustainable debt (Ali et al., 2022; Rakhmat, Warjiyo & Sadli, 2022; Oke & Ruth, 2021; Ndikumana & Boyce, 2011).

External debt can support development and the Sustainable Development Goals (SDGs) if managed prudently. For SDG 15 (Life on Land), debt financing can fund land restoration, biodiversity conservation, and sustainable agriculture projects, as seen in Kenya and Tanzania (World Bank, 2023). Similarly, SDG 2 (Zero Hunger) benefits when debt is directed toward agricultural infrastructure, technology, and food distribution systems (World Bank, 2023). However, high debt servicing and reliance on private creditors with shorter repayment terms can divert resources away from these priorities, limiting investments in sustainable agriculture and environmental initiatives, and potentially undermining both SDG 2 and SDG 15 (Mensah et al., 2018; Qayyum & Haider, 2012).

2.2.4.3 Remittances

In recent years, remittances funds sent home by migrants have become a crucial financial lifeline for many African economies. Remittances have proven to be the most stable and steadily growing financial flow to Africa. Remittances based on Table 1 increased from \$78 billion in 2018 to an estimated \$102 billion in 2025, demonstrating resilience even during

the COVID-19 pandemic, when slight fluctuations occurred in 2020-2021 (World Bank, 2023). The rapid recovery was supported by digital remittance platforms and continued diaspora engagement. Countries such as Nigeria, Egypt, and Ghana dominate remittance receipts, which play a vital role in household welfare, consumption, and small-scale investment. Given their stability, remittances represent a more reliable source of external finance compared with the volatility of FDI and portfolio flows (Battaile, Hernández & Norambuena, 2015; World Bank, 2022).

Remittances not only support household consumption but also stimulate local economies, reduce poverty, and advance several Sustainable Development Goals (SDGs) (Battaile, Hernández & Norambuena, 2015; World Bank, 2022). Remittances can support SDGs, particularly Goal 2 (Zero Hunger) and Goal 15 (Life on Land). Families invest in farming inputs, equipment, and conservation projects; for example, in Ethiopia, remittances fund reforestation and sustainable agriculture, while in Nigeria and Uganda, they improve food security and productivity. However, developmental impact depends on how funds are used. Many households prioritize immediate consumption over long-term investment, which limits sustainability and increases vulnerability if remittance flows decline (Battaile, Hernández & Norambuena, 2015; World Bank, 2022).

2.2.4.4 Portfolio investment

Portfolio investment in Africa has evolved significantly in recent years, shaped by global economic trends and investor confidence. Portfolio investment flows are the most volatile, reflecting sensitivity to global financial market conditions. Based on Table 1, inflows fell from \$23 billion in 2018 to \$12 billion in 2020 due to heightened risk aversion during the pandemic, but recovered gradually between 2021 and 2025, reaching approximately \$25 billion (Igbinedion & Abudu, 2023; Shabbir & Muhammad, 2019). Despite this recovery, portfolio

investments remain highly sensitive to interest rate changes, foreign investor sentiment, and emerging market volatility (Igbinedion & Abudu, 2023; Shabbir & Muhammad, 2019). While they can provide quick liquidity and capital gains, they are not reliable for long-term development projects, emphasizing the need for stronger capital market regulation and targeted investment incentives to stabilize these flows.

Investment distribution is uneven, with South Africa, Nigeria, and Egypt receiving most inflows. South Africa alone captures about 50% of Africa's portfolio investments due to its developed financial markets and political stability (African Development Bank, 2022). Other countries, including Kenya, Ghana, and Morocco, are attracting more foreign capital as their markets strengthen. Portfolio investments in sub-Saharan Africa have grown about 8% annually, yet the continent accounts for only 1.4% of global flows, compared to Asia's 30% share (World Bank, 2022). High political risk, currency volatility, and underdeveloped financial markets limit inflows, whereas Asia and Latin America benefit from more mature financial systems (World Bank, 2020).

Despite challenges, reforms improving governance, market structures, and regulations are increasing Africa's attractiveness. Projected growth of 4.2% in 2023 is supported by agriculture, telecommunications, and technology (World Bank, 2022). Africa's young, urbanizing population and emerging middle class create opportunities in technology, retail, and financial services (Gossel & Beard, 2019), while innovations in digital finance and mobile banking expand investor access and capital availability for SMEs.

Portfolio investments can also support global development goals, including sustainable development, agriculture, and environmental conservation (Horan, 2022). Green investments promote land restoration, resource conservation, and renewable energy, while agricultural investments finance modern technologies and infrastructure, helping smallholder farmers improve yields and access wider markets (Igbinedion & Abudu, 2023).

Table 2.1: Foreign capital flows to Africa from 2018-2025

Year	FDI Inflows (\$bn)	External Debt Stock (\$bn)	Remittances (\$bn)	Portfolio Investment (\$bn)
2018	46	690	78	23
2019	45	720	82	25
2020	39	790	83	12
2021	80	820	95	27
2022	45	860	100	19
2023	52.6	900	96	21
2024	97	940	100	24
2025* (est.)	95	980 (est.)	102 (est.)	25 (est.)

Source: Author's Construct, 2025

2.1.5 Foreign Capital and Economic Development

The dual gap theory explains that due to low savings and investment rates in developing countries, they cannot undertake development agendas in a sustainable manner; therefore, foreign capital is needed to close the savings and investment gaps to help foster economic growth and development in such economies. Hence, the study discusses the nexus between the studied variables.

The impact of foreign direct investment (FDI) on the progress and expansion of nations has emerged as a progressively pivotal factor. The primary objective of this literature review is to perform an exhaustive analysis of the extensive body of research dedicated to understanding the correlation between economic growth and foreign direct investment (FDI). Over the course of time, several scholars have examined this association (Ali, Jehan & Sherbaz, 2022; Rakhmat, Warjiyo & Sadli, 2022; Hayat, 2019), thereby providing significant contributions to the expanding knowledge regarding the effects of foreign direct investment on economic growth.

2.1.6 Impact of foreign direct investment (FDI) on economic growth

The endogenous growth model highlights that FDI promotes technological spillovers, innovation, and information flow, making it a key driver of sustained economic growth, while the neo-classical framework emphasizes its role in boosting capital accumulation and productivity (Luu et al., 2019; Sabir et al., 2019). Numerous cross-country panel studies examine FDI's link to economic growth, with findings ranging from strong positive effects to more complex interactions.

Hayat (2019) finds that FDI and institutional quality significantly enhance growth, particularly in low- and middle-income countries, whereas high-income nations may see slower growth from FDI. The role of institutions is critical in determining how foreign capital affects human development. Ali et al. (2022) shows that, in 65 developing countries from 1984–2014, FDI and foreign portfolio investment (FPI) negatively affect secondary school enrollment and per capita income, while remittances generally improve human development metrics. Strong institutions positively interact with all foreign capital types, though they cannot fully offset negative effects, highlighting the need for institutional reform (Luu et al., 2019).

Lee and Park (2013) demonstrate that countries with strong formal institutions attract more FDI, while weaker institutions and large informal economies deter investment. Corruption and financial development also influence FDI inflows (Lestari, Lesmana, Yudaruddin & Yudaruddin, 2022). Similarly, Rakhmat, Warjiyo, and Sadli (2022) show that exchange rates, foreign capital flows, global commodity prices, and US monetary policy significantly affect economic growth and inflation, informing Indonesia's monetary policy decisions.

In Vietnam, Hiep, Trung & Chien (2022) find that FDI positively impacts productivity, but regions with stronger institutions do not always see significant gains, and aggregate productivity measures may mask FDI's true effects. Overall, studies by Hayat (2019), Ali, Jehan and Sherbaz (2022), and Rakhmat, Warjiyo and Sadli (2022) underscore the theoretical and empirical significance of FDI for economic growth and human capital development, with institutional quality playing a decisive role.

2.1.7 Role of external debt in development

Over time, external debt has attracted considerable attention from scholars, policymakers, and economists due to its impact on national development (Tölle, 2018; Qayyum & Haider, 2012; Kusi, 2015; Onifade, Gyamfi, Haouas & Asongu, 2023). A central debate focuses on whether foreign debt hinders or promotes economic growth. Early studies, such as Tölle (2018), suggested that excessive debt could slow growth by diverting resources from productive activities and increasing debt servicing costs. However, other research, including Qayyum & Haider (2012), indicates that moderate borrowing can finance human capital and infrastructure investments, supporting growth when managed prudently.

Debt sustainability defined as a country's ability to meet its debt obligations without compromising public spending is critical for long-term development. Tools like the IMF's Debt Sustainability Analysis (DSA) are commonly used to assess this (Kusi, 2015). Excessive debt risks crises and macroeconomic instability, while sustainable borrowing can support development objectives.

External debt can also affect poverty reduction and social progress. Managed effectively, it can fund education, healthcare, and poverty alleviation, improving living standards and reducing inequality (Arezki & Banerjee, 2014). Conversely, when funds are

diverted to debt service rather than social investment, adverse social outcomes may result, highlighting the need for comprehensive debt management strategies that prioritize development goals.

Multilateral institutions like the World Bank and IMF play a key role in guiding developing countries on responsible borrowing and debt management, although reforms are needed to enhance their effectiveness and accountability (Sudreau & Bohoslavsky, 2015). Since the adoption of the UN Sustainable Development Goals (SDGs) in 2015, the role of external debt in achieving sustainable development has gained renewed focus. Aligning debt management with the SDGs is essential to address poverty, inequality, and environmental sustainability, exploring potential synergies and trade-offs between debt sustainability and SDG achievement (Onifade, Gyamfi, Haouas & Asongu, 2023).

2.1.8 Portfolio investments and their implications

Portfolio investment entails allocating financial capital across diverse assets, including equities, bonds, stocks, mutual funds, and ETFs, with the primary goal of generating income or capital appreciation (Sugozu, Yasar & Verberi, 2023). By spreading risk across multiple securities, investors can reduce the impact of poor performance in any single investment. Portfolio investments significantly influence sustainable development by directing capital toward sectors and companies that prioritise sustainability.

Investors can support socially responsible corporations, clean technology, and renewable energy, promoting growth in sustainable sectors (Malik, Shahzad, Shabbir & Muhammad, 2019; Derbali & Lamouchi, 2020; Igbinedion & Abudu, 2023; Sugozu, Yasar & Verberi, 2023). Many portfolio investors integrate ESG (environmental, social, and governance) criteria into decision-making, encouraging companies to improve ESG

performance. Shareholder activism and voting rights are often used to advocate for ethical business practices, enhancing firms' sustainability initiatives (Derbali & Lamouchi, 2020b).

Strategic investments in infrastructure, including sustainable construction, transport, and renewable energy projects, can promote sustainable urban development while reducing environmental impacts. Participation in the green bond market provides funding for projects with positive social and environmental outcomes. Portfolio investors can also influence natural resource management, favoring companies that adopt sustainable practices, which in turn supports economic growth, job creation, and social development in regions emphasizing sustainability. They often demand greater transparency and ESG reporting, which can enhance sustainability disclosures (Shabbir & Muhammad, 2019a). Portfolio capital can also fund R&D in sustainability-focused areas like waste management, water conservation, and renewable energy.

However, portfolio investments carry risks, especially in emerging markets with weaker regulations, which may lead to negative social or environmental impacts. Greenwashing, where companies misrepresent their sustainability to attract investment, remains a concern (Derbali & Lamouchi, 2020). Consequently, rigorous due diligence is essential. Investors are increasingly assessing climate-related risks, encouraging firms to adopt measures that enhance resilience to environmental threats (Bose et al., 2023). Portfolio investments can align with the UN Sustainable Development Goals (SDGs) by financing initiatives that tackle poverty, inequality, and climate change (Shabbir & Muhammad, 2019).

2.2 Institutions and Governance

The environment is an important part of the world's ecosystem, providing a habitat for aquatic animals and serving as a means of transport for goods between countries. To manage and regulate activities in the world's environment, institutional frameworks and governance

mechanisms are required. Ecosystem governance has long been viewed as a set of rules, institutions, and laws that guide and protect the use of ecosystem resources, but Christie et al. (2017) argue that the human dimension is required for a more complete assessment of the situation. The human dimension discusses issues of culture, human-caused pollution, forestry activities, and other uses of the ecosystem as it relates to humans. Here are some of the key aspects of institution and ecosystem governance:

2.2.1 The Global Environment Facility (GEF)

The Global Environment Facility (GEF), established in 1991, plays a key role in maintaining healthy ecosystems by funding projects that address environmental challenges and improve livelihoods. Working with partners like the World Bank, the UN, and various countries, the GEF supports initiatives in natural resource management, combining ecosystem protection with goals such as food security and poverty reduction. For example, it promotes agroforestry, planting trees alongside crops to restore degraded land and enhance local farming (Montagnini, Grover, Hering & Bachmann, 2024). The GEF also supports ocean health by backing sustainable fishing practices, establishing marine protected areas (MPAs), and training local fishermen to minimize ecological harm. Additionally, it funds land restoration projects to combat desertification and deforestation, helping ecosystems recover and ensuring clean water, fertile soil, and climate stability.

2.2.2 International Union for Conservation of Nature (IUCN)

The IUCN plays a big part in taking care of our ecosystems. They share scientific knowledge and help with policies for using natural resources wisely. Since 1948, the IUCN has brought together governments, NGOs, and scientists to work on environmental issues at all levels. One way the IUCN makes a difference is through research (Bhandari, 2022a). They provide important information that helps people make solid decisions. A key tool they use is

the Red List of Threatened Species. This list reveals which species are in trouble and provides data for conservation efforts. The IUCN also helps shape policies and international agreements about the environment. They work with global groups like the Convention on Biological Diversity and the UN Climate Change talks. Their goal is to make sure that services from ecosystems, like clean water and carbon storage, are valued in decision-making. Supporting protected areas is another important job for the IUCN. They work with countries to create management strategies that protect nature while considering human needs. They promote best practices for national parks and reserves to keep them healthy and open to visitors. The IUCN also helps governments and communities learn to manage ecosystems better. They provide training and tools for sustainable practices, from land management to policy-making. A key idea for the IUCN is ecosystem-based management (EBM). This means looking at the whole system soil, water, plants, and animals rather than just focusing on one part. EBM helps keep ecosystems healthy and support human life. The IUCN runs important programmes, like the Green List of Protected Areas, which sets standards for managing these spaces. They also have the Red List of Ecosystems to help pinpoint ecosystems that need protection. Additionally, the IUCN's Commission on Ecosystem Management offers guidance on restoration and sustainable livelihoods for communities.

The International Union for Conservation of Nature (IUCN) plays a critical role in the global effort to protect our planet by using science to inform decision-making, advocate for nature, and help establish effective policies for sustainable resource use. Since its establishment in 1948, the IUCN has brought together governments, organisations, and scientists to devise strategies for environmental protection. A central focus of IUCN's work is biodiversity, where they actively support the creation of protected areas and work on improving ecosystem management practices (Hoffmann, 2022). IUCN is also a leading source of scientific research,

and one of their key tools is the Red List of Threatened Species, which identifies species in need of conservation efforts and serves as a guide for developing protection strategies.

In addition to their scientific contributions, IUCN plays a significant role in shaping international environmental agreements. By collaborating with global initiatives like the Convention on Biological Diversity (CBD), IUCN helps develop policies that safeguard ecosystems while balancing other societal needs. Their advocacy work ensures that vital ecosystem services, such as clean water and carbon storage, are preserved within these frameworks. Another important aspect of IUCN's work is its involvement in defining and managing protected areas. Working closely with governments, IUCN helps create plans that support both environmental preservation and human development (Bhandari, 2022). Through the World Commission on Protected Areas (WCPA), IUCN shares best practices for managing national parks and wildlife reserves, ensuring these spaces remain healthy and resilient for future generations.

Beyond policy development, IUCN also provides training and support to governments and local communities, empowering them to manage ecosystems more effectively. They assist in creating policies that highlight the value of ecosystems and support sustainable resource use. This capacity-building work helps both local and national groups enhance their ability to protect natural resources. A core principle that guides IUCN's approach to ecosystem governance is ecosystem-based management (EBM). EBM takes a holistic view, focusing on the health of entire ecosystems rather than just individual species. By recognising the interconnectedness of all ecosystem components, EBM promotes the sustainable use of resources in a way that supports both environmental and human well-being. Through this approach, IUCN helps protect ecosystems while ensuring they continue to provide essential services to people and nature alike.

2.2.3 The Green Climate Fund (GCF)

The Green Climate Fund (GCF) plays an important role in ecosystem governance by supporting developing countries in their efforts to mitigate and adapt to climate change. Established to channel financial resources for climate resilience and sustainable development, the GCF funds projects that directly contribute to the management and restoration of ecosystems (Seo, Mulwa & Kabubo-Mariara, 2022). This includes initiatives focused on forest conservation, land restoration, and water management, all of which are essential for maintaining ecosystem services that support agriculture and food security. By addressing both mitigation and adaptation challenges, the GCF helps enhance the adaptive capacity of ecosystems, making them more resilient to the impacts of climate change. According to Devi, Goswami, Bisaria and Sinha (2024), by investing in sustainable land-use practices or reforestation projects, the GCF aids in restoring degraded lands and improving ecosystem health. These efforts are critical for preserving biodiversity and ensuring that ecosystems continue to provide vital services, such as carbon sequestration, water filtration, and soil fertility, which are necessary for long-term food security. Ultimately, through its investments, the GCF supports ecosystem governance by enabling the effective management of natural resources, enhancing ecosystem resilience, and promoting sustainable development practices in the face of climate change. This aligns with the broader goals of ecosystem governance, which seeks to balance human development needs with the preservation of ecological integrity.

2.2.4 The World Bank

The World Bank plays a significant role in ecosystem governance by providing financial resources, technical expertise, and policy guidance to support the sustainable management of natural resources and the preservation of ecosystems worldwide. As one of the largest global financial institutions, the World Bank's efforts are crucial for promoting

environmental sustainability and addressing pressing challenges like climate change, biodiversity loss, and ecosystem degradation.

One of the World Bank's primary roles in ecosystem governance is its financing of environmental projects. The institution funds projects that focus on biodiversity conservation, land restoration, sustainable agriculture, and climate resilience, all of which are integral to managing and protecting ecosystems (World Bank, 2022). For example, the World Bank supports initiatives to reduce deforestation, restore degraded landscapes, and promote sustainable land use practices, all of which contribute to preserving ecosystems and the services they provide.

Additionally, the World Bank provides technical assistance and policy advice to countries, helping them develop and implement effective environmental policies and governance frameworks. This includes providing guidance on integrating ecosystem services into national development plans, promoting ecosystem-based adaptation to climate change, and supporting the creation of protected areas. Through its expertise, the World Bank helps governments and local communities manage natural resources in a way that balances development goals with ecological preservation.

The World Bank also plays a key role in capacity building by strengthening the skills and knowledge of local institutions and stakeholders involved in ecosystem management. This helps ensure that countries have the necessary tools to make informed decisions about resource management and ecosystem conservation. Moreover, the institution works to improve environmental governance by supporting the establishment of frameworks that promote transparency, accountability, and participation in decision-making processes.

In recent years, the World Bank has increasingly emphasised the need for sustainable finance to support ecosystem governance. This includes promoting investment in natural

capital and encouraging the integration of environmental considerations into financial markets and policies. For instance, the World Bank supports the development of green bonds and other financial instruments that help raise funds for environmental projects and encourage private sector involvement in sustainable practices.

2.3 Ecosystem finance and ecosystem

The goal of ecosystem finance and the ecosystem is to strike a balance between economic development and ecological sustainability, especially in the use of environmental resources (Rambaud & Chenet, 2021). This balance, when achieved, will greatly benefit the planet and its dwellers because the environment offers a great deal of resources that serve as food, sources of renewable energy, regulators of climate change, and supporters of biodiversity. Both ecosystem finance and the ecosystem form part of the concerted efforts to address issues such as deforestation, pollution, and climate change in the environment while exploiting the resources of the ecosystem sector responsibly. This also calls for support from other sectors to not engage in activities that impact the ecosystem. In the following section, ecosystem finance and ecosystem are examined in turn:

2.3.1 Ecosystem Finance

According to Frimanslund, Kwiatkowski and Oklevik (2023) and Rambaud and Chenet (2021), ecosystem finance is concerned with the demand for and supply of financial capital for investing in environmental-related economic activities. For an ecosystem economy to work, there must be adequate finance directed at sustainable activities that do not destroy the environment and its resources. Ecosystem finance also provides financial resources for investment activities for exploiting environmental resources responsibly, allowing such resources to persist for as long as possible. This includes investing in responsible farming, planting trees in areas that are tourist attraction centres, and employing offshore windmills for

generating electricity, among others. Research indicates that Europe contributes approximately half of the global ocean energy investment, and there are still numerous opportunities to seize. Accordingly, ecosystem finance is at the centre of such a vast area of opportunities for the future of clean energy needs around the world (Wang, Li & Wang, 2021; Magagna & Uihlein, 2015). The study finds that technology is the short-term barrier that needs to be addressed, but without adequate finance, this dream might not be realised.

Ecosystem finance serves to bridge the gap between what most ecosystems are being used for and what they should have been used for. According to Jie, Khan, Alharthi, Zafar and Saeed (2023), the ecosystem's energy usage affects social and ecological well-being and should be exploited only when enough financial support enables modern technology to be used in exploiting such resources. For example, ecosystem finance requires that, through the provision of sufficient financial resources, ecosystem resources could be exploited responsibly with little damage to the environment. Zhang, Hua, Jiang and Miao (2024) demonstrate that financial growth in the Yellow River Basin (YRB) has a positive influence on high-quality development, encompassing economic, social, and environmental improvements. A key finding is that the impact of financial growth extends beyond the immediate area, resulting in significant spatial spillover effects. This means that neighbouring regions also experience positive developments due to financial growth in nearby areas. However, the strength of these spillover effects is not uniform across the basin; some regions benefit more than others.

2.3.2 Terrestrial Ecosystems

Terrestrial ecosystems such as forests, grasslands, wetlands, and arid lands are crucial for achieving SDG 15 because they regulate climate, manage water resources, sustain biodiversity, and support livelihoods and agriculture (Liu et al., 2017). Forests cover about 31% of the Earth's land and host over 80% of terrestrial species, but face significant deforestation

pressures, particularly in Africa's Congo Basin which loses about 1.5 million hectares annually (Liu et al., 2017). Grasslands and savannahs are vital for wildlife and livestock but are threatened by overgrazing and land-use changes (Zafar et al., 2019), while wetlands are important for water regulation and flood control, they are disappearing rapidly, with Africa losing about 35% due to urbanisation and agricultural expansion (Ganda, 2022). Arid regions such as the Sahel and Sahara are also increasingly vulnerable to desertification, prompting restoration initiatives like the Great Green Wall project (Shang, Yang & Pu, 2024). Despite their importance, biodiversity across these ecosystems faces severe threats from habitat destruction, pollution, climate change, and illegal wildlife trade, placing nearly one million species at risk (Flammer, Giroux & Heal, 2025). Addressing these challenges requires stronger conservation strategies, ecosystem restoration, and global initiatives such as REDD+ and the Convention on Biological Diversity, supported by improved governance and increased funding for conservation (Liu et al., 2024; Garg & Arora, 2024; Fu, Liu, Wang, Tian & Li, 2024).

2.3.3 Forests

Forests are crucial for achieving SDG 15, which targets the protection and sustainable management of land-based ecosystems, including halting deforestation and restoring degraded forests. Covering about 31% of the Earth's land, forests host over 80% of terrestrial species, supporting biodiversity, nutrient cycling, pollination, and pest control essential for agriculture and food security (Liu et al., 2024). Tropical rainforests regulate climate by absorbing around 2.6 billion metric tonnes of CO₂ annually, but deforestation, particularly in Africa's Congo Basin where 1.5 million hectares are lost yearly, releases carbon and threatens livelihoods (Zafar et al., 2019; Ganda, 2022). Forests also combat desertification, prevent soil erosion, manage water resources, and support resilience projects like Africa's Great Green Wall (Shang, Yang & Pu, 2024).

However, threats such as unsustainable agriculture, urbanisation, road construction, and illegal logging contribute to a global annual loss of 10 million hectares, undermining biodiversity and ecosystem services (Fu, Liu, Wang, Tian & Li, 2024). Addressing these challenges requires sustainable forest management, financial mechanisms like REDD+, global restoration initiatives, and community-led conservation projects in countries such as Namibia and Kenya (Garg & Arora, 2024). Protecting forests is therefore essential not only for biodiversity and climate mitigation but also for supporting human well-being and ensuring a sustainable future (Liu et al., 2017).

2.3.4 Desertification

Desertification, driven by climate change and human activities, is a major challenge to achieving SDG 15, which aims to halt land degradation, restore ecosystems, and protect biodiversity (World Bank, 2023). It significantly affects drylands covering nearly one-third of the Earth's surface and supporting about one billion people by reducing agricultural productivity, worsening food insecurity, and increasing poverty, particularly in Africa where about 46% of land is degraded and the Sahel region is heavily affected (World Bank, 2023). Desertification also leads to biodiversity loss, soil degradation, and reduced ecosystem services, while contributing to climate change through carbon emissions estimated at 0.8-3.3 billion tonnes of CO₂ annually. Addressing this issue requires sustainable land management and restoration initiatives such as the African Union's Great Green Wall project, alongside strong governance, policies promoting sustainable land use, and global frameworks like the UNCCD. However, weak institutional capacity, limited funding, technological constraints, and low awareness of sustainable practices continue to hinder progress, highlighting the need for coordinated efforts among governments, international organisations, and local communities (Ntow-Gyamfi, Bokpin, Aboagye, Ackah, 2020)

2.3.5 Land degradation

Land degradation, the loss of land productivity and ecosystem health due to human activities and natural processes, is a major challenge targeted by SDG 15, which emphasizes protecting, restoring, and sustainably using terrestrial ecosystems (Garg & Arora, 2024). Globally, about 25% of land is degraded, affecting over 1.3 billion people and causing economic losses up to \$10.6 trillion, with Africa particularly impacted as over 65% of productive land is degraded, exacerbating food insecurity and climate vulnerability (World Bank, 2023).

Land degradation reduces soil fertility, water retention, and agricultural productivity, as seen in sub-Saharan Africa where 280 million tonnes of cereal crops are lost annually, and also drives biodiversity loss by destroying habitats essential for ecosystem services (World Bank, 2023; Garg & Arora, 2024). It contributes to climate change by releasing stored carbon and diminishing carbon sequestration, accounting for about 10% of global emissions (World Bank, 2023). Combatting land degradation requires sustainable land management, restoration projects like the Bonn Challenge and Africa's Great Green Wall, and agricultural practices such as agroforestry and conservation agriculture that enhance soil health and productivity (Devi, Goswami, Bisaria, & Sinha, 2024; World Bank, 2023). Policy frameworks like Land Degradation Neutrality under the UNCCD, supported by funding mechanisms such as the GEF and GCF, are essential, but weak institutions, limited funding, and low community engagement remain challenges, necessitating multi-stakeholder approaches to achieve SDG 15 goals (Ntow-Gyamfi, Bokpin, Aboagye, Ackah, 2020).

2.3.6 Sustainable Land Management (SLM)

Sustainable Land Management (SLM) is vital for SDG 15, protecting and restoring land, preventing desertification, and conserving biodiversity. By using practices like conservation farming, agroforestry, and water harvesting, SLM improves soil health, restores ecosystems, and supports critical ecosystem services (United Nations Convention to Combat Desertification). With 25% of global land degraded, initiatives such as Africa's Great Green Wall show how SLM can restore land, enhance agriculture, strengthen climate resilience, and increase carbon sequestration.

Despite challenges such as weak institutions, limited funding, and lack of technical capacity, evidence shows SLM's effectiveness: conservation farming in sub-Saharan Africa has boosted crop yields by 50%, while reforestation projects in Asia and Latin America have restored biodiversity and ecosystem services, demonstrating its vital role in meeting SDG 15 (World Bank, 2023; Ntow-Gyamfi, Bokpin, Aboagye, Ackah, 2020; Devi, Goswami, Bisaria, & Sinha, 2024).

2.3.7 Combatting Illegal Wildlife Trade

Combating illegal wildlife trade is critical to achieving SDG 15, as it threatens biodiversity, disrupts ecosystems, undermines livelihoods, and poses public health risks, requiring coordinated global action through strong legal frameworks like CITES, community-based conservation, education campaigns, technological innovations, and enhanced international cooperation to protect endangered species and maintain ecosystem functions.

2.3.8 Climate Change Mitigation

Achieving SDG 15 is vital for tackling climate change, as protecting and restoring forests, wetlands, mangroves, and other ecosystems, alongside sustainable land management and restoration practices like agroforestry and the Great Green Wall, enhances carbon storage, prevents emissions, strengthens biodiversity, and supports nature-based climate solutions, including carbon markets and UN REDD+ initiatives.

2.3.9 Understanding African ecosystems

Africa's ecosystems are vital for the continent's economic, social, and environmental development, providing biodiversity, food, water, and other resources, yet they face severe pressures from deforestation, land degradation, overgrazing, and climate change, threatening livelihoods and human capital (Liu et al., 2017; Zafar et al., 2019). Deforestation in sub-Saharan Africa contributes about 30% of the region's greenhouse gas emissions, with around 3.9 million hectares of forest lost annually due to agriculture and illegal logging, undermining both ecosystems and local communities (Liu et al., 2017; Zafar et al., 2019). Foreign direct investment (FDI) plays a dual role, potentially supporting sustainable practices through technological and infrastructural development or exacerbating degradation when poorly regulated, as seen in the Niger Delta (Liu et al., 2024). Financial mechanisms, including biodiversity finance, are increasingly important for funding ecosystem restoration and conservation, aligning with UN Decade on Ecosystem Restoration targets to rehabilitate 100 million hectares in Africa (Ganda, 2022; Flammer, Giroux & Heal, 2025). Technological innovations and integrated green practices, such as agroforestry, conservation tillage, and renewable energy, can restore soil health, enhance biodiversity, improve food security, and build resilience to climate change (Fu et al., 2024). Additionally, sustainable ecotourism supported by FDI and political openness provides economic incentives for conservation,

though it requires careful management to avoid environmental harm, highlighting the need for integrated policies that balance economic development with ecosystem preservation (Shang, Yang & Pu, 2024).

2.3.10 Benefits of the ecosystem

Ecosystems provide essential services such as climate regulation, water purification, soil fertility, food security, biodiversity maintenance, and economic opportunities that underpin human well-being and environmental resilience, yet in Africa, deforestation, land degradation, overgrazing, and unsustainable agriculture threaten these benefits, making sustainable land management, restoration practices, and biodiversity finance crucial for protecting ecosystems, enhancing agricultural productivity, supporting livelihoods, and mitigating climate change (Liu et al., 2017; Zafar et al., 2019; Liu et al., 2024; Mathew & Alkhamis, 2024; Shang, Yang & Pu, 2024; Ganda, 2022; Flammer, Giroux & Heal, 2025).

2.3.11 Why has Africa not benefited much from the ecosystem?

Africa possesses vast and diverse ecosystems that could significantly support sustainable development, yet poor governance, inadequate financial investment, unsustainable land management, policy gaps, limited technical capacity, and political instability have hindered the continent from fully leveraging ecosystem services for economic growth, biodiversity conservation, and climate resilience, with land degradation alone costing Africa an estimated \$68 billion annually (Liu et al., 2017; Zafar et al., 2019; Ganda, 2022; Flammer, Giroux & Heal, 2025; Liu et al., 2024; Shang, Yang & Pu, 2024; World Bank, 2023).

2.3.12 Life on land as it relates to the ecosystem

Life on Land, as emphasized in SDG 15, focuses on protecting and restoring ecosystems forests, grasslands, wetlands, and deserts which are essential for biodiversity, food production,

clean air and water, soil fertility, and climate regulation, with restoration efforts like tree planting and ecosystem management helping combat land degradation, desertification, and climate change while supporting human well-being (Zafar et al., 2019; Ganda, 2022; Liu et al., 2024; Flammer, Giroux & Heal, 2025; Fu et al., 2024).

Flammer, Giroux and Heal (2025) highlight the need for strong support for these restoration efforts. Lastly, ecosystems help deal with climate change. For instance, forests absorb carbon dioxide, helping keep our planet at a stable temperature. Wetlands and coastal areas like mangroves protect against floods and storms while storing carbon in the ground. Strong ecosystems can protect communities from climate impacts and provide necessary resources like food and water. Fu et al. (2024) point out that restoring ecosystems is not just good for nature; it is also crucial for dealing with climate challenges.

2.4.12.1 Sustainable Development Goal 15 (SDG 15): Life on Land and Its Ecosystem Focus

Sustainable Development Goal 15 (SDG 15) aims to protect, restore, and sustainably manage terrestrial ecosystems, forests, and biodiversity, combat desertification, and reverse land degradation, with strategies such as reforestation, conservation, sustainable agriculture, and community-based forest management, while linking ecosystem health to climate regulation, food security, and water provision, and recognising that strong governance and institutional quality are essential for effectively leveraging foreign capital and implementing ecosystem-based solutions (Arana, Franco, Joshi & Sedhai, 2020; Anne, 2022; Chen, Jiang, Liu, Lin & Yang, 2023; Su, Song & Umar, 2021; Diz, Morgera & Wilson, 2019; Pinheiro et al., 2019; Morgera & Ntona, 2018; Ntona & Morgera, 2018; Halpern et al., 2008; Aust, Morais & Pinto, 2020; Belmiro, Silveira Neto, Barros & Ospina, 2023; Stokes, 1962; Meyer & Rowan, 1977; Platje, 2008; Orhan, 2016; Jahanger, Usman & Balsalobre-Lorente, 2022; Chien, Zhang,

Li & Huang, 2023; Sebele-mpofu, 2020; Ndikumana, 2014; Miola & Schiltz, 2019; Wu & Tsai, 2014; Mol, Spaargaren & Sonnenfeld, 2013; Mol, 2002).

2.4.12.2 Sustainable Development Goal 2 (SDG 2): Zero Hunger and Its Connection to Food

Security

Sustainable Development Goal 2 (SDG 2) aims to end hunger and ensure access to safe, nutritious, and sufficient food for all by enhancing food security through sustainable agriculture, improving availability, accessibility, utilisation, and stability, promoting nutrition education, reducing food waste, and building resilience against economic, climatic, and political shocks, while recognising that foreign capital and partnerships can strengthen these initiatives by leveraging resources, fostering innovation, and aligning investments with local and global food security objectives (Asemota & Igweagbara, 2023; Saidumohamed et al., 2021; Campagnolo & Davide, 2019; Mao, Xue, Tian & Michael, 2019; Scheyvens, Banks & Hughes, 2016).

2.3.13 Importance of SDGs for Economic Growth and SDG 15

Sustainable Development Goal 15 (SDG 15) is all about protecting our land and ecosystems (Arana et al., 2020). It calls for responsible forest management, fighting desertification, halting land damage, and keeping our biodiversity safe. Even though this goal is mainly about the environment, it closely connects to economic growth. Healthy ecosystems support key areas like agriculture, forestry, and tourism (Arana et al., 2020). At the same time, economic growth supplies the resources needed to care for these ecosystems. Let's look at some key SDGs that relate to economic development and how they tie into SDG 15.

2.4.13.1 SDG 1: No Poverty

Fighting poverty is a big part of economic development. When economies grow, they create jobs and improve access to basic services. SDG 15 helps by pushing for the smart management of natural resources, which many people, especially in rural areas, rely on for their income. The UN states that 75% of the world's poor depend on agriculture and natural resources. By tackling deforestation and land damage, SDG 15 helps keep these resources productive, helping vulnerable people in the long run (Arana et al., 2020; Liu, Bai & Chen, 2019). But when an economy misuses natural resources, it can lead to more poverty. For instance, the FAO reports that damage to 25% of the world's land negatively impacts farming and income for rural families. Projects like planting trees and restoring soil help both SDG 1 and SDG 15 (Arana et al., 2020; Liu et al., 2019). They fix damaged land, improve farming, and ensure resources for future generations.

2.4.13.2 SDG 2: Zero Hunger

SDG 2 aims to end hunger and ensure everyone has enough food. SDG 15 is crucial for keeping our ecosystems healthy, which is vital for farming (World Bank, 2023). Agriculture is key for billions of people, especially in developing nations. How a country manages land and protects biodiversity under SDG 15 directly impacts food security and economic stability. Currently, 52% of farming land is suffering from damage, which lowers crop yields and farmer income. By promoting sustainable agricultural practices and fighting desertification, SDG 15 helps secure food and boost farming. Techniques like agroforestry and crop diversity support both SDG 2 and SDG 15, making sure agriculture can keep driving economic growth.

2.4.13.3 SDG 8: Decent Work and Economic Growth

Sustainable Development Goal (SDG) 8 promotes inclusive and sustainable economic growth, productive employment, and decent work for all. SDG 15 complements this goal by supporting industries such as forestry, agriculture, and tourism, which rely heavily on healthy and well-managed ecosystems. For example, forests contribute approximately \$1.3 trillion annually to the global economy and provide employment for over 33 million people worldwide, most of whom live in rural communities (World Bank, 2023). Similarly, eco-tourism represents a powerful intersection between SDG 15 and SDG 8. When tourism is developed in ways that protect nature and wildlife, it generates substantial economic value while preserving environmental resources. In sub-Saharan Africa, for instance, wildlife tourism contributes about \$29 billion annually, accounting for roughly 8.5% of the region's GDP (World Bank, 2023). By promoting sustainable ecosystem management under SDG 15, countries can safeguard these economic opportunities, foster long-term growth, and create decent, environmentally responsible jobs.

2.4.13.4 SDG 12: Responsible Consumption and Production

Sustainable Development Goal (SDG) 12 emphasizes responsible consumption and production, encouraging economic growth that does not deplete natural resources. SDG 15 reinforces this objective by addressing biodiversity loss and promoting environmentally sound land management (Arana et al., 2020; Scheyvens et al., 2016). Thus, these goals advocate for reducing waste, reusing resources, and ensuring that growth remains sustainable over the long term. Unsustainable agricultural practices, however, continue to degrade ecosystems and result in significant economic losses. According to the United Nations Environment Programme (UNEP), global food waste alone costs approximately \$940 billion each year (World Bank, 2023). By aligning the policy frameworks of SDG 12 with the sustainable land-use strategies

outlined in SDG 15, countries can achieve economic development that respects ecological boundaries and preserves the planet's natural wealth for future generations (Arana et al., 2020; Scheyvens et al., 2016).

2.4.13.5 SDG 13: Climate Action

SDG 13 pushes for urgent action to fight climate change, which ties into SDG 15. Climate change speeds up land damage, forest loss, and biodiversity decline, which harm economies that count on natural ecosystems. On the bright side, managing ecosystems as per SDG 15 helps fight climate change through carbon capture and improving resilience. Economic prospects related to climate action also connect with SDG 15 (Arana et al., 2020; Scheyvens et al., 2016). Projects in renewable energy and climate-sturdy infrastructure open paths for sustainable growth. For example, restoring forests can generate carbon credits worth \$5 to \$50 per tonne of CO₂ (World Bank, 2023), promoting conservation while lowering emissions.

2.4.13.6 SDG 17: Partnerships for the Goals

Working together is key for reaching both economic goals and the aims of SDG 15. Partnerships among governments, businesses, and communities pull together resources and skills for restoring and protecting ecosystems. Initiatives like the Bonn Challenge, which wants to restore 350 million hectares of damaged land by 2030, show the power of teamwork in meeting SDG 15 while benefiting the economy. The Green Climate Fund (GCF) has raised \$10.3 billion to support sustainable practices in developing countries that fit with SDG 15 (World Bank, 2023). These partnerships not only offer financial assistance, but also facilitate the exchange of insights and innovative ideas, ensuring that economic growth aligns with environmental protection.

2.3.14 Measurement of sustainable development progress

The United Nations' seventeen Sustainable Development Goals (SDGs) provide a comprehensive framework to monitor progress in sustainable development, using indicators across environmental, social, and economic dimensions such as GDP growth, greenhouse gas emissions, and poverty rates to generate indices like the Human Development Index (HDI) and Environmental Performance Index (EPI) for global, national, and regional assessment (Abeysekera, 2023; Annamalaisamy & Vepur Jayaraman, 2023; Githaiga & Kilong'i, 2023); effective measurement relies on accurate, up-to-date data, stakeholder engagement, peer reviews, and capacity-building initiatives, while contemporary research highlights the role of foreign direct investment (FDI) in promoting economic growth and ecosystem development, alongside the importance of sustainable policies, environmental regulations, fiscal incentives, and government trust in ensuring ecological sustainability and responsible behaviour (Chen et al., 2023; Li, Wu & Patwary, 2022; Pinheiro et al., 2019; Morgera & Ntona, 2018; Halpern et al., 2008; Van De Vijver & Decuypere, 2022).

2.4 Food security in Africa and challenges

Food security in Africa has long been a pressing concern due to a combination of factors, including poverty, political instability, climate change, and limited infrastructure. The challenges of food insecurity are exacerbated by rapid population growth, poor governance, and the lack of investment in agricultural technologies (Sogah et al., 2024). However, in recent years, foreign direct investment (FDI) and foreign capital have emerged as potential solutions to address food insecurity, along with efforts to improve agricultural production and strengthen political stability. This thesis discusses the state of food security in Africa, its main challenges, and the role of foreign investments and policy frameworks in improving food security across the continent.

2.4.1 The Concept of Food Security

The United Nations defines food security as a situation where "all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life (United Nations, 2022; Asemota & Igweagbara, 2023)". This concept has evolved from a focus on food availability to one that includes access, utilisation, and stability across different contexts. Food insecurity in Africa is often seen not just as a lack of food but also as a lack of access to food and the inability of populations to afford nutritious diets (Asemota & Igweagbara, 2023; Sogah et al., 2024).

2.5.2 Current State of Food Security in Africa

Food security remains a serious challenge in Africa, with many people still experiencing hunger and malnutrition despite years of global attention and support (Asemota & Igweagbara, 2023). In sub-Saharan Africa, over 250 million people about 20% of the population were undernourished in 2020, highlighting the difficulty of accessing sufficient nutritious food (FAO, 2020). Poverty, poor governance, climate change, and inadequate infrastructure further worsen the situation (Asemota & Igweagbara, 2023). The 2022 Global Hunger Index ranks several African countries, including Chad, the Central African Republic, and Madagascar, among the worst affected (Asemota & Igweagbara, 2023). Over 40% of people in sub-Saharan Africa live on less than \$1.90 a day, limiting their ability to buy food or improve farming practices, while more than 70% rely on rain-fed agriculture, making them highly vulnerable to climate shocks (World Bank, 2023). Extreme events, such as the 2019 drought in the Horn of Africa, caused famine and livestock losses, affecting over 13 million people.

2.5.3 Determinants of food security

Food security, defined as access to sufficient, safe, and nutritious food for all, remains a major challenge in developing regions due to complex economic, social, political, and environmental factors (Dhahri & Omri, 2020). This review highlights key determinants of food security, including foreign capital, governance, remittances, agricultural productivity, economic inequality, and environmental sustainability. Foreign capital, especially FDI, plays a vital role in enhancing agricultural productivity, infrastructure, and rural livelihoods, contributing to SDGs 1 and 2 (Dhahri & Omri, 2020). However, its effectiveness depends on political stability and good governance, as instability or corruption can disrupt investments and limit impacts on food security (Aloui & Maktouf, 2024; Subramaniam, Loganathan & Masron, 2023; Wardhani & Haryanto, 2020). While FDI promotes long-term agricultural development, foreign aid provides short-term relief, and balancing both is essential for sustainable food security (Dhahri & Omri, 2020).

Remittances also support food security by providing stable household income, improving dietary diversity, and buffering against economic shocks (Ahmad et al., 2024; Moniruzzaman, 2022; Sulemana, Bugri Anarfo & Doabil, 2023). However, they can increase inequality and shift demand towards imported foods, potentially undermining local agriculture (Baako-Amponsah, Annim & Kwasi Obeng, 2024). Policies promoting productive use of remittances in sustainable agriculture are crucial.

Governance and political stability are central to food security. Strong institutions ensure transparent resource allocation and effective translation of foreign investments into tangible benefits, whereas conflict and instability, particularly in sub-Saharan Africa, severely disrupt food production and distribution (Aloui, Hamdaoui & Maktouf, 2024; Subramaniam et al., 2023). The FAO notes that 60% of food-insecure people globally live in conflict-affected areas.

Agricultural productivity directly affects food availability and rural incomes. Foreign investments boost yields and reduce post-harvest losses, but sustainable management is necessary to prevent environmental degradation (Jiang & Chen, 2020; Wardhani & Haryanto, 2020). Similarly, economic inequality and rising food prices hinder access to nutritious food for low-income households, requiring targeted interventions like subsidies and social protection (Sogah, Mawutor & Gborse, 2024).

Environmental sustainability is also critical, as climate change, land degradation, and biodiversity loss threaten agricultural output. Sustainable practices such as agroforestry, soil conservation, reforestation, and ecosystem-based approaches help maintain long-term food production (Aloui & Maktouf, 2024; Peng et al., 2024). Overall, integrated strategies addressing these determinants are essential to achieving resilient and equitable food security.

2.5 The Role of Foreign Direct Investment in Agriculture

Foreign direct investment (FDI) plays a crucial role in boosting agriculture in developing countries, especially in sub-Saharan Africa, helping to address food security challenges linked to population growth, climate change, and political instability (Montazeri et al., 2023; Qamruzzaman, Tayachi, Mehta & Ali, 2021; Hartati & Kussujaniatuni, 2020; Morgera & Ntona, 2018; Ellis & Ellis, 2016; Russell, 1986). FDI enhances agricultural productivity through technology transfer, infrastructure development, managerial expertise, and employment creation (Dhahri & Omri, 2020). For example, in Ethiopia, investments in the flower and horticultural sectors have increased exports, created jobs, and improved livelihoods, particularly where local financing is limited.

FDI also contributes to infrastructure development, improving roads, storage, and irrigation, which are critical for efficient food systems (Aloui & Maktouf, 2024). Additionally, foreign investment fosters new markets and agro-processing industries, integrating smallholder

farmers into supply chains, boosting income, and supporting food security (Hasudungan, Raeskyesa, & Fromm, 2024).

However, FDI can have negative effects if it leads to land grabs, displacing local farmers or prioritising export-oriented cash crops over staples, as seen in Mozambique and Zambia. Political stability and governance strongly influence FDI's success; stable, well-governed countries attract more investment, supporting long-term agricultural growth and food security, while conflict-affected nations like South Sudan and Somalia struggle to attract capital (Aloui, Hamdaoui & Maktouf, 2024).

Aligning FDI with Sustainable Development Goals (SDGs), particularly SDG 1 (no poverty) and SDG 2 (zero hunger), is essential. Investments should promote sustainable agriculture, climate-resilient practices, agroecology, and equitable benefits for local communities to ensure that foreign capital contributes to lasting improvements in food security and poverty reduction (Dhahri & Omri, 2020).

2.5.1 Political Stability and Governance

While FDI has the potential to boost food security, its effectiveness is closely tied to political stability and governance (Aloui & Maktouf, 2024). In politically unstable regions, foreign investors are often reluctant to commit capital to agriculture, as the risks associated with land tenure issues, corruption, and conflict may outweigh the potential returns. Aloui and Maktouf (2024) argue that political stability plays a crucial role in attracting FDI. Countries that maintain stable governments, enforce property rights, and ensure the rule of law are more likely to attract foreign investors into the agricultural sector. Conversely, countries with frequent political unrest, such as South Sudan and Somalia, struggle to attract the necessary investments to improve food security.

Strong governance is also critical in ensuring that the benefits of FDI are distributed equitably across society. Poor governance can result in the concentration of investments in a few areas, leading to increased inequality and, ultimately, exacerbating food insecurity. The government's role in creating favourable policies for sustainable agricultural development is vital for attracting investment and ensuring that it leads to long-term improvements in food security.

2.5.2 The Impacts of Climate Change on Food Security

Climate change poses a major threat to food security across Africa, where the continent remains particularly vulnerable to the impacts of climate variability ranging from shifting rainfall patterns and prolonged droughts to increasingly severe storms. In recent years, Sub-Saharan Africa has experienced more frequent and intense weather events that disrupt agricultural productivity and endanger the livelihoods of millions who depend on farming (World Bank, 2023).

In regions such as the Sahel, recurring droughts have triggered widespread food shortages, leaving millions at risk of hunger and malnutrition (World Bank, 2023). As temperatures rise and water resources continue to decline, many traditional farming practices have become unsustainable. Addressing these challenges requires greater access to modern agricultural technologies, improved irrigation systems, and accurate weather forecasting tools. At this stage, foreign investment and knowledge transfer become indispensable in enhancing agricultural adaptation and resilience.

Investments in climate-smart agriculture such as the development of drought-tolerant crop varieties and the implementation of efficient water management systems can significantly bolster Africa's ability to cope with the changing climate. These innovations not only increase

agricultural productivity but also strengthen the resilience of food systems, thereby ensuring greater stability and long-term food security for millions across the continent (World Bank, 2023).

2.5.3 The Role of Remittances in Supporting Food Security

In addition to foreign direct investment, remittances from African migrants working abroad have emerged as a significant source of income for many households in Sub-Saharan Africa. According to a study by Sulemana, Bugri Anarfo and Doabil (2023), remittances have a positive effect on food security, as they provide families with additional income to purchase food and invest in agricultural activities.

Many households in rural Africa depend on remittances to cope with food insecurity. These funds allow families to buy food during lean seasons, invest in farming tools, and improve nutrition. Moreover, remittances can help reduce poverty and support local economies by circulating money in areas that are otherwise underserved by formal financial institutions.

However, the role of remittances in addressing food insecurity is not without its challenges. High transaction fees and the informal nature of many remittance channels can reduce the effectiveness of remittances in improving food security. Strengthening the remittance infrastructure and promoting more cost-effective channels could increase the benefits of remittances to food security (Sulemana et al., 2023).

2.6 Theoretical Literature Review

The section reviewed theories underpinning the study.

2.6.1 Ecological Modernization Theory

The overarching theoretical framework underpinning this study is the Ecological Modernization Theory (EMT). This theory examines the interaction between market systems,

institutional arrangements, technological innovation, and ecological sustainability. It provides a useful framework for understanding how financial processes and strategic investments can support the environmentally sustainable modernization of the ecosystem. Contrary to the traditional view that economic development inevitably leads to environmental degradation, EMT argues that societies can achieve ecological sustainability through the adoption of advanced technologies, strengthened regulatory frameworks, and improved institutional structures within the existing economic system (Peres, Ameer & Xu, 2018). The theory therefore suggests that modernization can facilitate industrialization and financial development in ways that are environmentally responsible. Within the context of the ecosystem, the Ecological Modernization Theory can be applied in the following ways:

First, the theory argues that societies can industrialize and improve their socio-economic conditions by transforming their production processes. For instance, Tony Toke (2022) noted that the Ecological Modernization Theory promotes economic progress by replacing environmentally harmful production methods with more ecologically sustainable alternatives. To ensure that production systems remain sustainable, the theory advocates the adoption of modern, efficient, and environmentally friendly technologies and practices.

In this context, the concept of ecosystem sustainability emphasizes the responsible and sustainable use of ecosystem resources to support socio-economic development while minimizing environmental damage. Similarly, Ugur Pata and Ayman Samour (2022) argue that achieving sustainable industrialization requires organizations to shift away from energy-intensive technologies that generate higher levels of pollution and instead adopt renewable energy sources that enhance production with minimal environmental impact. Accordingly, implementing the ecosystem concept requires countries to transition from non-renewable energy sources to Renewable alternatives such as solar, wind, hydropower, tidal, biomass, and geothermal energy play a critical role in sustainable ecosystem development because they

reduce environmental degradation, support low-carbon economic growth, and promote long-term ecological resilience.

The Ecological Modernization Theory (EMT) recognizes the importance of institutional reforms and effective regulatory frameworks in promoting ecological modernization (Peres, Ameer & Xu, 2018).. For example, in forest management, activities such as deforestation can be controlled through institutions that enforce stricter environmental regulations. In this regard, changes in the methods used to exploit natural resources are often closely linked to the nature and effectiveness of the laws governing their use.

To ensure that the ecosystem-based approach gains momentum in Africa and contributes to addressing the region's numerous developmental challenges, strong institutional support is essential. In this context, Pal et al. (2023) examined the impact of transportation on climate change using EMT and found that the success of strategies aimed at modernizing natural resource exploitation largely depends on the strength of institutional support, particularly governance systems. Consequently, EMT emphasizes that ecological modernization requires not only technological advancement but also institutional transformation that promotes environmentally sustainable resource utilization.

Furthermore, the Ecological Modernization Theory (EMT) emphasizes the role of market mechanisms and economic incentives in encouraging businesses to adopt sound environmental practices. The theory argues that modernization requires reforms in institutions and regulatory frameworks that promote environmentally responsible behavior. For example, policy instruments such as carbon taxes, tradable emission permits, and other mechanisms that internalize the environmental costs of pollution can motivate firms to adopt cleaner and more sustainable production methods (Pan, Cross, Zou & Zhang, 2024).

In addition, EMT highlights the importance of broader social transformation that increases public awareness of environmental challenges and encourages collective action to protect natural resources. The theory therefore recognizes that ecological modernization is not purely technological or economic but also cultural. According to Zhou et al. (2020), societal practices such as farming methods, land management, and the control of activities like excessive bush burning must evolve to support environmental sustainability (Kamyab, SaberiKamarposhti, Hashim & Yusuf, 2024). By acknowledging that certain traditional practices may harm ecosystems, EMT advocates the adoption of more sustainable approaches that align human activities with the long-term health of the environment.

Additionally, the Ecological Modernization Theory (EMT) acknowledges the global dimension of environmental challenges and therefore advocates for international cooperation in addressing them. In an increasingly interconnected global trade system, the transportation of resources across continents and national borders often generates pollution that affects multiple regions, meaning that the environmental consequences are shared by all parties involved.

Given that many natural resources and environmental impacts extend beyond national boundaries, EMT recognizes the occurrence of transboundary pollution and emphasizes the need for coordinated action among countries and regions to effectively address such challenges. As noted by Awewomom, Dzeble, Takyi, Ashie, Ettey, Afua and Akoto (2024), tackling environmental problems linked to transboundary resource use requires collaborative policies and joint efforts among nations to reduce pollution and promote sustainable environmental management.

The concept of ecosystem sustainability, which promotes the responsible and sustainable use of marine resources, emphasizes that international cooperation and effective governance are essential for achieving the objectives of the blue economy (Mol, Spaargaren &

Sonnenfeld, 2013). In this regard, the ecosystem approach aligns with the principles of collaborative international action and shared governance in managing ecosystem resources.

2.6.2 New Institutional Theory

Again, the study employed the New Institutional Theory (NIT), which explores how rules, norms, and organizations shape the relationship between foreign investment and ecosystem health. Traditional economic theories often assume that individuals always make rational decisions; however, this perspective overlooks the significant influence of institutions and social structures on human behavior and decision-making. NIT was developed to emphasize the critical role that institutions play in shaping social and environmental outcomes. Accordingly, this section discusses the core principles of NIT and how they inform the sustainable use and management of natural resources.

To begin with, NIT highlights that institutions such as formal rules and informal norms profoundly influence how an economy operates. Although individuals and firms typically aim to maximize profits and minimize costs, these objectives can sometimes conflict with environmental sustainability. Institutions that promote cost-effective and environmentally friendly strategies can bridge this gap by guiding economic behavior toward responsible resource management. For instance, Silvestre and Țircă (2019) demonstrate that countries can simultaneously achieve cost savings and protect ecosystems by prioritizing long-term sustainability goals over short-term gains. Thus, NIT provides a framework for balancing economic efficiency with ecological preservation.

Building on this, NIT further explains that individuals' choices are not always purely rational, as they are shaped by the institutional environment within which they operate. Government policies such as price regulations or environmental standards challenge the assumption of complete rationality by emphasizing fairness, equity, and access. Broman and

Robèrt (2017) argue that achieving sustainability requires balancing resource efficiency with waste reduction, thereby underscoring the importance of long-term planning for responsible ecosystem management. In this context, the present study adopts NIT to show how institutional arrangements influence human responses to issues of resource use and sustainability.

Beyond individual and organizational behavior, NIT also recognizes that institutions evolve over time in response to technological innovation, changing social values, and shifts in power structures. For institutions to remain effective, they must adapt to emerging societal needs. Thompson, Herrmann, and Hekkert (2015) illustrate how innovative entrepreneurs can simultaneously drive economic growth and promote environmental goals by responding to these changing needs. However, while technological advancement often accelerates development, it may also intensify resource exploitation. Therefore, maintaining a balance between technological progress and ecological sustainability is vital for preserving healthy ecosystems.

Extending this discussion, NIT introduces the Hierarchy of Institutions Hypothesis, which suggests that not all institutions contribute equally to economic and environmental progress. Institutions are broadly categorized as inclusive or extractive. Inclusive institutions those that foster participation, protect property rights, and encourage innovation tend to promote sustainable growth more effectively (Xi, 2017). They empower local entrepreneurs to use ecosystem resources responsibly and stimulate regional development. In contrast, extractive institutions concentrate power in the hands of a few, stifling innovation and slowing growth (Mizuno, Naito & Okazawa, 2017).

For Africa to harness the full potential of its ecosystem resources, strengthening inclusive institutions while reducing the dominance of extractive ones is essential. The Hierarchy of Institutions Hypothesis further emphasizes the interdependence between political and economic institutions. Political institutions establish the governing framework, while

economic institutions function within it, often blending inclusive and extractive characteristics (Vanino & Lee, 2018). This interaction illustrates how institutions are interconnected and mutually reinforcing. Urbano, Aparicio, and Audretsch (2019) emphasize that collaboration among entrepreneurs, technological innovation, and supportive political environments is key to fostering sustainable ecosystem development across the continent.

Ultimately, the Hierarchy of Institutions Hypothesis offers critical insights into economic development as economies transition toward ecosystem-based strategies. Regions characterized by inclusive institutions are more likely to nurture creativity, entrepreneurship, and long-term growth. Conversely, extractive institutions tend to suppress innovation and impede progress. For Africa to sustain its ecosystems, there is an urgent need to replace extractive systems with inclusive ones. This institutional shift will ensure that innovation and entrepreneurship become the driving forces behind the sustainable management and conservation of natural resources.

2.6.3 Hierarchy of Institutions Hypothesis

The Hierarchy of Institutions Hypothesis asserts that not all institutions contribute equally to a country's economic development. According to this theory, institutions are divided into two categories: “inclusive” and “extractive,” with inclusive institutions being seen as the more significant drivers of economic growth. These institutions are arranged hierarchically, with varying levels of influence on the overall success of the economy. The following section delves into the key concepts of the hierarchy of institutions hypothesis.

At the top of this hierarchy are inclusive institutions, which are characterized by features that promote broad participation, protect property rights, and provide a conducive environment for economic growth and sustainability (Abdelaziz, 2022; Xi, 2017). Inclusive institutions create conditions where people can invest, innovate, and engage in economic

activities without facing excessive barriers. These institutions play a vital role in economic development by fostering creativity and entrepreneurship, thereby enabling individuals to make discoveries and innovations that drive economic progress. They support a dynamic environment where people are empowered to contribute to the economy, ultimately leading to sustainable growth. In the context of the ecosystem economy, inclusive institutions are particularly important, as they provide local entrepreneurs with the opportunity to sustainably exploit ocean resources, thus contributing to regional development.

In contrast, extractive institutions are characterized by the concentration of power in the hands of a few individuals or groups, which limits access to opportunities for the broader population. García (2024) describes extractive institutions as those that stifle innovation, discourage investment, and hinder economic growth. In order to harness the potential of Africa's vast ocean resources, it is crucial to distinguish between inclusive and extractive institutions. By promoting inclusive institutions and minimising the influence of extractive ones, the ecosystem agenda can be advanced more effectively. The hierarchy of institutions theory offers valuable insights into how such a balance can be achieved, ensuring that ecosystem resources are exploited in ways that benefit the broader society.

Moreover, the hierarchy of institutions hypothesis posits that institutions are not static but evolve over time. Political and economic institutions interact continuously, shaping both the political and economic landscapes. Political institutions distribute power, while economic institutions are either rewarded or penalised based on their actions. This dynamic interaction highlights the importance of collaboration between political and economic institutions to successfully implement a ecosystem strategy. In many cases, institutions are not purely inclusive or purely extractive; rather, they are a blend of both, with power distributed across a larger segment of society (Ogilvie, 2021). This nuanced view is crucial for understanding how ecosystem initiatives can succeed, as both political and economic institutions must work

together to create an environment conducive to the sustainable exploitation of ecosystem resources.

The hypothesis also emphasises the existence of a feedback loop between political and economic institutions. Economic institutions help to distribute wealth and power by adhering to the rules set by political institutions, and vice versa. This cyclical relationship ensures that both types of institutions contribute to the overall success of the economic system. For the ecosystem to thrive in Africa, it is essential to harness the synergy between political and economic institutions. Such collaboration will not only foster innovation but also ensure that the necessary political frameworks are in place to support the sustainable management of ecosystem resources. Qamruzzaman and Karim (2024) highlight that the sustainable exploitation of natural resources requires the combined efforts of entrepreneurs deploying innovative technologies within a politically supportive environment. This partnership between political and economic institutions could pave the way for a smoother transition to a ecosystem in Africa.

Finally, the hierarchy of institutions hypothesis has significant implications for economic development, particularly in the context of transitioning to a ecosystem. The theory suggests that regions or countries with inclusive institutions encourage innovation and entrepreneurship, leading to long-term economic prosperity. Conversely, regions with extractive institutions are likely to stifle innovation and limit the potential of entrepreneurs, which negatively affects long-term economic growth. For Africa's ecosystem to succeed, it is essential to replace extractive institutions with inclusive ones that promote entrepreneurship and innovation. This shift will be critical in driving the successful implementation of the ecosystem, ensuring that ecosystem resources are managed sustainably for the benefit of future generations.

2.6.4 The New Growth Theory

The New Growth Theory, also known as Endogenous Growth Theory, is an economic framework that seeks to explain long-term economic growth by focusing on the internal factors that contribute to sustained increases in productivity and output. Unlike neo-classical growth models, which emphasise exogenous factors such as technological progress and capital accumulation, the New Growth Theory focuses on internal, or indigenous, drivers of growth. This theory shifts the focus inward, seeking solutions to economic growth by leveraging resources and capabilities that are controlled within the economy, rather than relying on external factors. The theory is underpinned by several key principles, which are explored below.

Human capital is a central element of New Growth Theory and is considered fundamental to long-term economic development. This theory recognises the accumulation of knowledge, education, experience, and research as integral components of sustainable growth. Wang and Xu (2021) argue that human capital is the driving force behind smart, sustainable, and inclusive growth. Human capital is not just about individual education and skills but also about the collective transfer of knowledge and learning within a society. Unlike the neo-classical theory, which focuses on the external forces shaping economic growth, such as technological advances and the availability of physical capital, the New Growth Theory emphasises internal resources as the primary source of growth. According to Jahanger et al. (2024), human capital plays a mediating role in ensuring that the exploitation of natural resources is sustainable and environmentally friendly, even though an abundance of these resources may lead to environmental degradation.

This highlights the importance of knowledge and continuous learning in creating more sustainable methods for utilising natural resources without inflicting long-term damage to the

environment. The theory, therefore, advocates for solutions to economic growth that focus on the efficient and sustainable use of internal resources.

In a similar vein, technological progress is viewed as an endogenous factor in the New Growth Theory, in contrast to the neo-classical model, which treats technological advances as exogenous or external to the economic system. According to the New Growth Theory, technological progress is a product of research, innovation, and knowledge spillovers within the economy. This means that technological advancements emerge from the continuous efforts of individuals and institutions within the economic system to solve existing problems. Hanelt, Bohnsack, Marz and Antunes Marante (2021) note that technological innovations often trigger a cascade of further advancements, as new technologies are developed to build on existing ones. This "domino effect" of technological progress can drive broad economic development. For example, the development of one technology may inspire innovations in related areas, gradually improving productivity and efficiency across the economy. While the New Growth Theory links technological advancement to human capital as an endogenous force, it also acknowledges the anxiety that such changes may provoke. As Guttman (2022) observes, technological progress can sometimes be seen as a threat to traditional industries, as exemplified by the Luddite movement, which criticised the displacement of workers by machines. Nonetheless, technological advancements are viewed as integral to the ongoing progress of the economy in the New Growth Model, and the theory contends that innovation can lead to a virtuous cycle of increasing returns and productivity.

The New Growth Theory also introduces the concept of increasing returns to scale, in contrast to the neo-classical assumption of constant or diminishing returns. This assumption is based on the idea that as the economy produces goods and services over time, the accumulated knowledge, research, development, and innovations lead to enhanced productivity. Javaid, Haleem, Singh, Suman and Gonzalez (2022) argue that technological advancements can either

improve productivity by discovering new production methods or by reducing waste. By treating technology as an endogenous factor, the New Growth Theory suggests that increases in production stem from within the system rather than being externally imposed. In their study on return to scale in convex production technologies, Mauler, Duffner and Leker (2021) find that returns to scale can vary over time, particularly as technological progress influences production processes. This insight underscores the importance of leveraging appropriate technologies to enhance productivity and increase returns to scale.

2.6.5 Resource Curse Theory

The Resource Curse Theory, introduced by Richard Auty (1993), explains the paradoxical relationship between abundant natural resources and poor economic performance. Studies by Aljarallah (2020), Hou, Liu, and Zhang (2019), Ndikumana and Sarr (2019), Kanik and Kucuksenel (2017), and Wu and Tsai (2014) reveal that resource-rich countries often experience slower economic growth, weaker governance, and greater inequality compared to countries with fewer resources. This concept is particularly relevant when examining how foreign capital can contribute to achieving Sustainable Development Goal (SDG) 15, which focuses on protecting terrestrial ecosystems, managing forests sustainably, combating desertification, and halting biodiversity loss (Arana et al., 2020; Diz et al., 2019).

According to the theory, overreliance on natural resources can create structural and governance challenges. Countries dependent on resource exports may neglect other productive sectors such as manufacturing and agriculture, reducing economic diversification and resilience. Furthermore, resource wealth often breeds corruption and rent-seeking behaviors, where elites exploit national resources for personal gain rather than public welfare. Consequently, even nations that earn substantial revenues from resource extraction may still

face economic stagnation and environmental degradation. When institutions are weak, natural wealth can easily transform from a blessing into a curse.

The Resource Curse Theory is built on three major mechanisms. The first is the “Dutch Disease”, which occurs when resource booms cause currency appreciation, making other export sectors such as manufacturing and agriculture less competitive. The second is rent-seeking and corruption, where political and business elites capture resource rents, diverting revenues from essential public investments. The third is the “fiscal laziness” effect, where governments reliant on resource rents reduce their efforts to collect taxes, weakening fiscal accountability and governance structures. Collectively, these mechanisms illustrate how natural wealth can perpetuate underdevelopment, poor governance, and environmental decline, particularly in the context of SDG 15.

Empirical evidence supports these claims, especially regarding the environmental consequences of foreign investment in resource-rich economies. Akinlo (2015) found that foreign investment in Africa’s resource-dependent countries often exacerbates deforestation due to weak environmental regulations. Similarly, Asiedu (2013) noted that large-scale resource projects frequently displace local communities and undermine biodiversity conservation efforts. However, critics argue that the theory paints an overly deterministic picture, overlooking countries that have successfully leveraged resource wealth for sustainable development. Moreover, the theory underestimates the role of global financial systems and external actors in reinforcing resource dependence.

Recognizing these limitations, this study seeks to extend the Resource Curse Theory by incorporating the role of governance quality as a moderating factor. It argues that the resource curse is not inevitable. Effective governance, robust regulatory frameworks, and strong anti-corruption measures can mitigate the negative impacts of foreign investment in resource-rich

countries. Within the framework of SDG 15 and in connection to SDG 2 (Zero Hunger) this study posits that good institutions can transform natural resource wealth into opportunities for both environmental sustainability and food security (Liu et al., 2019; Scheyvens et al., 2016).

Accordingly, this research will examine how foreign capital and governance quality interact to influence environmental outcomes in Africa. It will analyze how governance structures shape the allocation and impact of foreign investments on conservation, forest management, and biodiversity protection key pillars of sustainable land use and food security. By linking resource wealth to SDG 15, the study aims to identify strategies that harness foreign investment for sustainable development in resource-rich African economies. Ultimately, the findings will contribute to the ongoing discourse on resource management, demonstrating how sound governance can turn the resource curse into a resource opportunity, driving both environmental and economic progress across Africa and similar regions worldwide.

2.6.6 Pollution Haven Hypothesis Theory

The Pollution Haven Hypothesis (PHH), introduced by Walter and Ugelow (1979), explores the relationship between environmental regulations and foreign investment. In essence, the theory posits that firms from developed countries often relocate their pollution-intensive industries to developing nations where environmental standards are weaker. This relocation allows such firms to reduce production costs but can lead to severe environmental degradation in host countries with lax regulations. The PHH is particularly relevant in discussions on foreign investment and environmental sustainability, especially within the framework of Sustainable Development Goal (SDG) 15, which seeks to protect terrestrial ecosystems, forests, and biodiversity (Arana et al., 2020; Liu et al., 2019).

From this perspective, countries with relaxed environmental laws tend to attract higher levels of foreign investment, as investors seek locations where compliance costs are low. In turn, developing nations motivated by the desire for economic growth and foreign exchange may intentionally lower environmental standards to appeal to investors. While such actions can generate short-term economic gains, they often come at a significant ecological cost, leading to deforestation, pollution, and loss of biodiversity. This creates a difficult balancing act for developing countries, as they struggle to reconcile economic growth with environmental protection.

The Pollution Haven Hypothesis rests on three core propositions. First, multinational corporations may deliberately exploit weaker environmental laws in host countries. Second, developing nations may engage in a “race to the bottom,” continuously lowering their environmental standards to attract more investment. Third, limited enforcement capacity in these countries often results in poor compliance and weaker environmental protection, further intensifying degradation. Empirical evidence supports these assertions. For instance, Akinlo (2015) found that foreign investment in Africa’s mining and agricultural sectors contributes to deforestation due to inadequate enforcement of environmental regulations. Similarly, Cole, Elliott, and Shimamoto (2006) observed that countries with lenient environmental rules tend to host more pollution-intensive industries, reinforcing the pollution haven argument.

However, the PHH is not without criticism. Some scholars contend that foreign firms can also transfer cleaner technologies and promote environmental innovation, challenging the notion that all foreign investments are harmful. They argue that the relationship between foreign investment and environmental quality depends on the institutional strength and governance capacity of the host country. Moreover, the PHH does not fully account for how

countries differ in their ability to manage resources or pursue long-term sustainability strategies.

Building on these insights, the present study emphasizes the critical role of governance quality in shaping the environmental outcomes of foreign investment. It posits that good governance, characterized by strong institutions, transparency, and effective anti-corruption measures, can mitigate the negative environmental effects of foreign capital inflows. Within the context of SDG 15, the study investigates how governance can influence the extent to which foreign investments contribute to environmental degradation or sustainability. It also considers the influence of international environmental agreements and corporate social responsibility practices in promoting sustainable investment behavior.

Accordingly, this research seeks to determine whether foreign investment in African countries exacerbates environmental degradation or supports sustainability-oriented development. It examines how governance structures can direct foreign investments toward environmentally beneficial projects such as reforestation, sustainable land management, and biodiversity conservation. Furthermore, it explores the connection between foreign investment, environmental protection, and food security, recognizing that land degradation directly affects ecosystem sustainability.

Thus, the study aims to provide valuable policy insights for African governments and development partners. It seeks to demonstrate how countries can attract foreign investment while safeguarding the environment, ensuring that economic growth aligns with global environmental objectives. Ultimately, the research aspires to show how effective governance can transform foreign investment from a source of environmental harm into a tool for achieving sustainable development and ecological resilience across Africa.

2.6.7 Dependency Theory

Dependency theory helps understand how foreign investment affects Africa's economy. Simply put, this theory says there's a gap between wealthy countries and those still developing. It suggests that countries in Africa often have to rely on outside help for financial resources, technology, and markets, which can hold them back from truly growing. Foreign investments, such as foreign direct investment (FDI), have a mixed impact on Africa's agriculture. They can spur growth but also harm the environment, depending on how they're handled.

Treacy (2022) looked into how dependency theory criticises Latin America's approach to development. The study points out that foreign capital often just reinforces existing power issues instead of helping real growth. In Africa, the region experiences similar issues with foreign investment in agriculture. While it is often said that this investment will boost farming and food security, it can sometimes harm local ecosystems. For instance, big farming operations supported by multinational companies might care more about quick profits than the long-term health of the land. This leads to issues like soil loss, deforestation, and water problems. Wang, He and Song (2021) say that these outside investments often push resource-heavy farming practices that can hurt the environment and make African nations even more dependent on foreign help.

Also, Ciplet et al. (2022) stress that climate finance, a vital type of foreign investment, is not always shared fairly. This unfairness can worsen environmental issues in developing areas. In Africa, even when foreign investment aims to boost farming, it can still harm the environment. The focus on crops for export, like cocoa and coffee, often puts these foreign needs above local environmental care. This can lead to problems like low crop variety, which hurts biodiversity and destroys local ecosystems, making countries more dependent on outside markets. Still, dependency theory can show an economy way to use foreign capital for better

sustainable farming practices. Antunes de Oliveira and Kvangraven (2023) suggest countries rethink how they handle dependency in international finance. In Africa, this could mean investing in local and sustainable farming that benefits both the economy and the environment. For example, working together with local communities can help introduce better farming methods, like agroecology, to protect the land while also boosting food security. By backing environmentally friendly farming, Africa can reduce harm to nature and promote long-lasting growth in agriculture. Another key idea in dependency theory is the global value chain (GVC), which explains how developing countries often rely on selling raw materials instead of building their economies.

Wang, He and Song (2021) point out that focusing too much on exporting these materials can lead to environmental pollution. In Africa, this reliance on exporting farm products makes the continent susceptible to global price changes, impacting both the economy and nature. As the demand for raw materials rises, there's often pressure to grow more crops, which can cause deforestation and degrade natural resources. This cycle keeps African countries dependent on outside markets, making it hard to shift to better farming practices without help.

In essence, dependency theory clearly shows how foreign investment interacts with ecosystems in Africa. On one hand, outside money can harm the environment by pushing unsustainable farming methods. On the other hand, a country can change this pattern by rethinking how foreign investments are structured. If an economy can align these investments with sustainable farming and local development, foreign money could help with both food security and caring for the environment. But this will take moving away from harmful practices to recognise how closely linked economic growth is with environmental health and fairness.

2.6.8 Sustainable development theories (e.g., Brundtland Commission, SDGs)

Significant academic attention has been devoted to the notion of sustainable development in the fields of economics, social policy, environmental science, and international politics, among others. By adopting this comprehensive strategy, one can effectively tackle the complex issues pertaining to economic growth, social equality, and environmental preservation (Viens & Fortier, 2018). Theoretical frameworks that are relevant to sustainable development offer methodical strategies for comprehending, assessing, and steering initiatives towards a future that is both sustainable and equitable.

The foundational tenet that guides the Brundtland Commission's sustainable development theory, as elaborated in the "Our Common Future" report, primarily revolves around achieving a mutually beneficial integration that encompasses economic progress, environmental preservation, and social fairness (Zhang & Wang, 2019). Although this theory does not explicitly analyse the consequences of foreign investments or capital, its foundational principles can function as a guide for the moral management and utilisation of such assets in the interests of sustainable development.

The concept of the Brundtland Commission is crucial for preserving the connection between sustainable development and foreign capital in a variety of respects. The imperative to meet the requirements of the current generation while ensuring the ability of future generations to do the same is given considerable weight. This principle underlines that environmental harm must be prevented to the degree that it endangers the well-being of future generations and creates an excessive depletion of natural resources, regardless of the origin of economic development (domestic or foreign).

According to the Brundtland Commission, prudent resource management is essential for sustainable growth. It is imperative that foreign capital investments in sectors or projects

that rely heavily on resources inside the host country be executed in a manner that ensures the responsible and sustainable utilisation of such resources (Ibitoye & Kleynhans, 2023). This includes, among other things, sustainable forestry, responsible mining, and efficient water resource management.

Further, the influx of foreign capital could potentially serve as a catalyst to promote a greater sense of environmental stewardship (Jahanger, Ogwu, Onwe & Awan, 2024). Sustainable development principles incentivize foreign investors to adhere to environmental regulations, implement eco-friendly technologies, and contribute to initiatives that try to reduce environmental harm. This behaviour aligns with the development objective of the Brundtland Commission, which prioritises ecological sustainability.

Furthermore, the Brundtland Commission's proposal points out the vital role of addressing social and economic disparities within the present cohort. It is crucial, when contemplating foreign capital, to ensure that investments do not exacerbate inequality in the country of origin. It is recommended that foreign investors use approaches that promote fair compensation, facilitate the establishment of employment opportunities within the host country, and actively contribute to the advancement of the local population.

The Brundtland Commission advocated for the application of the precautionary principle, which states that it is advisable to take pre-emptive measures to save the environment and society from potential negative impacts in uncertain circumstances. When contemplating foreign investments, investors are urged under this concept to diligently conduct comprehensive environmental and social impact evaluations and implement proactive measures to mitigate potential adverse consequences. In addition, the Brundtland Commission acknowledged the global scope of environmental and developmental concerns and espoused the need for international cooperation. Foreign money possesses the capacity to function as a middleman, facilitating global collaboration in endeavours pertaining to sustainable

development. It has the potential to facilitate the dissemination of technological advancements, foster the interchange of knowledge, and provide financial support for sustainable initiatives in developing nations.

2.7 Institutional Quality and Its Dimensions

Institutional quality is a critical determinant of the relationship between foreign capital flows and sustainable development. It reflects the effectiveness, transparency, accountability, and integrity of governance systems that regulate economic and social activities. Strong institutions ensure the enforcement of environmental standards, protection of property rights, and promotion of social equity, thereby facilitating sustainable development outcomes (Jahanger et al., 2022). Governance indicators such as rule of law, corruption perception, political stability, regulatory quality, and voice and accountability therefore play an essential role in shaping how foreign capital contributes to sustainable development.

Governance indicators, particularly rule of law and corruption perception, significantly influence foreign capital inflows. Countries with stronger governance systems generally attract higher levels of foreign direct investment (FDI) because they provide a predictable and stable investment environment (Makoni, 2021). The rule of law dimension captures the effectiveness of legal frameworks, contract enforcement, and protection of property rights. Strong legal systems increase investor confidence by ensuring fair dispute resolution and safeguarding investment interests (Lee & Park, 2013).

Similarly, corruption perception reflects the extent to which institutions are viewed as transparent and accountable. Lower levels of perceived corruption reduce investment risks and increase investor willingness to commit resources to long-term development initiatives (Bouchoucha & Benammou, 2020). Consequently, governance indicators help direct foreign

capital toward projects that align with sustainability objectives and national development priorities (UNCTAD, 2020).

Empirical evidence also highlights the importance of governance for achieving the Sustainable Development Goals (SDGs). Countries with effective governance systems tend to allocate resources more efficiently and implement development policies more successfully (Moyo & Dhliwayo, 2019). For example, Ghana has made progress toward SDG 4 (Quality Education) through policies that prioritise education access, while Rwanda's commitment to gender equality illustrates how inclusive governance can advance SDG 5 (Oxfam, 2019). Similarly, Botswana's strong institutional frameworks have supported natural resource management and biodiversity protection in line with SDG 15 (Arana et al., 2020). These examples demonstrate that robust institutions are essential for addressing environmental degradation, poverty, and inequality. However, the relationship between governance and SDG achievement remains debated.

While some studies argue that inclusive institutions and accountable governance promote sustainable development (Acemoglu & Robinson, 2012; Kaufmann et al., 2009), others find weaker or mixed relationships (Knack & Keefer, 1995; Foa et al., 2018). Given that Africa continues to lag behind global development indicators, governance remains a key factor influencing the continent's ability to achieve sustainable development outcomes (Gyimah et al., 2023).

Another important dimension of institutional quality is political stability and the regulatory environment, which strongly influence foreign investment decisions. Political stability reduces uncertainty and risk for investors, thereby increasing the attractiveness of a country as an investment destination (Makoni, 2021). Studies show that countries with stronger institutional frameworks and favourable regulatory environments attract higher levels of foreign capital (Githaiga & Kilong'i, 2023; Siti & Sri, 2020). Regulatory factors such as

property rights protection, contract enforcement, and ease of doing business are therefore crucial determinants of investment inflows. According to Githaiga and Kilong'i (2023), countries with more business-friendly regulations tend to attract greater FDI inflows. When properly managed, foreign capital can support sustainable development by financing infrastructure, renewable energy, and other environmentally responsible investments (Nxumalo & Makoni, 2021). Strong regulatory frameworks also enable governments to enforce environmental laws and labour standards more effectively, ensuring that development activities do not undermine environmental sustainability (Dong et al., 2021).

Empirical findings further show that democracy and renewable energy use reduce environmental degradation, while globalisation and financial development may increase environmental pressures (Jahanger et al., 2022; Alko, 2020). Similarly, Gossel and Beard (2019) identify political stability, regulatory quality, and corruption control as major determinants of foreign portfolio flows in Sub-Saharan Africa.

Institutional quality also encompasses voice and accountability, which reflect the ability of citizens to participate in governance processes and hold leaders accountable. Democratic participation enhances policy responsiveness and ensures that development initiatives reflect societal needs (Siti & Sri, 2020). Strong institutions promote transparency, protect civil liberties, and encourage citizen engagement in decision-making processes (Thi Cam Ha et al., 2023). Evidence suggests that foreign capital contributes more effectively to development outcomes in countries with strong institutional frameworks and accountability mechanisms (Nunnenkamp & Öhler, 2012). Inclusive governance therefore fosters sustainable development by ensuring responsible resource management and preventing misuse of authority (Baland et al., 2010).

Another key component of institutional quality is regulatory quality, which plays a crucial role in balancing economic growth, social inclusion, and environmental sustainability.

Effective regulations create a stable environment that encourages entrepreneurship, innovation, and investment while ensuring environmental protection (Annamalaisamy & Vepur Jayaraman, 2023). Strong regulatory frameworks enable governments to implement policies that reduce carbon emissions, promote renewable energy, and manage natural resources responsibly. In contrast, weak regulatory systems often lead to deforestation, pollution, and biodiversity loss, particularly in many developing countries. Regulatory quality also promotes social inclusion by protecting human rights, supporting gender equality, and ensuring equitable access to essential services. However, improving regulatory systems remains a challenge in developing countries due to limited institutional capacity, political instability, and corruption (Toke, 2022).

Closely related to regulatory quality is control of corruption, which plays a critical role in environmental governance and ecosystem sustainability. Corruption often leads to illegal resource extraction, pollution, and environmental degradation, while strong anti-corruption mechanisms promote transparency and accountability in resource management (Amoh et al., 2024; Zangina & Hassan, 2020). Effective governance prevents the misuse of environmental funds, strengthens enforcement of environmental regulations, and supports sustainable resource utilisation (Lestari et al., 2022; Luu et al., 2019). Moreover, countries with lower corruption levels are more likely to attract foreign investment and international environmental financing, thereby supporting conservation and ecosystem restoration initiatives (Qamruzzaman et al., 2021; Sabir et al., 2019; Russell, 1986). Strong governance also enhances the credibility of environmental impact assessments and ensures that development projects align with sustainability objectives (Liu, 2023; Pinheiro et al., 2019).

2.8.1 Critical Role of Institutions in Development

Institutions play a crucial role in development by shaping the rules, structures, and organisations that govern economic, political, and social activities. Strong institutions provide regulatory frameworks and protect property rights, enforce contracts, and uphold the rule of law, thereby creating a stable environment that promotes investment, innovation, and economic

participation (Michaely & Vincent, 2012; Siti & Sri, 2020; Lestari et al., 2022). They also facilitate the provision of essential public services such as education, healthcare, and infrastructure, which are vital for human and economic development (Lee & Park, 2013).

Furthermore, inclusive institutions promote equitable development by reducing discrimination, expanding opportunities, and addressing income inequality (Gankou et al., 2016). They also contribute to environmental sustainability through regulatory enforcement and effective resource management, while governance factors such as corruption control, democracy, and political stability influence environmental outcomes including carbon emissions (Zhuang & Ye, 2023; Qamruzzaman et al., 2021; Abid, 2016). Institutional quality also determines the effectiveness of foreign aid and its ability to attract foreign direct investment (Aluko, 2020).

Recent evidence shows that institutional quality shapes the development impact of foreign capital. In Sub-Saharan Africa, remittances and foreign direct investment positively affect human capital development, whereas official development assistance may have adverse effects, highlighting the need for stronger institutions (Githaiga & Kilong'i, 2023). Institutional structures also influence policy processes and knowledge systems, such as think tank development (Adil, 2023), and governance effectiveness and political stability affect labour market outcomes like unemployment (Oanh et al., 2023; Ali et al., 2022).

2.8 Hypothesis Development

This section discusses the empirical linkages among the study variables. This systematic review is meant to understand the literature viewpoint on the possible mechanisms through which foreign capital drives the ecosystem. The literature review and discussion lead to the development of the study's hypotheses.

2.8.1 External debt, FDI, Portfolio Investment, Remittances and Ecosystem

The existing literature failed to explain the nature of foreign capital and ecosystem nexus. Extant literature indicates that foreign capital drives ecosystem growth (Garg & Arora, 2024; Liu et al., 2017). Similarly, Zafar et al. (2019) establish that both natural resource dependence and unregulated FDI inflows have a positive relationship with the ecological footprint in the U.S. However, the presence of robust human capital partially offsets these negative effects by enhancing adaptive and sustainable capacities. Several empirical studies examine distinct finance mechanisms to improve ecosystem biodiversity (Flammer et al., 2025; Liu et al., 2024). In another instance, Shang et al. (2024) and Tengberg and Cabanban (2013) discovered that financial institutions should implement equivalent steps to attract foreign capital to the conservation of ecosystems at all levels, from local to national.

Additionally, Xu, Shang, Yu and Liu (2019) examined the ecosystem economy's ecological efficiency from the standpoint of foreign capital. They discovered that increasing physical capital clearly plays a part in enhancing the ecosystem economy's effectiveness. Furthermore, Wang, Li and Wang (2021) and Fu et al. (2024) examined the main factors influencing the development of China's ecosystem economy. They discovered that finance and technological advancement play a crucial part in this area. Zhao and Marin (2019) also discovered that ecosystem economic growth frequently exhibits a strong spatial correlation and spillover; the credit market and the insurance market can support ecosystem economic growth, but the effect of the stock markets is not significant enough to make a difference. Likewise, Liu and Yang (2019) discover that the improvement and modernisation of the ecosystem industry structure are supported by financial development.

The drawback from the extant literature is that, first, these studies largely look at the overall foreign capital; however, foreign capital comprises different dimensions (FDI,

remittances, external debt and portfolio investment), which could have varied impacts and imply different policy development (Sahay et al., 2015). Theoretically, improved access to financial resources could facilitate the adoption of eco-friendly technologies and practices within the ecosystem (Sarma & Pais, 2008; Abid, 2016; Mawutor et al., 2022; Igbinedion & Abudu, 2023; Urooj, 2023). FDI often facilitates the introduction of advanced technologies and practices that significantly enhance environmental management (Khan & Ikram, 2010).

Multinational corporations, for example, frequently bring cutting-edge innovations such as energy-efficient machinery and pollution control technologies. These advancements play a pivotal role in reducing industrial emissions and waste. A compelling illustration of this impact can be seen in the renewable energy sector, where FDI has the potential to accelerate the transition to cleaner energy sources, thereby contributing to a substantial reduction in carbon footprints. Second, the studies concentrate on economies such as Asia and Europe with little attention on Africa.

Thirdly, the studies focused on the ecosystem growth perspectives, ignoring the prominence of sustainability. Therefore, investigating the impact of foreign capital in terms of FDI, remittances and portfolio investment and external debt on the ecosystem in Africa is necessary. Foreign capital flows extend financial resources to actors committed to sustainable practices, leading to the long-term health and growth of ecosystems. Foreign capital flows play a crucial role in shaping the ecosystem economy by supplying capital, influencing pricing and valuations, controlling risks, and fostering sustainability through resource allocation and the promotion of ethical business practices. The integration of environmental and social considerations into financial systems is important for the ecosystem drive. Therefore, the current study fills this gap in the literature.

Based on this, the researcher proposes the following hypothesis 1:

- **Null Hypothesis (H0a):** There is no statistically significant relationship between external debt and ecosystems in Africa.
- **Alternative Hypothesis (H1b):** There is no statistically significant relationship between FDI and ecosystems in Africa.
- **Null Hypothesis (H0c):** There is no statistically significant relationship between remittances and ecosystems in Africa.
- **Null Hypothesis (H0d):** There is no statistically significant relationship between portfolio investment and ecosystems in Africa.
- **Alternative Hypothesis (H1a):** External debt has a statistically significant influence on the ecosystem in Africa.
- **Alternative Hypothesis (H1b):** FDI statistically influences the ecosystem in Africa.
- **Alternative Hypothesis (H1c):** Remittances statistically influences the ecosystem in Africa.
- **Alternative Hypothesis (H1d):** Portfolio statistically influences the ecosystem in Africa.

2.8.2 Foreign capital threshold and ecosystem

Guided by the EKC hypothesis (Grossman & Krueger 1995), several research studies examined the impact of foreign capital on ecological footprints. Nevertheless, the empirical findings vary/diverge in the extant literature. A strand of foreign capital-ecological footprint nexus shows that foreign capital causes environmental risk (Bachegour & Qafas, 2023; Wang et al., 2023; Ahmad, Ahmed, Yang, Hussain & Sinha, 2022; Ahmed, Ali, Kousar & Ahmed, 2022; Akam, Nathaniel & Muili, 2022; Bhujabal, Sethi & Padhan, 2021). These studies argued that improved foreign capital increases economic activities which leads to ecological damage.

Secondly, there is a higher probability that investors will increase their investments in an economy with improved regulations and protection of property rights, leading to economic expansion. Thirdly, bad governance and weak enforcement can mess up how countries manage natural resources. This lets illegal activities like logging, mining, and poaching run wild. These actions damage our ecosystems. Fourthly, corruption can also steal money that should be used for protecting the environment. This makes it harder to save fragile ecosystems. When institutions are weak, they do not enforce or check environmental rules. This leads to pollution, overusing resources, and destroying habitats. Finally, poor policies and land use can cause bad farming methods, cutting down forests, or sprawling cities. All of this pressures the ecosystem and lowers biodiversity. Therefore, the breakdown of our institutions can directly impact ecosystems and restrict their potential for recovery.

The second strand of studies indicates that the development of foreign capital has a beneficial influence on the environment. For instance, Shang, Yang and Pu (2024) assert that improved institutional quality improves the ecological system. Similarly, Liu et al. (2017) explore the role of foreign capital in enhancing R&D within the context of China's ecosystem, applying the dissipative structure theory to understand how external investments facilitate systemic environmental improvements. Their research highlights those foreign investments, particularly in technology-driven industries, contribute to the creation of more resilient and adaptive ecosystems, offering long-term benefits for both the environment and the economy. The study suggests that foreign capital can support the research required to develop sustainable practices, which are essential for maintaining ecological balance, particularly in rapidly developing regions.

Zafar et al. (2019) extend this perspective by investigating the influence of foreign direct investment (FDI) on the ecological footprint in the United States. Their study underscores that FDI can promote a reduction in environmental degradation by fostering

innovation in cleaner technologies and encouraging industries to adopt more sustainable practices. They assert that foreign capital, through technological advancements and efficient resource management, can mitigate the negative environmental impacts of industrial expansion, by promoting sustainability and ecological preservation.

Similarly, Liu et al. (2024) examine the interaction between regional innovation ecosystems and foreign direct investment, focusing on local firms' outward investments. They argue that a symbiotic relationship between FDI and local firms fosters innovation and strengthens governance frameworks that ensure the sustainable management of ecosystems. This approach emphasises how foreign investments not only enhance economic growth but also contribute to the development of local capacities to manage natural resources more effectively, thereby boosting both the ecological and economic resilience of regions.

Ganda (2022) presents a broader analysis of the nexus between financial development, natural resource rents, and FDI in the context of the BRICS economies. He emphasises that FDI, when channelled effectively, can drive technological innovation and promote environmental sustainability. In this framework, foreign capital helps to finance projects that reduce environmental degradation, such as green energy initiatives and sustainable agriculture practices. Ganda's work highlights how foreign investment in these areas can mitigate the adverse effects of resource extraction and foster eco-friendly innovations that improve both the economy and ecosystem health.

Flammer, Giroux and Heal (2025) further explore the intersection of finance and biodiversity, focusing on how investments in biodiversity finance can enhance ecosystem sustainability. The authors argue that integrating biodiversity into financial decision-making can redirect foreign capital towards conservation efforts. By aligning financial incentives with ecological goals, such investments can lead to more sustainable management of natural resources and improved biodiversity outcomes. Saleem, Ahmed and Samour (2024) provide a

broader analysis, focusing on Brazil and the role of external debt, natural resources, FDI, and economic growth in shaping ecological sustainability. The study finds that while foreign direct investment can potentially contribute to ecological sustainability through the adoption of green technologies, external debt tends to worsen environmental outcomes. This is particularly evident in countries where external debt is not strategically utilised to promote environmental policies. The authors argue that balancing debt with investments in natural resources and sustainable growth is crucial to fostering long-term ecological sustainability.

To situate the ecosystem agenda within the ecological debate, finance goals would need to evolve beyond certain levels in order to instigate the needed sustainability within the ecosystem (Song, Li, Wu & Yin, 2020). The conventional foreign capital framework cannot extend efficient fund allocation and laws towards only sustainable practices and ecosystem investment. But as more ecosystem demands prevail in an economy with institutions, it will transform to emphasize sustainable adoptions. The foreign capital flows at this stage would develop ecosystem regulatory instruments to foster the ecosystem agenda. Thus, in the beginning stages of regulations, sustainability might decrease, but after a certain amount of foreign capital comes in, sustainability improvements will increase quickly in the ecosystem, indicating a non-straightforward relationship. Unlike Ahmed et al. (2022) which examines the foreign capital threshold in ecosystem growth in Asia, this study differentiates by examining the foreign capital threshold across the sustainability of the ecosystems.

Despite previous literature provides impactful insights, significant scholarly gaps exists. Several studies focused on the direct effect of foreign capital on ecological indicators including ecological footprint, carbon emissions, ignoring broader ecosystem sustainability such as resilience and resource management. Again, several studies also treat foreign capital as a single measure, ignoring its multidimensional nature (FDI, external debt, portfolio investment and remittances) and their potential impact different environmental impacts. In addition, empirical

evidence is concentrated in developed and emerging regions while Africa remained underexplored, despite its unique ecological vulnerability and institutional challenges.

Although studies like Ahmed et al. (2022) investigate the threshold effects of foreign capital on ecosystem growth in Asia, there is limited empirical evidence on these dynamics in Africa. Addressing this gap is crucial, as African countries face pressing ecological challenges while increasingly relying on foreign capital to support development and environmental initiatives. Hence, the study tests the second hypothesis as follows:

- **Null Hypothesis (H0):** There is no statistically significant threshold effect of foreign capital on the ecosystem economy.
- **Alternative Hypothesis (H1):** There is a statistically significant threshold effect of foreign capital on the ecosystem economy.

2.8.3 Economic Institutions and ecosystem

The Fraser Institute defines economic institutions as the degree to which authorities safeguard private property, establish a legal framework that treats all equally, ensure balanced enforcement of contracts and a stable monetary environment, keep taxes low, avoid creating trade barriers, and allocate resources more fully through markets rather than government spending and regulation. Thus, features of economic institutions include the legal system and property rights, legal system integrity, regulations, international trade freedom, and government efficacy.

2.9.3.1 Regulation of the credit market, business sector labour market and ecosystem

Regulations are critical determinants in the transformation of all economic sectors, including the ecosystem (economic activity relating to pollution, afforestation) (Azam, Ftiti, Hunjra, Louhichi & Verhoeven, 2022; Lee, Zeng & Wang, 2022). Business, foreign capital

market credit market and labour market regulation have an impact on the sustainability of the ecosystem (Liu, Qi & Wan, 2022). Credit market regulation improves availability of funds at reduced cost for ecosystem ventures such as renewable energy projects, afforestation, etc (David, Yoshino & Varun, 2022). Credit market regulation also promotes innovations and investment in ecosystem technologies and sustainable practices. However, strict lending rules might limit access to capital for ecosystem-related financing. Regulations in the business sector enact and enforce environmental rules that can prevent overexploitation of environmental resources, habitat destruction, and pollution leading to long-term sustainability of ecosystems (Anisimova, Shekhovtsov & Donets, 2022). The rules governing licensing and permits would ensure responsible use of the forest, sustainable agricultural practices, etc. On the other hand, labour market regulation promotes the safety of workers in main sectors like farming, renewable energy, water and ecosystem resource management and oil and gas. This also promotes eco-friendly skill development and local engagement.

Currently, Kenya's Environmental Management and Coordination Act (EMCA), established in 1999, serves as the primary legal framework for environmental governance. This Act established the National Environmental Management Authority (NEMA), which is tasked with overseeing the implementation of policies and enforcing regulations that aim to protect the country's ecosystems (Aminu & Alabi, 2024). One of the key provisions of the EMCA is the requirement for Environmental Impact Assessments (EIAs). These assessments are mandatory for all major development projects to evaluate their potential environmental impacts, ensuring that any harmful effects are mitigated before the projects are approved. Additionally, the Act addresses pollution control, setting strict standards for air, water, and soil pollution, with penalties for violations. The EMCA also includes provisions for biodiversity protection, regulating land use and development projects to prevent habitat destruction and

encourage conservation efforts. In this way, the law ensures that development occurs in harmony with the natural environment (Aminu & Alabi, 2024).

Similarly, South Africa has implemented a comprehensive regulatory framework through the National Environmental Management Act (NEMA), first passed in 1998. The legislation emphasises sustainable development, aiming to strike a balance between economic growth and ecosystem protection. NEMA promotes sustainable development by encouraging practices that do not harm the environment. It also regulates biodiversity conservation through the Biodiversity Act (2004), which provides guidelines for the creation of protected areas and governs the use of indigenous species (Anisimova, Shekhovtsov & Donets, 2022). Another significant aspect of NEMA is its focus on pollution and waste management. The National Waste Management Strategy, established under NEMA, aims to reduce pollution, manage waste effectively, and ensure cleaner ecosystems. Moreover, NEMA promotes environmental governance by encouraging public participation in environmental decision-making processes, making it a comprehensive framework for environmental sustainability in South Africa (Anisimova, Shekhovtsov & Donets, 2022).

The environmental governance frameworks across Kenya, South Africa, Nigeria, Ethiopia, Ghana, Tanzania, and Uganda share several common features, yet notable gaps persist. In each country, national agencies such as Kenya's NEMA (Aminu & Alabi, 2024), South Africa's NEMA (Anisimova, Shekhovtsov & Donets, 2022), Nigeria's NESREA, Ethiopia's EPA, Ghana's EPA, Tanzania's NEMC, and Uganda's NEMA enforce environmental regulations through mechanisms such as Environmental Impact Assessments (EIAs), pollution control, biodiversity and forest conservation, and waste management. These frameworks emphasize sustainable development, public participation, and harmonizing economic growth with ecosystem protection.

However, despite the robust legal structures, gaps remain. First, there is limited evidence on how effectively these regulations translate into practical outcomes, particularly in enforcing compliance and mitigating ecosystem degradation. Second, while EIAs and pollution standards exist, challenges such as weak institutional capacity, insufficient monitoring, and enforcement inconsistencies reduce their effectiveness. Third, the literature shows little comparative analysis of how these regulatory frameworks perform across countries, particularly in the African context where institutional, financial, and ecological conditions vary significantly. Lastly, studies often overlook the interaction between governance quality, policy implementation, and broader ecosystem sustainability outcomes, leaving gaps in understanding the effectiveness of environmental laws in promoting resilient and sustainable ecosystems (Aminu & Alabi, 2024; Anisimova, Shekhovtsov & Donets, 2022).

These gaps highlight the need to empirically investigate the linkages between institutional quality, governance, and ecosystem outcomes. Therefore, the study states the following hypothesis:

- **Hypothesis 1a:** Regulations have a positive significant influence on ecosystems in Africa.

2.9.3.2 Legal System and Property Rights (LSPR) and Ecosystem

The LSPR of an economy plays a key role in the development and sustainability of the ecosystem. The enforcement of property rights and ecosystem legal frameworks can affect the conservation of environmental resources. LSPR would ensure sustainable ownership and allocation (Deng, Song, Li, Zhang & Liu, 2024). In this regard, LSPR classifies the nation's rights and boundaries over their exclusive economic zones (EEZs). Well-demarcated EEZs help in the exploitation of environmental resources like fish stocks, energy and mineral resources. LSPR defines main protected areas, mining regulations and licensing, and energy and mineral

exploration (Carvalho et al., 2021; Monteiro, Bezerra, Moita Neto & Silva, 2021). The legal system and property rights play a big role in how countries resources and take care of the environment. When the laws are strong, people follow the rules about who owns what. Such behaviour helps stop the overuse of resources and encourages better management. When folks know their rights, they're more likely to invest time and money into keeping things sustainable. On the flip side, if the legal system is weak or property rights are unclear, things can go wrong. Resources can get misused, leading to problems like pollution and damage to nature. Without accountability, people might just take what they want without planning for the future.

Despite the acknowledged importance of LSPR in ecosystem management, several research gaps remain. Existing studies have predominantly focused on the economic and legal aspects of property rights, with limited empirical investigation into how LSPR interacts with environmental governance to influence ecosystem sustainability across different national contexts. Furthermore, the effectiveness of LSPR in mitigating ecosystem degradation under conditions of institutional weakness, governance challenges, or socio-political instability remains largely underexplored, particularly in developing economies with diverse economic, political, and cultural settings. Addressing these gaps is crucial for informing policies that strengthen legal frameworks, promote sustainable resource use, and enhance long-term ecosystem resilience.

- **Hypothesis 1b:** There is a significant positive effect of LSPR on ecosystems.

2.9.3.3 Integrity of Legal System and Ecosystem

The legal system is important for keeping our ecosystems healthy. When laws are clear, fair, and dependable, it helps protect our natural resources and wildlife. But when the legal system is weak or corrupt, it leads to problems like mismanagement of resources and damage to the environment. One key way the law helps the environment is by enforcing rules about

how countries treat it. Strong legal systems make sure that laws against things like poaching and pollution are enforced. When people see that there are real consequences for breaking these laws, they are less likely to harm the environment. For example, where laws are strong, there's usually less deforestation and better protection for wildlife (Aminu & Alabi, 2024; Ahmad, Ahmed, Majeed & Huang, 2021; Danish & Ulucak, 2020). But if enforcement is weak, bad practices continue, and ecosystems suffer. Another way the legal system helps is by protecting land and property rights. When communities, especially indigenous ones, have recognised rights, they are more likely to take care of the land (Kangal, 2023). Secure property rights can stop harmful practices like land grabbing that lead to loss of habitats. Studies show that fair land rights make people more invested in using land sustainably. The legal system is also crucial for Environmental Impact Assessments (EIAs). These assessments look at how development projects will affect the environment. A reliable legal system ensures that these assessments are done properly. If laws are weak, they can lead to fake assessments and the approval of projects that harm the environment. Resource use is another area where the law is key. By using rules like licenses and quotas, the legal system helps manage resources like water and forests in a way that protects them. Overuse and habitat damage result from not adhering to these rules. The evidence shows that strong laws are vital for keeping our ecosystems balanced. Corruption is a big threat to our ecosystems. It leads to illegal activities that harm conservation efforts. On the flip side, countries with strong legal systems and low corruption see better environmental results, like healthier ecosystems and more responsible use of resources. Tackling corruption helps the law manage resources better. The legal system is also important for climate action. Strong laws support international agreements, like the Paris Agreement, and help enforce policies to reduce emissions and promote renewable energy. On the other hand, weak legal systems can slow down progress and make it harder to fight climate change. Public participation is another key role of the legal system. When laws are clear and

fair, they encourage people to get involved in decisions about the environment. This helps make sure that conservation efforts consider everyone's needs. Getting the community involved boosts trust and makes protection efforts more effective. Lastly, the legal system helps resolve environmental conflicts. Disputes over land and resources often need fair legal solutions. A strong legal system offers a fair way to handle these issues, protecting vulnerable communities and the environment at the same time. Good conflict resolution helps bring people together and supports conservation efforts, showing how justice and ecological health go hand in hand.

- **Hypothesis 1c:** There is a significant positive effect of LSPR on ecosystems.

2.9.3.4 Government Effectiveness and Ecosystem

Government effectiveness plays a crucial role in environmental management, influencing how countries utilize natural resources, enforce environmental laws, and address ecological challenges. In essence, well-functioning governments are able to formulate and implement robust policies and deliver public services efficiently, thereby supporting the conservation of ecosystems both now and for the future (Bin-Nashwan, Riyadh, Khlifi & Haladu, 2026).

A key mechanism through which effective governments promote environmental sustainability is law enforcement. Strong governance structures enhance the ability to prevent illegal activities such as deforestation, wildlife trafficking, and pollution. When regulations are effectively applied, ecosystems are better protected, and biodiversity is preserved. For example, nations with strong institutional frameworks have successfully reduced deforestation through clear legal frameworks and vigilant monitoring systems (Ayambire et al., 2025). In contrast, weak governments often struggle to enforce environmental regulations, allowing harmful practices to persist.

Resource management is another area where government effectiveness matters. Governments with strong capacity allocate financial and natural resources strategically, supporting conservation initiatives such as protected areas, reforestation, and sustainable land use. Evidence suggests that countries with higher governance quality are more likely to employ resources in ways that balance environmental and economic benefits, whereas ineffective governments often fail to fund essential conservation programs (Zhang, Guo & Zhang, 2026).

Collaboration is also central to successful environmental governance. Effective governments engage local communities, businesses, and international organizations, creating partnerships that enhance conservation outcomes and support livelihoods. By contrast, weak governments may fail to coordinate these stakeholders, resulting in fragmented efforts (Bin-Nashwan et al., 2026).

Moreover, adaptive governance enables countries to respond to external pressures such as climate change, urban expansion, and population growth. Governments that are proactive in adjusting policies can mitigate ecological risks while maintaining essential services like clean water supply (Ayambire et al., 2025). Investment in research and human capital further strengthens environmental management. Governments that support scientific studies, monitoring technologies like remote sensing, and environmental education programs equip stakeholders to address complex ecological challenges effectively (Zhang et al., 2026).

Finally, effective governments integrate environmental considerations into broader economic and social planning. By aligning infrastructure development, agriculture, and industrial activities with sustainability objectives, these governments strike a balance between economic growth and ecosystem protection. Countries with strong governance are often more successful in achieving this integration (Bin-Nashwan et al., 2026).

In summary, government effectiveness underpins environmental governance by enhancing law enforcement, resource management, collaboration, adaptability, and the integration of environmental concerns with socio-economic objectives, thereby fostering sustainable ecosystem management (Mawutor et al., 2025). Based

- **Hypothesis 1d:** There is a significant positive effect of GEF on ecosystems.

2.9.3.5 Political institutions and ecosystem

Political institutions play a pivotal role in shaping ecosystem performance, a perspective rooted in New Political Economics (NPE) theory, which posits that the rules, policies, and governance structures of a country directly influence its economic and institutional outcomes (Toke, 2022). Empirical research suggests that the strength and quality of these political institutions significantly affect how environmental and business ecosystem function. For instance, Huang, Yi, Chen, Xu, and Chen (2022) argue that in the absence of democratic oversight, public authorities often lack the mechanisms to monitor risky behaviours within economic and ecological systems, leading to heightened vulnerabilities.

Studies examining the effects of weak political institutions reveal systemic risks. Shan, Lin, Chu, Yu, and Song (2023), using cross-country data and institutional quality indices, show that weak institutions often create rent-seeking opportunities, including bribery and entry barriers, which allow governments or politically connected actors to capture excess profits from established ecosystem participants. Similarly, favoritism in the allocation of licenses or concessions encourages politically connected firms to engage in riskier practices, expecting government protection during periods of instability (Chen, Matousek & Wanke, 2018). These patterns indicate that weak political institutions not only distort market mechanisms but also undermine the stability and resilience of ecosystems.

Conversely, strong political institutions are associated with enhanced information flow, transparency, and accountability, which improve ecosystem performance. Chen, Wu, Jeon, and Wang (2017) demonstrate that robust institutional frameworks facilitate better dissemination of information, reduce opportunistic behaviour, and encourage responsible corporate actions, thereby fostering a more stable and sustainable ecosystem. These findings highlight that institutional strength is not merely a background condition but an active determinant of ecosystem functionality.

2.8.4 Role of Political Institutions in the Economic Institutions and Ecosystem Nexus

Institutions play a crucial role in shaping ecosystem sustainability and environmental governance. The Hierarchy of Institutions Hypothesis (HIH) argues that the effectiveness of economic institutions depends fundamentally on the quality of political institutions (Acemoglu, Johnson & Robinson, 2005). In ecosystem governance, economic institutions include regulatory frameworks, environmental policies, and property rights that guide resource use and sustainable practices, while political institutions such as political stability, regulatory quality, accountability, and transparency provide the broader governance architecture that determines whether these economic rules are effectively implemented.

Recent studies highlight that environmental governance outcomes depend on the interaction between governance quality, institutional capacity, and economic incentives. For example, Bin-Nashwan et al. (2026) showed that environmental governance and strategic organizational capital shape carbon disclosure practices, while Zhang, Guo and Zhang (2026) find that policy-driven governance initiatives can improve environmental performance when supported by strong institutional coordination. However, assessing the effectiveness of environmental governance systems remains difficult due to measurement challenges and institutional heterogeneity across countries (Ayambire et al., 2025).

The broader political economy of climate change literature further emphasizes the role of institutional structures in shaping environmental outcomes. Ross (2025) argues that climate policy is strongly influenced by political incentives and institutional arrangements. Similarly, Albahouth and Tahir (2025) show that stronger institutional quality reduces climate vulnerability, while Boussaidi and Hakimi (2025) demonstrate that institutional quality conditions the environmental effects of economic development and financial inclusion. Additional evidence suggests that regulatory quality and political stability enhance environmental performance by supporting renewable energy demand (Nazir et al., 2026), and that strong institutions reduce ecological footprints by promoting sustainable growth and environmental accountability (Mohamed et al., 2025).

Another important strand of literature focuses on the role of foreign capital flows within institutional contexts. Foreign capital can provide resources for sustainable development, but its impact depends on the quality of governance. Smith (2021) argues that strong institutional frameworks allow foreign capital to improve public investment efficiency and sustainability outcomes, whereas Jones (2022) finds that weak governance and corruption may lead capital inflows to reinforce rent-seeking behaviour and undermine sustainability goals. In Sub-Saharan Africa, Asongu and Odhiambo (2020) show that foreign capital contributes to green growth only when institutional quality such as rule of law, regulatory quality, and government effectiveness exceeds certain thresholds.

Despite these contributions, several research gaps remain. First, much of the literature examines environmental governance, institutional quality, and economic drivers of sustainability separately, with limited analytical integration within a unified institutional framework. While studies such as Bin-Nashwan et al. (2026) and Zhang et al. (2026) focus on governance structures and environmental outcomes, and others such as Boussaidi and Hakimi (2025) and Nazir et al. (2026) analyze institutional quality and environmental performance,

few studies integrate these strands to explain how political institutions shape the effectiveness of economic institutions and foreign capital in sustaining ecosystems.

Second, the interaction between foreign capital and institutional quality in influencing ecosystem sustainability remains underexplored, particularly regarding the mechanisms through which political institutions transform external financial resources into sustainable environmental outcomes. Third, evaluating environmental governance outcomes remains methodologically challenging due to measurement constraints and cross-country heterogeneity (Ayambire et al., 2025). Finally, much of the existing empirical evidence focuses on regions such as China, the MENA region, and South Asia, with limited studies on Sub-Saharan Africa, where institutional weaknesses, foreign capital dependence, and environmental pressures intersect

Thus, this study seeks to address key questions related to the role of political institutions in shaping the relationship between economic institutions and the stability of the ecosystem: How does an undue level of government dominance impact the stability of the ecosystem, particularly when key agents within the sectors have strong political affiliations? To what extent does political influence affect the effectiveness of regulatory frameworks, such as the Legal and Policy Framework for Sustainable Resource Management (LSPR), in achieving stability within the ecosystem? How can political connections within credit markets, labour markets, foreign investors, and the broader business sector influence the stability of the ecosystem, especially when major actors in these agents may have the propensity to renege on financial contracts due to their political affiliations?

2.9.4.1 Foreign capital and food security

Foreign capital has increasingly been recognized as a key driver of agricultural development and food security, particularly in developing economies. Dhahri and Omri (2020)

argue that foreign direct investment (FDI) in agriculture can advance Sustainable Development Goals (SDGs) 1 and 2 by improving agricultural productivity and facilitating technology transfer. Similarly, Jiang and Chen (2020) emphasize that foreign agricultural investments enhance production efficiency and introduce modern farming techniques in developing countries. However, the effectiveness of these investments depends heavily on the institutional environment of the host country. Wardhani and Haryanto (2020) show that FDI improves food security only when supported by strong governance and adequate infrastructure, while Dhahri and Omri (2020) caution that weak institutions can undermine these benefits by creating inefficiencies and reducing agricultural output.

In addition, remittances represent another important channel through which foreign capital influences food security. By increasing household income and purchasing power, remittances enhance food access and dietary diversity (Sogah et al., 2024). Evidence from Ahmad et al. (2024) and Moniruzzaman (2022) shows that remittances in Pakistan and Bangladesh enable households to consume more nutritious and diverse diets. In Sub-Saharan Africa, Sulemana, Bugri Anarfo, and Doabil (2023) find that remittances have particularly strong positive effects on low-income households, suggesting that policies targeting vulnerable populations can amplify the benefits of these financial inflows.

Recent studies show a close relationship between external debt, food systems, and macroeconomic stability in developing economies. Gbambie et al. (2025) find that food price volatility and climate change increase fiscal pressure and external borrowing in Sub-Saharan Africa. Sanakulova and Jamolov (2023) note that although external debt can support development, excessive borrowing threatens financial stability. Additionally, Chidoko, Jimu, and Ndhlovu (2026) show that rising food import dependence in Sub-Saharan Africa contributes to growing external debt, reinforcing the cycle between food insecurity and debt accumulation.

Foreign capital also influences the multidimensional aspects of food security, including availability, accessibility, and stability. Using a dataset covering 93 countries, Peng et al. (2024) find that foreign capital significantly improves food availability and accessibility, although its effect on food stability remains limited, particularly in countries vulnerable to climate change and economic shocks. Similarly, Mathew and Alkhamis (2024) highlight that foreign investments in fisheries and aquaculture can diversify food sources and support sustainable food systems beyond traditional agricultural production.

Despite its potential benefits, foreign capital faces several structural challenges that can hinder its contribution to food security. Governance weaknesses, political instability, and global shocks can significantly constrain the effectiveness of foreign investments. Jagtap et al. (2024) describe a “quadruple whammy” of climate change, geopolitical conflicts, pandemics, and economic recessions that disrupt global food systems, even in countries receiving substantial foreign capital inflows.

Empirical evidence also indicates that foreign capital contributes to both poverty reduction and food security when appropriately managed. Using data from 49 developing countries, Dhahri and Omri (2020) show that FDI and official development assistance (ODA) help reduce poverty and hunger by improving agricultural productivity. While FDI promotes technological transfer and innovation, ODA supports essential infrastructure such as roads and rural services. However, the effectiveness of these financial flows depends largely on governance quality and their alignment with national agricultural development priorities.

Despite the growing literature, several important research gaps remain. First, existing studies often analyze individual forms of foreign capital particularly FDI in isolation, with limited analytical integration of multiple capital flows and institutional conditions. While research by Dhahri and Omri (2020), Jiang and Chen (2020), and Wardhani and Haryanto (2020) highlights the role of FDI in agricultural productivity and food security, relatively few

studies simultaneously examine the broader composition of foreign capital, including portfolio investment, remittances, and external debt. As noted by Sahay et al. (2015), these financial flows operate through different transmission channels and may have distinct implications for food security outcomes. For instance, FDI facilitates technological diffusion and infrastructure development, portfolio investment stimulates broader economic activity that can support agricultural financing, external debt may fund productive agricultural investments or crowd out food-related spending if poorly managed, and remittances directly improve household income and food access.

Second, although several studies recognize the moderating role of governance, there remains limited analytical integration between foreign capital flows and institutional quality in explaining food security outcomes. Existing research often treats governance as a control variable rather than explicitly examining how institutional quality conditions the effectiveness of different types of foreign capital. This leaves an important gap in understanding how governance structures transform external financial resources into sustainable food system improvements.

Third, the literature has not sufficiently examined the multidimensional nature of food security including availability, access, utilization, and stability in relation to foreign capital. While Peng et al. (2024) highlight that foreign capital improves food availability and accessibility but not stability, more empirical work is needed to explore how different types of foreign capital influence these dimensions simultaneously, particularly in climate-vulnerable regions.

Again, much of the existing empirical evidence remains geographically fragmented, focusing on specific regions such as South Asia, individual developing countries, or limited cross-country samples. This leaves a need for broader empirical analyses that capture the institutional, macroeconomic, and structural conditions shaping the foreign capital–food

security nexus across developing regions. Addressing these gaps is particularly important given the persistent challenges of poverty and hunger. In 2015, approximately 736 million people lived on less than \$1.90 per day, and by 2018 nearly 820 million people around one in nine globally experienced hunger (World Bank, 2023). Achieving the Sustainable Development Goals requires substantial financial resources, with global investment needs estimated at \$5-7 trillion annually, while developing countries face an investment gap of about \$2.5 trillion in sectors such as infrastructure, clean energy, water, and agriculture. Bridging this gap requires a more integrated understanding of how different forms of foreign capital interact with institutional and macroeconomic conditions to enhance food security in developing economies.

Therefore, this study contributes to the literature by being among the first to investigate the effect of foreign capital on the sustainability of food security in Africa moving beyond traditional measures of accessibility, affordability, utilization, and availability to include long-term resilience and sustainability dimensions. Based on the above gap, the third hypothesis is stated as:

- **Null Hypothesis (H0a):** There is no statistically significant relationship between external debt and food security in Africa.
- **Null Hypothesis (H0b):** There is no statistically significant relationship between FDI and food security in Africa.
- **Null Hypothesis (H0c):** There is no statistically significant relationship between remittances and food security in Africa.
- **Null Hypothesis (H0d):** There is no statistically significant relationship between portfolio investment and food security in Africa.
- **Alternative Hypothesis (H1a):** There is a statistically significant relationship between external debt and food security in Africa.

- **Alternative Hypothesis (H1b):** There is a statistically significant relationship between FDI and food security in Africa.
- **Alternative Hypothesis (H1c):** There is a statistically significant relationship between remittances and food security in Africa.
- **Alternative Hypothesis (H1d):** There is a statistically significant relationship between portfolio investment and food security in Africa.

2.9.4.2 Partnership for the Goals and foreign capital

The relationship between foreign capital and the achievement of the United Nations Sustainable Development Goals (SDGs), particularly Goal 17, which emphasises the need for partnerships to achieve the goals, has gained considerable attention in recent academic discourse. This goal is all about building partnerships to make progress. It points out that working together, governments, businesses, non-profits, and international organisations is key to finding the money, knowledge, and tools need to solve big problems. Foreign direct investment, is especially important in this mix. It brings in fund, new technology, and skills to help developing countries grow. It can lead to better partnerships that tackle issues like poverty, inequality, climate change, and the damage to ecosystems. Research reveals that foreign investment can achieve SDG 17.

For instance, a study by Aloui and Maktouf (2024) argued that FDI is essential for economic growth in Sub-Saharan Africa. They claim that these partnerships can help reduce hunger and poverty by boosting food production and improving distribution. Similarly, Dhahri and Omri (2020) examine how foreign dollars can promote agriculture productivity, promoting food security in developing areas. They found that investments in agriculture can increase productivity, cut down on hunger, and improve lives. These partnerships with foreign investors, governments, NGOs, and local farmers are necessary for this growth. Ganda (2022) talks about

how FDI and financial development can support several SDGs by encouraging green growth and protecting the environment. The partnerships between foreign and local businesses, along with governments, are key to making sure FDI benefits the environment. Investing in clean energy and sustainable farming can help fight environmental damage, supporting SDG 13 (climate action) and SDG 15 (life on land). Zafar et al. (2019) take a different angle, looking at how foreign investment affects natural resources and sustainability in the U.S. They found that if not managed well, foreign money can harm the environment.

This shows how important it is for governments and companies to work together. They stress that strong rules and global partnerships are needed to make sure foreign investment helps both the economy and nature. Liu et al. (2024) focus on how FDI supports local innovation. They found that local businesses often invest abroad but also partner with international firms to share knowledge. This teamwork can lead to new technologies that help sustainable development in renewable energy, digital tech, and sustainable farming. These partnerships encourage sharing ideas and creating eco-friendly technologies, helping reach SDG 9 (industry, innovation, and infrastructure) and SDG 12 (responsible consumption).

Lastly, Flammer, Giroux and Heal (2025) study was premised on biodiversity finance. They argue that foreign investment can boost conservation efforts through global collaborations. By using foreign money, governments and international groups can fund projects that protect nature, helping to achieve SDG 15. Their research shows that strong partnerships with financial resources, scientific know-how, and local insights are critical in this work.

It becomes clear that foreign capital, particularly FDI, not only provides financial resources and technological capabilities but also shapes the institutional and collaborative frameworks necessary for achieving multiple SDGs. These insights provide a strong foundation for developing testable hypotheses that examine how foreign capital, in combination with

governance quality and institutional partnerships, influences sustainable development outcomes across economic, social, and environmental dimension. Hence, the following hypothesis is stated as:

- **Null Hypothesis (H₀):** There is no statistically significant relationship between partnership for the goals and foreign capital in Africa.
- **Null Hypothesis (H_a):** There is a statistically significant relationship between partnership for the goals and foreign capital in Africa.

2.9.4.3 Foreign capital, Food Security and Partnership with the Goal

Theoretically, foreign capital can influence food security by strengthening partnerships aligned with the SDGs. Increased flows of foreign capital encourage investment in research, technical expertise, and capacity-building, thereby facilitating the transition toward more resilient and sustainable food systems (Leal Filho, Dibbern et al., 2024; Beck & Ferasso, 2023; Horan, 2022; World Health Organisation, 2022). These contributions support the development of comprehensive policies and regulatory frameworks that promote sustainable food security. In particular, FDI serves as a key driver of agricultural development by introducing advanced technologies, improving infrastructure, and fostering modern farming practices, all of which enhance agricultural productivity and efficiency.

Foreign investment plays an importance role in farming and food security. When countries receive money from abroad, it often leads to better research and new farming techniques. For example, funds for agricultural research can produce crops that can survive tough conditions. This is crucial, especially with climate change and more people to feed. Smyth, Webb and Phillips (2021) say that when big companies, governments, and local farmers work together, they can improve food supplies and rural areas. Teamwork is key to fighting food insecurity around the world. Foreign investment helps local organisations manage

agricultural growth better. It pairs well with goals like Zero Hunger and responsible farming. This cooperation helps share knowledge and best practices among farmers.

Leal Filho, Sigahi et al. (2024) point out that partnerships are vital to getting the most out of FDI for sustainable progress. With foreign investment, countries can access new tech and skills to boost local farming. This not only supports food security but also strengthens local economies, especially in rural areas. Using foreign investment wisely can spark fresh ideas in agriculture. Money for things like irrigation, rural roads, and storage can help farmers do more while reducing food waste. This ensures food from rural areas reaches markets quickly, which is key for food security in developing countries.

Horan (2022) mentions the need for a strong plan to make these partnerships successful and meet sustainability goals. When governments, global organisations, private companies, and local communities join forces, they can create solid plans for food security. Foreign investment also often brings better farming techniques and tools. These advancements can help increase crop yields and lower environmental impact. Climate-smart practices like drought-resistant crops and improved land management can emerge from FDI. Many of these innovations come from large companies working with local partners.

Kumar et al. (2021) highlight that these advancements are essential for sustainable farming, especially when combined with local knowledge to improve ecosystem health. Good governance and clear partnerships are essential. Beck and Ferasso (2023) discuss how strong governance directs foreign investment toward sustainability projects in farming. countries need rules that support social good and protect the environment so that investments do not worsen inequalities or harm nature.

The World Health Organisation (2022) stresses the need for global cooperation and rules to ensure food safety and keep environmental standards in agricultural growth. By having

these regulations, governments can promote responsible investments that boost food security over time. In short, foreign investment, particularly through FDI, is critical for enhancing food security through sustainable farming. When it is used in partnerships with different groups, it can improve farm production, infrastructure, and shared knowledge. However, in order for these investments to be beneficial, they must be effectively managed in accordance with local needs and global sustainability objectives. As noted by Smyth, Webb and Phillips (2021) and Leal Filho, Sigahi et al. (2024), collaboration across different areas is key to creating lasting benefits for farming and the environment.

Despite these patterns, key gaps remain: most studies concentrate on FDI while overlooking other forms of foreign capital, such as remittances, portfolio investments, and development assistance, and there is limited empirical research on how governance structures and partnerships transform foreign capital into sustainable agricultural outcomes, especially in climate-vulnerable regions. Based on the above discussions, the thesis tested the following hypothesis:

- **Null Hypothesis (H₀):** There is no statistically significant relationship between foreign capital and food security conditions on partnerships for the goals in Africa.
- **Null Hypothesis (H_a):** There is a statistically significant relationship between foreign capital and food security conditions on partnerships for the goals in Africa

2.10 Conceptual framework

This study investigates the impact of foreign investment on sustainable development, with a particular focus on Zero Hunger (SDG 2) and Life on Land (SDG 15). The goal is to

understand how different forms of foreign capital contribute to agricultural productivity, food security, and environmental sustainability in developing countries.

Foreign capital, the central variable of this study, is captured through four main components: foreign direct investment (FDI), remittances, portfolio investment, and external debt shown in Figure I. Each represents a distinct dimension of financial inflows into developing economies. FDI involves long-term investments that often bring technological innovation, employment opportunities, and improved infrastructure. Remittances refer to funds sent home by migrants, which boost household income and support small-scale investments. Portfolio investment consists of more volatile, short-term financial flows such as stocks and bonds, while external debt encompasses loans obtained from international creditors under varying conditions. Together, these four components provide a comprehensive view of how foreign capital enters and influences developing economies.

To evaluate sustainable development outcomes, the study employs indicators linked to SDG 2 and SDG 15. SDG 2 seeks to eradicate hunger, achieve food security, and promote sustainable agriculture. Relevant indicators include food production levels, rates of undernourishment, and agricultural growth. In contrast, SDG 15 focuses on the sustainable management of terrestrial ecosystems, forest conservation, and biodiversity protection. Indicators such as forest cover, land degradation, and ecosystem health are used to assess environmental outcomes. By combining these measures, the study examines how foreign investment affects both agricultural productivity and ecological sustainability.

In addition, the study incorporates institutional quality as a key moderating factor influencing the relationship between foreign capital and sustainable development. Institutional factors are assessed from both political and economic perspectives. Political institutions are evaluated based on their stability, accountability, adherence to the rule of law, and government effectiveness factors that determine whether foreign capital is used productively or

mismanaged. Economic institutions, on the other hand, are examined through the lens of regulatory quality, property rights protection, and control of corruption, which collectively shape the efficiency with which foreign capital contributes to sustainable development goals.

Finally, the study integrates Partnerships for the Goals (SDG 17) to highlight the importance of collaboration in achieving sustainable outcomes. Strong partnerships among governments, private investors, international organizations, and local communities are crucial for ensuring that foreign capital supports both economic growth and environmental stewardship. Indicators of SDG 17, such as development financing, international cooperation, and inclusive policymaking, are used to assess how partnerships enhance the effectiveness of foreign investment in promoting the SDGs.

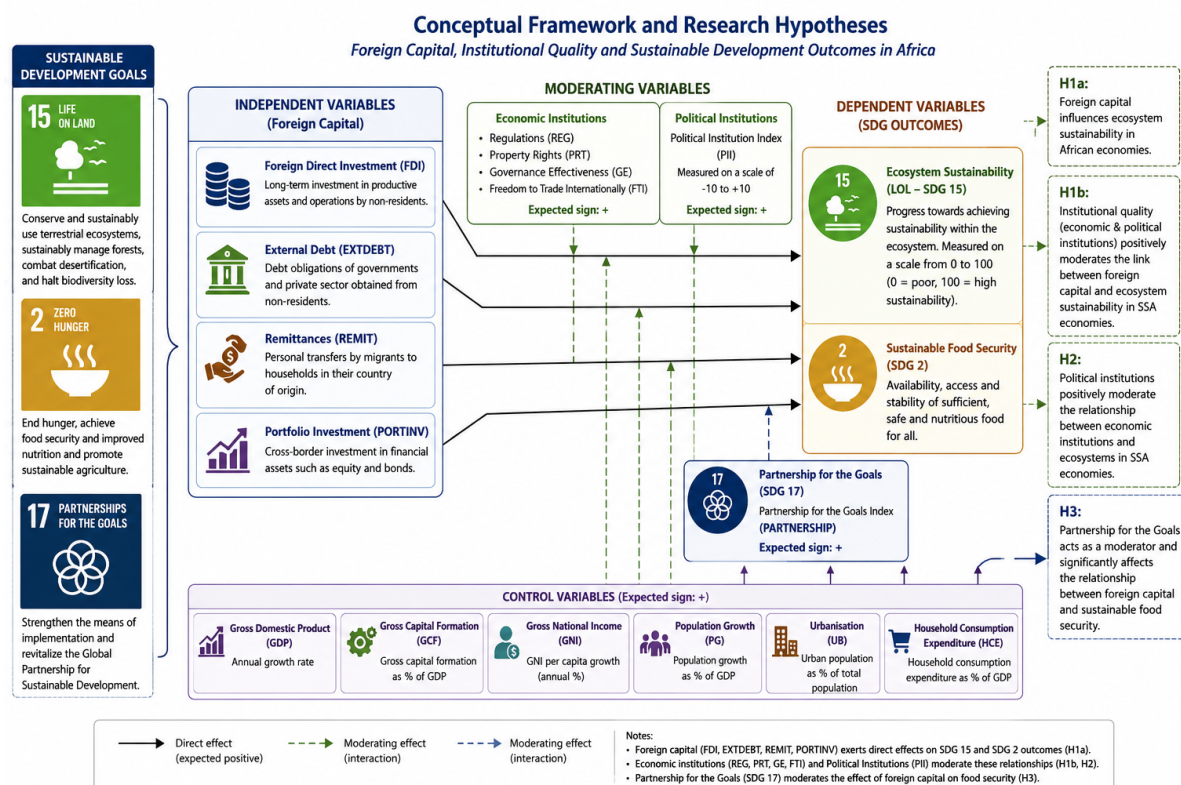


Figure 2.1: Conceptual framework of the study

Source: Author's computations, 2025

2.11 Summary of the Chapter

In summary, although, ecological crises are widespread globally, it is particularly severe in developing regions like Africa; however, empirical studies on this issue in these regions remain scanty. The few existing studies are largely focused on other regions including Europe and Asia, highlighting the need for African analysis of the phenomenon. Again, existing studies on ecology proxy the variable using ecological footprint, deforestation, forest destruction and land pollution, ignoring the sustainability of the entire SDG 15. In addition, the literature examining the relationship between foreign capital and ecosystems is still new, and the moderating role of institutional quality in the relationship has received little scholarly attention. Again, quality institutions can enhance the effectiveness of economic institutions by enforcing regulations, strengthening property rights and ensuring accountability, thereby promoting sustainable ecosystem management. However, little is known about how economic institutions conditioned on political institutions can influence ecosystem sustainability transition in Africa. Again, little is known concerning how international foreign capital flows support agriculture in promoting food security in Africa. Again, the literature examining the moderating role of partnership for the goals in foreign capital-food security transition is scarce.

3 CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

In this chapter, the study examines the comprehensive methodological strategies applied in conducting this study. Within this section, the researcher delves into various research philosophies, research paradigms, and the philosophical principles that shape the research. Additionally, the researcher explores the data sources and types employed in this thesis, outlines the criteria for country selection in the study, and details the analytical techniques utilised.

3.2 Research Philosophy

The positivist philosophy is adopted as a philosophical paradigm of the current study. A research paradigm refers to the underlying set of beliefs and assumptions that guide the choice of research methods and techniques. Park et al. (2020) classify research philosophies into three main types including positivism, interpretivism and pragmatism. The section outlines the philosophical stance of the current study, emphasizing how it informs the research design, including data collection, analysis and interpretation.

Positivism is categorically suitable when the aim is to identify observable patterns and trends in dataset. In the current study, key variables including ecosystem, food security, foreign capital and institutions are inherently quantifiable and lend themselves to objective measurement. Corry et al. (2019) highlight that a positivist approach prioritizes objectivity and researcher independence, minimizing personal bias in the analysis process. This objectivity is crucial when dealing with economic, financial and environmental variables, where conclusions must be based strictly on empirical evidence.

Therefore, by engaging a positivist philosophy, the study adopts a quantitative approach that emphasizes empirical validity and generalizability. The findings are intended to go beyond

the specific research context and offer insights that can inform policy and practice across broader settings. In this way, the positivist paradigm not only supports rigorous analysis in the current study but also contributes to addressing similar challenges in future.

3.3 Population

The population of the study consist of 48 economies in SSA. The region is selected because it is one among many vulnerable to environmental degradation, forest depletion, deforestation, pollution among others (World Bank, 2022). Again, the study focused on Sub-Saharan Africa due to the region's structural economic characteristics, dependence on foreign capital inflows, and environmental vulnerabilities relevant to the research objectives. As noted by Strong et al. (2020), selecting an appropriate population is essential for ensuring the availability of vital data that sufficiently serves the study's objective

3.4 Research Design

This study adopts a quantitative research design to empirically examine the impact of foreign capital on the achievement of Sustainable Development Goals (SDGs), with particular emphasis on the moderating influence of institutional quality. The quantitative approach is suitable because the study focuses on measurable variables such as foreign capital inflows, institutional indicators, and sustainable development outcomes that can be expressed numerically and analyzed statistically to identify patterns, relationships, and causal effects.

A quantitative design is also appropriate for this study because it enables the use of objective and replicable methods to test hypotheses and draw generalizable conclusions across multiple countries and time periods. By employing statistical tools, the study can quantify the magnitude and direction of the relationship between foreign capital and sustainable development while controlling for institutional quality and other country-specific

characteristics. This systematic approach enhances the precision and credibility of the findings, providing evidence-based insights relevant for policy formulation in developing economies.

The study adopts an explanatory research design, which is well-suited for identifying cause-and-effect relationships. Specifically, it seeks to determine how different forms of foreign capital such as foreign direct investment (FDI), remittances, portfolio investment, and external debt affect sustainable development outcomes represented by selected SDGs. It also examines how variations in institutional quality influence or moderate these relationships. The explanatory design thus allows for a deeper understanding of not just whether, but how and under what conditions, foreign capital contributes to sustainable development.

The dependent variable, sustainable development, is measured using indicators aligned with SDG 2 (Zero Hunger) and SDG 15 (Life on Land). SDG 2 focuses on eliminating hunger and achieving food security, which can be assessed through agricultural productivity, food production index, and the prevalence of undernourishment. SDG 15 relates to the sustainable management of terrestrial ecosystems, measured by forest cover, land degradation, and biodiversity indicators. These dimensions together reflect both human welfare and environmental sustainability.

The independent variable, foreign capital, is operationalized through four key components FDI, portfolio investment, remittances, and external debt to capture the multidimensional nature of financial inflows into developing countries. Each of these inflows plays a distinct role in influencing development outcomes, and examining them separately helps to provide a more nuanced understanding of their effects on sustainability.

The moderating variable, institutional quality, is captured using the Worldwide Governance Indicators (WGI), which include government effectiveness, rule of law, political

stability, control of corruption, and regulatory quality. Institutional quality is expected to shape how effectively foreign capital contributes to sustainable development, as strong institutions promote transparency, accountability, and efficient resource allocation.

The study focuses on developing countries in Africa, where foreign capital remains a vital source of development financing, yet institutional weaknesses often hinder its transformative potential. Using a panel dataset covering several years and countries, the study employs quantitative econometric techniques, particularly the Generalized Method of Moments (GMM), to address endogeneity concerns and unobserved heterogeneity.

3.5 Data Sources

The study collected secondary data for the econometrics estimations. Data on variables including foreign capital, ecosystem, food security among others are readily available on United Nations Department for Economic and Social Affairs (UNDESA), International Monetary Fund and World Bank. Data on other variables like government expenditure on agriculture was obtained from ReSAKS. Finally, data on remaining variables Polity 5, the Fraser Institute, and World Development Indicators of the World Bank database. To ensure data quality, the dataset was carefully screened for inconsistencies, outliers, and incomplete observations. The collected data were cross-checked with the original data sources to confirm accuracy and reliability. Additionally, variables were inspected for missing values, and appropriate procedures were applied to address them. Specifically, observations with substantial missing information were excluded, while minor missing values were treated using suitable data handling techniques to minimize bias and maintain the robustness of the analysis. These steps helped to improve the reliability and validity of the dataset used in the study.

3.6 Sampling

The process of choosing the most suitable sample for a research paper is both essential and difficult. It is customary for researchers to select between probability and non-probability sampling methods. This segment provides a concise overview of various sampling techniques and delineates our methodology for country selection in this thesis. The research solely utilises census population methods throughout all three essays, with a specific emphasis on Sub-Saharan Africa, which comprises a total of forty-eight countries. Our objective is to incorporate every single country in Sub-Saharan Africa to its maximum capacity. The study employed a census sampling strategy by including all 48 countries classified under Sub-Saharan Africa (SSA) according to standard regional classifications. No country was deliberately excluded at the design stage. Where countries had minor missing observations, appropriate data treatment procedures were applied. Observations with substantial data gaps across core variables were omitted to preserve the reliability and robustness of the panel analysis.

The thesis employs aggregated data for the entire SSA region in the first study, which examines the direct and effects of foreign capital on ecosystems. Again, the study further examines the role of institutional quality in the foreign capital-ecosystem nexus. The thesis utilises panel data for econometric analysis in the second study, which investigates the role of institutions on ecosystem. The third essay utilises panel data to examine the relationship between foreign capital and food security, conditioned on partnership for the goal. The panel data span from 2000-2022 and the reason for this time span is due to the fact that this is the period when government and other stakeholders in environmental protection have introduced measures to protect the ecosystem and food security. Hence, the study is interested in finding out how these policies can be sustainable for the long period of time toward the sustainability of the ecosystem transition drive and food security sustainability.

3.7 Data Collection

The study concentrated on 48 Sub-Saharan African countries because the region exhibits significant reliance on foreign capital, varying institutional quality, and pressing environmental and developmental challenges, making it an appropriate context for analysing the proposed relationships. The collection of secondary data would involve distinct sources. The initial aim of this study is to analyse the impact of foreign capital on key indicators of sustainable development goals, including SDG 15 and 2. The study relies on panel data on 48 countries from the World Development Indicators, Fraser Institute, UNDESA, and Polity5. Annual panel data was collected from 2000 until 2022. The first objective investigates the direct and indirect effects of foreign capital on ecosystems. Data on ecosystems was obtained from UNDESA. Panel data on 48 African countries from 2000 to 2022 was employed for the econometric estimation. The duration of the research was determined by the availability of data pertaining to the variables that are pertinent to the study's objectives. In addition, countries were selected based on the availability of consistent economic and environmental data over the specified period, ensuring a representative sample across diverse African economies. The second objective investigates the effect of institutions on the ecosystem in Africa. Data was obtained from 2000 to 2022 for the purpose of this objective; data on institutions was obtained from Polity 5 and the Fraser Institute. Panel data on 48 African countries from 2000 to 2022 was employed for the econometric estimation. The third objective investigate the effect of foreign capital on food security conditioned on partnership for the goal. Data on food security and partnership for the goal were obtained from UNDESA. Again, panel data on 48 African countries from 2000 to 2022 was employed for the econometric estimation. Nevertheless, the control variables remain consistent across all three objectives of the study. population growth rate, gross capital formation as a percentage of GDP, gross national income as a percentage of GDP, household consumption expenditure as a percentage of GDP, urbanisation as a percentage of the total population, and financial development except for the third objective where government

expenditure on agriculture is used as additional control variable. The data sources utilised to acquire all these variables were the World Development Indicators provided by the World Bank. However, government expenditure on agriculture was obtained from ReSAKSS.

3.8 Robustness check

To support the credibility of the findings, future studies should include some checks. To ensure the robustness of the empirical results, the Pooled Ordinary Least Squares (POLS) estimator was employed as an additional robustness check. POLS provides a baseline estimation approach that assumes homogeneity across cross-sectional units and helps verify whether the main results remain consistent under alternative estimation techniques. The use of POLS therefore allows for comparison with the primary estimation method and helps confirm the stability of the findings.

3.9 Model Specification and Estimation Strategy

This section specifies the empirical models used to address the research objectives and test the corresponding hypotheses. The empirical framework examines the relationships among foreign capital, institutional quality, ecosystem sustainability and food security in African economies. The models are grounded in New Institutional Theory, Dependency Theory and Ecological Modernisation Theory and draw on empirical studies examining the financial, economic, demographic and institutional determinants of sustainable development (Shinkevich, Kudryavtseva & Samarina, 2023; Dafermos & Nikolaidi, 2021; Bose, Dong & Simpson, 2019).

The analysis uses annual panel data for 48 Sub-Saharan African economies over the period 2000–2022, subject to data availability. The panel structure enables the study to account for both cross-country heterogeneity and changes over time. The principal estimation technique is the two-step System Generalised Method of Moments (System GMM), supplemented by dynamic panel threshold estimation where the research objective requires investigation of non-linear or threshold effects.

The empirical analysis is organised around the study hypotheses:

- **H1a:** Foreign capital influences ecosystem sustainability in African economies.

- **H1b:** Institutional quality positively moderates the relationship between foreign capital and ecosystem sustainability in Sub-Saharan African economies.
- **H2:** Political institutions positively moderate the relationship between economic institutions and ecosystem sustainability in Sub-Saharan African economies.
- **H3:** Partnership for the Goals moderates the relationship between foreign capital and sustainable food security in African economies.

3.9.1 Data Sources and Measurement of Variables

The study uses secondary data obtained from internationally recognised databases (Table 3.1). Ecosystem sustainability and food-security indicators are obtained from the United Nations Department of Economic and Social Affairs (UNDESA). Foreign-capital variables and the principal macroeconomic control variables are obtained predominantly from the World Bank's World Development Indicators (WDI). Measures of economic institutions are obtained from the Fraser Institute, while the Political Institutions Index is obtained from the Polity5 database. Financial-development indicators are obtained from the International Monetary Fund (IMF), and government expenditure on agriculture is obtained from ReSAKSS.

Two sustainable-development outcomes are examined. **Ecosystem sustainability (LOL)** represents progress towards SDG 15 (Life on Land) and is measured on a scale ranging from 0 to 100, where higher values represent greater progress towards ecosystem sustainability. **Food security (FS)** represents progress towards SDG 2 (Zero Hunger) and is similarly measured on a scale ranging from 0 to 100.

Foreign capital is operationalised through four components: foreign direct investment (FDI), external debt (DEBT), remittances (RM) and portfolio investment (PORT). In addition to estimating the effects of the individual foreign-capital components, a composite foreign-capital index (INDDEXFC) is employed where appropriate.

Institutional conditions are captured through economic and political institutional indicators. Economic institutions include regulations (REG), property rights (PRT), governance effectiveness (GE)

and freedom to trade internationally (OP). Political institutions are represented by the Political Institutions Index (PII). Partnership for the Goals (SDG 17) is used as the moderating variable in the model examining foreign capital and sustainable food security.

The principal control variables include gross domestic product growth (GDP), gross capital formation (GCF), gross national income per capita growth (GNI), population growth (PG), urbanisation (UB) and household consumption expenditure (HCE). Financial development (FM) and government expenditure on agriculture (GEA) are additionally included where required by the particular empirical model.

Table 3.1: Summary of Variables, Measurement and Data Sources

Variable	Description/Measurement	Data Source	Expected Sign
Ecosystem sustainability (LOL)	Progress towards SDG 15; index ranging from 0 to 100, with higher values indicating greater ecosystem sustainability	UNDESA	N/A
Food security (FS)	Progress towards sustainable food security under SDG 2; index ranging from 0 to 100	UNDESA	N/A
Foreign capital index (INDDEXFC)	Composite measure comprising FDI, remittances, external debt and portfolio investment	World Bank	+/-
External debt (DEBT)	External debt flows relative to GDP	WDI	+/-
Foreign direct investment (FDI)	FDI flows relative to GDP	WDI	+/-
Remittances (RM)	International remittance flows relative to GDP	WDI	+/-
Portfolio investment (PORT)	Foreign portfolio investment relative to GDP	WDI	+/-
Regulations (REG)	Regulation indicator measured on a 0–10 scale; higher scores indicate greater regulatory flexibility	Fraser Institute	+
Property rights (PRT)	Property-rights indicator measured on a 0–10 scale; higher scores indicate stronger property rights	Fraser Institute	+
Governance effectiveness (GE)	Coherence and effectiveness of government policies relevant to economic and ecosystem management	Fraser Institute*	+
Freedom to trade internationally (OP)	Measure of openness/freedom to trade internationally	Fraser Institute/WDI*	+

Political Institutions Index (PII)	Political institutional measure ranging from -10 to +10, with higher values indicating more democratic political institutions	Polity5	+
Partnership for the Goals (SDGP)	Progress towards SDG 17, measured on a 0–100 scale	UNDESA	+
Gross domestic product (GDP)	Annual GDP growth rate	World Bank	+
Gross capital formation (GCF)	Gross capital formation as a percentage of GDP	World Bank	+
Gross national income (GNI)	GNI per capita growth (annual %)	World Bank	+
Population growth (PG)	Annual population growth rate	World Bank	+/-
Urbanisation (UB)	Urban population as a percentage of total population	World Bank	+/-
Household consumption expenditure (HCE)	Household consumption expenditure as a percentage of GDP	World Bank	+/-
Financial development (FM)	Financial development indicator/index	IMF	+
Government expenditure on agriculture (GEA)	Government expenditure on agriculture relative to GDP	ReSAKSS	+

Source: Author's construct, 2025.

Note: The precise database and operationalisation of GE and OP should be verified against the final dataset before submission to ensure consistency between the thesis, dataset and data-source citations.

3.10 Model Specifications and Hypothesis Testing

3.10.1 Foreign Capital and Ecosystem Sustainability: H1a

The first component of the empirical analysis examines whether foreign capital influences ecosystem sustainability. Following Shinkevich et al. (2023), Dafermos and Nikolaidi (2021), and Bose et al. (2019), ecosystem sustainability may be influenced by financial, economic, demographic and institutional factors. The general functional relationship is therefore expressed as:

$$LOLo_{it} = f(FC, L, IQ, \dots) \dots \dots \dots 3.1$$

where (LOL_{it}) represents ecosystem sustainability for country (i) at time (t); (FC_{it}) represents foreign capital; (IQ_{it}) represents institutional quality; and (X_{it}) represents the vector of relevant control variables. Expanding the control variables gives:

$$LOL_{it} = f(FC, GDP, GCF, GNI, PG, UB HCE IQ,) \dots \dots \dots 3.2$$

Because ecosystem conditions are likely to exhibit persistence over time, the empirical model incorporates a lagged dependent variable. Following the dynamic specification adopted in related empirical studies (Mehmood, 2022; Kangal, 2023; Aminu & Alabi, 2024), the baseline dynamic model is specified as:

$$LOL_{it} = \alpha_0 + \alpha_1 LOL_{it-j} + \alpha_2 FC_{it} + \alpha_3 \sum X_{it} + \varepsilon_{it} \dots \dots \dots 3.3$$

Where LOL_{it} stands for ecosystem proxy across the cross-sections(i), number of countries (48) over the period (t) of 22; 2000 to 2022, LOL_{it-j} , represents the lag of the explained variable (ecosystem), FC is the main explanatory variable (foreign capital), X is a vector of control variables such as gross domestic product, gross capital formation, gross national income, population growth, urbanisation, household consumption expenditure and institutional quality, and ε_{it} is the error term.

To determine whether different forms of foreign capital exert heterogeneous effects, the aggregate specification is decomposed into external debt, FDI, remittances and portfolio investment, consistent with the distinction among foreign-capital flows emphasised by Sahay et al. (2015):

$$LOL_{it} = \alpha_0 + \alpha_1 LOL_{it-j} + \alpha_2 DEBT_{it} + \alpha_3 \sum X_{it} + \varepsilon_{it} \dots \dots \dots 3.4$$

$$LOL_{it} = \alpha_0 + \alpha_1 LOL_{it-j} + \alpha_2 FDI_{it} + \alpha_3 \sum X_{it} + \varepsilon_{it} \dots \dots \dots 3.5$$

$$LOL_{it} = \alpha_0 + \alpha_1 LOL_{it-j} + \alpha_2 RM_{it} + \alpha_3 \sum X_{it} + \varepsilon_{it} \dots \dots \dots 3.6$$

$$LOL_{it} = \alpha_0 + \alpha_1 LOL_{it-j} + \alpha_2 PORT_{it} + \alpha_3 \sum X_{it} + \varepsilon_{it} \dots \dots \dots 3.7$$

The estimated coefficients on the foreign-capital variables provide the empirical basis for evaluating **H1a**. Given that the literature identifies both potentially beneficial and potentially adverse environmental consequences of foreign-capital flows, the empirical analysis determines the direction and statistical significance of these relationships rather than assuming that all forms of foreign capital necessarily produce identical ecosystem effects.

3.10.2 Moderating Role of Institutional Quality: H1b

The study further proposes that the effect of foreign capital on ecosystem sustainability is conditional on institutional quality. Institutional arrangements can influence the manner in which foreign resources are allocated, regulated and monitored and may therefore alter the environmental consequences of foreign-capital inflows.

To test **H1b**, an interaction term between foreign capital and institutional quality is incorporated into the baseline dynamic model:

$$LOL_{it} = \alpha + \sum_{j=1}^p \beta^j X_{it} + \varepsilon_{it} \quad (3.8)$$

where i represents the countries of sampled ($i = 1, \dots, N$), t represents year/time dimensions within the series ($t = 1, \dots, T$), $X_{i,t}$ stands for the vector of explanatory regressors including the threshold variable (foreign capital), α_i is the country-specific fixed effect, $\varepsilon_{it} \approx (0, \sigma^2)$ is the independently and identically distributed error term.

A positive and statistically significant α would provide support for **H1b**, indicating that improvements in institutional quality strengthen the contribution of foreign capital to ecosystem sustainability or attenuate an otherwise adverse effect of foreign capital.

The interpretation of the interaction is based on the conditional marginal effect of foreign capital:

$$LOL_{it} = \alpha + \beta_1^1 X_{it} I(FC_{it} \leq \gamma) + \beta_2^1 X_{it} I(FC_{it} > \gamma) + \varepsilon_{it} \quad (3.9)$$

$I(.)$ is the indicator function specifying the regime, γ is the threshold parameter that divides the equation into two regimes slope coefficients β_1 and β_2 . More explicitly, if $X_{i,t}$ includes the lagged value of the dependent variable, equation (4.10) presents the dynamic panel threshold model to determine the threshold effect of the financial development on the ecosystems.

Thus, the effect of foreign capital on ecosystem sustainability is conditional upon the prevailing level of institutional quality.

3.11 Economic Institutions, Political Institutions and Ecosystem Sustainability: H2

The second objective examines the effect of economic institutions on ecosystem sustainability and determines whether this relationship is conditioned by the quality of political institutions.

Economic institutions are represented by regulations (REG), property rights (PRT), governance effectiveness (GE) and freedom to trade internationally (OP). The baseline dynamic model is specified as:

$$LOL_{it} = \mu_i + \beta_1 FC_{it} I(FC_{it} \leq \gamma) + \delta_1 I(FC_{it} \leq \gamma) + \beta_1 FC_{it} I(FC_{it} > \gamma) + \varphi X_{it} + \varepsilon_{it} \quad (3.10)$$

where μ_i captures unobserved country-specific effects and ε_{it} represents the idiosyncratic error term.

To test whether political institutions moderate the relationship between economic institutions and ecosystem sustainability, the Political Institutions Index is introduced together with the relevant interaction term. Let $(ECON_{it})$ denote the economic-institutions construct/index and (PII_{it}) denote the Political Institutions Index. The moderation model is specified as:

$$Y_{it} = \beta_0 + \alpha_i Y_{it-1} + \beta_1 X_{it} + \beta_2 X_{2i,t} + \dots + \beta_n X_{t,in} + \epsilon_i + \eta_{it}, t = 1, 2, \dots, t \quad (3.11)$$

Where Y_{it} is the dependent variable; Y_{it-1} is the lag of the dependent variable Y ; X_{it} is $k \times 1$ matrix of independent variables; α is the coefficient of the lagged predictor; β is the coefficient of other predictor variables; ϵ_i is the error term.

The coefficient β_0 is the principal parameter for testing **H2**. A positive and statistically significant interaction coefficient indicates that stronger political institutions positively condition the relationship between economic institutions and ecosystem sustainability.

The conditional marginal effect of economic institutions is therefore:

$$LOL_{it} = \beta_0 + \beta_1 LOL_{it-1} + \beta_2 REG_{it} + \beta_3 PROPT_{it} + \beta_4 GE_{it} + \beta_5 OP_{it} + \beta_6 GDP_{it} + \beta_7 GNI_{it} + \beta_8 FM_{it} + \beta_9 GCF_{it} + \beta_{10} PG_{it} + \beta_{11} UB_{it} + \beta_{12} HCE_{it} + \epsilon_i + \eta_{it} \quad (3.12)$$

Where LOL = Ecosystem; LOL_{it-1} = the lagged value of ecosystem; REG = regulations; $PROPT$ = property rights; GE = government effectiveness; OP = the freedom to trade internationally; GDP = Gross Domestic Products; ub = urbanization; GNI = Gross National Income; FM = financial development index; GCF = Gross capital formation; PG = Population Growth; HCE = household consumption expenditure, β = coefficient of the variables; i = Number of countries; t = the time period; ϵ = the error term; η_{it} = unobservable individual-specific effect.

This formulation permits the study to determine whether the ecosystem effect of economic institutions changes according to the strength of the political institutional environment.

Where the empirical analysis estimates REG , PRT , GE and OP separately rather than through an aggregate economic-institutions index, corresponding interaction terms between each institutional dimension and PII should be specified and reported consistently with the actual estimations.

3.12 Foreign Capital, Partnership for the Goals and Sustainable Food Security: H3

The third objective examines the relationship between foreign capital and sustainable food security and assesses whether Partnership for the Goals (SDG 17) conditions this relationship.

Food security is represented by the SDG 2 index obtained from UNDESA. Foreign capital is represented by external debt, FDI, remittances and portfolio investment. Government expenditure on agriculture, financial development and relevant macroeconomic and demographic variables are included as controls.

The baseline food-security model is specified as:

$$FS_{it} = \alpha_0 + \alpha_1 FS_{it-1} + \alpha_2 DEBT_{it} + \alpha_3 FDI_{it} + \alpha_4 RM_{it} + \alpha_5 PORT_{it} + \alpha_6 SDGP_{it} + \alpha_7 GDP_{it} + \alpha_8 FM_{it} + \alpha_9 GEA_{it} + \alpha_{10} PG_{it} + \alpha_{11} UB_{it} + \alpha_{12} HCE_{it} + \epsilon_i + \eta_{it} \quad (3.13)$$

Where FS = food security; LOL_{it-1} = the lagged value of food security; $DEBT$ = external debt; FDI = foreign direct investment; RM = remittances; $PORT$ = is portfolio investment; $SGDP$ = partnership with the goal; ub = urbanization; GEA = Government expenditure on agriculture; FM = financial development index; GCF = Gross Capital Formation; PG = Population Growth; HCE = household consumption expenditure, α = coefficient of the variables; i = Number of countries; t = the time period; ϵ = the error term; η_{it} = unobservable individual-specific effect.

To test **H3**, an interaction term between foreign capital and Partnership for the Goals is introduced:

$$FS_{it} = \alpha_0 + \alpha_1 FS_{it-1} + \alpha_2 DEBT_{it} + \alpha_3 FDI_{it} + \alpha_4 RM_{it} + \alpha_5 PORT_{it} + \alpha_6 SDGP_{it} + \alpha_7 GEA_{it} + \alpha_8 GDP_{IT} + \alpha_9 (FC * SDGP)_{it} + \alpha_{10} FM_{it} + \alpha_{11} PG_{it} + \alpha_{12} GCF_{it} + \alpha_{13} UB_{it} + \alpha_{13} HCE_{it} + \epsilon_i + \eta_{it} \quad (3.14)$$

The coefficient α_4 represents the moderating effect of Partnership for the Goals. A statistically significant interaction coefficient provides evidence that the effect of foreign capital on food security varies according to countries' progress towards SDG 17.

The corresponding conditional effect is:

$$\frac{\partial FS_{\{it\}}}{\partial FC_{\{it\}}} = \alpha_2 + \alpha_4 SDGP_{it} \quad (3.15)$$

A positive and statistically significant α_4 would support the hypothesised positive moderating role of Partnership for the Goals.

Where the four foreign-capital components are entered separately in the empirical estimation, the interaction model should correspondingly estimate:

$$DEBT \times SDGP, FDI \times SDGP, RM \times SDGP, PORT \times SDGP \quad (3.16)$$

This enables the study to determine whether SDG 17 conditions the food-security effects of different forms of foreign capital differently.

3.13 Estimation Strategy

3.13.1 Two-Step System Generalised Method of Moments

The principal estimator employed in the study is the two-step System Generalised Method of Moments. The selection of System GMM is informed by the dynamic nature of the empirical relationships and the structure of the panel dataset.

First, the panel consists of a relatively large cross-sectional dimension and a shorter time dimension, comprising up to 48 countries observed over the period 2000–2022. This panel structure is consistent with applications of dynamic-panel GMM in the finance and development literature (Tchamyou & Asongu, 2017; Roodman, 2009).

Second, ecosystem sustainability and food security may exhibit persistence. Current sustainable-development outcomes may partly reflect conditions inherited from previous periods. For example, ecosystem degradation in one period may affect ecosystem conditions in subsequent periods because environmental restoration requires both time and resources. Similarly, food-security conditions may persist through agricultural capacity, infrastructure and household vulnerability. The models therefore incorporate lagged dependent variables.

Third, including $LOL_{i,t-1}$ or $FS_{i,t-1}$ among the regressors can create correlation between the lagged dependent variable and the composite error term. In addition, the relationships examined may be affected by simultaneity, omitted variables and other sources of endogeneity (Anderson & Hsiao, 1981; Arellano, 2003; Hall, 2015).

System GMM is appropriate in this setting because it employs internal instruments derived from suitable lagged values of endogenous or predetermined variables. This permits the study to address potential endogeneity while controlling for unobserved country-specific heterogeneity (Roodman, 2009; Tchamyou & Asongu, 2017). The estimator combines equations expressed in first differences with equations expressed in levels, subject to the relevant moment conditions.

The use of System GMM is also consistent with applications in the finance and ecological literature (Khan, Khan & Zuojun, 2022; Asongu, Uduji & Okolo-Obasi, 2020; Lagoarde-Segot, 2020).

However, the validity of GMM estimates depends on the appropriateness of the instruments and the absence of problematic higher-order serial correlation. These conditions are therefore evaluated through post-estimation specification tests.

The study employs the **two-step System GMM estimator** and reports the relevant specification diagnostics. Particular attention is given to avoiding excessive instrument proliferation because a very large instrument set can weaken the reliability of the Hansen test and overfit endogenous variables (Roodman, 2009).

3.13.2 Dynamic Panel Threshold Estimation

The linear models establish the average relationship between foreign capital and sustainable-development outcomes. However, the literature suggests that the effect of foreign capital on ecosystem sustainability may not necessarily be linear. Foreign capital may initially have adverse ecosystem effects but become beneficial after particular economic, institutional or financial conditions are reached (Wang & Uctum, 2024; Saqib, Ozturk, Usman, Sharif & Razzaq, 2023).

The study therefore supplements the linear dynamic-panel analysis with a dynamic panel threshold model. Hansen (1999) initially developed a static panel threshold framework under assumptions of strict exogeneity. Subsequent developments accommodated gradual regime transitions and endogenous regressors (González, Teräsvirta & Van Dijk, 2005; Caner & Hansen, 2004; Kremer, Bick & Nautz, 2013).

The non-threshold specification can be represented as:

$$LOL_{it} = \mu_i + \beta' X_{it} + \varepsilon_{it} \quad (3.17)$$

where X_{it} represents the vector of explanatory variables and μ_i represents country-specific effects.

Introducing foreign capital as the threshold variable gives:

$$LOL_{it} = \mu_i + \beta_1' X_{it} I(FC_{it} \leq \gamma) + \beta_2' X_{it} I(FC_{it} > \gamma) + \varepsilon_{it} \quad (3.18)$$

where $I(\cdot)$ is an indicator function, γ is the estimated threshold parameter, and β'_1 and β'_2 represent the slope coefficients below and above the estimated threshold respectively.

For the dynamic specification, the lagged dependent variable is incorporated into the model:

$$LOL_{it} = \mu_i + \rho LOL_{i,t-1} + \beta_1 FC_{it} I(FC_{it} \leq \gamma) + \beta_2 FC_{it} I(FC_{it} > \gamma) + \phi' X_{it} + \varepsilon_{it} \quad (3.19)$$

Following Seo and Shin (2016) and Seo, Kim and Kim (2019), the study employs a dynamic-panel threshold framework capable of accommodating endogenous covariates and lagged dependent variables. The approach also permits testing whether the relationship is better represented by a threshold or kink rather than assuming an abrupt discontinuity between regimes.

Foreign capital serves as the threshold variable. The estimated threshold (γ) identifies the point at which the relationship between foreign capital and ecosystem sustainability changes. The coefficients below and above the threshold are then compared to establish whether the magnitude or direction of the foreign-capital effect differs across regimes.

3.14 Diagnostic and Specification Tests

The validity of the empirical findings depends on appropriate assessment of the statistical assumptions underlying the estimated models. Diagnostic testing is therefore undertaken before and after estimation.

3.14.1 Multicollinearity

Multicollinearity among explanatory variables is assessed using the Variance Inflation Factor (VIF). Excessive multicollinearity can inflate standard errors and make individual coefficient estimates unstable. The VIF results are reported in the relevant appendix and are used to establish whether the explanatory variables can be included jointly in the empirical models.

3.14.2 Endogeneity

Potential endogeneity is considered both theoretically and empirically. The Durbin-Wu-Hausman procedure is used as one diagnostic assessment of whether particular regressors may be endogenous. However, the use of dynamic System GMM is not based solely on this test. The inclusion of a lagged dependent variable, possible simultaneity between sustainable-development outcomes and explanatory variables, unobserved country heterogeneity, and potential omitted-variable effects provide additional grounds for adopting a dynamic-panel estimator.

Accordingly, variables are classified as endogenous, predetermined or exogenous according to the theoretical structure of each model, and appropriate lagged instruments are employed in the System GMM estimation.

3.14.3 Arellano-Bond Serial-Correlation Tests

The Arellano-Bond AR(1) and AR(2) tests are employed to evaluate serial correlation in the first-differenced residuals. First-order serial correlation may arise mechanically following first differencing. The critical diagnostic for the validity of the dynamic-panel specification is therefore the absence of statistically significant second-order serial correlation.

Accordingly, the null hypothesis for the AR(2) test is that there is no second-order serial correlation. Failure to reject this null hypothesis supports the validity of the model specification and the use of the selected lagged instruments.

3.14.4 Hansen and Sargan Tests of Instrument Validity

The Hansen J-test and, where applicable, the Sargan test are employed to assess the validity of the over-identifying restrictions. The null hypothesis is that the instruments are jointly valid and uncorrelated with the error term.

Consequently, failure to reject the null hypothesis provides support for the validity of the instrument set. The Hansen test is interpreted together with the number of instruments, because

instrument proliferation can weaken its diagnostic power. Where necessary, the instrument matrix is restricted or collapsed to maintain a parsimonious and defensible instrument set (Roodman, 2009).

3.14.5 Threshold and Linearity Tests

For the dynamic threshold models, the study tests whether the threshold specification provides a statistically meaningful improvement over a linear specification. Consistent with Seo and Shin (2016) and Seo et al. (2019), the analysis assesses the presence of threshold or kink effects before interpreting regime-specific coefficients.

Collectively, these tests provide evidence regarding model adequacy, instrument validity and the robustness of the estimated relationships.

3.15 Interpretation of Moderating Effects

The study contains three conceptually distinct moderation relationships and therefore interprets interaction coefficients carefully.

For **H1b**, institutional quality conditions the relationship between foreign capital and ecosystem sustainability:

$$FC \times IQ \rightarrow LOL \quad (3.20)$$

For **H2**, political institutions condition the relationship between economic institutions and ecosystem sustainability:

$$ECON \times PII \rightarrow LOL \quad (3.21)$$

For **H3**, Partnership for the Goals conditions the relationship between foreign capital and sustainable food security:

$$FC \times SDGP \rightarrow FS \quad (3.22)$$

A statistically significant interaction coefficient indicates that the effect of the relevant independent variable on the dependent variable varies according to the level of the moderator. The interaction coefficient is therefore interpreted jointly with the main effects rather than independently.

Where appropriate, conditional marginal effects are computed to demonstrate how the estimated effect changes at different values of the moderator. This approach provides a clearer interpretation of moderation than relying solely on the sign and significance of the interaction coefficient.

3.16 Alignment of Objectives, Hypotheses and Empirical Models

The alignment between the study objectives, hypotheses, variables and estimation models is summarised in Table 3.2.

Table 3.2: Alignment of Research Hypotheses and Empirical Models

Hypothesis	Relationship Tested	Dependent Variable	Main Explanatory Variable	Moderator	Principal Estimation
H1a	Foreign capital ecosystem sustainability →	LOL – SDG 15	FC; DEBT; PORT	FDI; RM; —	Two-step System GMM; Dynamic Threshold
H1b	Foreign capital institutional quality × ecosystem sustainability →	LOL – SDG 15	Foreign capital	Institutional quality	Two-step System GMM interaction model
H2	Economic institutions × political institutions → ecosystem sustainability	LOL – SDG 15	REG, GE, ECON	PRT, OP / Political Institutions Index	Two-step System GMM interaction model
H3	Foreign capital × Partnership for the Goals → food security	FS – SDG 2	FC; DEBT; PORT	FDI; RM; Partnership for the Goals – SDG 17	Two-step System GMM interaction model

Source: Author's construct, 2025.

This alignment ensures that each hypothesis is linked directly to an identifiable empirical model and corresponding estimated parameter.

3.17 Ethical Considerations

The study adheres to established ethical principles governing research based on secondary data. No primary data were collected from human participants and, consequently, the study did not involve

direct issues of informed consent, participant confidentiality or the collection of personally identifiable information.

The data were obtained from publicly available and recognised institutional sources, including the World Bank's World Development Indicators, UNDESA, the Fraser Institute, Polity5, the International Monetary Fund and ReSAKSS. The datasets are aggregated at country level and contain no personally identifiable information.

Academic integrity was maintained through appropriate acknowledgement and citation of all datasets, theoretical sources and empirical literature. Data preparation, transformation and econometric estimation were undertaken systematically, and the empirical results are reported transparently subject to the assumptions and limitations of the selected econometric techniques.

The study further recognises that the interpretation of cross-country sustainable-development indicators must be undertaken cautiously because the underlying data are compiled by third-party institutions and may differ in coverage and completeness across countries and years. These considerations are acknowledged when interpreting the empirical findings and assessing their policy implications.

Overall, the research uses secondary data responsibly and seeks to contribute to policy debates on sustainable development, institutional accountability, environmental sustainability and food security in African economies.

3.18 Chapter summary

This chapter discussed the methodology employed in the research. The work follows a positivist approach, uses an explanatory design, and focuses on quantitative methods. It also reviewed different panel econometric models and explained which estimation techniques were best suited for this study.

4 CHAPTER FOUR: FINDINGS AND INTEPRETATION

4.1 Introduction

The chapter presents the empirical findings, and all the interpretations are done based on the econometric methodology discussed in Chapter 3. The results are presented based on the three objectives; the study presents on objective one followed by objective two and three, respectively.

Objective one: The impact of foreign capital on ecosystem in Africa role of institutional quality.

In this section the study focused on the first objective which seeks to investigates the direct, indirect and threshold effect of foreign capital on ecosystem sustainability. The presentation starts with the empirical findings and discussion of the results in literature.

Table 4.1 presents the results of the descriptive statistics. The dependent variable, thus is ecosystem sustainability, which captures a country's progress towards achieving sustainability within the ecosystem (SDG15) score is measured on the scale of 0 to 100. This indicator records an average of approximately 26.56 percent. This indicator records an average of approximately 26 percent which is 24 percent shy of the median mark of 50 percent. If the sample countries aim to advance in achieving SDG15 by 2030, there is ample opportunity for enhancement (Huan & Zhu, 2023; Sartore-Baldwin, 2022). The overall foreign capital index has an average score of 66.40624, 53.54855 percent for external debt, 22.283509 percent for FDI, 4.283509 percent for remittances and 30.6308 percent for portfolio investment. The output reveals that the African continent is foreign capital dependent. The economic institution variable was scored from 0 to 10. The average score for the economic institution index (ECON) is 7.65. This indicates that the African countries in our sample have pretty strong economic systems. The property rights (PR) score is 4.68. The integrity of legal systems (ILS) gets an average of 4.95.

The regulations and the Legal System and Property Rights (LSPR) score even lower, at 4.43 and 4.16, which reveals they are doing okay, but not great. On the other hand, the political institution index is measured from -7 to +7. It scores an average of 1.61. This low score points to weak political systems in these countries. A score of 1.61 means they struggle with issues like poor governance and lack of accountability. This difference in the strength of economic and political systems may affect the overall ecosystem.

Table 4.1: Descriptive statistics

Variables	Observation	Mean	Maximum	Minimum	Std. Dev.
LOL	1008	26.57426	95.89900	0.000000	20.57136
FC	1008	66.40624	89.58209	23.93498	45.73408
IQ	1008	0.134522	0.590000	0.000000	0.101748
GDP	1008	3.839601	63.37988	-36.39198	5.419668
GCF	1008	17.89927	76.78231	0.000000	12.38128
GNI	1008	2.881077	49.68389	-23.20987	5.061648
PG	1008	38.96538	90.09200	0.120000	17.03736
UB	1008	3.670559	8.368037	-4.502432	1.533196
HCE	1008	55.90371	133.1094	0.674889	33.02063
DEBT	1008	53.54855	89.4519	40.03546	63.92286
FDI	1008	22.283509	65.3374	-17.29224	8.046528
RM	1008	3.061444	53.8264	0.982	5.68280
PORT	1008	30.6308	51.4398	15.9723	14.7283
ECON	1008	7.65543	0.96575	4.76489	8.78644
POLITY	1008	1.61354	0.96532	0	8.97641
ILS	1008	5.560055	1.982518	1.226054	8.753286
LSPR	1008	5.529907	1.283142	0	9.672501
RGQ	1008	5.679261	1.196947	1.196947	0.656025
PR	1008	4.680762	1.023956	2590877	9.672501
GEFF	1008	4.752359	1.150494	0	4.655990

Source: Author's construct, 2025

4.2 Correlation

Table 4.2 and *Table 4.3* presents results on the pairwise correlation matrix. The correlation matrix in this study is used to assess the potential existence of multicollinearity amongst the variables. The results in represent correlation among the institutional structures and foreign capital flows. Partly high correlation coefficients are recorded among the variables. Hence, the institutional structure variables enter the model in turns. Also, the first lag of the dependent variable is included in the matrix. The correlation coefficient of 0.904 between the dependent variable (LOL) and its first lag (L.LOL) in *Table 4.3* indicates the presence of persistence in the outcome variable (sustainable ecosystem). A coefficient above 0.8 is an indication that GMM is an appropriate technique (Asongu, Orim & Nting, 2019; Tchamyou, Erreygers & Cassimon, 2019; Tchamyou & Asongu, 2017; Blundell & Bond, 1998).

Table 4.2: Correlation Part 1

	LOL	FM	GDP	GCF	GNI	PG	UB	HCE
LOL	1.000000							
FM	-0.07484	1						
GDP	0.296803		1					
GCF	-0.02753	0.031770		1				
GNI	-0.02329	0.035354	0.192290		1			
PG	-0.07875	0.043500	-0.05236	-0.05236		1		
UB	0.308535	-0.11427	0.311673	0.230300	0.311673		1	
U	-0.03421	-0.11427	-0.0342	0.052239	-0.2728	0.113244		1
HCE	0.092779	0.052239	0.09277	0.025772	-0.1958	0.195871	-0.124	1

Source: Author's construct 2025

Table 4.3: Correlation Part 2

	LOL	POLITY	ECON	FC	DBT	FDI	RM	PORT	Lag 1
LOL	1								0.904
POLITY	0.15	1							
ECON	0.123	0.792	1						
FC	0.159	0.879	0.898	1					

DEBET	0.192	0.857	0.906	0.921	1			
FDI	0.120	0.731	0.791	0.816	0.749	1		
RM	0.247	0.721	0.671	0.794	0.711	0.676	1	
PORT	0.070	-0.04	-0.07	-0.07	-0.048	0.027	-0.05	1

Source: Author's construct 2025

4.3 Cross-section Dependency Test (CD)

A common assumption in panel data analysis is that error terms are cross-sectionally independent. In practice, however, cross-sectional dependence is pervasive in panel datasets, particularly where countries are exposed to shared shocks, spillovers, or common institutional and economic dynamics (Adams et al., 2022; Pesaran et al., 2001). Ignoring such dependence can generate serious econometric problems and lead to biased or inefficient estimates. Consequently, this study explicitly tests for cross-sectional dependence.

The results of the Pesaran (2004) cross-sectional dependence (CD) test, reported in Appendices I, strongly reject the null hypothesis of cross-sectional independence at the 1% significance level. This outcome underscores the presence of cross-country interdependencies and highlights the necessity of accounting for cross-sectional dependence in the empirical analysis.

4.4 Heterogeneous Panel Unit Root Test

Table J confirms the presence of cross-sectional dependence in the data, which warrants the use of panel unit root tests that explicitly account for such dependence. Consequently, second-generation unit root tests, namely the CADF and CIPS tests, were applied. As reported in Appendices I, the results indicate that the variables are stationary at least after first differencing, implying integration of order one, $I(1)$. Specifically, the CADF results show that climate action and budget transparency attain stationarity at the first-difference level, a conclusion that is further supported by the CIPS test.

4.5 Pre-Estimation Diagnostic Tests

To encourage policy implications from the findings, it is imperative to ensure consistency, unbiased and efficient coefficients. As a results, the study tested for endogeneity, multicollinearity. The study employed Du-Wu-Hausman Test for Endogeneity. According to the findings in Appendices, D, it is evidence that there is no presence of endogeneity in the dataset. In addition, the study tested for evidence of multicollinearity in the dataset by employing Variance Inflation Factor (Appendix C). Findings revealed no evidence of multicollinearity in the studied variables. In essence, the study proceeded by employed the two-step System Generalized Methods of movement and dynamic panel threshold estimation techniques following (Seo et al., 2019). Again, the p-values of the Arellano-Bond AR(2) and Hansen tests indicate that the null hypotheses of no second-order serial correlation and valid over-identifying restrictions cannot be rejected, confirming the suitability of the instruments used to address endogeneity.

4.6 Model Selection – DGMM/SGMM

The results in *Table 4.4* reveal that the coefficient of the lag dependent variable (LLOL) in the two-step differenced GMM model is less than the same coefficient in the upper bound estimator (POLS) and the lower bound estimator (FE). This indicates that the difference GMM is inefficient and biased in estimating the features of the data (Kusi, 2021; Bond, 2002; Bond, Hoeffler & Temple, 2001). Hence, the system GMM is econometrically efficient and is deployed in the study.

Table 4.4: Model Selection Between Difference-and-System-GMM

VAR	POLS	FE	Two-Stem DGMM
LOL(-1)	0.97*** (0.009)	0.64*** (0.03)	0.51*** (0.01)
FC	-3.39 (3.51)	-2.04 (3.95)	-4.6 (8.15)

GDP	0.04 (0.04)	0.008 (0.03)	0.02 (0.003)***
GCF	0.01 (0.02)	0.03 (0.02)	0.01 (0.002)***
GNI	0.01 (0.04)	0.004 (0.04)	0.09 (0.005)***
HCE	-0.007 (0.006)	-0.004 (0.01)	0.04 (0.003)***
PG	0.002 (0.01)	0.12 (0.06)**	0.02 (0.01)*
UB	-0.05 (0.11)	0.05 (0.25)	-0.09 (0.02)***
C	1.43 (0.74)**	11.02 (2.53)***	
Year dummies			YES
R-squared	0.932899	0.944431	
Number of countries	48	48	48
P-value: AR (1)			0.091
AR (2)			0.35
Sargan			0.73
Hansen			0.864

Source: Author's construct 2025; Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

4.7 Effect of Foreign Capital on Sustainable ecosystem in Africa

This sub-section presents both the results and discussions of the study. The results in *Table 4.5* reveal the direct linear effect of foreign capital sub-indicators on ecosystem transition from the SGMM. Also, the SGMM result on the threshold effect of foreign capital and ecosystem nexus in Africa is presented in *Table 4.6*.

The findings based on the results indicate that the lag value of sustainable ecosystem (L.LOL) has a statistically significant positive effect on the present level of sustainable ecosystem in Africa, as indicated in all columns in *Table 4.5*. This confirms that the use of SGMM is econometrically sound and appropriate. The foreign capital flows, including FDI,

RM and DEBT presented in columns 1, 2 and 4 are found to have a negative effect on sustainable ecosystems in Africa within the period of the study. External debt, FDI and RM were found to be significant at the 1 percent level of significance. On the contrary, PORT was found to have a positive but insignificant effect on sustainable ecosystems in Africa.

The findings of this study, which reveal that Foreign Direct Investment (FDI), external debt, and remittances have a negative and statistically significant effect on ecosystems in Africa, while portfolio investment demonstrates a positive but statistically insignificant impact, carry important implications for policy and future research. These results both challenge and complement existing literature in several ways, providing fresh insights into the complex relationships between financial flows and ecological sustainability in Sub-Saharan Africa.

Column 1 of *Table 4.5* report that external debt has a statistically significant influence on ecosystem sustainability. The result indicate that external debt has negative effect on ecosystem. Meaning that increase in external debt flows to SSA lead to ecological crises in the region. The finding is consisted with hypothesis one which state that external debt has statistically significant effect on ecosystem sustainability in SSA. Again, the results is contrary to the ecological modernization theory employed as the theoretical foundation of the study. The theory posits that foreign capital and innovation are key in resolving ecological crises.

Again, the findings reported in column 2 of *Table 4.5* report that FDI lead to ecological crises in SSA. This outcome contradicts ecological modernization theory which state that finance promote ecological development. The finding is consisted with the pollution haven hypotheses which state that firms could relocate to economies with weaker environmental regulations to cut costs of doing business. The findings support the second hypothesis that FDI has a significant effect on ecosystem sustainability. The results align with concerns raised in previous studies. For example, research by Akinlo (2015) and Asiedu (2013) highlights that FDI, particularly in resource-intensive industries like mining, agriculture, and infrastructure,

often leads to environmental degradation. This is especially relevant for Africa, where much of the FDI is directed toward sectors that contribute to deforestation, land degradation, and biodiversity loss. The findings in this study confirm that FDI's extractive nature exacerbates environmental issues by over-exploiting natural resources, reinforcing the concerns raised in earlier research. Similarly, external debt has long been associated with environmental degradation in African countries, as noted by Battaile, Hernández and Norambuena (2015). Heavily indebted nations often prioritise debt repayment over environmental protection, limiting their ability to fund conservation programmes and weakens environmental governance. This study echoes that sentiment, demonstrating that while external debt may support short-term economic growth, it can undermine long-term environmental sustainability if not properly managed. Again, the findings also resonate with previous research. The negative relationship between FDI and ecosystem sustainability observed here is consistent with the work of Wang and Uctum (2024), who explored the ecological footprint of FDI inflows and income threshold effects. Their study underscored that FDI, particularly in low- and middle-income countries, can have detrimental environmental consequences, especially when institutional quality is weak. This supports the argument that, in Africa, FDI, if not carefully managed, may lead to unsustainable land-use changes and environmental degradation.

The results also align with Saqib et al. (2023), who examined how European countries leverage FDI to mitigate their ecological footprint. They found that FDI could either alleviate or exacerbate environmental damage, depending on the institutional context. In the African context, weak institutions and inadequate environmental regulations likely explain why FDI has a negative effect on ecosystems (Bose, Lim, Minnick & Shams, 2023; Ibitoye & Kleyhans, 2023; Adegboye, Osabohien, Olokoyo & Matthew, 2020; Hartati & Kussujaniatuni, 2020; Hayat, 2019; Herrera-Echeverri et al., 2014).

Moreover, the study by Aminu and Alabi (2024) highlights the critical role of institutional quality in shaping the FDI-ecological footprint relationship in Sub-Saharan Africa. The findings in this study reinforce the notion that weak institutions in many African countries may exacerbate the negative environmental consequences of financial inflows like FDI and remittances (Younas, 2009; Herrera-Echeverri, Haar & Estevez-Bretón, 2014; Huynh, 2021). This suggests that improving institutional quality could mitigate these adverse effects and foster more sustainable development.

Furthermore, the results in column 3 of Table 4.5, remittances is found to have negative and statistical effect on ecosystem in SSA. Suggesting that remittances flow to the region do not support ecological development. The findings support hypothesis three of the study which state that remittances have significant effect on ecosystem sustainability. The negative relationship between remittances and ecosystems also aligns with existing literature. Studies by Gupta, Pattillo and Wagh (2009) and Anyanwu and Erhijakpor (2010) point out that remittance-driven investments often drive urban sprawl and agricultural expansion, both of which contribute to land degradation and deforestation. In this study, remittances are seen as indirectly fuelling land-use changes, underscoring the need for policies that channel remittance funds toward sustainable projects that protect ecosystems.

Again, the study report in *Table 4.5*, column 4 that portfolio investment has positive but insignificant effect on ecosystem sustainability. The results do not support the fourth hypothesis which says that portfolio has significant effect on ecosystem sustainability. Again, the finding is somewhat unexpected, as previous research Della Croce, Stewart and Yermo (2011) suggests that financial markets can play a crucial role in promoting environmental sustainability through investments such as green bonds and socially responsible investment. While portfolio investments generally target financial markets rather than sectors with direct environmental impacts, the potential to support sustainable development goals remains largely untapped in

Africa. The positive direction observed in this study indicates that portfolio investment could be better aligned with environmental objectives, but its lack of statistical significance suggests that the current levels of such investments are not adequately directed toward ecosystem-friendly initiatives. This points to the need for stronger institutional frameworks to guide portfolio investments into projects that prioritise environmental sustainability.

In addition, the signs of the coefficients of the control variables are in agreement with prior literature; for example, it is established that gross capital formation, household consumption expenditure, GDP, and urbanisation all have a statistically positive effect on ecosystem development (Chien et al., 2023; Xu et al., 2023; Buhaug & Urdal, 2013; Mol et al., 2013). These factors, which contribute to economic growth and increased human activity, influence the way ecosystem's function and evolve.

Firstly, the positive impact of gross capital formation on ecosystems can be attributed to the role it plays in fostering infrastructure development, technological advancements, and improved resource management (Russell, 1986). As investments are made in capital goods, particularly in sectors such as energy, transportation, and manufacturing, the economy expands, which, in turn, can lead to better management of natural resources. However, this growth may also have unintended consequences, particularly if such investments lead to overexploitation of natural resources, pollution, and habitat destruction. It is, therefore, essential to ensure that capital formation is directed towards sustainable and eco-friendly investments that benefit ecosystems without compromising their long-term health.

Similarly, household consumption expenditure and GDP, which are often used as indicators of economic well-being, exhibit a positive effect on ecosystems. As household consumption rises, there is typically an increase in demand for goods and services, driving economic growth. However, the growth in consumption also leads to increased resource use and waste generation, both of which can strain ecosystems. The challenge, therefore, lies in

balancing economic growth with environmentally sustainable practices. Policymakers must consider ways to decouple economic growth from environmental degradation, promoting green technologies and sustainable consumption patterns.

Urbanisation, which often accompanies economic growth, has a positive effect on ecosystems, but its impacts are more pronounced in urban populations (Xu et al., 2023; Buhaug & Urdal, 2013). On one hand, urbanisation can facilitate more efficient use of land, resources, and infrastructure, contributing to better ecosystem management and reduced pressure on rural environments. On the other hand, urbanisation typically results in the expansion of cities, leading to habitat fragmentation, increased pollution, and greater strain on local ecosystems. The challenge is to guide urban development in a way that mitigates these negative impacts, promoting sustainable cities that harmonise with their surrounding environments.

However, not all findings indicate positive effects. The negative effect of population growth on ecosystems is particularly significant. As population density increases, demand for food, water, and energy rises, leading to greater pressure on ecosystems. The expansion of human settlements, agricultural activities, and industrialisation often leads to deforestation, loss of biodiversity, and pollution. These negative effects underscore the importance of managing population growth through policies that promote sustainable development, resource conservation, and family planning.

Table 4.5: Foreign Capital on Sustainable Ecosystem in Africa

VAR	1	2	3	4
LOL(-1)	0.92*** (0.04)	0.91*** (0.04)	0.98 (0.035)***	0.90*** (0.03)
GDP	0.28*** (0.05)	0.29*** (0.05)	-0.18** (0.08)	0.20*** (0.04)
GCF	0.28** (0.02)	0.35*** (0.04)	0.23*** (0.028)	0.26*** (0.02)

GNI	0.60*	0.11***	0.42***	0.14***
	(0.03)	(0.05)	(0.05)	(0.03)
PG	-0.23***	-0.315***	0.12	-0.25
	(0.54)	(0.05)	(0.09)	(0.05)***
UB	1.13*	-0.07	0.83	0.04*
	(0.63)	(0.61)	(0.45)**	(0.56)
HCE	0.09***	0.16***	0.002*	0.15***
	(0.02)	(0.03)	(0.02)	(0.02)
FM	0.21	1.5	6.15***	2.41
	(1.27)	(1.73)	(1.76)	(1.80)
DEBT	-0.04***			
	(0.01)			
FDI		-0.22***		
		(0.02)		
RM			-1.81***	
			(0.13)	
PORT				4.58
				(2.87)
Observations	912	912	912	912
NO. of groups	48	48	48	48
No. of instru.	40	40	40	40
AR1(p-value)	0.081	0.097	0.102	0.097
AR 2 (p-value)	0.452	0.534	0.236	0.871
Hansen(p-value)	0.065	0.087	0.657	0.645
Sargan(p-value)	0.398	0.603	0.712	0.487

Source: Author's construct, 2025; Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

4.8 Threshold level of foreign capital on sustainable ecosystem in Africa

The afore-discussed negative but significant direct impact in the FC -LOL (-1) nexus creates the need to test the threshold effect. This proposition is corroborated Song, Wang and Liu (2024) and Wang, Qi and Wang (2024). The results of the DPTM are presented in Table 4.6. The results in Table 4.6 revealed that the lagged value of the ecosystems (LOL (-1)) has a

statistically significant positive effect on the present ecosystems Africa at a one percent level of significance.

In addition, the result in *Table 4.7* revealed that the kink model was the true dynamic panel threshold model for the panel of selected ecosystems since the coefficient of kink slope is statistically significant at one percent. However, the positive coefficients of the kink-slope confirm the increasing trend observed in the level of institutional structures in Africa, which implies that the sampled countries that attained the threshold level in foreign capital flows were able to sustain it over time. Also, the result revealed that the threshold variable (foreign capital) is statistically significant at one percent ($r = 0.12$, at 1 percent significance level). As a result, the study rejected the null hypothesis of no threshold effects of foreign capital on the ecosystem in Africa. This finding implies that the relationship between foreign capital and the sustainability of the ecosystem is nonlinear. This study supports the findings in the extant study, see, Saqib et al. (2023), Wang, Qi and Wang (2024) which concluded that foreign capital positively impacts ecosystem growth beyond a specific threshold of foreign capital flows among states in China. This result implies that for foreign capital flows to promote the ecosystem economy transition, African countries must reach and maintain persistently a level of foreign capital flows that is above 0.12 out of a -1-to-+1-point scale. Thus, it can be concluded that foreign capital flows in Africa aren't having a strong positive impact on the ecosystem because many countries are receiving low amounts of foreign capital, which is below the necessary level to make a difference. Foreign capital flows to many African countries are below the threshold point, which makes it almost impossible for foreign capital flows to mitigate the negative influences or risks associated with ecosystem activities in Africa (Destek, Sohag, Aydın & Destek, 2023; Yoo & Woo, 2023; Oke & Ruth, 2021; Hayat, 2019).

Furthermore, the study demonstrates that external debt, FDI, remittances and portfolio investment have significant positive threshold values of 22.32, 18.48, 010 and 26.58,

respectively. The outcome supports the alternative hypothesis that foreign capital have significant threshold effect on ecosystem sustainability. These findings imply that external debt, FDI, remittances, portfolio investment below their respective threshold values would have a negative impact on the sustainable ecosystem transition; however, beyond the threshold values, foreign capital would improve the ecosystem drive. The mean of the foreign capital index is 66.40624 far apart from the minimum threshold value of 0.10. The threshold result confirms the reason external debt has a negative but insignificant effect.

Table 4.6: Threshold effect of foreign capital on Sustainable Ecosystem in Africa

VAR	1	2	3	4	5
Lag_y_LOL	0.46*** (0.0)	0.3*** (0.04)	0.46*** (0.03)	0.66*** (0.04)	0.46*** (0.03)
gdp_b	-0.06*** (0.18)	-0.02*** (0.006)	0.01 (0.02)	0.05 (0.07)	-0.2** (0.02)
gcf_b	0.08*** (0.01)	0.04*** (0.02)	-0.22*** (0.14)	-0.01 (0.01)	0.03 (0.02)
gni_b	-0.41*** (0.01)	0.03*** (0.01)	-0.04** (0.02)	0.12*** (0.02)	-1.18*** (0.04)
pg_b	0.08 (0.05)	0.17*** (0.04)	0.22*** (0.04)	0.14** (0.06)	0.19*** (0.04)
ub_b	0.7* (0.3)	0.22 (0.36)	0.57*** (0.23)	-0.12 (0.44)	-0.83*** (0.30)
hce_b	-0.03*** (0.005)	-1.15*** (0.07)	-0.002 (0.007)	-0.009*** (0.005)	0.01** (0.008)
fm_b	0.12*** (0.02)	0.03* (0.01)	0.10*** (0.02)	1.84 (7.77)	0.2 (7.09)
kink_slope	9.27*** (1.82)	9.57*** (3.94)	5.94*** (3.14)	-10.2*** (2.27)	0.11*** (0.02)
r	55.32*** (10.12)	22.48*** (3.96)	18.61*** (7.65)	0.10* (0.03)	26.58*** (6.57)
fc_b	-0.22*** (0.04)				
Debt b		-5.6			

	(3.50)		
FDI_b	-1.09		
	(0.80)		
rm_b		-2.15***	
		(0.83)	
port_b			-24.31***
			(6.21)

Source: Author's construct 2025; Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

4.9 Moderating role of institutions on the nexus between foreign capital and ecosystem in Africa.

This study found that foreign capital affects ecosystems, but it does so indirectly through the quality of economic and political institutions. This helps explain the negative direct impact of foreign capital that is illustrated in *Table 4.7*. To understand this better, the study examined how economic and political institutions work together with foreign capital flows and ecosystems. The results offer important insights into these nexuses.

When considering economic institutions, the direct effect of foreign capital on ecosystems improves. However, it becomes positive but statistically insignificant. This means that while good economic institutions can lessen the negative effects of foreign capital, they cannot eliminate them. On the other hand, the link between foreign capital and political institutions is troubling. A stronger political economy correlates with a drop in ecosystem quality when foreign capital increases.

This negative effect likely comes from weak political institutions in many African countries. Issues like low transparency, weak accountability, and corruption make it hard for political institutions to use foreign capital for eco-friendly projects (Huynh, 2021; Adegboye et al., 2020; Rosenfeld, 2020). This gap reveals that there is a big difference between what foreign capital could do for ecosystems and what it actually does. It challenges the ecological

modernisation theory, which suggests that strong markets and good institutions can solve environmental issues. Ideally, political institutions should help foreign capital support sustainable growth, but that is not happening in Africa (Mol, 2002; Mol, Spaargaren & Sonnenfeld, 2013; Miola & Schiltz, 2019). The results reveal a strong need for political reforms that improve transparency and governance to make sure foreign capital helps protect ecosystems.

On a positive note, the study reveals that when economic institutions, like property rights, are strong, foreign capital can have a good impact on ecosystems in Africa. This aligns with the ecological modernization theory's idea that improving financial systems and institutions can help sustainability (Spaargaren & Sonnenfeld, 2013; Miola & Schiltz, 2019). Strong property rights and good economic governance create a solid base for matching foreign investment with eco-friendly goals. When economic institutions are solid, foreign capital can be directed toward green projects and better resource management.

The relationship between foreign capital, economic institutions, and political institutions is complex. Economic institutions can help create positive links between foreign capital and ecosystems, but weak political ones are a major roadblock. Without strong, transparent political systems, foreign capital struggles to improve ecological conditions (Aluko & Ibrahim, 2020; Lee & Park, 2013). This situation highlights the urgent need for reforms that address both economic and political issues together.

Table 4.7: Interaction between institutions on foreign capital and sustainable ecosystem in Africa

VAR	1	2	3
LOL(-1)	0.67*** (0.10)	0.82*** (0.14)	0.64*** (0.12)
GDP	0.15*** (0.10)	0.17* (0.09)	0.14 (0.11)

GCF	0.29*** (0.04)	0.19*** (0.04)	0.25*** (0.04)
HCE	0.23*** (0.04)	0.28* (0.16)	0.43 (0.42)
PG	-0.1*** (0.1)	0.40** (0.18)	0.31 (0.04)
UB	7.14 (7.50)	1.14 (1.24)	1.62 (1.09)
FM	-0.08 (0.13)	27.66** (10.84)	19.36* (10.52)
FC	11.8 (3.90)	1.29 (5.86)	-0.06** (0.03)
PORTY		0.26*** (0.07)	
c.FC#c.POLRTY		-0.14** (0.07)	
ECON			10.39** (5.02)
c.FC#c.ECON			0.28***
Net effect		1.15	(0.05)
			0.22
Observations	912	912	912
NO. of groups	48	48	48
No. of instru.	33	33	33
AR1(p-value)	0.029	0.042	0.023
AR 2 (p-value)	0.376	0.625	0.690
Hansen(pvalue)	0.556	0.478	0.341
Sargan(p-value)	0.896	0.270	0.705

Source: Author's construct, 2025; Standard errors in parentheses; *** p<0.01, ** p<0.05, *

p<0.1

4.10 Robustness

To unpack the dynamics of the relationship between foreign capital and ecosystem sustainability, countries were categorized according to the strength of their institutions, reported in Table 4.8. This classification provides insight into how institutional quality

moderates the effects of foreign capital inflows. The analysis suggests that in countries with strong political institutions, foreign capital contributes positively to environmental outcomes. In these contexts, robust regulatory frameworks ensure that investment activities are aligned with sustainability objectives.

By contrast, in countries with weak political institutions, foreign capital inflows are often detrimental to ecosystem sustainability. Weak governance structures and inadequate enforcement of environmental regulations allow resource exploitation and ecological degradation to prevail.

A more nuanced pattern emerges with respect to economic institutions. The findings indicate that countries with weaker economic institutions display a more favourable association between foreign capital and ecosystem sustainability. This outcome may reflect constraints on economic freedom, which restrict investors' capacity to overexploit natural resources. Conversely, in countries with strong economic institutions and liberalized markets, foreign capital may unintentionally facilitate environmental harm by enabling unregulated resource use driven by profit motives (Lee and Park, 2013b; Aluko and Ibrahim, 2020).

4.10.1 Moderation role of foreign capital and ecosystem Nexus

Table 4.8: Moderating role of institutions on foreign capital, and sustainable ecosystem in Africa

	1	2	3	4
	Low polity	High polity	Low econ	High econs
LOL(-1)	0.67*** (0.10)	0.64*** (0.13)	0.65*** (0.11)	0.70*** (0.11)
GDP	0.15*** (0.10)	0.179* (0.09)	0.197** (0.09)	0.20)** (0.11)
GCF	0.29*** (0.04)	0.23*** (0.04)	0.26*** (0.04)	0.26*** (0.03)

HCE	0.23*** (0.04)	0.34*** (0.06)	0.29*** (0.05)	0.296*** (0.04)
PG	-11.8 (3.90)	-9.23 (0.16)	-0.07 (10.14)	5.92 (4.43)
UB	2.25*** (0.86)	2.15 (1.30)	-0.13 (0.15)	1.81* (1.03)
FM	7.14 (7.50)	25.40*** (9.72)	14.75 (9.53)	15.50 (14.65)
FC	-0.10*** (0.10)	8.74 (5.95)	12.10*** (4.71)	11.34** (5.10)
FC*LOWPOLITY	-0.11*** (0.03)			
FC*HIGH POLITY		-0.08*** (0.02)		
DC*LOW ECON			1.92* (1.06)	
FC*HIGH ECONS				-0.12 (0.14)
Observations	912	912	912	912
AR1(p-value)	0.016	0.011	0.023	0.018
AR 2 (p-value)	0.795	0.632	0.467	0.423
Hansen(p-value)	0.924	0.256	0.632	0.529
Sargan(p-value)	0.583	0.559	0.184	0.713

Source: Author's construct, 2025; Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Objective two: Economic institutions, political institutions and ecosystem in Africa.

In the second objective, the thesis investigates how economic institutions and political institutions affects ecosystem in Africa.

4.11 Economic institutions and ecosystem: role of political institutions

The second objective aims to investigate the impact of economic institutions on ecosystem conditioned on the strength of political institutions. The study presents on the, results and empirical findings with discussion of the results in literature.

4.11.1 Pre-Estimation Diagnostic Tests

To encourage policy implications from the findings, it is imperative to ensure consistency, unbiased and efficient coefficients. As a results, the study tested for endogeneity, multicollinearity. The study employed Du-Wu-Hausman Test for Endogeneity. According to the findings in Appendix, F, it is evidence that there is no presence of endogeneity in the dataset. In addition, the study tested for evidence of multicollinearity in the dataset by employing Variance Inflation Factor (Appendix E). Findings revealed no evidence of multicollinearity in the studied variables. In essence, the study proceeded by employed the two-step System Generalized Methods of movement in answering the research objective. Again, the diagnostic tests for the Generalized Method of Moments were conducted to ensure the validity and reliability of the results. The Arellano–Bond Test for Autocorrelation indicates that AR(1) is statistically significant, which is expected in first-differenced GMM models, while AR(2) is statistically insignificant. The absence of second-order serial correlation confirms that the model specification and moment conditions are valid.

4.11.2 Model Selection – DGMM/SGMM

The results in Table 4.9 reveal that the coefficient of the lag dependent variable (L.LOL) in the two-step differenced GMM model is less than the same coefficient in the upper bound estimator (POLS) and the lower bound estimator (FE). This indicates that the differenced GMM is inefficient and biased in estimating the features of the data (Kusi, 2021; Bond, Hoeffler & Temple, 2001) Hence, the study deploys the econometrically efficient the two-step GMM.

Table 4.9: Model Selection Between Difference-and-System-GMM

VAR	POLS	FE	Two-Step DGMM
LOL(-1)	0.97*** (0.009)	0.64*** (0.03)	0.51*** (0.01)
INDEXFC	-3.39 (3.51)	-2.04 (3.95)	-4.6 (8.15)
GDP	0.04 (0.04)	0.008 (0.03)	0.02*** (0.003)
GCF	0.01 (0.02)	0.03 (0.02)	0.01*** (0.009)
GEA	0.01 (0.04)	0.004 (0.04)	0.09*** (0.005)
HCE	-0.007 (0.006)	-0.004 (0.01)	0.04*** (0.003)
PG	0.002 (0.01)	0.12** (0.06)	0.02* (0.01)
UB	-0.05 (0.11)	0.05 (0.25)	-0.09*** (0.02)
C	1.43** (0.74)	11.02*** (2.53)	-
Year dummies	-	-	YES
R-squared	0.932899	0.944431	
Number of countries	48	48	48
P-value : AR (1)	-	-	0.091
AR (2)	-	-	0.35
Sargan	-	-	0.73
Hansen	-	-	0.864

Source: Author's construct 2025; Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.

4.12 Economic Institutions and Ecosystem in Africa: The Moderation role of Political Institutions

4.12.1 Effect of Economic and Political Institutions on Ecosystem in Africa

This sub-section presents both the results and discussions of the study. The results in Table 4.9 reveal the direct linear effect of economic and political institution sub-indicators on ecosystem economy transition from the SGMM.

Also, the SGMM result on the moderating effect of political institutions on economic institutions and ecosystem nexus in Africa is presented in Table 4.10. The result reveals that the lagged value of the ecosystem (LOL) has a statistically significant positive effect on the present level of the ecosystem in Africa, as illustrated in all columns. This confirms that the use of SGMM is econometrically sound and appropriate. The economic institution index, as illustrated in column (1), negatively but significantly influences ecosystem transition in Africa. This is because excessive economic freedom can promote corruption and rent-seeking behaviour by all means possible, leading to undermining regulations.

In column 5 of Table 4.9, regulation has a strong beneficial impact on the ecosystem. This supports the first hypothesis, which states that effective regulation of foreign capital, labour, and businesses benefits the ecosystem economy. The economic assumption here is that nations that allow credit markets, labour markets, and product markets to freely choose how players get funding, treat workers and treat the environment are more likely to result in a sustainable ecosystem. Labour regulations can ensure fair and safe working conditions for workers in the ecosystem, which can lead to more sustainable practices by reducing labour exploitation and enhancing social well-being and impact. Likewise, regulations in the credit market can help people lend and invest wisely in the ecosystem. They discourage bad practices and encourage long-lasting solutions. Business rules would make sure companies act in an eco-friendly way. They would have to follow sustainability guidelines and be socially responsible.

These regulations can offer perks like tax breaks for businesses that go green. This means they can use less energy, invest in eco-friendly tech, and lower their impact on the environment.

The findings in column 3 of Table 4.9 demonstrate a substantial positive coefficient for Legal System and Property Right (LSPR), indicating that LSPR facilitates ecosystem transition in the studied African economies. These findings support the second hypothesis which holds that Legal System and Property Right have a strong favourable influence on ecosystem sustainability transition drive in SSA. This report means that when people know what they own, they can manage resources better. It encourages them to care for their things. When users feel safe about their resources, they're more willing to invest time and money in taking care of them. This helps both their interests and goals for sustainability. Clear property rights also cut down on fights over resources. This fosters collaboration in the management of those resources. With clear rules, governments, businesses, and communities can work together to protect the environment. A strong legal system keeps everyone accountable. It helps ensure that resources are used responsibly and within safe limits. In the end, these findings reveal how legal systems impact governance in Africa. A strong legal framework not only helps with resource management but also builds trust among investors. This can attract investments that focus on protecting ecosystems and battling climate change. The link between legal systems, investment, and sustainability highlights their importance for environmental progress in the area.

Property right is key for companies to manage their resources well. When people or communities have clear rights to their resources, they tend to take better care of them. This sense of ownership drives them to use resources sustainably. A strong legal system also means better rules against corruption. This helps cut down on bribery, fraud, and other shady activities. When these actions are limited, resources can be shared fairly and protected, making it easier for sustainable practices to thrive. Additionally, a legal system that values integrity promotes

openness and accountability. This means that decisions about resources are clear and fair, aligning with goals for sustainability. When firms know they have to account for their actions, they are more likely to follow environmental rules. All these parts work together to ensure resources are managed well, and companies are responsible for their impact on the environment.

In contrast to the premise that government effectiveness has a positive influence on the ecosystem, the coefficient of GEF in Column 6 of Table 4.9 is significant but negative. This is most likely due to the low average level of government efforts and commitment in the selected economies, as evidenced by descriptive statistics. Consistent with Yasmeen et al.'s (1962) theory, this finding suggests that the limited effectiveness of government in initiating and implementing policies across various sectors of the economy may hinder efforts to achieve a sustainable ecosystem. Thus, the findings do not support the hypothesis four, which states that governance effectiveness significantly influence ecosystem sustainability.

The empirical findings in Column 2 of Table 4.9 reveal a strong link between political institutions and the environment in the countries studied. This supports our fifth hypothesis: political institutions help the environment. They can create and carry out rules that focus on taking care of ecosystems. This includes laws on forestry, conservation efforts, and pollution control. The findings are consistent with previous literature (Kaufman et al., 2011; Tchamyou et al., 2019).

The results reaffirm the theoretical essence of the Hierarchy of Institutions Theory in understanding the interdependence and sequencing of institutional layers in achieving sustainability. Thus, ecosystem transition in Africa is not solely a product of market mechanisms or isolated governance reforms but rather an outcome of the interactive between legal, political and economic institutions within a structured hierarchy. Strengthening higher-order institutions including a legal frameworks and political governance could promote the

performance of economic institutions, ensuring that market-driven activities support rather than hinder environmental sustainability. Hence, the study contributes to institutional theory by empirically demonstrating that the hierarchical coherence and quality of institutional layers are critical determinants of ecological transformation in developing economies.

Table 4.10: Economic and Political Institutions on ecosystem in Africa

VAR	1	2	3	4	5	6
LOL(-1)	0.74*** (0.16)	0.86*** (0.15)	0.74*** (0.17)	0.80** (0.15)	0.64*** (0.14)	0.69*** (0.16)
GDP	0.29*** (0.12)	0.23* (0.13)	0.30*** (0.12)	0.33** (0.13)	0.40*** (0.12)	0.38*** (0.11)
GCF	0.21*** (0.50)	0.21*** (0.50)	0.21*** (0.05)	0.21** (0.50)	0.24*** (0.05)	0.17*** (0.50)
GNI	0.17** (0.8)	4.04 (3.57)	0.14* (0.08)	0.14 (0.08)	0.09 (0.08)	4.45*** (2.23)
HCE	0.18*** (0.60)	0.14** (0.10)	-4.89 (6.21)	-1.20 (4.50)	-8.10 (3.31)	0.13*** (0.50)
PG	1.30 (0.80)	-0.3 (0.18)	0.18 (0.25)	0.29 (0.19)	0.27 (0.19)	0.14** (0.60)
UB	0.10 (0.20)	1.20* (0.71)	1.67* (0.94)	1.25 (0.77)	1.38* (0.78)	1.51** (0.74)
FM	20.50*** (6.68)	29.08*** (7.75)	17.55* (9.75)	23.06** (6.65)	19.54*** (8.02)	21.55*** (6.33)
ECON	1.77 (7.23)	-12.64* (6.79)	-4.89 (6.21)	-6.03 (6.62)	3.81 (4.55)	-7.45 (2.23)
PIS	-7.01** (3.32)					
PROPT		0.18* (0.09)				
LSPR			0.14** (0.06)			
ILS				0.16*** (0.06)		
REG					-1.17*** (0.10)	

GEFF						0.93 (0.08)
Observations	912	912	912	912	912	912
NO. of groups	48	48	48	48	48	48
AR1(p-value)	0.011	0.038	0.018	0.045	0.023	0.045
AR2(p-value)	0.325	0.422	0.874	0.842	0.845	0.643
Sargan(p-value)	0.756	0.987	0.543	0.754	0.896	0.785

Source: Author's construct, 2025, 2025; Standard errors in parentheses; *** p<0.01, ** p<0.05,

* p<0.1

4.12.2 The conditional effect of political institutions on the relationship between economic institutions and ecosystem

Columns 1-5 of Table 4.10 provide the findings on the conditioning impact of political institutions on the link between economic institutions and the ecosystem in African economies. In comparison to the findings in column 1 of Table 4.10, the study discovers in column 1 of Table 4.13 an improvement in the size of the coefficient of the overall economic institutions index, despite the interaction term being negative but statistically significant. The negative interaction term could be an indication of poor political institutions within the sample. But solely concluding using the interaction coefficient may be misleading. Hence, the marginal/net effect is computed. The computed net effect reveals a positive conditional effect. This finding indicates that political institutions can influence and guide economic institutions to align with the ecosystem goals. Political institutions initiate effective governance systems, collaboration, and regulatory oversight aimed at ensuring that economic activities in the ecosystem are environmentally responsible and support long-term ecological health. This supports the premise that in Africa, political institutions positively influence the link between economic institutions and the ecosystem. This finding validates the hypothesis of Acemoglu, Johnson and Robinson (2005).

In terms of the individual conditional influence of political institutions, the study discovers that column 2 of Table 4.10 has a higher LSPR coefficient than column 2 in Table 4.10. Additionally, the interaction term was positive and significant. As a result, for the studied African economies, improved political institutions will boost the enforcement of LSPR, which is important for promoting eco-friendly practices. In comparison to the coefficient of government efficiency in Table 4.10, the study finds an improvement in column 3 of Table 4.10. However, political institutions may increase government efficacy and sustainability in the ecosystem; government policies in the selected countries are insufficient to preserve the ecosystem. As a result, the influence of government effectiveness may be mitigated when interacting with political institutions.

Despite the fact that the interaction term between REG and political institutions in column 4 of Table 4.10 is statistically insignificant, the coefficient of REG increases compared to its direct unconditional impact coefficient. This finding is consistent with Sabir, Qayyum and Majeed (2020), who discovered that strong political institutions enforce rules by increasing implementation capability and uniformity.

Table 4.11: Conditioning effect of political institutions on the relationship between Economic institutions and ecosystem – two step system GMM

VAR	1	2	3	4	5
Lol	0.61*** (0.13)	0.73*** (0.15)	0.62*** (0.16)	0.68*** (0.17)	0.85*** (0.15)
ECON	9.51*** (3.95)				
POLITY	1.14 (11.06)	-14.13* (7.98)	-13.14*** (5.25)	-8.30 (6.4)	-25.17*** (8.17)
c.ECON#c.POLITY	-6.70** (2.59)				
GDP	0.47***	0.38	0.27**	0.35***	0.17

VAR	1	2	3	4	5
	(0.11)	(0.24)	(0.12)	(0.12)	(0.13)
GFC	0.16**	0.17***	0.16***	0.15***	0.17***
	(0.07)	(0.05)	(0.05)	(0.05)	(0.05)
GNI	0.15*	-2.12	0.24***	0.19***	0.25***
	(0.09)	(4.43)	(0.08)	(0.07)	(0.10)
HCE	-9.01	0.19**	-4.12	0.21***	3.31
	(4.80)	(0.09)	(7.95)	(0.07)	(3.54)
PG	0.22	-6.71***	0.21	-7.98	-0.09
	(0.19)	(2.87)	(0.20)	(2.60)	(0.185)
UB	1.50**	1.29*	0.2***	1.88**	1.33*
	(0.69)	(0.75)	(0.83)	(0.87)	(0.73)
FM	0.25***	13.24	0.22***	0.19	23.65***
	(0.08)	(8.31)	(0.06)	(0.24)	(8.83)
LSPR		0.17**			
		(0.08)			
c.LSPR#c.POLITY		0.07			
		(0.19)			
ILS			15.04**		
			(6.45)		
c.ILS#c.POLITY			-7.72***		
			(2.95)		
REG				-8.40	
				(10.12)	
c.BR#c.POLITY				11.70	
				(9.78)	
GEFF					-7.50**
					(3.10)
c.GEFF#c.POLITY					0.19***
					(0.08)
Net effect	2.31	0.24	7.32	3.3	-7.31
Observations	912	912	912	912	912
NO. of groups	48	48	48	48	48

VAR	1	2	3	4	5
AR1(p-value)	0.013	0.089	0.076	0.067	0.176
AR2(p-value)	0.467		0.190	0.642	0.673
Sargan(p-value)	0.768	0.987	0.212	0.953	0.345

Source: Author's construct 2025; Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Robustness check

As part of the robustness checks, the study incorporates natural resource rent to account for how resource dependence influences ecosystem sustainability. This addition is grounded in existing literature, particularly Afolabi (2023) and Gondwana (2024), who finds that natural resource rent significantly undermines environmental quality in Sub-Saharan Africa due to weak regulatory frameworks. Consistent with these insights, our robustness results reveal that natural resource rent exerts a negative and statistically significant effect on ecosystem sustainability. This outcome aligns with the earlier findings reported in Table 4.11, reinforcing the reliability of the main results.

Hence, the findings highlight the environmental vulnerability of resource-dependent African economies, where reliance on extractive activities often comes at the expense of ecological health. Again, it underscores the need for stronger governance, effective regulatory mechanisms, and sustainable resource management practices to mitigate the ecological damage associated with natural resource exploitation.

Table 4.12: Conditioning effect of political institutions on the relationship between Economic institutions and ecosystem – two step system GMM

Variable	Model
ES(-1)	0.362*** (0.052)
ECON	8.73*** (0.501)
POLITY	0.29*** (0.02)
c.ECON#c.POLITY	-17.96*** (2.29)
GDP	0.24

	(0.16)
GFC	0.06 (0.08)
GNI	-0.766 (2.44)
HCE	0.001 (0.04)
PG	0.134 (0.17)
UB	2.33 (8.33)
FM	0.10 (0.09)
RESOURCE RENT	-0.29*** (0.073)
NO. of groups	
AR1(p-value)	
AR1(p-value)	

*Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$*

Source: Author's construct, 2025

Objective three: Foreign capital, food security and partnership for the goals in Africa.

In this section, the thesis investigates the impact of foreign capital on food security in Africa. In addition, the thesis investigates the role of partnership for the goals in the relationship between foreign capital and food security.

4.13 Role of partnership of the goals on the relationship between foreign capital and sustainable food in Africa

4.14 Descriptive statistics

Table 4.12 presents the descriptive statistics of the study variables. To contextualize these results, it is important to consider the global progress toward Sustainable Development Goal 2 (SDG 2), which seeks to end hunger by 2030. Unfortunately, hunger and food shortages

have worsened steadily since 2015, driven by the combined effects of the COVID-19 pandemic, armed conflicts, climate change, and rising inequality. By 2022, about 735 million people approximately 9.2% of the world's population were suffering from chronic hunger, representing a significant increase since 2019. In the same year, nearly 2.4 billion individuals experienced food insecurity, an increase of 391 million people compared to 2019. These alarming figures highlight the growing severity of the global food crisis and emphasize the urgent need for coordinated action.

Within the sample used for this study, the SDG 2 indicator records an average value of approximately 26.57 percent (rounded to 26 percent), which is 24 percentage points below the median score of 50 percent. This substantial gap indicates that the sampled countries have considerable room for improvement if they are to make meaningful progress toward achieving SDG 2 by 2030 (Davis et al., 2015; Guo et al., 2022; Saxena et al., 2025; Gil et al., 2019).

Moving beyond food security, the descriptive statistics also show that African economies rely heavily on foreign capital. The overall foreign capital index averages 66.41, while external debt stands at 53.55 percent. Foreign direct investment (FDI) averages 22.28 percent, remittances 4.28 percent, and portfolio investment 30.63 percent. These figures clearly illustrate the continent's strong dependence on external financial inflows.

This reliance on foreign capital underscores the importance of Sustainable Development Goal 17 (SDG 17), which focuses on strengthening global partnerships to support the 2030 Agenda. SDG 17 emphasizes that no country can address complex development challenges alone; instead, governments, the private sector, civil society, and international organizations must collaborate to achieve inclusive and sustainable growth.

A major component of SDG 17 is mobilizing financial resources, particularly for developing countries. This includes improving tax systems, expanding public-private

partnerships, and encouraging investments in sustainable projects critical steps toward financing poverty reduction, infrastructure development, and environmental protection. Equally important is the promotion of technology transfer. Providing developing countries with access to innovative and environmentally friendly technologies enhances their capacity to tackle challenges such as climate change and food insecurity, while reducing the technological gap between richer and poorer nations.

SDG 17 further highlights the need for capacity building through technical assistance, knowledge sharing, and the development of effective policy frameworks. These efforts strengthen countries' abilities to implement sustainable development strategies and respond to emerging challenges. In addition, the goal advocates for a fair and open global trading system that supports developing economies by removing trade barriers and expanding market opportunities.

Beyond these areas, SDG 17 emphasizes the importance of global macroeconomic stability and policy coherence, ensuring financial and trade systems work together to promote sustainable development. Strong, inclusive partnerships bringing together governments, private sector actors, civil society, and international institutions form the foundation for addressing interconnected global challenges. Reliable data and accountability mechanisms are also essential, enabling countries, especially developing ones, to track progress accurately and allocate resources effectively.

Ultimately, SDG 17 serves as the backbone of the entire Sustainable Development Goals framework. Challenges such as poverty, inequality, climate change, and hunger are deeply interconnected, and meaningful progress requires collective effort and shared responsibility. By promoting inclusivity and ensuring support for vulnerable groups including least developed countries and small island states SDG 17 lays the groundwork for a sustainable and equitable future for all.

As noted earlier, the SDG 2 indicator averages approximately 26 percent, falling significantly short of the 50-percent benchmark. This reinforces the need for stronger partnerships and coordinated efforts if the sampled countries are to advance meaningfully toward achieving SDG 2 by 2030 (Davis et al., 2015; Guo et al., 2022; Saxena et al., 2025; Gil et al., 2019).

Table 4.13: Descriptive statistics

Variables	observation	Mean	Maximum	Minimum	Std. Dev.
FS	1008	26.57426	95.89900	0.000000	20.57136
GDP	1008	3.839601	63.37988	-36.39198	5.419668
GCF	1008	17.89927	76.78231	0.000000	12.38128
GEA	1008	2.881077	9.247593	4.20987	3.109656
PG	1008	38.96538	90.09200	0.120000	17.03736
UB	1008	3.670559	8.368037	-4.502432	1.533196
HCE	1008	55.90371	133.1094	0.000000	33.02063
SGDP	1008	53.19501	82.45740	25.00000	10.94896
DEBT	1008	53.54855	89.4519	40.03546	63.92286
FDI	1008	22.283509	65.3374	-17.29224	8.046528
RM	1008	3.061444	53.8264	0.982	5.68280
PORT	1008	30.6308	51.4398	15.9723	14.72383
FC	1008	66.40624	89.5829	23.93498	45.73408

Source: Author's construct 2025

4.15 Correlation matrix

The correlation results reported in Table 4.13 indicate that multicollinearity is not a concern among the explanatory variables. This conclusion is supported by the pairwise correlation matrix, where all coefficients fall below the commonly accepted threshold. As noted by Kennedy (2008), a correlation value exceeding 0.70 between any two independent variables may signal potential multicollinearity problems that could distort regression estimates. However, in Table 4.16, all pairwise correlations are comfortably below this 0.70 benchmark. This suggests that the independent variables are sufficiently distinct and do not

exhibit problematic linear relationships. Consequently, the study proceeds with the estimation process with confidence that multicollinearity will not bias or weaken the empirical results.

Table 4.14: Correlation matrix

	FS	GDP	GNI	HCE	PG	SDGP	UB	GFC	DEBT	FDI	PORT	RM
FS	1											
GDP	-0.03	1										
GEA	-0.07	0.50	1									
HCE	0.09	-0.05	0.19	1								
PG	0.31	-0.07	-0.05	-0.14	1							
SDGP	0.22	0.05	0.01	0.01	0.2	1						
UB	-0.03	0.28	0.11	0.008	0.01	-0.01	1					
GCF	-0.02	0.05	0.25	0.38	0.2	0.21	0.06	1				
DEBT	0.07	-0.12	-0.12	-0.1	0.06	-0.08	0.02	-0.21	1			
FDI	-0.05	0.17	0.02	-0.2	0.16	-0.01	0.07	0.05	0.03	1		
PORT	-0.07	0.03	0.04	0.02	-0.11	-0.13	0.05	0.03	0.12	0.16	1	
RM	0.03	-0.02	-0.07	0.04	-0.04	0.27	-0.12	-0.09	0.11	0.14	0.01	1

Source: Author's construct 2025

4.16 Model Selection – DGMM/SGMM

The results in Table 4.14 reveals that the coefficient of the lag dependent variable (FS) in the two-step differenced GMM model is less than the same coefficient in the upper bound estimator (POLS) and the lower bound estimator (FE). This indicates that the differenced GMM is an inefficient and biased to estimate the features of the data (Kusi, 2021; Bond et al., 2001). Hence, the system GMM is econometrically efficient and is deployed in the study. Again, the diagnostic tests for the Generalized Method of Moments were conducted to ensure the validity and reliability of the results. The Arellano-Bond Test for Autocorrelation indicates that AR(1) is statistically significant, which is expected in first-differenced GMM models, while AR(2) is

statistically insignificant. The absence of second-order serial correlation confirms that the model specification and moment conditions are valid.

Table 4.15: Model Selection Between Difference-and-System-GMM

VAR	POLS	FE	Two-Step DGMM
FSL(-1)	0.96*** (0.009)	0.65*** (0.02)	0.402*** (0.03)
GDP	0.03 (0.04)	0.003* (0.04)	0.07*** (0.004)
GEA	0.02 (0.04)	0.01 (0.04)	0.08*** (0.003)
HCE	-0.006 (0.006)	-0.004 (0.01)	0.003*** (0.001)
PG	0.0002 (0.01)	0.06 (0.06)	0.01*** (0.01)
SDG17	0.0002 (0.02)	0.03 (0.06)	-0.07*** (0.01)
UB	0.012 (0.12)	0.01 (0.25)	-0.06*** (0.01)
GCF	0.01 (0.02)	0.03 (0.02)	0.02*** (0.003)
FM	3.56 (2.18)	14.8 (7.25)	16.88*** (0.59)
C	1.07 (1.05)	9.9*** (3.94)	
Year dummies	-	-	YES
R-squared	0.933	0.944	
Number of countries	48	48	48
P-value: AR (1)			0.067
AR (2)			0.364
Sargan			0.567
Hansen			0.110

Source: Author's construct, 2025; Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

4.16.1 Pre-Estimation Diagnostic Tests

To encourage policy implications from the findings, it is imperative to ensure consistency, unbiased and efficient coefficients. As a results, the study tested for endogeneity, multicollinearity. The study employed Du-Wu-Hausman Test for Endogeneity. According to the findings in Appendix, H, it is evidence that there is no presence of endogeneity in the dataset. In addition, the study tested for evidence of multicollinearity in the dataset by employing Variance Inflation Factor (Appendix G). Findings revealed no evidence of multicollinearity in the studied variables. In essence, the study proceeded by employed the two-step System Generalized Methods of movement in answering the research objective. Again, the p-values of the Arellano-Bond AR(2) and Hansen tests indicate that the null hypotheses of no second-order serial correlation and valid over-identifying restrictions cannot be rejected, confirming the suitability of the instruments used to address endogeneity.

4.16.2 Foreign capital and sustainable food security in Africa

The results from the two-step system GMM panel dynamic regressions are reported in Tables 4.15, 4.16 and 4.17 respectively. From columns 1, 2, 3, and 15 in Table 4.15 presents results on the effect of foreign capital (external debt, FDI, remittances and portfolio investment) and sustainable food security in Africa. While in Table 4.16, columns 1, 2, 3, and 4 reports on the effect of partnership with the goals (SDG17), foreign capital and sustainable food security. And finally, columns 1, 2, 3, and 4 of Table 4.17 reports on the moderating role of partnership for the goals (SDG 17) on the nexus between foreign capital (external debt, FDI, remittances and portfolio investment) and sustainable food security. From column 1, the lag of the regressand has a positive and significant effect on the current levels. This means that the previous levels of sustainable food security would induce higher sustainable food security in the present year. The coefficient that is above 0.7 in most of the values reaffirms the rate of

persistence in the dependent variable. From our analysis, when an independent variable induces a positive effect on the independent variable, it implies an increment in sustainable food security.

The key explanatory variable foreign capital, including external debt, FDI, remittances and portfolio investment has a negative and statistically significant effect on sustainable food security, except for portfolio investment, which is found not to be significant. The findings reveal that the key explanatory variable, foreign capital including external debt, FDI, remittances, and portfolio investment has a negative and statistically significant effect on sustainable food security. However, portfolio investment stands out as an exception, revealing no statistically significant impact. These findings diverge from previous studies Sogah et al. (2024) where they found that FDI contributes to food security in SSA.

Column 1 of Table 4.15 shows that external debt significantly influences the food security sustainability, indicating that the level of external debt in SSA significantly but negatively affects the food security sustainability. This implies that as countries get access to more external finances, food security is worsen. The findings support the first hypothesis that external debt has significant effect on food security

Again, the results in Table 4.15, column 2 indicates that remittances have negative and statistically significant effect on food security sustainability. The findings support the second hypothesis which states that remittances have significant effect on food security. The results suggest that increase in remittances to the region worsen food security. This outcome is inconsistent with the works of Sogah et al. (2025) where they found that remittances induce food security in Ghana. The outcome supports the third hypothesis which state that FDI has a significant effect on food security. The finding diverts from the works of Sogah et al. (2025) where FDI was reported to promote food security on Ghana.

In addition, the findings in Table 4.15, column 4, shows that portfolio negatively but insignificantly affect food security sustainability within the studied period. This do not support the fourth hypothesis which states that portfolio has a significant effect on food security.

These results may be attributed to several factors. First, external debt can divert resources away from critical investments in agriculture and food systems due to high repayment obligations, undermining efforts to achieve sustainable food security. Second, while FDI and remittances are often associated with economic growth, their potential to disproportionately benefit non-agricultural sectors or urban areas might limit their contribution to rural and agricultural development, where food security challenges are most acute. Lastly, the lack of significant impact from portfolio investment could stem from its typically short-term and speculative nature, which is less likely to directly address structural issues in food production and distribution systems. Categorically, fostering partnership for goals (SDG 17) could promote these effects by enhancing knowledge sharing, resource pooling, and stakeholder collaboration, which are imperative for attaining sustainable food security (Horan, 2022; Makhurt, 2024).

Furthermore, the findings based on the control variables revealed interesting outcomes. For example, gross capital formation, population growth, and government expenditure on agriculture all have a statistically positive and significant effect on food security, while gross capital formation and urbanisation exhibit a statistically negative and significant impact. These results have practical implications for policymakers, as they suggest both opportunities and challenges in achieving long-term food security.

The positive and significant impact of gross capital formation on food security suggest the value of investing in capital infrastructure and productive assets. Capital investments, such as those in agricultural technology, machinery, and irrigation systems, can increase food production efficiency and sustainability. This finding highlights the need for increased

investments in the agricultural sector to boost productivity and enhance the capacity of local economies to meet the growing demand for food. Policymakers should focus on creating conducive environments for both public and private investments in agriculture, as well as facilitating access to financial resources for smallholder farmers and agribusinesses.

Similarly, population growth has a positive and significant effect on food security, which may initially seem counterintuitive. However, this finding can be attributed to the potential for a larger population to contribute to a more dynamic agricultural labour force, thus increasing the capacity for food production. Population growth may also stimulate the demand for food, driving agricultural innovation and technological advancement. To harness this potential, governments must ensure that population growth is matched by investments in agricultural infrastructure, education, and technology that can sustain food production and supply. Effective family planning programs and policies to promote smallholder farming will also be crucial in managing population pressures.

Government expenditure on agriculture further reinforces the positive relationship with food security. The significant and positive effect of government spending on agriculture indicates that public investment plays a vital role in creating an enabling environment for food security. These investments can enhance rural infrastructure, improve access to agricultural inputs, and support research and development in sustainable farming practices. Governments must prioritise increasing funding for agriculture, especially in developing countries where such investments are often insufficient. This should include strengthening rural extension services, providing subsidies for essential agricultural inputs, and supporting farmer organisations to improve productivity and sustainability.

However, while gross capital formation and population growth contribute positively to food security, the findings regarding urbanisation and gross capital formation suggest some challenges. Urbanisation, in particular, is found to have a statistically negative and significant

effect on food security. As urban areas expand, agricultural land is often converted to non-agricultural uses, which can reduce the availability of arable land for food production. Additionally, urbanisation can lead to shifts in consumption patterns and the displacement of agricultural labour, making it more difficult to sustain local food production systems. This suggests that urban growth must be carefully managed to prevent negative impacts on food security. Policymakers should focus on promoting sustainable urbanisation that minimises the loss of agricultural land and encourages the development of urban agriculture initiatives to complement rural food systems.

The negative relationship between gross capital formation and food security also warrants attention. While capital formation is generally beneficial for economic growth, its impact on food security in this context may be linked to the allocation of resources. If investments are disproportionately directed toward sectors unrelated to agriculture or food security, such as industrialisation or urban infrastructure, this may detract from efforts to ensure a stable and sustainable food supply. To address this, governments should align capital formation strategies with food security objectives, ensuring that investments in agriculture and rural development receive adequate priority.

Table 4.16: Foreign capital and sustainable food security in Africa

VAR	1	2	3	4
FS(-1)	0.93*** (0.09)	0.93*** (0.07)	0.86*** (0.04)	0.79*** (0.06)
GDP	-0.19*** (0.03)	-0.19*** (0.07)	0.15*** (0.04)	-0.06 (0.05)
GCF	0.29*** (0.03)	0.032*** (0.04)	0.022*** (0.04)	0.21*** (0.04)
GEA	0.08 (0.05)	0.35*** (0.08)	0.18*** (0.03)	0.23*** (0.054)
PG	1.03*** (0.20)	0.01 (0.12)	0.17*** (0.03)	-3.1*** (0.12)
UG	-1.40 (0.88)	-1.89*** (0.70)	-0.74*** (0.08)	-0.001 (0.78)

VAR	1	2	3	4
DEBT	-0.14*** (0.03)			
RM		-1.22*** (0.23)		
FDI			-0.25*** (0.11)	
PORT				-5.5 (3.87)
Observations	912	912	912	912
NO. of groups	48	48	48	48
AR1(p-value)	0.084	0.098	0.012	0.008
AR2(p-value)	0.112	0.112	0.743	0.893
Hansen (p-value)	0.643	0.692	0.269	0.394
Sargan (p-value)	0.657	0.657	0.410	0.331

Source: Author's construct 2025, 2025; Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

4.16.3 Foreign, capital, sustainable food security and partnership with the goals

From columns 1 to 4 in Table 4.16, the study shows that the coefficients of foreign capital are negative for external debt and foreign direct investment (FDI), although these effects are only weakly significant at the 10% level. Conversely, the coefficients for remittances and portfolio investment are positive but statistically insignificant. These outcomes suggest that the negative influence of foreign capital on sustainable food security lessens when the partnership for the goals (SDG 17) is incorporated into the analysis. This finding lends support to the hypothesis that global partnerships can mitigate the adverse effects of foreign capital inflows on food security by enhancing coordination, accountability, and the efficient use of resources.

The implications of these results are twofold. First, they highlight the critical role of SDG 17 partnerships in strengthening the effectiveness of foreign capital toward promoting sustainable food systems. Strengthening international cooperation, improving transparency in

the management of foreign resources, and aligning external financing with national food security priorities can significantly enhance the developmental impact of foreign capital Beck and Ferasso (2023). Second, from a theoretical standpoint, the results emphasize the importance of institutional collaboration and policy coherence in shaping the relationship between foreign capital and food security outcomes Beck and Ferasso (2023). Hence, policymakers should design and implement strategies that foster multi-stakeholder partnerships and ensure that foreign financial inflows are directed toward productive, inclusive, and sustainable agricultural and food security initiatives. Accordingly, the study proceeds to examine the moderating effect of partnerships for the goals, as presented in Table 4.17.

Table 4.17: Foreign capital, sustainable food security and partnership with the goals

VAR	1	2	3	4
FS (-1)	0.39*** (0.09)	1.04*** (0.07)	1.10*** (0.05)	1.07*** (0.07)
GDP	-0.14*** (0.04)	-0.17** (0.07)	-0.05 (0.05)	-0.64 (0.11)
GCF	0.28*** (0.03)	0.30*** (0.04)	0.15*** (0.04)	0.11*** (0.02)
GNI	0.08 (0.06)	0.32*** (0.07)	0.17*** (0.03)	0.21*** (0.04)
PG	1.18*** (0.22)	0.31 (0.22)	-0.14 (0.16)	-0.15 (0.16)
UB	-0.10*** (0.03)	-1.11*** (0.23)	-0.43 (0.89)	-1.12 (0.93)
SDG17	0.02 (0.12)	0.19 (0.12)	0.14*** (0.03)	-0.12 (0.09)
DEBT	-1.48* (0.85)			
RM		-1.1* (0.79)		
FDI			-0.12 (0.03)	
PORT				-4.68

VAR	1	2	3	4
				(3.48)
Observations	912	912	912	912
NO. of groups	48	48	48	48
AR1(p-value)	0.051	0.012	0.010	0.013
AR2(p-value)	0.102	0.880	0.466	0.752
Hansen(p-value)	0.641	0.383	0.238	0.249
Sargan(p-value)	0.873	0.414	0.535	0.471

Source: Author's construct, 2025; Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

4.17 Role of the partnership of the goal on the nexus between foreign capital and sustainable food security in Africa.

Table 4.17 incorporate the level of partnership with the goal in a country. To improve the sustainability of food security, partnerships with the goal play a role in addressing food insecurity by leveraging collective resources, expertise, and efforts. Nonetheless, the study considers the stakeholders' willingness to implement proper agriculture sector changes and/or provide adequate money to be a critical part of the food production and supply transition process. Both might be viewed as a flaw in the partnership structures, which could be acknowledged as a major factor in the sustainability of accessibility, utilisation, affordability and availability of food. This is because whether or not food security sustainability can be founded is largely in the hands of the stakeholder through partnership with the goal, even if they have no direct involvement in the financing. This is because they provide the parameters that focus on building global, regional, and local partnerships to mobilise resources, foster innovation, and create inclusive and equitable solutions for sustainable growth. Strong, effective partnerships are essential to address systemic challenges, build resilience, and create inclusive food systems that support long-term development.

As Kumar et al. (2021) suggest, indigenous knowledge and community involvement are vital, but institutional shortcomings in developing countries can exacerbate risks,

particularly when organisational structures are weak or underdeveloped. In the context of SDG 17, the absence or inefficacy of partnerships may undermine Africa's efforts to achieve sustainable food security by restricting access to resources, technology, and markets, as well as diminishing policy coherence.

As Beck and Ferasso (2023) argue, strong, effective partnerships are critical for addressing systemic challenges, building resilience, and developing inclusive food systems that support long-term growth and development.

Again, Horan (2022) and Makhurt (2024) argues that fostering partnership for goals (SDG 17) could promote these effects by enhancing knowledge sharing, resource pooling, and stakeholder collaboration, which are imperative for attaining sustainable food security. Hence, the study accounted for the role of partnership for the goals in foreign capital and food security sustainability contagion.

The findings from column 1-4 in Table 4.17 revealed that partnership for the goals reverses the unconditional negative effect of foreign capital on food security sustainability. This outcome supports the hypothesis which states that partnership for the goals have a significant moderating effect on foreign capital and food security.

Again, the results in Table 4.17 indicate that for external debt, even though the coefficient is negative, there is evidence of improvement in the value of the coefficient that in Table 4.18. again, the results revealed that the interaction term is positive and statistically significant. Therefore, for the sample countries, improved partnership for the goals will boost efficient allocation of external debt resources important to promoting agriculture activities. Again, similar outcome is found in column 2 where FDI even though having negative effect on food security, there is an improvement in the coefficient, again the interaction term is also found to be positive and statistically significant.

Again, the study report in column 3 and 4 of Table 4.17 those remittances and portfolio have negative but insignificant effect on food security. This supports the assertion that partnership for the goals could reverse the negative unconditional effect of remittances and portfolio on food security. Again, the interaction terms revealed that both remittances and portfolio have positive and statistical strong effect on food security in the sample countries. The outcomes support the works of Horan (2022) and Makhurt (2024) argues that fostering partnership for goals (SDG 17) enforces rules by increasing implementation capability and uniformity.

Furthermore, relying on the findings could be misleading without findings the partial effect and its implications. Therefore, the marginal effect of foreign capital on the sustainable food security of the partnership's goal is computed as 6.07, 0.37, 17.3, and 16.13 respectively. Thus, a percentage rise in foreign capital would increase sustainable food security by 17.31% at a unit level of partnership with the goal. This finding resonates with Smyth, Webb and Phillips (2021), who highlight the role of public-private partnerships in improving global food security by combining resources and knowledge to achieve sustainable outcomes. Similarly, Horan (2022) emphasises that effective partnerships are critical for achieving the SDGs because they provide the framework needed to address pressing challenges in areas like food security. Hence, an increase in foreign capital and an increase in partnership with the goal will have a stronger long-run effect than an instantaneous increase and decrease in one of these variables in SSA.

Table 4.18: Role of the partnership of the goal on the nexus between foreign capital and sustainable food security in Africa

VAR	1	2	3	4
FS (-1)	0.44*** (0.11)	0.75*** (0.14)	0.78*** (0.08)	0.78*** (0.12)

VAR	1	2	3	4
GDP	-0.06 (0.07)	-0.26*** (0.09)	-0.09 (0.09)	-0.11 (0.07)
GCF	0.29*** (0.04)	0.23*** (0.05)	1.14*** (0.05)	0.16*** (0.04)
GNI	0.08 (0.08)	0.37*** (0.09)	0.22*** (0.07)	0.26*** (0.078)
PG	1.10*** (0.23)	0.42* (0.24)	0.07 (0.19)	0.26 (0.23)
UB	-1.8* (1.10)	-0.43 (0.94)	1.86 (1.23)	1.68 (1.06)
SDG17	-0.03 (0.03)	14.53*** (0.33)	0.04 (0.21)	9.23* (5.40)
DEBT	-0.09* (0.05)			
RM		-0.75** (0.14)		
FDI			-0.09 (0.17)	
PORT				-1.37 (1.01)
c.DEBT#c.SDG17	6.16*** (3.18)			
c.RM#c.SDG17		1.12*** (0.38)		
c.FDI#c.SDG17			17.40*** (4.0)	
c.PORT#c.SDG17				17.55***
Net effect	6.07	0.37	17.31	(4.40) 16.18
Observations	912	912	912	912
NO. of groups	48	48	48	48
AR1(p-value)	0.126	0.012	0.014	0.009
AR2(p-value)	0.759	0.214	0.168	0.283
Hansen(pvalue)	0.649	0.923	0.369	0.453
Sargan(p-value)	0.873	0.464	0.759	0.759

Source: Author's construct, 2025, 2025; Standard errors in parentheses; *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

4.18 Robustness check

As a robustness check, the study re-estimates the moderating effect of institutional quality on the relationship between foreign capital and food security in Africa using the system GMM (SGMM) estimator. Institutional quality is employed now as an alternative proxy for partnership which serve as a moderator for the third objective. Institutional quality is proxied by the Institutional Governance Index constructed from the World Governance Indicators (WGI), which encompasses six governance dimensions voice and accountability, political stability, government effectiveness, regulatory quality, rule of law, and control of corruption following Mawutor et al. (2023) and Ofoeda et al. (2025).

The results presented in Table 4.19 are consistent with those reported in Table 4.18, which examine the moderating role of Partnership for the Goals (SDG 17) in the foreign capital-food security nexus, thereby confirming the robustness of the baseline findings. The interaction terms indicate that institutional quality mitigates and ultimately reverses the negative effects of remittances, foreign direct investment (FDI), external debt, and portfolio investment on food security in Africa. This suggests that foreign capital contributes positively to food security when embedded within strong institutional frameworks.

The policy implications are noteworthy. High-quality institutions enhance transparency, accountability, and regulatory efficiency, ensuring that foreign capital is directed toward productive agricultural investments, food system infrastructure, and social protection rather than being lost to inefficiencies or rent-seeking. In this sense, institutional quality functions as a governance mechanism comparable to SDG 17 partnerships, reinforcing coordination, oversight, and strategic alignment in translating foreign capital inflows into sustainable food security outcomes.

These findings align with existing empirical evidence. Cassimon, Fadare, and Mavrotas (2022) show that strong institutions amplify the positive effects of capital flows on food and nutrition security in Sub-Saharan Africa, while Subramaniam, Masron, and Subramaniam (2022) identify institutional

effectiveness as a key driver of food security. At a broader development level, Ali et al. (2022) demonstrates that institutional quality conditions the impact of foreign capital flows on human development in developing countries. Additionally, Ogunniyi et al. (2020) find that good governance strengthens the food and nutrition security benefits of remittances in Sub-Saharan Africa.

Again, the thesis engaged the Panel Ordinarily Least Squared (POLS) as an alternative estimator, the study specifically re-examines the role of partnership for the goals in foreign capital-food security contagion. The findings reported in Table 4.20 are consistent with the findings reported Tables 4.18 and 4.17 respectively. Thus, the implications are that the findings are reliable and can be used for policy decisions in the selected economies and other economies with similar geographical features.

Table 4.19: Role of institutional quality on the nexus between foreign capital and sustainable food security in Africa.

VAR.	1	2	3	4
FS(-1)	0.91*** (0.011)	0.902*** (0.011)	0.906*** (0.011)	0.910*** (0.122)
GDP	0.91 (0.66)	-0.229 (0.544)	-0.072* (0.043)	-0.029 (0.087)
GCF	-0.28 (0.544)	0.211 (0.130)	-0.257 (0.544)	-0.002 (0.035)
GEA	1.72 (1.19)	0.02 (0.04)	5.038 (3.479)	0.03 (0.117)
PG	0.195 (0.131)	0.06 (0.059)	0.20 (0.130)	0.205 (0.131)
UB	-0.013 (0.035)	-0.22 (0.13)	-0.011 (0.035)	-0.237 (0.546)
IQ	0.16** (0.073)	0.161** (0.07)	2.079* (1.146)	2.152*** (1.147)
DEBT	-0.44*** (0.082)			
RM		-0.451*** (0.08)		
FDI			-0.427*** (0.082)	
PORT				-0.446***

				(0.082)
c.DEBT#c.IQ	6.66*			
	(3.776)			
c.RM#c.IQ		2.36**		
		(1.159)		
c.FDI#c.IQ			0.151**	
			(0.072)	
c.PORT#c.IQ				0.155**
				(0.073)
Observations	912	912	912	912
NO. of groups	48	48	48	48
AR1(p-value)	0.011	0.018	0.090	0.010
AR2(p-value)	0.980	0.564	0.324	0.167
Hansen (pvalue)	0.672	0.109	0.563	0.171
Sargan (p-value)	0.786	0.112	0.789	0.513

Source: Author's construct 2025; *Standard errors in parentheses*; *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table 4.20: Role of the partnership for the goal in the nexus between foreign capital and sustainable food security in Africa.

	(1)	(2)	(3)	(4)
VARIABLES	FS	FS	FS	FS
DEBT	-2.266*			
	(1.261)			
GNI	0.0573	-0.211	-0.130*	-0.0795
	(0.0874)	(0.160)	(0.0722)	(0.0611)
c.DEBT#c.SGD17	0.158*			
	(0.0885)			
PG	0.101	-1.891**	-0.436	-0.278
	(0.763)	(0.760)	(0.744)	(0.747)
UB	-0.394***	-0.277***	-0.416***	-0.402***
	(0.0436)	(0.0462)	(0.0436)	(0.0435)
GCF	0.254***	0.332***	0.281***	0.320***
	(0.0791)	(0.0775)	(0.0785)	(0.0806)
TO	-0.153***	-0.122***	-0.152***	-0.138***

	(0.0202)	(0.0200)	(0.0202)	(0.0205)
GDP	-0.0937	-0.0885	-0.0744	-0.0909
	(0.0916)	(0.0903)	(0.0917)	(0.0916)
TECHNOLOGY	-0.00647	0.0190	0.00792	-0.00513
	(0.0179)	(0.0179)	(0.0184)	(0.0179)
SGD 17	0.0698**	0.152***	0.0889***	0.0868***
	(0.0336)	(0.0332)	(0.0324)	(0.0325)
FDI		0.00166		
		(0.00212)		
c.FDI#c.SGD17		0.217***		
		(0.0326)		
RM				
			0.000674	
c.RM#c.SGD17			(0.000752)	
			0.0288**	
FDI			(0.0125)	-0.189*
				(0.105)
c.FDI#c.SGD17				4.15e-05
				(0.0102)
Constant	111.1***	89.59***	108.6***	108.9***
	(3.356)	(4.323)	(3.281)	(3.262)
R-squared	0.150	0.177	0.149	0.146

Source: Author's construct 2025; Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

4.19 Summary of the Chapter

Chapter Four presents the empirical findings and interprets them in line with the methodology outlined in Chapter Three. The results are structured around the study's three objectives: (1) the effect of foreign capital on ecosystem sustainability, (2) the role of economic and political institutions in ecosystem outcomes, and (3) the relationship between foreign capital, food security, and partnerships (SDG 17). The chapter moves from examining direct and threshold effects to the moderating role of institutions and concludes by connecting these dynamics to food security outcomes in Africa. The study finds that foreign capital affects

ecosystem sustainability and food security in complex ways. FDI, external debt, and remittances generally have negative effects on ecosystems and food security, while portfolio investment shows minimal impact. Threshold analysis reveals that positive outcomes occur only when foreign capital exceeds specific levels, which most African countries have not reached. Institutional quality plays a critical moderating role: strong economic and political institutions enhance the positive impact of foreign capital on ecosystems, while weak governance worsens environmental and food security outcomes. Similarly, partnerships aligned with SDG 17 help mitigate the negative effects of foreign capital on food security by improving coordination, accountability, and knowledge sharing.

5 CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Chapter Introduction

The study presents a summary of the study, categorically the main specific objectives and findings of the four empirical chapters. The chapter also provides the conclusions and practical implications of the study. The chapter starts with a summary of the thesis; followed by a summary of main findings by research objectives; next is a conclusion and recommendations. The chapter ends with suggesting avenues for future studies.

5.2 Thesis Summary

The thesis consists of five chapters; of these, chapter four is designed to investigate the effect of foreign capital and institutional quality on ecosystems in Africa. Also, the study investigates the effect of foreign capital on food security conditioned on partnership for the goals in Africa.

The main aim was to find out how foreign capital dynamics and institutional quality influences ecosystems in Africa. The study has become imperative because of the paucity of literature on how foreign capital mechanisms affect the sustainability of ecosystems, specifically in Africa. Such a study on Africa is important considering the level of environmental destruction and hunger there. Secondly, the SDG 15 and 2 remain the least financed global agendas due to inadequate foreign financing arrangements. It is also clear that the literature in the area has concentrated categorically on issues, opportunities and the development of a framework to promote a sustainable practice specifically in the ecosystems. This makes foreign capital-ecosystem literature limited in scope, as important and burgeoning issues in the field have been left unexplored. For instance, little is known concerning how foreign capital flow mechanisms could influence sustainable practice The study focused on four specific objectives

The thesis first examines the relationship between foreign capital and ecosystems as the first objective. In the first objective, the thesis categorically tested the threshold beyond which foreign capital can promote sustainable ecosystems in the sampled African economies depending on a dynamic panel threshold estimation technique following (Seo et al., 2019). The moderation of institutional structure quality was tested using the two-step system GMM. The first hypothesis tested the direct effect of external debt, FDI, remittances and portfolio investment on ecosystems. Again, the study examines the effect of external debt, FDI, remittances and portfolio investment on ecosystems. Again, the study examines the role of institutional quality in foreign capital-ecosystem nexus. The study report that

Secondly, the thesis specifically examines the nexus between economic institutions and ecosystems conditioned on the level of political institutions in the sampled African countries using the two-step system GMM.

Thirdly, this thesis investigates the link between foreign capital and food security conditioned on the level of partnership for the goals in the sampled African countries using the two-step system GMM.

Data for the study is drawn from various databases, including the World Bank, IMF, ReSAKSS and UNDESA. It is essential to note that the above estimation techniques employed in the thesis allowed any possible endogeneity problem that may affect the models to be sufficiently dealt with, thereby enabling reliable estimates to be reported. All the empirical essays focus exclusively on 48 African countries.

5.3 Summary of Main Findings by Research Objective

This study set out to explore how different types of foreign capital affect environmental and food security outcomes in Africa, while also examining how institutional quality and global partnerships under the Sustainable Development Goals (SDGs) influence

these relationships. The findings, structured around the study's objectives, shed light on how international capital flows interact with Africa's ecological systems and broader development agenda.

Objective 1: Investigate the the impact of foreign capital on ecosystem: role of institutional quality

The results show that foreign capital inflows particularly foreign direct investment (FDI), remittances, and external debt generally have a negative and statistically significant impact on the sustainability of ecosystems in Africa. This suggests that much of the foreign capital entering the continent is still concentrated in resource-intensive and environmentally harmful activities. Portfolio investment, on the other hand, shows a positive but statistically insignificant relationship with ecosystem sustainability. Although this indicates potential for financial market instruments to promote green investments, such opportunities remain largely untapped in many African economies. The threshold analysis further shows that a minimum institutional quality level equivalent to a foreign capital threshold is needed before positive environmental outcomes begin to appear. Unfortunately, most African countries fall below this threshold, which explains why the ecological benefits of foreign capital remain limited across the continent. Again, the study uncovers those strong institutions, characterized by transparent regulations, rule of law and effective contract enforcement. Can moderate the negative effect of foreign capital on the ecosystem. In countries where these institutions function well, foreign investment tends to shift toward more sustainable and environmentally responsible sectors.

Thus, these findings point to a worrying trend: foreign capital often contributes to environmental degradation rather than ecological improvement, particularly when directed toward sectors like mining, energy, and large-scale agriculture without strong environmental safeguards. This highlights the need for African countries to strengthen environmental regulations, improve monitoring systems, and adopt green investment frameworks. Doing so

can help ensure that foreign investments contribute to environmental resilience, biodiversity conservation, and long-term sustainability rather than ecological decline.

Objective 2: Examine the moderating role of political institutions in the relationship between economic institutions and ecosystem sustainability

The second objective focused on how institutional quality both economic and political affects the ecosystem sustainability. The findings reveal that strong institutions, characterized by well-defined property rights, transparent regulations, and effective contract enforcement, can moderate the negative effects of economic institutions on the ecosystem. In countries where political institutions are strong and effective, they can enforce environmental regulations, strengthen accountability, and create incentives that encourage economic institutions to adopt a sustainable practice that protect and enhance the ecosystem

However, weak political institutions often failed to enforce environmental regulations and accountability, allowing economic institutions to prioritize profit-driven activities that lead to ecosystem degradation.

These findings emphasize that institutional reforms are essential for achieving environmentally sustainable growth. Strengthening governance structures, ensuring transparency, and enhancing policy enforcement can help transform economic institutions into a driver of ecological progress rather than a source of environmental harm.

Objective 3: Analyse the effect of foreign capital on food security, conditional on partnership with the SDG goals

The third objective examined how global partnerships specifically SDG 17 (Partnerships for the Goals) influence the relationship between foreign capital and food security in Africa. The study finds that such partnerships play a positive and significant moderating role, turning previously negative or insignificant effects of foreign capital into more favourable

outcomes for food security. When foreign investments are guided by collaborative frameworks that emphasize accountability, transparency, and knowledge sharing, they are more likely to support food availability, access, and nutritional improvement.

This highlights the importance of aligning foreign capital inflows with global sustainability frameworks and strengthening partnerships among governments, international organizations, and private investors. Enhanced collaboration can improve resource allocation, stimulate agricultural innovation, and ensure that foreign financing contributes to resilient and inclusive food systems.

Hence, the study's findings show that while foreign capital has the potential to promote sustainable food security in Africa, its positive impact depends heavily on two key factors: the strength of domestic institutions and the degree of alignment with global partnerships. Strengthening governance systems, promoting transparency, and fostering collaborative international frameworks are therefore essential for ensuring that foreign capital supports both environmental sustainability and food security across the continent.

Table 5.1: Key findings

Statement	Decision
External debt significantly affects ecosystem	Supported
FDI significantly affects ecosystem	Supported
Remittances significantly affects ecosystem	Supported
Portfolio investment significantly affects ecosystem	Not Supported
Overall foreign capital significantly affects ecosystem	Supported
External debt has a significant threshold effect on ecosystem	Supported
FDI debt has a significant threshold effect on ecosystem	Supported
Remittances has a significant threshold effect on ecosystem	Supported
Portfolio investment has a significant threshold effect on ecosystem	Supported
There is a significant positive effect of the legal system and property rights on ecosystem	Supported
Regulations has a positive significant influence on ecosystem in Africa	Supported

Integrity of legal system have positive significant influence on ecosystem in Africa.	Supported
Government effectiveness has positive significant influence on ecosystem Africa.	Not Supported
Overall economic institution quality positive significant influence on ecosystem	Supported
Foreign capital significantly affects food security	Supported
Partnership with the goal significantly affects food security	Supported
Partnership for the goals as a moderator has a significant effect in the relationship between foreign capital and food security sustainability	Supported

Source: Author's construct, 2025

5.4 Chapter Conclusion

The results for the first objective show that overall foreign capital contributes to ecosystem transition in the sampled African economies, although portfolio investment does not have a statistically significant direct effect on ecosystems. However, the threshold analysis indicates that external debt, foreign direct investment (FDI), remittances, and portfolio investment have positive threshold effects on ecosystems during the study period. This means that foreign capital improves ecosystem outcomes once it reaches certain minimum levels. In particular, portfolio investment, remittances, and FDI begin to positively influence ecosystems after exceeding their respective threshold levels.

For the second objective, the study examined the conditional role of political institutions in the relationship between economic institutions and ecosystems. The findings show that legal systems and property rights, as well as the integrity of legal systems and regulations, have a positive but weak influence on ecosystems in Africa. Overall, however, economic institutions measured by the economic freedom index have a negative effect on ecosystems. Importantly, when strong political institutions are present, the interaction between political institutions and economic institutional variables significantly strengthens their positive impact on ecosystems. This supports the Hierarchy of Institutional Theory, which

suggests that improvements in political institutions can help address ecological challenges. The findings also emphasize the importance of environmental governance in promoting the sustainable use of ecosystem resources.

Regarding the third objective, which examined the effect of foreign capital on food security conditional on partnerships for the goals, the results show that foreign capital positively influences the sustainability of food security when supported by strong partnerships for development. This indicates that partnerships for the goals play a moderating role in strengthening the relationship between foreign capital and sustainable food security in Africa.

5.5 Contribution of the study

The study makes several empirical, theoretical and methodological contributions to the field of ecosystem, food security and finance. The study further makes contributes to practice and some policy recommendations.

5.5.1 Theoretical contribution

This study contributes to the literature on ecological modernization theory, the institutional theory, development finance, and sustainability by examining the drivers of foreign capital decisions and the relationship between foreign capital flows and ecosystem and food security sustainability in Sub-Saharan Africa (SSA). Specifically, the study highlights the role of institutional structures and partnerships in shaping these outcomes.

First, Ecological modernization theory emphasizes that financial markets and technological innovation are key to addressing ecological crises, and this study contributes by reinforcing their central role in promoting ecosystem sustainability.

second, the thesis advances the application of new institutional theory by demonstrating the importance of institutional quality in attracting and sustaining foreign capital flows to SSA.

The findings show that strong institutional frameworks create a more predictable and credible environment for foreign investors, thereby influencing foreign capital allocation decisions.

Third, the study contributes to institutional theory by applying the Hierarchy of Institutions Hypothesis, which posits that political institutions represent the highest-order institutional structure shaping national development. Political institutions determine the nature and effectiveness of economic institutions, which subsequently influence long-term economic growth. By incorporating this hypothesis, the thesis extends the discussion of political and economic institutions to the domain of ecosystem sustainability in SSA, highlighting how institutional arrangements shape environmental outcomes.

Fourth, the thesis contributes to the resource curse literature by examining how foreign capital inflows interact with natural resource governance and ecosystem sustainability. The findings suggest that the impact of foreign capital on environmental sustainability is significantly conditioned by the strength and effectiveness of institutional structures, which can either mitigate or exacerbate resource-related environmental degradation.

Finally, the study extends new institutional theory within the context of food security sustainability by investigating the role of Partnerships for the Goals (SDG 17) in moderating the relationship between foreign capital and food security outcomes. The results indicate that collaborative institutional partnerships can strengthen the positive contribution of foreign capital toward improving food security in SSA.

5.5.2 Contribution to Methodology

The study addresses nonlinearities by employing a panel threshold estimation technique proposed by Seo et al. (2019). It is the first to the best of my knowledge to articulate the threshold effect of foreign capital-ecosystem sustainability relationship. It is the first to the best of my knowledge to established that the effect foreign capital on ecosystem sustainability is

contingent on foreign capital threshold specific. Again, the study employed a dataset from the United Nations Department of Economic and Social Affairs (UN-DESA) dataset first to unravel the effect of each foreign capital indicator on the ecosystem sustainability instead of growth, specifically in African economies condition on quality of institutions.

5.5.3 Contribution to Empirics

The study presents empirical evidence on the impact of foreign capital on ecosystem across SSA. The role of international capital flows was recognized at the Third UN international Conference on Financing for Development, where they there were foreign capital flows identified as potential source of financing for the SGDs including the ecosystem, presenting their vital role as complementary resources to development efforts at country level. In spite many studies examining the determinants of foreign capital, the current study, to the best of knowledge to examine how institutional quality promote foreign capital influence on ecosystem in SSA. Again, the study is also the first attempt to examining whether the impact of foreign capital on ecosystem depends on the initial level of foreign capital flows to countries.

The Hierarchy of institutions hypothesis argues that the establishment of functioning economic institutions depend on the structure and effectiveness of political institutions. Again, scholars posit that political institutions provide the fundamental framework within which economic institutions evolve and operate. The study therefore argues that the high level of ecological crises in SSA are largely attributable to poor political institutions. The current study makes the first attempt to examine the role of political institutions in the economic institutions-ecosystem sustainability contagion in SSA. The study uncovers that improvement in both economic and political institutions play a critical role in advancing ecosystem transition in SSA.

Food security has emerged as a significant global crisis in recent years, affecting millions of people globally, especially in developing regions like Africa. The Covid 19 pandemic further exposed the vulnerability of world food systems, as disruptions in supply chains, economic downturns, and widespread job losses intensified food insecurity across several regions. The current study made the first attempt to investigate the role of partnership for the goals in foreign capital-food security in SSA. The study uncovers that partnership for the goals reverses the unconditional negative effect of foreign capital on food security in SSA.

5.6 Recommendations

This study provides important insights into how foreign capital influences ecosystem sustainability and food security in Africa. The findings indicate that the environmental outcomes of foreign capital depend largely on investment structure, institutional quality, and international partnerships. Based on these findings, the study outlines implications for theory, policy, and practice.

5.6.1 Policy Implications

The study highlights several policy directions that African governments can adopt to improve climate resilience and ecosystem sustainability while maximizing the developmental benefits of foreign capital.

First, governments should promote investments in cleaner industries and green sectors. The results show that some forms of foreign capital contribute to environmental degradation when directed toward resource-intensive sectors such as mining, fossil energy, and large-scale agriculture. Policymakers should therefore implement green investment frameworks that channel foreign capital toward renewable energy, smart agriculture, and green technologies.

Second, governments should ensure that portfolio investment reaches the identified threshold of 26.58, as the findings show that positive environmental effects emerge only when

investments exceed this level. Policymakers should therefore strengthen financial markets and regulatory frameworks to attract stable and sustainable portfolio investments.

Third, policymakers should strengthen environmental governance and institutional quality. This includes improving property rights protection, strengthening environmental regulations, and ensuring effective contract enforcement. Strong political and economic institutions reduce environmental risks associated with foreign capital while encouraging sustainable investment flows.

Fourth, governments should formalize financing mechanisms within the agricultural sector. Establishing regulated credit unions or cooperatives can expand access to capital for small-scale ecosystem businesses and improve financial inclusion. Additionally, policies should encourage households receiving remittances to invest in climate-resilient farming and green infrastructure, supported by financial literacy programs.

Fifth, countries facing high external debt should integrate environmental considerations into debt restructuring strategies. Instruments such as debt-for-nature swaps can reduce fiscal pressure while directing resources toward biodiversity conservation and climate adaptation.

To facilitate the translation of the study findings into actionable policy and practice, a Policy Brief entitled *'Leveraging Foreign Capital for Ecosystem Sustainability and Food Security in Africa: A Governance and Partnership Framework for Achieving SDGs 2, 15 and 17'* has been developed and is included as Appendix K. The policy brief translates the empirical findings into implementable actions for governments, development finance institutions, private investors, civil society organisations, and regional economic communities.

5.6.2 Practical Implications

The findings of this study have significant practical implications for governments, development finance institutions, private investors, multilateral agencies, civil society

organisations, and regional economic communities seeking to advance SDG 2 (Zero Hunger), SDG 15 (Life on Land), and SDG 17 (Partnerships for the Goals) in Africa.

5.6.2.1 Implications for Governments and Public Policy

The study demonstrates that foreign capital does not automatically generate positive environmental or food security outcomes. Rather, its developmental impact depends on the quality of institutions and the effectiveness of governance systems. This finding suggests that African governments should move beyond policies that merely attract foreign capital and instead adopt policies that govern the quality, destination, and sustainability of capital inflows.

In practical terms, ministries responsible for finance, planning, agriculture, environment, and investment promotion should establish sustainability screening mechanisms for foreign-funded projects. Environmental, social, and governance (ESG) criteria should become mandatory components of investment approval processes. Governments can operationalise this recommendation by requiring foreign investors to report on environmental performance and linking investment incentives to measurable sustainability outcomes, such as biodiversity conservation, renewable energy adoption, climate resilience, and sustainable agricultural production.

The threshold effects identified in the study also provide policymakers with evidence-based benchmarks for designing investment attraction strategies. Rather than focusing solely on increasing investment volumes, governments should prioritise achieving the institutional conditions necessary for foreign capital to generate positive ecosystem outcomes.

5.6.2.2 Implications for Development Finance Institutions and Multilateral Agencies

The findings have important implications for organisations such as the African Development Bank, World Bank, International Fund for Agricultural Development, United

Nations Development Programme, and regional development banks. The results suggest that development financing should increasingly incorporate institutional strengthening components alongside traditional infrastructure and investment projects.

Development partners can utilise the findings to design integrated programmes that simultaneously improve governance quality, environmental sustainability, and food security. For example, agricultural financing initiatives could be linked to institutional capacity-building programmes that strengthen land governance systems, environmental monitoring capabilities, and climate adaptation planning.

The positive moderating role of partnerships for the Goals further suggests that development agencies should prioritise multi-stakeholder implementation models involving governments, private investors, research institutions, local communities, and civil society organisations. Such partnerships can increase the developmental effectiveness of foreign capital while reducing the risks of environmental degradation and food insecurity.

5.6.2.3 *Implications for Private Sector Investors*

The findings provide strategic guidance for multinational corporations, foreign direct investors, portfolio investors, and impact investment funds operating in Africa. The results indicate that investments aligned with environmental sustainability objectives are more likely to contribute positively to long-term ecosystem resilience.

Investors should therefore incorporate sustainability risk assessments into investment decision-making processes and prioritise sectors such as renewable energy, climate-smart agriculture, sustainable forestry, ecosystem restoration, circular economy initiatives, and green infrastructure. The findings further suggest that investors can improve investment performance and reduce environmental risk exposure by operating within jurisdictions characterised by stronger institutional quality and governance systems.

Impact investors and ESG-focused funds can use the study's threshold findings to identify environments where foreign capital is most likely to generate both financial and sustainability returns.

5.6.2.4 *Implications for Agricultural and Food Security Practitioners*

The study's findings offer practical guidance for agricultural ministries, extension services, agribusinesses, farmer cooperatives, and food security practitioners. The evidence suggests that foreign capital can contribute to improved food security when accompanied by strong partnerships and institutional support mechanisms.

Agricultural development programmes should therefore focus on leveraging foreign capital to support climate-smart agriculture, irrigation infrastructure, agricultural technology transfer, improved seed systems, digital agriculture platforms, and sustainable value-chain development. Development practitioners can utilise the findings to design interventions that encourage productive investment in food systems rather than short-term extractive activities.

The findings further highlight the importance of remittance mobilisation strategies. Governments and financial institutions could develop financial products that channel remittance flows into agricultural investments, sustainable land management projects, and rural enterprise development.

5.6.2.5 *Implications for Civil Society and Environmental Organisations*

The findings underscore the importance of accountability mechanisms in ensuring that foreign capital contributes positively to sustainable development outcomes. Civil society organisations can use the study's findings to strengthen advocacy efforts to improve transparency, environmental compliance, and community participation in investment decision-making processes.

Environmental organisations can also utilise the findings to advocate for stronger environmental safeguards and monitoring systems in sectors receiving substantial foreign investment. Community-based organisations can play an important role in monitoring project implementation and ensuring that investment benefits are equitably distributed while minimising ecological harm.

5.6.2.6 Implications for Regional Economic Communities and Continental Policy Frameworks

At the regional level, institutions such as the African Union, the African Continental Free Trade Area (AfCFTA), ECOWAS, SADC, EAC, and COMESA can utilise the findings to develop regional frameworks that promote sustainable foreign investment practices. The study supports the integration of environmental sustainability criteria into regional investment protocols and trade agreements.

The findings also align with Agenda 2063 and the Sustainable Development Goals by demonstrating how foreign capital can be strategically leveraged to advance ecosystem sustainability and food security objectives. Regional institutions can therefore use the study's evidence to harmonise investment regulations, strengthen governance standards, and promote cross-border partnerships that enhance sustainable development outcomes across Africa.

5.6.2.7 Practical Contribution of the Study

Ultimately, the practical contribution of this study lies in demonstrating that foreign capital alone is insufficient to achieve sustainable development outcomes. Instead, the effectiveness of foreign capital depends on the presence of strong institutions, effective governance systems, and collaborative partnerships. The study therefore provides a practical roadmap for transforming foreign capital from a potential source of environmental degradation into a catalyst for ecosystem sustainability, food security, and inclusive development in Africa.

5.7 Limitations of the study

The study is subject to two main limitations, although these do not undermine the validity or broader relevance of the findings. First, the empirical analysis focuses on 48 African economies, which may constrain the geographical scope of inference; future research could extend the investigation to other developing regions to enhance comparative generalisability. Second, while foreign capital may influence ecosystem outcomes through multiple transmission channels, this study primarily emphasises institutional quality. Other potential moderating mechanisms such as financial development, technological progress, and levels of economic development were not explicitly examined and warrant further exploration to better understand how these channels facilitate ecosystem transition.

Moreover, the considerable economic, political, and cultural heterogeneity across African countries complicates the application of uniform policy recommendations. Variations in governance structures and episodes of political instability, as noted by the (World Bank, 2023), may affect both data reliability and policy implementation. Again, Since the study relies on secondary data obtained from international databases, the findings may be subject to limitations such as measurement errors, missing observations, data inconsistencies across countries, and differences in reporting standards. Variations in data quality and institutional reporting practices across African economies may also introduce comparability challenges.

5.8 Suggestions for future studies

The current study has some useful insights, but there are a couple of limitations to keep in mind. First, it only used secondary panel data from 48 African countries. While that's good enough to draw some solid conclusions, future research could get a broader picture by including data from other developing areas like Latin America or Southeast Asia. That way, countries could compare these relationships more effectively. Second, this study looked at how foreign investment affects ecosystems through institutional quality, but it did not consider other factors

like financial development, tech growth, or different levels of economic progress. Future studies should check out how these other factors might play a role in moving towards a ecosystem. For example, looking at how financial systems and technology can support sustainable use of ecosystem resources, especially in countries at different development stages, could provide more useful insights for policy making.

6 REFERENCES

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7 APPENDICES

7.1 A: Editor Report



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7.2 B: Similarity Report

Similarity Report

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Summary

7.3 C: Variance Inflation Factor

	VIF	1/VIF
ES	1.44	0.69873
GDP	1.56	0.46735
GCF	1.33	0.90833
GNI	1.66	0.67282
PG	1.21	0.56374
UB	1.40	0.46575
HCE	1.38	0.56283
ECOS	1.54	0.94849
POLITY	1.11	0.74845
ILS	1.38	0.62435
LSPR	1.49	0.60937
RGQ	1.53	0.64753
PR	1.29	0.50983
GEFF	1.49	0.61036
	1.415	

7.4 D: Du-Wu-Hausman Test for Endogeneity

.esta engog

Test for endogeneity

Ho: Variables are exogeneous

Robust score chi2(1)

Robust regression F(1, 876) = 0.690637 (P=0.4198)

7.5 E: Variance Inflation Factor

	VIF	1/VIF
ES	1.45	0.6784

FC	1.37	0.7384
IQ	1.29	0.6732
GDP	1.48	0.609
GCF	1.36	0.7633
GNI	1.54	0.3547
PG	1.34	0.890
UB	1.44	0.673
HCE	1.36	0.452
DEBT	1.41	0.753
FDI	1.50	0.893
RM	1.49	0.609
PORT	1.38	0.734
ECONS	1.48	0.619
POLITY	1.35	0.563
	1.416	0.463

7.6 F: Du-Wu-Hausman Test for Endogeneity

.esta engog

Test for endogeneity

Ho: Variables are exogeneous

Robust score chi2(1)

Robust regression F(1, 976) = 1.578648 (P= 0.4840)

7.7 G: Variance Inflation Factor

	VIF	1/VIF
FS	1.59	0.784
GDP	1.38	0.890
GCF	1.49	0.456
GEA	1.53	0.764
PG	1.30	0.784

UB	1.33	0.267
HCE	1.42	0.894
SDGP	1.31	0.345
DEBT	1.43	0.567
FDI	1.49	0.784
RM	1.52	0.736
PORT	1.48	0.263
FC	1.50	0.539
	1.444	

7.8 H: Du-Wu-Hausman Test for Endogeneity

.esta engog

Test for endogeneity

Ho: Variables are exogeneous

Robust score chi2(1)

Robust regression F(1, 986) = 2.029269 (P= 0.2735)

7.9 I: Panel Cross-Sectional Dependency Test

Pesaran's test of Independence (CSPp)	16.113
Average absolute value of the diagonal elements	0.433
P-value	0.000
F-value	58.36
Prob.>F	0.00

Source: Author construction, 2025

7.10 J: Second Generation Panel Unit Root Test

	LOL	FC	GDP	GNI	PG	FM	HCE	GCF	GDP	TO
CADF	-1.287	-0.907	-1.34	-2.4**	-2.44**	-2.7**	-2.23**	-2.30**	-3.18***	-1.23
LEVELS	I(I)	I(I)	I(I)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(I)
1 st Diff.	-2.8**	-2.7**	-2.9**							-3.9***
CIPS	I(I)	I(I)	I(I)	I(I)	I(0)	I(0)	I(0)	I(0)	I(0)	I(I)
LEVELS	-1.55	-0.78	3.44**	-1.83	2.99**	2.90**	2.67**	-3.98***	-2.122**	
1 st .Diff.	-2.98**	-2.89**		2.88**						2.55**

Source: Author construction, 2026

7.5 K: POLICY BRIEF: Leveraging Foreign Capital for Ecosystem Sustainability and Food Security in Africa:

A Governance and Partnership Framework for Achieving SDGs 2, 15 and 17

Author: Ernest Sogah

Policy Audience

- Ministries of Finance
- Ministries of Environment and Climate Change
- Ministries of Agriculture and Food Security
- Central Banks

- Investment Promotion Agencies
- African Development Bank
- World Bank
- UNDP
- FAO
- International Investors
- Regional Economic Communities (SADC, ECOWAS, COMESA, EAC)
- Civil Society Organisations

7.5.1 Executive Summary

Africa continues to rely heavily on foreign capital—including foreign direct investment (FDI), remittances, portfolio investment, and external debt—to support economic development. However, evidence from this study covering 2000–2022 demonstrates that foreign capital does not automatically improve ecosystem sustainability or food security.

The research finds that:

- The impact of foreign capital on ecosystem sustainability becomes positive only after certain thresholds are achieved.

- Strong political and economic institutions significantly improve environmental outcomes.
- Foreign capital alone may negatively affect food security.
- Effective partnerships for the Sustainable Development Goals (SDGs) can transform foreign capital into a positive driver of food security.
- Governance quality is the critical factor determining whether foreign capital contributes to sustainability or environmental degradation.

The policy implication is clear: Africa must move from a strategy of attracting capital at any cost toward a strategy of governing capital for sustainable development.

7.5.2 The Policy Challenge

Many African countries compete aggressively for foreign investment, external borrowing, and international capital inflows.

However, weak institutional environments often result in:

- Environmental degradation
- Resource depletion
- Biodiversity loss
- Unsustainable agricultural practices
- Food insecurity

- Climate vulnerability

Current investment policies frequently prioritize capital attraction while paying insufficient attention to sustainability outcomes.

7.5.3 Key Research Findings

Finding 1:

Foreign capital contributes positively to ecosystem sustainability when supported by strong institutions.

Finding 2:

Political institutions strengthen the effectiveness of economic institutions in promoting environmental sustainability.

Finding 3:

Portfolio investments generate positive ecosystem outcomes after reaching critical threshold levels.

Finding 4:

Partnerships for the Goals (SDG 17) transform the relationship between foreign capital and food security from negative to positive.

Finding 5:

Weak governance reduces the developmental benefits of foreign capital.

7.5.4 Policy Recommendations

7.5.4.1 Recommendation 1: Introduce Sustainable Foreign Capital Screening Frameworks

Governments should require:

- Environmental Impact Assessments
- Climate Risk Assessments
- Biodiversity Impact Assessments
- ESG Compliance Reporting

before approving large foreign-funded projects.

Expected Outcomes

- Reduced environmental degradation
- Improved ecosystem sustainability
- Higher quality investment inflows

7.5.4.2 Recommendation 2: Strengthen Institutional Quality

Priority reforms should include:

- Anti-corruption measures
- Improved regulatory enforcement
- Property rights protection
- Judicial efficiency
- Environmental compliance monitoring

Expected Outcomes

- Increased investor confidence
- Improved environmental governance
- Sustainable resource management

7.5.4.3 Recommendation 3: Promote Green Foreign Investment

Investment incentives should prioritize:

- Renewable energy
- Climate-smart agriculture
- Sustainable tourism

- Circular economy initiatives
- Green infrastructure

Expected Outcomes

- Reduced carbon emissions
- Enhanced ecosystem resilience
- Green job creation

7.5.4.4 Recommendation 4: Establish SDG Partnership Platforms

Governments should create national partnership platforms involving:

- Public sector institutions
- International investors
- Development agencies
- Universities
- Civil society organisations

Expected Outcomes

- Improved project coordination
- Enhanced food security outcomes
- Increased development effectiveness

7.5.4.5 Recommendation 5: Mobilise Remittances for Sustainable Agriculture

Policy instruments should include:

- Agricultural investment bonds
- Green savings schemes
- Cooperative financing mechanisms
- Diaspora investment funds

Expected Outcomes

- Increased agricultural productivity
- Improved rural livelihoods
- Enhanced food security

7.5.4.6 *Recommendation 6: Scale Debt-for-Nature and Debt-for-Climate Swaps*

African governments and development partners should negotiate:

- Debt-for-nature swaps
- Debt-for-climate swaps
- Conservation-linked financing mechanisms

Expected Outcomes

- Reduced debt burdens
- Increased conservation financing
- Enhanced climate adaptation

7.5.5 Implementation Roadmap

Stakeholder	Priority Action	Time Horizon
National Governments	Sustainable investment frameworks	1–3 years
Ministries of Environment	ESG monitoring systems	Immediate

Stakeholder	Priority Action	Time Horizon
Ministries of Agriculture	Climate-smart agriculture programmes	1–5 years
Development Finance Institutions	Governance-linked financing	Immediate
Investors	Green investment portfolios	Immediate
Civil Society	Environmental accountability monitoring	Ongoing
Regional Bodies	Harmonised sustainability standards	3–5 years

7.5.6 Expected Impact

If implemented, these recommendations can contribute to:

- SDG 2: Zero Hunger
- SDG 15: Life on Land
- SDG 17: Partnerships for the Goals

while simultaneously advancing Agenda 2063 objectives on environmental sustainability, food security, and inclusive development.

7.5.7 Key Message

The question for Africa is no longer whether to attract foreign capital, but how to govern it. Strong institutions and effective partnerships are the mechanisms through which foreign capital can be transformed from a potential source of environmental degradation into a catalyst for ecosystem sustainability, food security, and long-term development.

7.6 L: Ethics Clearance Certificate



College of Economic and Management Sciences_ERC Finance, Risk Management
& Banking

Date: 09/10/2024

Dear: Mr Ernest Sogah

**Decision: Ethics Approval from
09/10/2024 to 08/10/2029**

NHREC Registration # : (if applicable)
Ref #: 3255
Name: Mr Ernest Sogah
Student #: 20652062
Staff #:

Researcher: Mr Ernest Sogah

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Supervisor: Professor Raphael Tabani Mpofu mpofurt@unisa.ac.za

FOREIGN CAPITAL FOR SUSTAINABLE DEVELOPMENT: THE MEDIATING INFLUENCE OF INSTITUTIONAL QUALITY

Qualification: Doctor of Philosophy in Management Studies

Thank you for the application for research ethics clearance by the College of Economic and Management Sciences_ERC Finance, Risk Management & Banking for the above-mentioned research study. Ethics approval is granted for five years.

The **negligible risk application** was **reviewed** by College of Economic and Management Sciences_ERC Finance, Risk Management & Banking on in compliance with the Unisa Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.

The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the College of Economic and Management Sciences_ERC Finance, Risk Management & Banking.
3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
4. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing, accompanied by a progress report.

5. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.
6. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data requires additional ethics clearance.
7. No field work activities may continue after the expiry date (08/10.2029). Submission of a completed research ethics progress report will constitute an application for renewal, for Ethics Research Committee approval.

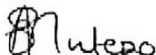
Additional Conditions

1. Disclosure of data to third parties is prohibited without explicit consent from Unisa.
2. De-identified data must be safely stored on password protected PCs.
3. Care should be taken by the researcher when publishing the results to protect the confidentiality and privacy of the university.
4. Adherence to the National Statement on Ethical Research and Publication practices, principle 7 referring to social awareness, must be ensured: "Researchers and institutions must be sensitive to the potential impact of their research on society, marginal groups or individuals, and must consider these when weighing the benefits of the research against any harmful effects, with a view to minimising or avoiding the latter where possible." Unisa will not be liable for any failure to comply with this principle.

Note

The reference number 3255 should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.

Kind regards,



Prof A Mutezo
Chair of College of Economic and Management Sciences_ERC Finance, Risk Management & Banking
E-mail: Muteza@unisa.ac.za



Prof MC Mulaudzi
Deputy Executive Dean / By delegation from the Executive Dean of the College of Economic and Management Sciences_ERC Finance,
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