Strategy framework for sustainable industrial development in sub-Saharan Africa: Systems-evolutionary approach

Mebratu, Desta

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Strategy Framework for Sustainable Industrial Development in sub-Saharan Africa

Desta
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LUND
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The International Institute for Industrial Environmental Economics
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Abstract

The increasing state of environmental decline, the failure of development strategies and the continuous proliferation of unsustainable production and consumption practices are the major challenges of sustainable development. The challenges become more difficult due to the prevailing confusion around the concept of sustainable development that has led to the deepening division of the sustainable development agenda into the 'green' and 'brown' agenda. With this as the background, the principal objectives of this research were:

- to develop a conceptual framework on sustainability and sustainable development and
- to propose a strategy framework for sustainable industrial development in Sub-Saharan Africa (SSA).

The research was conducted based on a systems evolutionary approach having the following methodological principles as a guide.

- The dynamic complexity of environmental and developmental issues can be better understood by utilizing transdisciplinary theories such as 'General Systems Theory', 'General Evolutionary Theory' and 'Information Theory'.
- From an environmental perspective, the 'add-on approach' has limited success both at the macro and micro level. At the macro level, sustainable development requires mainstreaming socio-ecological and socio-economic principles in development policies and strategies.
- From the systems dynamics perspective, it is crucial to make a distinction between fundamental and facilitating factors of the development process and to understand the interaction within and among these factors.

The following are the major conclusions and recommendation that were generated from the research.

- Systems can be described by the 'entity factors', that define the boundary conditions of the system and the 'significance factors', that determine the field of significance of the system.
- The interaction between the 'entity factors' and the 'significance factors' provides the basis for fulfillment of the systemic function.
- Sustainability is a systemic property of maintaining the positive slope of the systemic functions through evolutionary succession of systems.

- The path and pace of the evolutionary succession of a given system is determined by its ability to identify, process, utilize and accumulate survival-relevant (SR) information.
- For societal systems, the 'entity factors' are ecological space, demography, and culture while the 'significance factors' are institutional structures and norms, capital structures and flows, and technological innovation and diffusion.
- Sustainable development is a process of achieving an optimum interaction between the entity and significance factors of a society to maintain evolutionary succession and productive engagement as the principal function of a societal system.
- Industrial development strategies that have been promoted in SSA have been of the 'transplanting' nature instead of being 'transformational'. This has resulted in a mismatch between the 'entity factors' of the African society and the 'significance factors' that are increasingly dictated by 'global interest'.
- The development of the region's ability to manage SR information is a fundamental prerequisite for promoting sustainable industrial development in sub-Saharan Africa as a transformational process.
- Identification and utilization of the positive elements of endogenous capacities and indigenous knowledge, as essential repositories of SR information, constitutes the core principle of building such a capacity.
- Resource depletion, disoriented property rights regimes, sectoral dichotomy and global inertia were identified as the principal challenges. Hence, valorization of resources is the core element of the strategic framework, supplemented with sub-models on property rights regimes, sectoral synergy and global momentum.
- A sustainability function sub-model reinforces the proposed framework. This sub-model covers macro and sectoral strategy elements that ensure the sustainability of the industrial development process.

The promotion of sustainable development as a social transformation process will require a fundamental reorientation of national, regional and international structures. This includes reorienting the currently dominant knowledge structure in the world. It is believed that a transdisciplinary approaches provide sound bases to undertake such reorientation at a global scale. This thesis contributes to the promotion of sustainable industrial development in SSA through the application and advancement of transdisciplinary approaches.

Preface

In September 1995, I made an impromptu speech at the inaugural ceremony of the International Institute for Industrial Environmental Economics. During this speech, I said that I did not join the Institute for the sake of obtaining a master's degree because I never felt the need for having a masters degree for the work I was then doing. I told the audience that my decision to come to Sweden was mainly driven by the desire to respond to the intellectual challenge I encountered during my engagement in the environmental field and through involvement in grass-roots environmental and developmental activities. My academic curiosity was triggered by a number of practical questions that are commonly faced by most practitioners involved in promoting sustainable development in the developing world. The same academic curiosity and intellectual challenge, which was not satisfied by the end of the masters program, led to my further enrollment in the Ph.D. program. This dissertation provides a partial if not a complete answer to most of the fundamental questions I had when I joined the Institute in 1995.

During the past three years of my academic research, I have come across a number of experts who either underplayed the importance of deliberating on the conceptual clarity of sustainable development or declared the impossibility of defining sustainable development, even if it is desirable. The experts belonging to the first group can, further, be classified into two sub-groups. Firstly, there are experts who have a vested interest in the current vagueness of the concept of sustainable development. It will be a futile attempt to convince this group of experts. Secondly, there are experts who believe that sustainable development is about action at the local level rather than conceptual deliberation. Nevertheless, the limited progress made so far indicates that such actions need to be guided by a coherent conceptual framework if they are to lead to global sustainability.

This dissertation is, however, mainly meant for the second group of experts who are promoting the 'impossibility' hypothesis. Truly enough, sustainability and sustainable development cannot be understood and be well defined within the context of disciplinary and interdisciplinary thinking. As an issue of organized complexity, it is neither amenable to reductionist simplification nor understandable through mechanistic summation. Alternatively, this dissertation attempts to show that sustainability and sustainable development can be understood and defined through a transdisciplinary thinking framework that is based on systems and evolutionary theory. As research belonging to the 'frontier sciences' there may not be consensus on the conclusions; but it definitely represents a new way of addressing the sustainability issues.

This dissertation further demonstrates that the conceptual deliberation on sustainability and sustainable development is of critical practical relevance to the effort of designing sustainable development strategies in the developing world. In the course of undertaking this research, I have come across numerous literature and individuals that focus on conflicts and lack of political stability as the major reasons for development failure in SSA. I do agree that conflicts and political instability are sources of inertia for any development. But these are just the manifestations or symptoms of deep-rooted crises: the institutional and resource crises. From a policy and strategy perspective, the crises we have in SSA are more of methodological crises that came as a result of putting emphasis on facilitating factors rather than the fundamentals; the symptoms rather than the root causes. Addressing these methodological crises is a fundamental prerequisite for promoting sustainable industrial development in SSA. The situation requires a new framework of thinking. It is my earnest hope that this research will contribute to the development of this new framework of thinking.

Needless to say, such a research work requires broad-based collaboration with different institutions. In this context, a number of institutions and individuals have made significant contribution to the successful completion of the research. In general, I would like to thank all individuals and institutions that gave me assistance at different phases of my work. In particular, I would like to express my gratitude to the International Institute for Industrial Environmental Economics (IIIEE) at Lund University for providing me the opportunity to undertake my Ph.D. study and research. I would also like to express my appreciation for the United Nations Economic Commission for Africa (UNECA) in Addis Ababa, Ethiopia, for providing me with all the necessary support in the course of the second phase of the research. The research benefited significantly from the valuable inputs given and challenges posed by participants of the seminars given at IIIEE and UNECA. I thank all participants for their valuable inputs.

At the individual level, I deeply appreciate the intellectual insight, administrative support and personal encouragement I received from my supervisor Professor Don Huisingh. His continuous support was critical for the completion of the research. I would also like to thank Professor Gote Hansson, Mr. Jonathon Hanks and Ms. Lyn Raffan for their valuable comments on the draft manuscript. I thank Dr. David Tommy of UNIDO for facilitating my attachment with UNECA and Mr. Mbaye Diouf and Dr. Sam Ochola of UNECA, for their continuous support during my stay at UNECA. Finally, I would like to thank my family who has taken part in the research in different ways.

Table of contents

List of Tables

List of Figures

List of Abbreviations

AAF-SAP	African Alternative Framework for Structural Adjustment Programs
AAU	Addis Ababa University
ADB	African Development Bank
ADLI	Agricultural Development Led Industrialization
AFSIDS	Alternative Framework for Sustainable Industrial Development Strategies
APPER	Africa's Priority Program for Economic Recovery
ARB	African Research Bulletin
BWIs	Bretton Woods Institutions
CP	Cleaner Production
CSE	Conservation Strategy of Ethiopia
ECPC	Ethiopian Cleaner Production Center
EIA	Ethiopian Investment Authority
EIA	Environmental Impact Assessment
EID	Eco Industrial Development
EIU	Economic Intelligence Unit
EMS	Environmental Management System
EMAS	Eco-Management Audit Scheme
EPA	Environmental Protection Authority
EPA	Ethiopian Privatization Agency
EPE	Environmental Policy of Ethiopia
EPR	Extended Producers Responsibility
EPRDF	Ethiopian Peoples Revolutionary Democratic Front
EPZ	Export Processing Zone
ERRP	Economic Recovery and Reconstruction Program
ESAF	Enhance Structural Adjustment Facility
ESID	Ecologically Sustainable Industrial Development
ESTC	Ethiopian Science and Technology Commission
ETR	Economic Tax Reform
FDRE	Federal Democratic Republic of Ethiopia
GATT	General Agreement on Trade and Tariff
GDP	Gross Domestic Product
HIPC	Highly Indebted Poor Countries
IDDA	Industrial Development Decade for Africa
IIED	International Institute for Environment and Development
IMF	International Monetary Fund
ISO	International Organization for Standardization
IUCN	International Union for Conservation of Nature

LDCs	Least Developed Countries
LPA	Lagos Plan of Action
MAI	Multilateral Agreement on Investment
MOPED	Ministry of Planning and Economy Development
MOTI	Ministry of Trade and Industry
MSEs	Micro and Small-scale Enterprises
OAU	Organization of African Unity
OECD	Organization for Economic Cooperation and Development
P2	Pollution Prevention
PEC	Primary Environmental Care
RCS	Regional Conservation Strategy
SAP	Structural Adjustment Program
SID	Sustainable Industrial Development
SPD	Sustainable Product Development
SSA	Sub Saharan Africa
TGE	Transitional Government of Ethiopia
UN	United Nations
UNDP	United Nations Development Program
UNECA	United Nations Economic Commission for Africa
UNIDO	United Nations Industrial Development Organization
UNPAARED	United Nations Program of Action for African Economic Recovery and Development
UNTACDA	United Nations Trade and Communication Decade in Africa
WCED	World Commission on Environment and Development
WTO	World Trade Organization

CHAPTER

ONE

1. Introduction

The development of science and technology and the subsequent unparalleled economic growth that has been achieved in the twentieth century has been the major source of economic prosperity and improvement of living standards in different parts of the world. The same economic growth has fundamentally changed the relationships within a society, between societies and between man and nature. Thus, as we approach the end of the second millennium, we are overwhelmed by complexities that are unprecedented in human history. Today, humankind has the capacity to produce far more information than anyone can absorb, to foster far greater interdependency than anyone can manage, and to accelerate change far faster than anyone's ability to keep pace (Senge 1990). In parallel with (or as a result of) this unprecedented scale of complexity, we have a myriad of systemic dysfunctions each with its own ecological, economic and social dimensions that have no simple causes or solutions.

Although environmental concerns, as reactions to local ecological disasters, have been known for a long time in human history, environmental concerns with direct linkages to economic growth started to emerge in the 1960s. This happened as a consequence of visible ecological impacts of the rapid post-World War II industrial development in Northern America and Europe. This concern received international attention in 1972, when the World Conference on Human Environment was held in Stockholm, Sweden. Subsequently, the increasing recognition of the scale of the ecological damage caused by economic growth and the growing disparity between the rich and the poor countries led to the evolution of the concept called "sustainable development" in the 1980s.

1.1 Problem description

It has been a little more than a decade since the 'term sustainable development rose to the prominence of mantra-or a shibboleth' (Daly, 1996) following the 1987 publication of the UN sponsored World Commission on Environment and Development (WCED) report, **Our Common Future**. Despite its vagueness and ambiguity, the WCED definition of sustainable development has been highly instrumental in developing a global vision regarding our planet's future.

As a result, it has become a key element of major policy documents developed by national governments, international organizations, and even corporate companies. However, as can be seen from the following points, there is a disturbing development behind the acceptance of sustainable development as 'a motherhood apple-pie' concept (Holmberg 1994).

State of decline: The United Nations Conference on Environment and Development (the Rio-Summit) has led to thousands of initiatives at the local, national, and global levels. Nevertheless, evidence shows that the progress made is far from a sufficient level of improvement on the state of the global environment. The Global Environmental Outlook (GEO-1) report produced by UNEP (1997,4) states that "despite the progress made on several fronts, from a global perspective the environmental conditions have continued to degrade during the past decade, and significant environmental problems remain deeply embedded in the socio-economic fabric of nations, in all regions." This report further notes that progress towards a global sustainable future is just too slow and, as a result, the gap between what has been done thus far and what is realistically needed is widening. According to GEO-1 (UNEP, 1997,5), "the world should embark on major structural changes to pursue environmental and associated socio-economic policies vigorously." This suggests that, addressing the root causes of the systemic dysfunctions is an essential element to enhance the effectiveness of the actions at the local level.

Conceptual confusion: Although there is an emerging political consensus on the desirability of something called sustainable development, 'this term - touted by many and even institutionalized in some places - is still dangerously vague' (Daly 1996). Such a situation has led to a significant level of confusion and frustration to the extent of the concept being branded as an oxymoron by its own protagonist (Tryzna 1995). In the words of Johan Holmberg (1994), sustainable development as a concept has become 'devalued to the point where, to some, it is just a cliché'.

"Green" and "brown" agenda: Most of the major environmental problems that are threatening the very survival of humanity are of global nature requiring global cooperation based on mutual understanding and respect. Today, the sustainable development agenda has taken two different forms from the developing world perspectives. The 'green agenda' with emphasis on the protection of the natural ecosystems and the 'brown agenda' with emphasis on social priorities such as poverty-alleviation and food self-sufficiency. As it stands now, it is not easy to develop a meaningful dialogue between these two agendas. Because, they are of incoherent wavelengths however refined they seem to be as an independent agenda. The discord that has become typical of most global environmental forums is a manifestation of the conflicting dichotomies existing within the global environmental agenda.

Globalization and liberalization: Presently, the international economic environment is mainly characterized by two distinct but closely linked trends called globalization and liberalization. While the very closely related trends of globalization and liberalization open vast possibilities for global economic growth, they are also creating a disturbing trend in terms of the expanding social inequality between countries and within societies. With liberalization gaining the upper hand, unsustainable production and consumption are continuously proliferating in the developing world through relocation of polluting industries and the transfer of inefficient industrial practices. In response to the global pressure, most developing countries are embarking upon ambitious industrialization strategies with the objective of expanding their industrial basis and increasing their share in the global market. While the structural transition to an industrial society may be a desirable goal, it will be a major mistake if the developing world follows paths of industrialization that have been followed by the developed world.

Development in sub-Saharan Africa: Africa's economic performance during the last two decades has been conspicuously disappointing compared to its past achievements and relative to its potential and rich endowment. The persistent decline in economic performance and worsening poverty have had significant adverse impacts on the natural environment. Empirical evidence has shown that there is a direct correlation between poverty alleviation and environmental protection and development strategies that effectively address poverty will benefit the environment. Similarly, the implementation of disoriented development strategies will perpetuate underdevelopment and poverty thereby causing further damage to the environment. Thus, a closer review of development strategies within the context of the local priority and global sustainability is essential for promoting sustainable development.

In short, the pressing need for system-wide intervention before it is too late and the accompanying lack of a concrete body of theory on sustainable development have led to a moment of perturbation that is manifesting itself in different ways (Mebratu, 1996c). As Daly (1996) pointed out, acceptance of a largely undefined term sets the stage for a situation where whoever can pin his or her definition to the term will automatically win a large political battle for influence over our future. This has been reflected in a number of global and national initiatives where the fora have become a political battleground between the North and the South and the corporate empire and civil societies.

While it may be true that definitions, in the sense of names, are more a matter of convenience than principle, it is not true that concepts are mere matters of convenience. Unspecified concepts make analysis too complicated and too artificially contrived. The key issue here is not what name shall we give the agreed upon concept. It is rather what concept shall we denote by the agreed upon names of sustainability and sustainable development, and how can we operationalize them within the sub-Saharan Africa context.

1.2 Research objectives

This research was undertaken to address these problems and to make a contribution from the scientific community towards an improved understanding of sustainable development. In this context, the research has the following objectives:

- to develop a conceptual framework for sustainability and sustainable development based on the empirical and theoretical knowledge gained from the tradition of indigenous societies, the environmental movement, and disciplinary and interdisciplinary sciences;
- to develop a framework for sustainable industrial development strategies for Sub-Saharan Africa that can be used as a generic model for developing industrial development policies and strategies in the region.

1.3 Methodology and approach

As is clear from the research objectives, the first part of the research focuses on developing the theoretical basis for sustainability and sustainable development. Based on the outcome of the first part, the second part of the research examines existing industrial development strategies in sub-Saharan Africa and proposes an alternative framework for promoting sustainable industrial development in the region. The research approach is based on undertaking both theoretical and empirical analyses. The major part of the theoretical analyses that focused on the first research objective was done at the International Institute for Industrial Environmental Economics (IIIEE) at Lund University, Sweden. Based on the outcome of the first portion of the research, the empirical analysis that focused on the second objective was done at the United Nations Economic Commission for Africa located in Addis Ababa, Ethiopia. The following were the key methodologies and approaches utilized in the process of undertaking the research.

Modular approach: the relevant research questions were identified and structured in different modules as follows:

Module one (Chapter 2)

- Are there any precedents in socio-economic transformations, from which the environmental past may indicate useful parallels with the present and the future?
- How is sustainability/sustainable development understood and defined by different groups? What are their principal epistemological and conceptual strengths and weaknesses?

Module two (Chapter 3)

- What major scientific paradigm shifts have been observed in response to the environmental challenges? What are their strengths and weaknesses?
- What are the theoretical bases that can be used for developing the conceptual framework for sustainability?

Module three (Chapter 4)

- What are the basic principles of sustainability that have a common application for 'natural' and 'man-made' systems?
- How can we define sustainable development on the basis of the sustainability principles?

Module four: (Chapter 5)

- What are the major categories of evolving concepts and tools in the field of promoting sustainable industrial development?
- How can these evolving concepts and tools influence the industrialization process in sub-Saharan Africa

Module five (Chapter 6)

- What are the most relevant criteria for reviewing the sub-Saharan African development strategies from a sustainability perspective?
- What are the major kinds of industrial development strategies that have been in practice in sub-Saharan Africa and how have they performed?
- What are the strengths and limitations of the principal industrial development strategies in the region from a sustainable development perspective?

Module six: (Chapter 7)

- What are the fundamental factors that have to be addressed by a strategy framework that promotes sustainable industrial development in SSA?
- An Alternative Framework for Sustainable Industrial Development Strategies (AFSIDS) in sub-Saharan Africa is proposed.
- An illustration of the application of the model to Ethiopia is presented.

Methodological tools: The first part of the research, which covers modules one to three, was conducted mainly through review of existing literature. The second part of the research was conducted through a combination of literature review, analysis of program reports and individual discussions with development experts in field offices in Africa. The following are the principal methodological tools utilized in the process of undertaking the research.

Seminars and conferences: Seminars were organized to present the results of each module to the staff working at the research base. Accordingly, five seminars were given at IIIEE, Lund University while another three were given at the United Nations Economic Commission for Africa in Addis Ababa. Additionally, three presentations were made to the following international conferences:

- "Conceptual review for sustainable development." The Second International Sustainable Development Research Network Conference, April 5-7, 1997, Manchester, UK.
- "Transdisciplinary paradigm for sustainability." The First European Conference on Integrating Natural and Social Sciences, October 27-29, 1997, Roskilde, Denmark.
- "Conceptual framework for sustainability." The Third International Sustainable Development Research Network Conference, April 6-8, 1998, Leeds, UK.

The feedback obtained from the conferences and the seminars was used to refine earlier conclusions and to reorient subsequent research directions. Furthermore, based on an invitation received from the organizers, a summarized version of the dissertation under the title 'Transdisciplinarity and the Developing World' will be presented to the following conference:

- International Transdisciplinarity Conference: Managing Complexity. February 27 - March 1, 2000, Zurich, Switzerland.

Publications: Besides the publication of the papers presented at the international conferences as conference proceedings, an article based on the research results of Module one was published in the 'Environmental Impact Assessment Journal'. Articles based on the second section of the research are being processed for publication.

Web-posting and interaction: a synopsis of the Ph.D. research was posted on IIIEE's homepage. The Ph.D. research homepage was regularly updated with a brief outline of the conclusions made after completion of each module of the research. An electronic discussion was made with researchers working in related fields. Furthermore, an active part was taken in the following of on-line conferences for which inputs were made to the discussion based on the conclusions and recommendations of the research.

- Promoting environmental sustainability in development: an evaluation of the World Bank's performance, on World Bank's Development forum, organized by the Operations Evaluation Department of the World Bank. July 6 - August 16, 1999.
- African Realities and International Policies, organized by African Policy Information Center (APIC) and UNECA, January 2000.

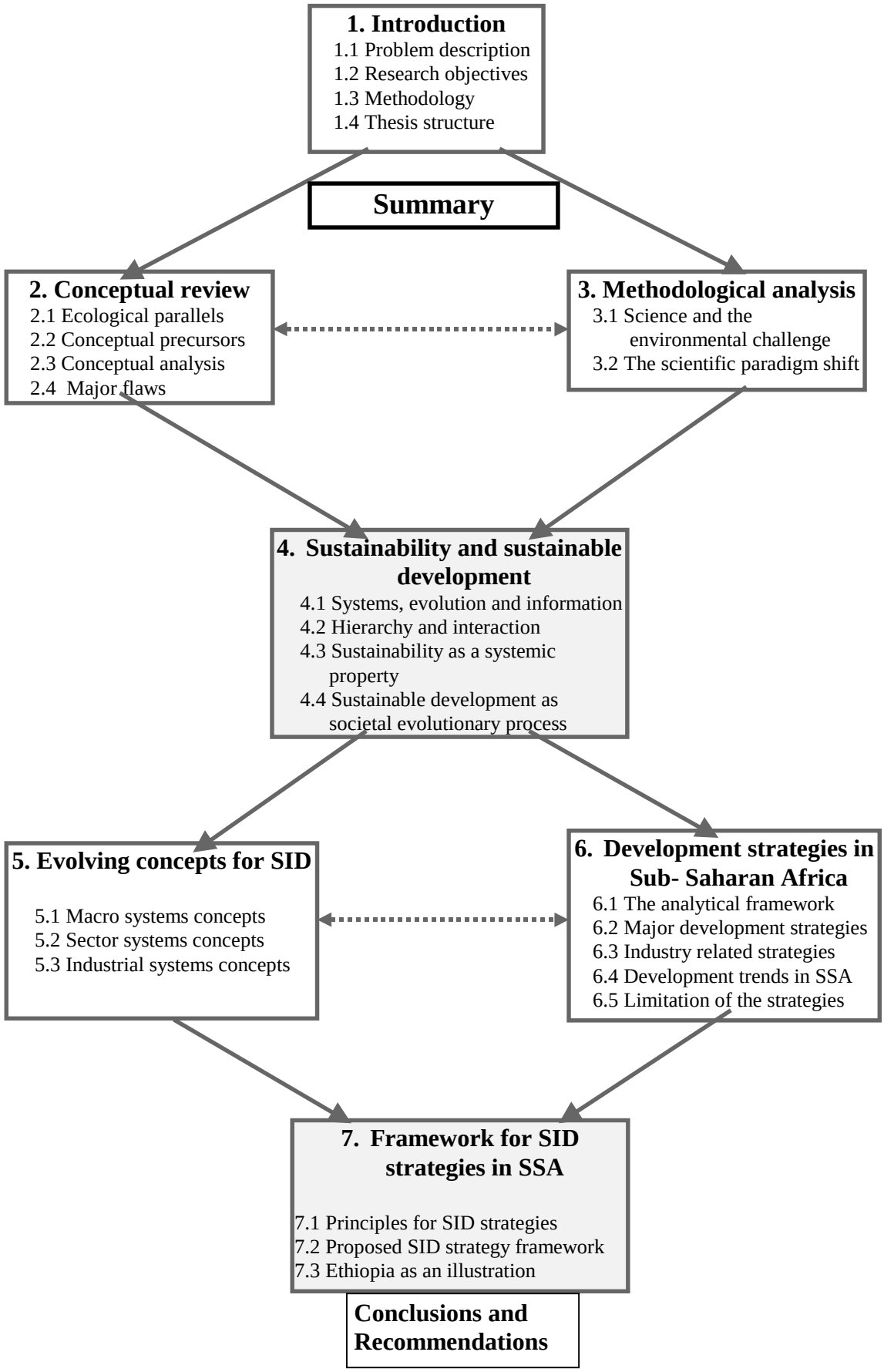
1.4 Structure of the dissertation and a guide for the reader

Following the structure of the research, the dissertation has seven chapters (refer to Figure 1) and a summary section. The chapters of the dissertation can be further categorized into the following three sections:

- *Section one* includes the introductory chapter of the dissertation where the background, objectives and methodologies of the research are presented and the summary section where the major findings of the research are summarized.
- *Section two* is the section that covers chapters two to four where the first objective of the research is addressed.
- *Section three* covers chapters four to seven and addresses the second objective of the research.

All readers are advised to read section one which covers the background and the major findings and conclusions of the research. Detailed information on the findings and conclusions can be obtained from sections two and three.

Figure 1: The structure of the dissertation



Summary

The increasing state of environmental decline, the failure of development strategies and the continuous proliferation of unsustainable production and consumption practices are the major challenges of sustainable development. The challenges become more difficult due to the prevailing confusion around the concept of sustainable development that has led to the deepening division of the sustainable development agenda into the 'green' and 'brown' agenda. With this as the background, the principal objectives of this research were:

- to develop a conceptual framework on sustainability and sustainable development and
- to propose a strategy framework for sustainable industrial development in Sub-Saharan Africa (SSA).

These objectives were addressed in two sections of the dissertation. The following is a summary of the major findings and conclusions of the research.

1. Contemporary environmental debate predominantly assumes that environmental concern is linked to the problem of industrial pollution and considers this to be a unique feature of the industrial society. Historically, however, hazards of pollution, deforestation, land degradation and food adulteration have dogged humanity, to a greater or lesser extent, for most of its existence. Throughout most of human history the growth of population, the degradation and depletion of resources, the restructuring of societies, and the development of new technologies have usually been so slow as to be imperceptible. The global economy has shown incredible growth during the past two centuries, and especially during the last five decades, transforming the character of the planet and especially of human life, in a fundamental way. This led to new generations of global environmental concerns that led to the evolution of the concept of sustainable development.

2. The report, *Our Common Future*, published by WCED, is taken as a starting point for most current discussions on the concept of sustainable development. This report, a comprehensive one produced through a global partnership, constituted a major political turning point for the concept of sustainable development. But it is neither the starting point nor the possible end of the conceptual development process. There are numerous cases of religious teachings, traditional beliefs and indigenous practices that go back hundreds f years and have 'living in harmony with nature' as their core principle. The

'Theory of Limit' that was developed by Thomas R. Malthus, the theory on 'Scale of Organizations' forwarded by the anarchist school of thought and the concept of 'Appropriate Technology' championed by Ernest F. Schumacher could be considered as the precursors for the evolution of the concept of sustainable development.

3. The politically expedient vagueness of the WCED definition on sustainable development has made it highly instrumental for developing a global consensus in the 1980s and the early 1990s. By 1995, however, this initial vagueness was no longer a basis for consensus, but a breeding ground for disagreement. The acceptance of a largely undefined term has set the stage for a situation where capturing the meaning of sustainable development has become a critical element to win the political battle for influence over the future. As a result, most of the efforts to interpret the concept were, to a large extent, influenced by the fundamental tenets of the specific group or organization.

4. The response of the scientific community to the global environmental challenge, naturally, started within the disciplinary domains which later evolved towards the interdisciplinary response. The disciplinary response led to scope limitations in terms of addressing the problems while the interdisciplinary approach led to an era of detailed complexities where the root causes are overshadowed by the long list of symptomatic solutions. Despite their limitations, the disciplinary and interdisciplinary responses to the environmental challenge have made a major contribution in terms of expanding our knowledge base and opening doors for questioning some of the assumptions of the previously dominant scientific thinking.

5. The transdisciplinary paradigm is a cross sectional paradigm that focuses on uncovering the general principles and theories behind the functions of natural and human systems. It serves as an instrument to understand the dynamic complexity behind every systemic function. By doing so, it helps us to overcome the 'scope limitation' of the disciplinary domains, and the 'detailed complexity' of the interdisciplinary domain. As a paradigm that runs across the disciplinary domains, it provides an effective communication platform between the natural and social sciences in their efforts for dealing with environmental complexities.

6. Understanding sustainable development as a societal transformation process will require us to begin a new form of dialogue on a transdisciplinary basis. In confrontation with the entrenched compartmentalization of specialized disciplines, progress in transdisciplinary paradigm development must prove stronger than the territoriality that keeps theories developed within specialized disciplines apart. In this context, the general systems and general evolution theories, as the 'sciences of complexities', provide sound bases for developing an alternative conceptual framework for sustainability and sustainable development.

7. In terms of understanding the evolutionary process of systems, all physical processes and transformations can be described in terms of two fundamental information parameters. These are, respectively, pure uncertainty-reducing or distinguishability information that provides the basis for the 'Entity Factors' and evolutionary survival-relevant information that provides the basis for the 'Significance factors' of any system. The entity factors are the factors that exist independently of any reference system or observer. On the contrary, the 'Significance factors' are the factors that are relevant to the evolutionary selection process and are definable only in terms of a specific local system. The interactions within and among the 'Entity' and 'Significance' factors provide the bases for evolutionary succession.

8. The definition of the concept of sustainability within the context of this research is based on the following two assertions. First, every unit has a given functional capacity, which follows an initially increasing and later decreasing pattern with time. The second assertion is that every system has a succession function that enables the system to sustain its functional capacity through alternative cycles of succession.

   > *Sustainability is, therefore, the maintenance of a positive slope of systemic function as a function of the interaction among the entity factors and significance factors of the system through the proper combination of unit functional capacity and succession of time.*

   As such, sustainability could be considered as the driving force behind any systemic function. The sustainability of a given system is determined by its ability to identify, process, utilize and accumulate survival-relevant (SR) information as a function of the interaction between the Entity and Significance factors.

9. The principal elements of the Entity (Distinguishability) factors of societal systems are ecological space, demography and culture. The ecological space defines the possibility paths for societal evolutionary process. In terms of a society, this is given by the source and sink function of the natural environment. Demography stands for the overall distribution of population and the nature of human settlements in a given ecological space. Culture constitutes the accumulated survival-relevant information of a given society through evolutionary succession. As such, culture can be considered as the DNA equivalent of societal systems. The Significance factors of a societal system are the factors that provide the field of significance for a given societal system to fulfill a desirable societal function. The principal significance factors of a 'societal system' are institutional structures and norms, capital structures and flows, and technological innovations and diffusions.

10. The interaction between the Entity factors and the Significance factors of a given social system constitutes the basis for fulfilling societal functions. While there are numerous attributes and functions that could be listed under societal functions, all of these functions can be broadly categorized under the function of evolutionary succession and productive engagement. As part of the broader universe that is evolving, achieving evolutionary succession becomes the inherent cardinal function of any societal system. On the other hand, as a distinct entity from the natural universe, productive engagement becomes the other cardinal function of any societal system.

11. The principal functions of evolutionary succession and productive engagement will take different forms of expressions and attributes depending on the nature of the entity factors and the nature of interactions among the entity and significance factors. On the basis of the preceding discussion:

Sustainable development is defined as a societal process of maintaining an optimum interaction between the entity and significance factors of a given society with an objective of providing productive engagement for its members and maintaining the necessary socio-ecological and socio-economic conditions for achieving evolutionary succession of the society.

12. Since the middle of the twentieth century, there have been numerous efforts to address the environmental impacts of industries. Initially, most of the efforts were limited to the reduction and/or containment of the adverse impacts of industrial activities on human health. Starting from the mid 1970s, the focus shifted to the broader objective of reconciling industrial activities with the ecological balance of the natural system. This has required a

fundamental rethinking of industrial structures and operations. The rethinking process has led to the evolution of different concepts related to sustainable industrial development.

13. While most of these concepts are still at early stages of evolution, some have started to gain increasing acceptance at a policy and industrial operation level. Even if some of these concepts and tools that are being used for developing national and international policies and strategies are well developed, little has been done with regards to developing a framework for their combined application and utilization. In the context of this research and of the relevance of the concepts to Africa's industrialization effort, the evolving tools and concepts for SID can be categorized under concepts of Macro systems, Sectoral systems and Industrial systems.

14. An overview of development efforts in SSA shows that there have been three major groups of development strategies that have been influencing national development strategies in SSA. The first group consists of strategies adopted and promoted by the UN system based on the concept of development decade. In parallel with these UN initiatives, there have been other regional initiatives promoted by the UNECA and the Organization of African Unity (OAU). These constitute the second group of strategies. The third major group of initiatives that has affected the course of events since the eighties is the policy intervention by the World Bank and the International Monetary Fund (IMF) in economic policy making of most African countries.

15. As much as there are many development strategies prescribed for SSA, there are different analytical frameworks that have been employed to review the numerous development strategies and generate solutions. Apparently, all of the analytical frameworks are influenced by the specific epistemological orientation that serves as the foundation of the analysis. As can be seen from the first part of this dissertation, this research has been based on developing a new epistemological foundation that is based on a "Systems Evolutionary Approach". Accordingly, the following are identified as the major components of the analytical framework: pre-analytic vision; local-global responsiveness; fundamental versus facilitating factor variation; socio-ecological considerations; socio-economic impacts; adaptive mechanisms.

16. A closer look at the philosophical and epistemological foundation of these strategies shows that the continental initiatives promoted by UNECA and the Bretton Woods initiatives are fundamentally different. The regional strategic initiatives spearheaded by the UNECA were based on the achievement of self-reliance and self-sustainment through active state intervention. On the

contrary, the initiatives promoted by the BWIs were based on the promotion of a laissez-faire approach that is governed by the market. Until the early eighties, the national development strategies of most African countries were promoting active state intervention in development planning and implementation. Throughout the eighties, development strategies of most Sub-Saharan African countries were moving between the two extreme positions of active state intervention and laissez-faire approaches with very few countries fully endorsing one or another form of the strategy.

17. The social development effort that has been spearheaded by the development decade concept has led to some positive, but not sufficient, results in the areas of social development. For instance, between 1960 and 1994 life expectancy increased from 40 years to 52 years, while since the mid 1980s the proportion of the population with access to safe water was almost doubled, from 25% to 43% of the total. During the past two decades adult literacy advanced from 27% to 55%.

18. In economic terms, however, the Sub-Saharan economy declined in virtually every measurable way from the 1970s through to the mid 1990s. SSA economy declined in terms of Gross Domestic Product (GDP) and per capita GDP after an impressive start at independence. On the other hand, Africa's debt has grown geometrically during the last three decades. In 1960 the region's external debt amounted to less than 3 billion USD and the average debt service ratio was only 2% of exports. The region's aggregate ratio of debt to exports was estimated at 239.9%, in 1996. Africa has also been missing the large expansion of international trade. Africa's share of global trade has fallen from around 3% in the 1950s to around 1% in 1995.

19. Numerous authors have analyzed the limitations of development strategies promoted in SSA from different perspectives. Most of these analyses do not go beyond finding explanations as to why a specific development strategy failed due to factors that fall outside the very process of developing the strategy in the first place.

20. The following conclusions can be made in the context of the analytical framework employed in this research.

- The disoriented and often conflicting emphasis on the self-sustainment philosophy of LPA and liberalization of SAP was not able to provide a sound basis for the development of efficient development strategies in SSA.

- Both groups of strategies were inclined towards transplanting development either through foreign investment/technology flow and/or through central planning instead of building upon the transformational dynamics of the local socio-economic factors.
- The strategies placed more emphasis on facilitating factors that determine the pace of the development process instead of identifying and focusing on fundamental factors that determine the nature and direction of the development process.
- The strategies have weak considerations for socio-ecological factors. In cases where they considered socio-ecological factors, they have been limited to 'environmental policy add-ons' instead of mainstreaming socio-ecological considerations.
- Despite the massive effort of promoting the two groups of strategies, the socio-economic situation in SSA became worse in the 1980s. Even if some sub-Saharan African countries have registered improvements in the 1990s, they have a problem of sustaining their socio-economic gains.
- Both groups of strategies have suffered from 'frozen policy and strategy frameworks' that left little room for dynamic adaptation of the frameworks to changing environments. Their review process was limited to minor tinkering of the performance variables and finding external explanations for the limited successes.

In conclusion, the strategies proposed so far represent a significant mismatch between strategy frameworks proposed and the local operational realities on the ground. This has further undermined the capacities of sub-Saharan African countries in terms of identifying, processing, utilizing and transferring SR information for their development process. The first step to get out of this situation is to identify the fundamental factors that are affecting development efforts in sub-Saharan Africa and address them within a dynamic strategy framework.

21. In the context of this research, the major challenges of promoting sustainable industrial development in SSA are resource depletion, disoriented property rights, sectoral dichotomy, and the inertia caused by globalization/liberalization.

- The major components of resources are the natural resources, financial resources, human resources and the infrastructural resources. SSA is faced with severe depletion of all kinds of resources. Reversing this trend is a fundamental prerequisite for promoting sustainable industrial development in SSA.

- The sectoral bias that is dominant in Africa's development strategies has undermined the development process in SSA. Three of the major sector biases are private versus public, agriculture versus industry, and formal versus informal.
- SSA is suffering heavily from the existence of disoriented property right regimes that have their roots in the colonial era. This is one of the fundamental factors that must be rectified.
- Africa's development on a sustainable basis will require addressing the global inertia caused by the debt burden and trade liberalization.

22. The proposed 'SID Strategic Framework for SSA' was developed based on the conceptual analysis and the critical review of the empirical evidence that has been done in the proceeding chapter. The model has one core element dealing with resource valorization and four sub-elements that interact with one another. The four sub-elements are the property rights dimension, the sectoral synergy dimension, the global momentum dimension and the sustainability dimension. Each sub-element in the model provides the basis for the development of a sub-model.

23. The resource valorization model constitutes the core element of the strategy framework. The major drive of the resource sub-model is based on the belief that an optimum and efficient utilization of a country's resources is a fundamental prerequisite for sustainable development. The key element of the valorization process is the identification and utilization of the positive elements of indigenous knowledge and skill as useful repositories of SR information. While the whole process of resource valorization is influenced by the actions to be taken at the other levels of the macro-model, each component will require specific strategic measures that are focused on overcoming the limitations.

24. If the sustainability transformation is to happen, a new form of property rights structure is required. Thus, the 'Ownership Sub-model' is identified as one of the key elements of the strategy framework for SSA. The major drive of the 'Ownership sub-model' is that the nature of ownership and its protection constitute the fundamental element in determining the nature and pace of societal development. The 'Ownership sub-model' is composed of two components, namely, the ownership structure and the level of protection. From the perspective of promoting sustainable development, the key objective of the 'Ownership Sub-model' is to develop a combination of ownership structures with efficient protection mechanisms.

25. The promotion of sectoral synergy is identified as a fundamental factor to promote sustainable industrial development in SSA. While the promotion of sectoral synergy at all levels is essential, there are three sectoral synergies that are critical for SID in SSA. These are the synergies between the public and private sector, formal and informal sector, and the agriculture and industry sector. The principal objective of the 'Sectoral Synergy Sub-model' is to overcome the policy bias against one sector and to strengthen their complementarities.

26. In today's world of globalization, no country's strategy can be free of influence from global factors. The effect of globalization on Africa's development has been significant in the past three decades. While there are a number of global factors that may have one or another kind of influence, two global factors have been identified as the fundamental factors that need to be addressed to promote sustainable industrial development in SSA. These two factors are the impact of debt burden and the trade liberalization. Addressing these two factors, that are currently acting as global inertia to Africa's development efforts, will provide additional global momentum to facilitate sustainable industrial development in sub-Saharan Africa.

27. The applicability of the above models and sub-models may be limited to SSA even if the general framework and approach may provide an insight that could be useful for other parts of the world. The 'Sustainability sub-model' that is presented at the base of the general framework, however, is a model that is applicable to all parts of the world. It provides a general principle that has to be applied in the process of developing policies and strategies for sustainable development in any part of the world irrespective of their specificity. The Sustainability Sub-model consists of the macro-policy and the sectoral policy domain.

28. The macro-policy domain is composed of two fundamental principles. These are the policy mainstreaming principle and adaptive management principle. These principles are based on the recognition of the following two factors.

    Primarily, one of the key features that emerges from policy analyses with respect to environmental issues or sustainability is the limitation of considering environmental issues as an 'add-on' element in development policies and strategies. The 'add-on' approach with respect to environmental issues at the macro-level has limited contribution to the promotion of sustainable development at the macro-level. Hence, there is a need for a shift with respect to the treatment of environmental consideration at this level. This forms the basis for the principle of mainstreaming.

Secondly, no one can talk about a perfect strategy at any moment in time while we have a continuously and irreversibly evolving and changing environment. In short, it can be said that any development strategy is as good as its response mechanisms to the changing environment. Thus, the primary focus in strategy development for sustainable development should not be on how perfect it could be but on how efficiently responsive it is. Overcoming the limitation of the static approach is a key element in developing strategies for sustainable development at the macro-level. This can be achieved through the adoption of the adaptive management principles in the field of policy and strategy development. The basis of this principle is that a strategy should be primarily based on the local dynamics and should have a feedback mechanism that would enable it to evolve continuously in response to the changing internal and external environment.

29. The second dimension of the 'Sustainability Sub-model' is the sectoral policy domain that specifically refers to the development of the industrial sector. One of the major shortcomings of industrial development strategies in SSA is their inability to consider the industrialization process as a societal transformation process in its broadest sense. As a result, industrialization has been mainly promoted as a unidirectional economic growth that could be achieved through the transfer (or rather the transplantation) of technologies and the infusion of foreign direct investment. This has led to a misplaced emphasis on unidirectional 'technology transfer' and attraction of foreign direct investment (FDI) to SSA, which have never been successful.

30. Besides rectifying the myopic perception of the industrialization process, sub-Saharan African countries need to incorporate socio-ecological considerations into their industrial development strategies. This can be achieved by the adoption of proactive environmental management and the eco-industrial development approach. Sub-Saharan African countries are placed in an advantageous position that would enable them to utilize the evolving concepts and tools in the field of sustainable development as a basis for laying the foundation for sustainable production and consumption. This provides the possibility for developing countries to tunnel through the "Environmental Kuznet's Curve" and achieve the desired level of industrial development without causing a significant adverse impact on the natural environment.

31. The eco-industrial development (eco-restructuring) approach takes the environmental performance improvement one step higher by focusing on a number of industries operating in a given region. This involves industrial planning at a regional level with the objective of fulfilling socio-economic and socio-ecological objectives on a sustainable basis. Eco-industrial development approaches are particularly effective in developing natural resource-based industries. SSA has a significant potential to develop natural resource-based industries. Adapting the eco-industrial development approach as its principal industrial development strategy will enable Africa to develop its industrial sector on a more sustainable basis.

32. In a global economic system where the markets hold prominent positions as the sources of a signal (information), economic instruments have a vital role to play in promoting sustainable industrial development. This can be achieved by applying different kinds of economic incentives that encourage industries to take proactive measures to improve their resource efficiency, and instituting economic disincentives that force polluting industries to reduce their environmental impact through polluter pays principles. The design of such economic instruments should be guided by the objective of facilitating a desirable, behavioral and operational change at the industry level rather than being driven by revenue generation for the government. In this context, sub-Saharan African countries should take the necessary steps to put the appropriate economic instruments in place together with the necessary technical and institutional support.

33. An illustrative case study was done to relate the proposed strategy framework with the current state of development strategies in Ethiopia. The illustrative case study showed that the current development strategy framework of Ethiopia has strategic elements that act as facilitators, semi-facilitators, and detractors for the country's progress towards sustainable industrial development. In this context, the country has to maintain the facilitating elements, revitalize the semi-facilitating elements by addressing the missing components, and review the detracting elements. Considering the negative effect of the detractors on the whole process of development, the government should give high priority to the rectification of the detracting elements.

Finally, it is important to note that new ways of scientific thinking are related to the development of new paradigms. A paradigm should not be expected to give an explanation for all possible questions. As was pointed out by Thomas S. Khun (1962) 'to be accepted as a paradigm, a theory must seem better than its competitors, but it need not and in fact never does, explain all the facts with which it can be confronted'. Paradigm changes do not necessarily happen incrementally, although they almost certainly take a long time to succeed. This dissertation is based on recognizing the need for such a new paradigm. As a research that presents a different departure in terms of understanding sustainability and sustainable development, it is expected to make a contribution towards catalyzing such a change.

CHAPTER

TWO

2. Conceptual review

In the 1980s, some proclaimed that sustainable development was no more than a catch phrase that eventually would wither out as the concept of appropriate technology of the 1970s did. Contrary to this belief, the influence of the concept has increased significantly in national and international policy development, making it the core element of the policy documents of governments, international agencies and business organizations. This has led to a widening of the discourse on the concept of sustainable development, resulting in a wide variety of definitions and interpretations. Understanding the whole process that has led to the evolution and diverse interpretations of the concept of sustainable development is useful in terms of developing a coherent conceptual framework. To this end, this chapter addresses the following questions: Are there any precedents from which the environmental past may indicate useful parallels with the present and the future? How is sustainability/sustainable development understood and defined by different groups? What are their principal epistemological and conceptual strengths and weaknesses?

2.1 The ecological parallel

The natural system possesses self-regulating mechanisms, which are composed of a complex web of positive and negative feedback systems operating within the context of the carrying, regeneration and assimilation capacity of the respective systems. Mobility of plants and animals, as an essential element of self-regulation of the biotic system, has played a major role in the evolution of life on this planet. As an integral part of the animal kingdom, mobility governed by ecological factors has patterned the dominant lifestyle of mankind for millions of years. About 8,000 years ago, after eons of slow increase, the human population reached the comparatively large number of about 10 million (Meadows et al. 1992). This led to the problem of dwindling wild resources that required changes in the way of living. Some people intensified their migratory lifestyle; they started to move out of Africa into the rest of the world.

Others began to domesticate animals and cultivate plants, and as a consequence settled in one place, which was a totally new idea. Simply by staying in one region, the proto-farmers altered the face of the planet and the thoughts of humankind in ways they could never have foreseen (Meadows et al. 1992).

For example, for the first time it made sense to own land. Thus, the ideas of wealth, trade, money, and power were born. As a result of this change in human behavior, history from 3000 B.C. to the present witnessed the development of more advanced agriculture, increasingly complex social divisions of labor and means of exploitation, and the continual creation of tools to delve into and shape the earth and its products. Part of this development also witnessed the devaluation of "nature," the creation of dominantly masculine symbols for divinity, and the subjugation of women by patriarchal control over their reproductive and sexual status (Gottlieb 1996). Nevertheless, agriculture was a successful response to wildlife scarcity faced by the hunter-gatherer society. It permitted continued slow population growth, which added up over centuries to an enormous increase from about 10 million people to about 800 million by 1750 (Meadows et al. 1992). By that time, the larger population had created new scarcities, especially in land and energy, so another revolutionary step was necessary. Thus, the industrial revolution began in England with the substitution of abundant coal energy for that derived from the rapidly vanishing trees.

Once again, everything changed in ways that no one could have imagined. The utilization of coal led to steam engines. Machines replaced land as the central means of production. This development led to great material productivity and a world that today supports, at least partially, about 6 billion people[1]. The expansion of industrialization led to environmental deterioration from the poles to the tropics, from the top of the mountains to the ocean depths. The success of the industrial transformation, like the more limited successes of the hunter-gatherer and agricultural transformations, has led to ecological scarcities, not only in terms of natural resource supply, but also in terms of the absorptive capacity of the natural sinks (Meadows et al. 1992) and species losses.

The contemporary environmental debate predominantly assumes that environmental concern is linked to the problem of industrial pollution and considers this to be a unique feature of the industrial society. Historically, however, hazards of pollution, deforestation, land degradation and chemical food adulteration (Wall 1994) have dogged humanity, to a greater or lesser extent, for most of its existence.

[1] The world's population passed the six billion mark during the second week of October 1999.

Heavy metal pollution, especially lead pollution, is considered as one of the major factors that contributed to the fall of Rome (Niragu 1994). Furthermore, there is a growing consensus among environmental archaeologists that numerous ancient societies, including the Babylonian Empire, may have collapsed because of environmental degradation.

Besides the sweeping effects of environmental degradation, socio-ecological factors have been one of the major driving forces behind every social transformation recorded in history, including the agricultural and the industrial transformations. In the historical context, it can be stated that the environmental past may often indicate useful parallels with the environmental present and future. Throughout most of human history, the growth of population, the degradation and depletion of resources, the restructuring of societies, and the development of new technologies have usually been so slow as to be imperceptible during an individual life span (Meadows et al. 1992). However, during the past two centuries, and especially during the last five decades, the global economy has shown significant growth, transforming the character of the planet and especially of human life, in numerous ways.

Through industrialization and globalization, the standard of living in the developed world has shifted from bare subsistence to affluence. The natural environment has reached a limit where it is beginning to give "vital signs" of environmental decline (Brown et al. 1995). Moreover, as pointed out by Gottleib (1996), the continuous growth of technological and social power and the attendant religious and political ideologies that support them have strengthened the illusion of mankind's fundamental difference from nature, thereby eroding the harmonized relationship between the human race and the natural environment. It is in this womb that the embryo of contemporary environmentalism began to develop.

2.2 Conceptual precursors

The report, *Our Common Future*, published by WCED, is taken as a starting point for most current discussions on the concept of sustainable development. This report, a comprehensive one produced through a global partnership, constituted a major political turning point for the concept of sustainable development. But it is neither the starting point nor the possible end of the conceptual development process. As with any conceptual process governed by general evolutionary theory, there are some significant conceptual precursors that led to the WCED's definition of sustainable development, which in turn is followed by other conceptualization efforts. This section focuses on reviewing the historical and conceptual precursors of the concept of sustainable development.

2.2.1 Religious beliefs and traditions

Historically, religions have taught us to perceive and act on non-human nature in terms of particular human interests, beliefs, and social structures. Through religious beliefs and laws, we have socialized nature, framing it in human terms. And to a great extent we have done so to satisfy human needs, abilities, and power relations. Yet, at the same time 'religion has also represented the voice of nature to humanity' (Gottleib 1996). Spiritual teachings have celebrated and consecrated our ties with the non-human world, reminding us of our delicate and inescapable partnership with air, land, water and other living beings. To assess religion's view of nature and to see how contemporary theology deals with the environmental crises, we must attend with care to the full range of writings and practices that religious traditions offer. Many writers have found the Judeo-Christian writings about "man's right to master the Earth" an essential source for the havoc wreaked by Western societies upon the earth. Other religious environmentalists have discovered environmentally positive passages in classic texts, and they claim that Judaism and Christianity are more environmentally minded than they seem at first glance (Kinsley 1996). A critical review of the writings on both sides leads to the conclusion that religions have neither been simple agents of environmental degradation nor unmixed repositories of ecological wisdom. As pointed out by Gottleib (1996), they have been both.

Besides the dominant religions of east and west, there are numerous indigenous beliefs and traditions that have been used as the basis for traditional coping mechanisms long before the rise of any religious beliefs. One still can find numerous cases of such beliefs, based on indigenous traditions and values, being used as the basis of community life. In Hawaiian thought, there are close parallels between humans and nature (Dudley 1996). Hawaiians traditionally have viewed the entire world as being alive in the same way that humans are alive. Similarly, there was no such thing as emptiness in the world for a Lakota Indian (Mathiessen 1984). Even in the sky there were no vacant places. Life was existent everywhere, visible and invisible, and every object imparted great interest to life. In the African view, the universe is both visible and invisible, unending, and without limits (Mbiti 1996). Events come and go in the form of minor and major rhythms. The minor rhythms are found in the lives of the living things of the earth (such as men, animals, and plants), in their birth, growth, procreation and death. These rhythms are thought to occur in the lives of everybody and everything that has life. The major rhythms of time are events like day and night, the seasons of rain and dry weather and similar events of nature that come and go. In many communities, circles are used as symbols of eternity and continuity.

For African tradition, man is not the master of the universe; 'he is only the center, the friend, the beneficiary, and the user. For this reason, he must live in harmony with the universe, obeying the laws of natural, moral, and mystical order' (Mbiti 1996). If these are unduly disturbed, it is man who suffers most.

Although they have different contexts and structures, the core element of all of the indigenous traditions and beliefs is the importance of living in harmony with nature. The most prominent positions on indigenous traditions and beliefs range from a hubristic dismissal as "primitive" to the advocacy of returning back to the indigenous tradition of "reverence to nature" as perceived by some environmental groups. An important lesson to be drawn from indigenous traditions and beliefs is the "holistic vision" that is inherent in all of the beliefs and the importance attached to being in constant communication with nature. Whatever environmental value we may find in the teachings of the different religions of East and West, and the indigenous traditions and practices, it would be unrealistic to advocate any of these traditions as the basis for addressing the environmental crises of the twentieth century. Despite the brilliance or quality of revelation of founding teachings, we now live in a very different world of complexity that goes beyond the realm of these teachings. Nonetheless, traditional wisdom has much to offer in terms of living in harmony with nature and in society; and this is one of the fundamental tenets of the concept of sustainability.

2.2.2 Economics and the theory of limits

Thomas Robert Malthus (1766–1834) is considered to be the first economist to foresee the limits to growth caused by resource scarcity. While he fits into the classic economics tradition, Malthus is sufficiently at variance with some basic principles (Oser and Blanchfield 1975). By 1798, many of the evil effects of the industrial revolution had surfaced. Unemployment, poverty, and disease were already problems calling for remedial treatment. Contrary to the ideas of William Goldwin (1756 - 1836) and Marquis de Condorcet (1743–1794), Malthus said that the vices and misery that plague society are not due to evil human institutions, but are due to the fecundity of the human race (Oser and Blanchfield 1975). This led to his theory of population dynamics.

According to Malthus's theory, population, when unchecked, increases geometrically while subsistence increases arithmetically, at best (Oser and Blanchfield 1975). Together with David Ricardo (1772–1823), who fundamentally agreed with his population theory, Malthus expressed his "environmental limits thinking" in terms of the limits on the supply of good quality agricultural land and the resultant diminishing returns in agricultural production (Pearce and Turner 1990). For Malthus, the fixed amount of land available meant that as the population grew, diminishing returns would reduce the per capita food supply. The standard of living would be forced down to a subsistence level, and the population would cease to grow. Diminishing returns set in, not so much because of absolute scarcity, but because the available land varied in quality. The fundamental shortcoming of this theory is that, in both cases, 'the subject of diminishing returns was defined on the basis of keeping the total production curve fixed' (Pearce and Turner 1990). In reality, technical innovations, such as the use of fertilizers, have shifted the total production curve upwards, increasing output per unit of input and offsetting the tendency towards diminishing returns. Still, the Malthusian theory of "environmental limits" may be considered a precursor to the concept of sustainable development.

2.2.3 Political economy and the "scale" of organization

Looking back at the history of political economics, one finds the "subterranean tradition" of organic and de-centralist economics, whose major spokesmen includes Prince Kropotkin, Gustav Lanauer, Tolstoy, William Morris, Gandhi, Lewis Mumford and most recently, Alex Comfort, Paul Goodman, and Murray Bookchin (Roszak 1989). It is the tradition one might call anarchism – libertarian political economy that is distinguished from orthodox socialism and capitalism by insisting that the scale of organization must be treated as an independent and primary problem.

The tradition, while closely affiliated with socialist values, nonetheless prefers mixed to "pure" economic systems. Bigness is the nemesis of anarchism, whether the bigness be that of public or private bureaucracies, because bigness engenders impersonality, insensitivity and a lust to concentrate abstract power (Roszak 1989). Reaching backward, this tradition embraces communal, handicraft, tribal, guild, and village lifestyles as old as Neolithic cultures. According to Roszak (1989), 'if there is to be a humanly tolerable world on this dark side of the emergent technocratic world system, it surely will need to flower from this yet fragile renaissance of organic husbandry, communal households, and do-it yourself techniques as described by Ernest F. Schumacher'.

Roszak (1989) said it would be no exaggeration to call Schumacher the Keynes of post- industrial society, by which he meant a society that has left behind its lethal obsession with those mega systems of production and distribution that Keynes tried so hard to make manageable. The first work of Schumacher appeared in 1959 under the title, *The Crucial Problems of Modern Living*. His works culminated in international recognition and fame after the first publication of his famous book, *Small is Beautiful*, in 1979. The themes addressed in this book included (McClaughry 1989):

- Sharp criticism of over-organized systems as destructive of the human spirit and of the planet alike;
- Concern about the rapid depletion of natural resources and the corresponding destruction of the environment;
- Concept of intermediate or appropriate technology and the importance of human scale, perhaps the concept for which the book is best known;
- Failure of traditional economics to bring incommensurable "non-economic factors" into the policy-making process; and
- Need for human beings to be close to the nurturing land, in both fact and spirit.

To a world awakening to the specter of global pollution, resource exhaustion, corporate concentration, and the corresponding diminution of individual liberties, Schumacher's book was "a ray of hope" (McClaughry, 1989). As a result, in the mid-1970s, *Small is Beautiful*, became a rallying cry, while the concept of appropriate and intermediate technology became the catch phrase of the following decade. Although the book contains a number of controversial and debatable ideas, Schumacher's concern about the exhaustion of the planet's resources gave new impetus to a whole generation of environmental defenders. His effort of looking at the economic, ecological, and social aspects of a given system added a new dimension to the discourse on the "scale of organization." Some experts believe that the concept of appropriate technology defined as technology that takes heed of the skill, levels of population, availability of natural resources, and pressing social needs defined by the people themselves is the immediate precursor to the concept of sustainable development. According to DuBose et al. (1995), 'sustainable development can be traced back at least as far as the mid-1960s, when appropriate technology was promoted as the way to help develop the lesser developed countries'.

2.2.4 Post-Stockholm Conference

The 1972 UN Conference on Human Environment in Stockholm, which recognized the "importance of environmental management and the use of environmental assessment as a management tool" (DuBose et al. 1995), represents a major step forward in the development of the concept of sustainable development. Even if the link between environmental and developmental issues did not emerge strongly, there were indications that the form of economic development would have to be altered. Around the same time as the Stockholm Conference, a group of eminent scientists and concerned citizens gathered in Rome to look at the global environmental crisis that was expanding at an alarming rate. This group, later to be known as the Club of Rome, produced a comprehensive report on the state of the natural environment. This report emphasized that the industrial society was going to exceed most of the ecological limits within a matter of decades, if it continued to promote the kind of economic growth witnessed in the 1960s and 1970s.

The fact that environment and development could not for long remain in a state of conflict gradually became apparent after the 1972 UN Conference on the Human Environment. In the years following, the terminology evolved to terms like "environment and development," "development without destruction," and "environmentally sound development." Finally, the term "eco-development" appeared in the UN Environment Program review in 1978. By this time, it became recognized internationally that environmental and developmental ideas needed to be considered concurrently. According to Tryzna (1995), however, the first major breakthrough in conceptual insight came from the International Union for the Conservation of Nature (IUCN). Working closely with the World Wildlife Fund for Nature and The United Nations Environment Program, IUCN formulated the World Conservation Strategy, which was launched internationally in 1980. This was a major attempt to integrate the environment and development concerns into an umbrella concept of "conservation."

Khosla (1995) states that, 'by bringing the element of time directly into the environment and development debate, the strategy discovered a truly synthesizing factor in sustainability and was able to provide a focus to what earlier had been a rather diffuse idea'. If the IUCN takes the credit for incorporating the phrase "sustainable development" for the first time, the World Commission on Environment and Development (WCED), through its report, *Our Common Future* (1987), provided the major political turning point that made the concept of great geopolitical significance and the catch-phrase it has become today (Holmberg 1994).

The report of WCED, also known as the Bruntland Commission, contains the key statement of sustainable development, which is defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987). This definition marks the concept's political coming of age and establishes the content and structure of the present debate (Kirkby et al. 1995). The conceptual definition of the Brundtland Commission contains two key concepts:

- Concept of "needs," in particular the essential needs of the world's poor, to which overriding priority should be given; and
- Idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.

The Commission underlined the strong linkage between poverty alleviation, environmental improvement and social equitability through sustainable economic growth. Not surprisingly, since it may be interpreted in so many different ways, the Brundtland Commission's definition of sustainable development has received a very wide acceptance. As noted by Pearce et al. (1989), 'it fits nicely into political sound bites compared with its predecessor's "eco-development"; it is something to which everyone can agree, like motherhood and apple pie'.

According to Holmberg (1994), by 1994 there were more than 80 different definitions and interpretations fundamentally sharing the core concept of the WCED's definition. Considering the institutional foundation of WCED and the global realities in the mid-1980s, the definition of sustainable development, provided by WCED, contains much practical wisdom. It has been highly instrumental in developing new global thinking that is emerging today. Having consensus on a vague concept, rather than disagreement over a sharply defined one, was a "good political strategy" (Daly 1996). By 1995, however, "this initial vagueness was no longer a basis for consensus, but a breeding ground for disagreement" (Daly 1996).

2.3 Conceptual analysis

Beginning with the general position on the pending environmental crises faced by humanity, one finds two extremely polarized variations. At one end of the environmental debate spectrum is the Limits to Growth school, advocated by such groups as the Club of Rome, 'which has done much to dramatize' (Bhaskar and Glyn 1995) the issue of environmental constraints by projecting a drastic showdown and even collapse.

At the other end are the technocrat/economist optimists who argue that resource constraints can be overcome at relatively little cost, provided the correct (usually market-oriented) policies are put in place. Despite the range of possibilities within the debate, in the years following the 1972 Stockholm Conference, the scientific consensus on the occurrence of ecological imbalance has gradually emerged. This led to the conclusion that the damage inflicted by human activities on the natural environment renders those activities unsustainable (Erkins and Jacob 1995). This created the need for a new world view to serve as a basis for global consensus, which eventually led to the coining of the term "sustainable development."

Since the definition and subsequent popularization of the term by WCED in 1987, numerous efforts have been made by different groups, organizations and individuals to capture the meaning of the concept. In broad terms, the existing variety of definitions can be categorized into three major groups, depending on the constituent representation reflected in their presentation. These are: (1) the institutional version, (2) the ideological version, and (3) the disciplinary version. The conceptual analysis done under this research focuses on what are identified as the sources of the environmental crises? What is the core approach to solving the problem? What are the proposed solution platforms? What is the key instrument for the solutions? Besides these questions, each group of definitions is analyzed against the major drivers of the conceptualization effort.

2.3.1 Institutional version

For the Institutional version, the definitions given by WCED, the International Institute of Environment and Development (IIED), and the World Business Council for Sustainable Development (WBCSD) are taken as representative. A synoptic comparison of these definitions shows that they all share the same definition of sustainable development, which is very much based on needs satisfaction, with in varying contexts of interpretation. As can be seen from Table 1, the differences in interpretation are reflected in their differences regarding the identification of the epicenter of the solution, the solution platform, and the leadership center for actualizing the solution. These factors are very much influenced by the institutional objectives, which are the direct reflection of the interests of the establishments.

The definition of sustainable development given by the Brundtland Commission serves as the core element for almost all of the institutional versions. According to some authors belonging to this group, the Brundtland Commission Report, *Our Common Future*, is the key statement of sustainable development, which is defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987).

A similar definition was developed by the International Institute for Environment and Development (IIED).[2] This definition of sustainable development is based on the identification of three systems as basic to any process of development: the biological or ecological resource system, the economic system, and the social system. Human society applies a set of goals to each system, each with its own hierarchy of sub-goals and targets (Holmberg 1994). The objective of sustainable development will, then, be to maximize goal achievement across these three systems at one and the same time through an adaptive process of trade-offs. IIED uses the term "primary environmental care" (PEC) to describe the process for progress toward sustainability at the "grassroots" level. The typical feature of the IIED definition is that its solution is based on the increasing empowerment of people to take charge of their own development, combined with a clear knowledge of environmental constraints and of requirements to meet basic needs. This position reflects the institute's primary focus on rural development in developing countries.

Table 1: Comparative Analysis of the Institutional Versions of Sustainability

Institution	**Drivers**	**Solution epicenter**	**Solution platform**	**Instruments** (Leadership)
WCED	Political Consensus	Sustainable growth	Nation-state	Governments and international organizations
IIED	Rural development	Primary environmental care (PEC)	Communities	National and international NGOs
WBCSD	Business Interest	Eco-efficiency	Business and industry	Corporate Leadership

[2] IIED is one of the organizations that was said to be using the term "sustainable" long before IUCN in 1980, to stress the links between the environment and the need for development.

The other institutional version is the definition presented by the industrial business establishment, as epitomized by the WBCSD[3]. As stated in the charter of WBCSD, the concept of sustainable development 'recognizes that economic growth and environmental protection are inextricably linked, and that the quality of present and future life rests on meeting basic human needs without destroying the environment upon which all life depends' (Schmidheiny 1992). As a direct extension of the WCED definition, this version asserts that economic growth in all parts of the world is essential for improving the livelihood of the poor, for sustaining growing populations and eventually for stabilizing population. New technologies will be needed to permit growth, while energy and other resources may be used more efficiently to produce less pollution. This version asserts that the requirement for clean, equitable economic growth remains the single greatest difficulty within the larger scope of sustainable development. Proving that such growth is possible is certainly the greatest test for business and industry, which must devise strategies to maximize value added while minimizing resource and energy use through the implementation of the principles of eco-efficiency[4]. According to this version, given its large technological and productive capacity, any progress towards sustainable development requires the active leadership of the business community (Schmidheiny 1992).

2.3.2 Ideological version

At the ideological level, although there are some factors that indicate the emergence of a distinct green ideology, the environmental versions of classic ideologies such as liberation theology, radical feminism, and Marxism are the dominant ones. Eco-feminism is considered to be the conceptual juncture at which point the four tectonic plates of liberation theory – those concerned with the oppressions of gender, race, class, and nature – finally come together (Plumwood 1993).

[3] The WBCSD has become the principal promoter of the concept of 'ecological modernization' that combines economic growth with incremental changes in environmental performance of businesses as its core.

[4] Eco-efficiency is a term coined by WBCSD and is described as the continuous improvement of the economic and environmental performance of a business.

Table 2: Comparative Analysis of the Ideological Versions of Sustainability

Ideology	Liberation Theory	Source of the Environmental Crisis	Solution Epicenter	Leadership Center
Eco-theology	Liberation theology	Disrespect to divine providence	Spiritual revival	Churches and congregations
Eco-feminism	Radical Feminism	Male-centered (Androcentric) epistemology	Gynocentric value hierarchy	Women's movement
Eco-socialism	Marxism	Capitalism	Social egalitarianism	Labor movement

The term eco-feminism was introduced in the mid-1970s by the French feminist writer, Francoise d'Eaubonne who identified overpopulation and the destruction of natural resources as the two most immediate threats to our survival (Braidotti et al. 1994). In her view, the only way out would be women's destruction of "the male system," which is the source of the threats. Then, 'the planet in the feminine gender would become green again for all'. Eco-feminism, today, refers to a significant stream within the feminist movement, containing a range of theoretical positions resting on the assumption that there is a critical correlation between the domination of nature and the domination of women. Eco-feminism points to the interconnections between feminist and ecological concerns. When it emerged, it promised to expose, challenge, and change dominant power structures, whether within the framework of meaning, in gender relations or in economic systems. These promises have been based primarily on the idea of merging the critical and transformative potentials of ecology and feminism, which were expected to create a new, powerful movement for social and cultural change. Thus, eco-feminism has become a new, rather diversified and decentralized movement.

With the rise of modern environmentalism in the 1970s, a new debate between red and green politics (socialist and environmentalist, respectively) emerged, which led to the evolution of the concept of Eco-socialism. Eco-socialism is based on the assumption that sustainable, ecologically sound capitalist development is a contradiction in terms that never can be realized. It asserts that the ecological crisis we are facing is a manifestation of the inherent crisis within the capitalist system and it can be overcome only through ecologically oriented socialist development. The following are summarized as the major principles of eco-socialism (Pepper 1993).

- Eco-socialism is anthropocentric and humanistic. It rejects the bio-ethic and mystification of nature and any anti-humanistic sentiment that these may spawn, although it does attach importance to human spirituality.
- Humans are not a pollutant, neither are they "guilty" of hubris, greed, aggression, over-competitiveness, or other savageries. If they behave thus, it is not by virtue of unchangeable genetic inheritance or corruption as in original sin: the prevailing socio-economic system is more likely the cause.
- Humans are not like other animals, but neither is non-human nature external to society. The nature that we perceive is socially perceived and produced.
- Thus, alienation from nature is separation from a part of us. It can be overcome by re-appropriating collective control over our relationship with nature, via common ownership of the means of production: for production is at the center of our relationship with nature even if it is not the whole of that relationship.
- We should not dominate or exploit nature in the sense of trying to transcend natural limits and laws, but we should collectively 'dominate' (i.e. plan and control) our relationship with it for collective good.

Pepper (1993) stated that production and industry are not to be rejected per se. If unalienated, they are liberating. Capitalism initially developed productive forces, but now it hinders their unalienated and rational development. It, therefore, must be replaced by socialist development where technology (a) is adaptive to all nature (including human) and not destructive of it, and (b) strengthens the competency and controlling power of the producers. It further asserts that the labor movement must be a key force in social change, rediscovering its potential in this respect, and resurrecting its character as an environmental movement. However, it asserts that trying to smash capitalism violently will probably not work while capitalists control the state, so the state must be taken over and liberated for the service of all (Pepper 1993).

The long-standing religious claim for absolute truth started to erode with the spread of both democracy and the critical intellectual tendencies embedded in Enlightenment philosophies and modern sciences. This has led some people to a complete rejection of religion. For many others, abandoning the claim to literal veracity of a particular theology allows adherents of very different traditions to recognize common ground and celebrate each other's spiritual beliefs.

With the rise of the feminist movement, the patriarchal biases in virtually all established traditions of religion became a major focus of criticism.
The rise of environmentalism opened a new door of criticism toward the traditional religions. The Judeo-Christian religious traditions were specifically singled out by environmental groups as one of the major instruments enhancing the destruction of the natural environment through teaching man's domination over nature. It is against this background that a new breed of theologians known as eco-theologians started to emerge. Eco-theologians have sought to reinterpret old traditions: finding and stressing passages in classic texts to help us face the current crisis. Thus, we are reminded (Gottlieb 1996) that the "Talmud instructs not to live in a city without trees; or that St. Francis' love of animals makes him a kind of early Christian Deep Ecologist."

Thinkers also have tried to extend more familiar religious beliefs, especially ethical ones concerning love and respect for other people, to non-human nature. Nature becomes the Body of the God, or the neighbor whom we must treat as we would like to be treated. Creative eco-theologians synthesize elements of different traditions. As part of the ecumenical tendency of contemporary spiritual life, we see some Christian thinkers unhesitatingly using Taoist images of humanity's integration into a natural setting, or Jews quoting Buddhist nature poetry. In particular, ideas from indigenous or native peoples, communities whose relationship to nature originated before the current mode of the domination of the earth, have been studied. Contemporary eco-theology voices the sorrow of a broken-hearted earth, expresses our despair over the past, and fear for the future. Simultaneously, theoreticians of both religion and the environment question whether, and in what ways, religious energies can be connected to secular environmental philosophy and ecological activism.

Eco-theology is based fundamentally on the belief that mankind has simply ignored the wealth of ecologically relevant material in the religious traditions. Therefore, what we need to do now to have an adequate environmental theology is to dig up the appropriate texts and allow them to illuminate the present crisis. According to this thinking, "the main source of our predicament is simply human greed, and the solution lies in a renewed commitment to humility, to the virtue of detachment and to the central religious posture of gratitude by which we accept the natural world as God's gift and treat it accordingly" (Haught 1996). Eco-theologians believe that if we allow our lives to be shaped by genuine religious virtue, our relation to nature will attain the appropriate balance, and we may avert the disaster that looms before us.

Despite the conceptual basis of eco-theology, eco-feminism and eco-socialism being rooted in very different liberation theories (as may be seen from Table 2) there is a striking structural similarity among these versions in the identification of the source of the environmental crisis, the solution epicenter and the role of leadership.

2.3.3 Disciplinary version

In the Disciplinary version, the economist, ecologist, and sociologist conceptualizations reflect the response of the scientific community to the challenge of the environmental crisis of the twentieth century. At heart, the neo-classical economic approach to environmental problems has one aim (Jacobs 1994): 'to turn the environment into a commodity that can be analyzed just like other commodities'. These economists are of the opinion that the environment is frequently undervalued: because it can often be used free of charge, it tends to be over used, and, therefore, degraded. If the environment was given its proper value in economic decision-making terms, it would be protected much more highly (Redclift and Benton 1994).

Table 3: Comparative Analysis of the Disciplinary Versions of Sustainability

Academic Discipline	**Drivers**	**Source of Environmental Crisis**	**Solutions Epicenter**	**Instruments** (Mechanism of Solutions)
Environmental economics	Economic reductionism	Undervaluing of ecological goods	Internalization of externalities	Price instruments
Ecological sustainability	Ecological reductionism	Human domination over nature	Reverence and respect for nature	Bio-centric egalitarianism
Social ecology	Social-holism	Domination of people and nature	Co-evolution of nature and humanity	Re-thinking of the social hierarchy

The solution package of neoclassical economics is composed mainly of two stages. The first stage is to determine the price of the environmental commodities by constructing supply and demand curves based on the outcome of the application of different valuation techniques. This enables the economist to identify the appropriate (optimal) level of environmental protection for society to adopt (Jacobs 1994).

The second stage is to turn these imputed prices into real-life prices: either by changing the prices of the existing market activities by taxing environmental damage, by subsidizing environmental improvement or by creating markets for environmental goods by issuing permits that are then tradable between firms or consumers.

Two factors may be identified as the basic premises for an ecologist's conception of sustainability (Carpenter 1995). First, nature, left alone, is a self-organizing system that changes, responds and evolves over time through a highly variable set of quasi-stable conditions. It is sustainable in the sense that it has no discernible goals or purposes. Hence, every ecosystem is self-controlled within larger scale constraints. Second, human beings seek to impose some constancy and dependability of supply of needed products through deterministic interventions. Based on these premises, there are quite a number of sustainability concepts within the disciplinary framework of ecology that may be broadly categorized into two domains: shallow ecology and deep ecology.

Shallow ecology basically means (Clarke 1993) the treatment of environmental problems without tackling the underlying causes and without confronting the philosophical assumptions that underlie our current political and economic thinking. On the other hand, we find the concept of deep ecology formulated by the Norwegian philosopher, Arena Nabs, in the early 1970s as a response to the limits of shallow ecology. His view was that in the long run, environmental reforms of social and economic systems are not a viable solution to offset the accelerating destruction of the environment. Warning that the ecological crises threaten the survival of humanity, Arena Nabs identified the deeper roots of the crises in Western culture and in particular in the cultural values legitimizing the domination of nature (Braidotti et al. 1994).

Seeking to overturn the epistemological foundations of Western culture, deep ecologists propose to replace anthropocentric hierarchies with biocentric egalitarianism. According to this view, humanity is no more, but also no less, important than all other things on earth. Deep ecologists see richness and diversity of life as values in themselves and assume that human beings have no right to reduce these, except to satisfy their basic needs. They also stress the need for cultural diversity and diversity in social arrangements as necessary preconditions for the survival of the planet.

In an attempt to qualify deep ecology, ecologists have developed the concept of Gaia. The major tenet of this hypothesis is that Gaia is a totally self-organizing and self-reproducing, organic, spatio-temporal and teleological system with the goal of maintaining itself. The Gaia hypothesis has caught the imagination of the ecological movement (Plumwood 1993) and has contributed to replacing the image of the "Earth as a machine" with the image of the "Earth as an organism." The contribution of the Gaia theory is to highlight interdependencies within and among the organic and inorganic world and to focus on Gaia-centrism instead of on anthropocentrism, competition, and individualistic aggression, typical of some other biological and social theories. The theoretical underpinnings of the Gaia theory touch upon the biocentric position: the survival of the earth, Gaia, is the foundational image of the newly emerging esocratic rationality.

In general, the disciplinary versions exhibit conceptual shortcomings of one type or another that are related to their reductionist epistemological foundations and reflected in their solution frameworks. Moreover, there is a danger that 'the prevailing conflicts of views about the environmental crisis, which arise from being locked within the reductionist way of thinking, may harden into inflexible and polarized oppositions' (Redclift and Benton 1994). The source of the problem is that every discipline approaches the other in a reductionist fashion, seeking to impose its views and procedures on the decision-making process (Tryzna 1995). In this respect, there is a need for a new way of scientific thinking based on radical revision of existing approaches, with the objective of transcending the pervasive "dualism" that dominates modern thinking (Clarke 1993).

2.4. Major flaws

Alongside the variations of interpretation within the different versions, one observes fundamental flaws running across the different versions of sustainability and sustainable development. These crosscutting flaws are discussed under the headings of the misconceptions of the "environment," the cosmic (mis)perceptions, and ethics and visions.

2.4.1 Misconceptions of the 'Environment'

One of the major conceptual flaws that has become a source of confusion in the environmental debate is the conception of the term "environment." There are two basic problems that arise from this misconception. Primarily, environment and ecology have become increasingly synonymous, limiting the environmental focus to the natural environment. Second, there is a danger of abstraction due to the distended notion of the word "environment" (Cooper and Palmer 1992).

Random House Webster's College Dictionary (1995) defines environment as "the aggregate of surrounding things, conditions, or influences; surroundings, milieu; the air, water, minerals, organisms and all other external factors surrounding and affecting a given organism at any time; the social and cultural forces that shape the life of a person or population." The same dictionary defines ecology as: "the branch of biology dealing with the relations and interactions between organisms and the (natural) environment; the set of relationships existing between organisms and their environment."

From these definitions, one can easily see that ecology and environment, although they are very much related, are not one and the same thing. First, an environment is something that an organism or a thing has, whereas ecology is the study of the relationship between the organism and the natural environment. Second, the environmental crises include the economic, social, political, and cultural crises within the human universe, as well as the ecological crises between humans and the natural universe.

The distended notion of environment suggests a concept of the environment that is much too big. The environment for which we are supposed to feel reverence is nothing less than nature itself. According to this notion, each person's environmental concern is supposed to extend everywhere, "from the street corner to the stratosphere" as a currently popular adage has it. (Cooper and Palmer 1992). David Cooper (1992) described environment as milieu; not something a creature is merely in, but something it has. To speak in the language of phenomenology, a creature's relation to its environment is an inherent one. An environment is something for a creature, a field of meanings or significance. In calling an environment a field of significance, it means that the items within it signify or point to one another, thereby forming a network of meanings. Medieval scholars used to speak of the world as "the Book of God" an immense collection of "signs" provided for our benefit by God. On a smaller scale, and without the theological baggage, an environment might be called a "book of signs" for those whose practical mastery of the right "language" enables them to "read it" (Cooper 1992).

2.4.2 The Cosmic (Mis)Perception

The generally accepted understanding of the cosmic world with respect to the environmental debate and the concept of sustainability is based on the recognition of the supposedly separate existence of the natural, economic, and social systems. As a result, the model depicted below is predominantly used in many articles as the basis for describing the sustainable development process.

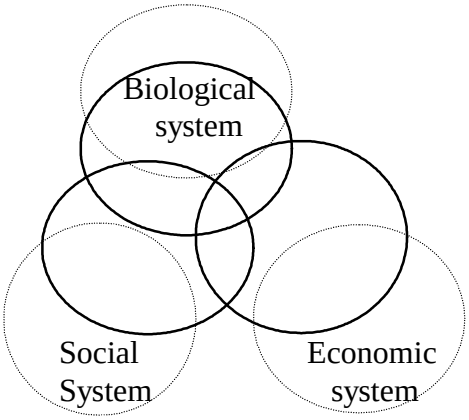


Figure 2: The predominant model of sustainable development

This model suggests that:

- The natural, economic, and social systems are independent systems and may be treated independently (refer to the light circles).
- The interactive zone where the three different systems interact is the solution area of integration where sustainability is achieved, whereas the area outside the interactive zone is assumed to be an area of contradiction.
- The ultimate objective of sustainability is the full integration of the natural, economic and social systems.

To the contrary, the following are the conclusions to be drawn from the Cosmic Interdependence model developed based upon the systems approach (Mebratu 1996c):

- The human universe, in general, and the economic and social cosmos, in particular, never have been and never will be, separate and independent from the natural universe.

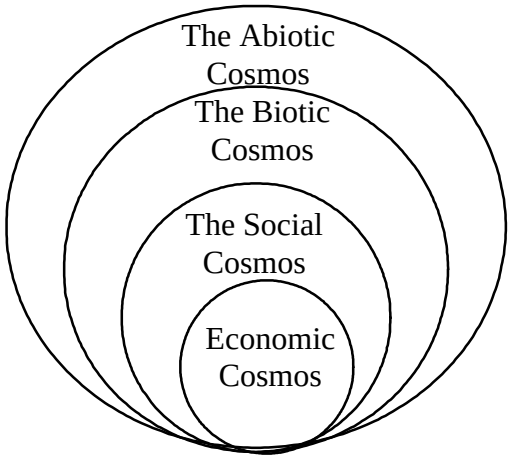


Figure 3: The Cosmic Interdependence

(Source: Mebratu, D. 1996. Sustainability as a scientific paradigm. MSc. Thesis, Lund University)

- The intersection area of the four cosmoses is the area where we have numerous combinations of conflict and harmony serving as a seedbed for the process of co-evolution of the natural and human universe.
- The vehicles of interaction within the interactive zone are numerous systems that do not belong exclusively to one cosmos but have a four-dimensional (or three-dimensional, if we put the biotic and abiotic under the ecological dimension) systemic parameter.
- The environmental crises recorded throughout human history were an outcome of the cumulative effects of deliberate, or otherwise, human neglect of one or more of the systemic parameters, resulting in millions of feedback deficient systems.
- There is an abiotic region that is essentially free of direct interaction with the biotic, economic, and social cosmos (e.g. deep earth). Similarly, there is a biotic region that is not yet in direct interaction with the human universe (e.g. aquatic life). However, neither of these regions can be claimed to be free from the second-degree effects of the interactive region.

2.4.3 Ethics and Vision

Amid the confusion and frustration, an increasing number of people have reverted to searching for new visions and ethics. As Schmidheiny (1992) pointed out, 'when politicians, industrialists, and environmentalists run out of practical advice, they often take refuge in appeals for a new vision, new values, a new commitment, and a new ethic. Such calls often ring hollow and rhetorical. This is the crux of the problem of sustainable development, and perhaps the main reason why there has been acceptance in principle, but less concrete actions to put into practice'.

One of the manifestations of the lack of scientific understanding on the concept of sustainability is the monotonous nature of dialogue revolving around the question of ethics. In this connection, David Cooper says that he is 'not alone in being depressed by the monotonous character of much of the literature, especially at the more popular end of the spectrum, which declaims the new ethic' (Cooper 1992). Basically, ethics is an important attribute of a given means to an end rather than the means to the end. That is why most literature that emphatically advocates the need of ethical change, without treating the core element, has a hollow ring.

Benton (Redclift and Benton 1994) underlines that 'one of the most important insights that the social scientist can offer in the environmental debate is that the eminently rational appeal on the part of environmentalists for 'us' to change our attitudes, or lifestyles, so as to advance a general 'human interest' is likely to be ineffective'. In reality, meaningful choice of individuals is always governed by the existing physical, institutional, and intellectual structure. This structuralist emphasis on the patterned contexts in which individuals make choices clearly has much to offer for environmental analysis. Furthermore, the "new" version of ethics that is emerging in connection with the sustainability debate embraces diverse themes among which there are real tensions - at both practical and theoretical levels.

According to David Cooper (1992), one of the tensions at a theoretical level is "the tension between the attitude of 'reverence' we are urged to accord nature and the 'holistic' theme of man as just one part of nature. Worship of a nature that includes ourselves might betray that hubris of which 'new' ethicists typically complain." In other words, the advocates of eco-centric ethics, who adamantly criticize the anthropocentric ethics as being dangerously "human-centered" are reflecting an anthropocentric stance at its extreme by acting to play the role of "God."

Although the prevailing ethical debate is based on polarizing the supposed tension between the anthropocentric and ecocentric positions, in the final analysis one cannot be eco-centric without being anthropocentric first. In conclusion, it would be ineffective to appeal for new ethics and changes of attitude without having a structural change on the patterned contexts in which individuals make choices and decisions (Redclift and Benton 1994).

By the same token, the appeal for a new vision increasingly has become the core message of many publications on the topic of sustainable development. Although there is no doubt about the importance of vision in any social transformation, actions based on visions that are not tested or guided by a concrete body of theory may lead to chaos instead of solutions (Mebratu 1996c). Individuals perceive life through different prisms. What some consider as high priority may be trivial for others, and each individual's ability to imagine a positive future is constrained by his or her perspective. As a result, it would be impossible to follow visionary directions that would lead to the same endpoint, in the absence of a common point of departure. This was substantiated by the findings of the study undertaken by the 2050 Project, which attempted "to pin down diverse 'sustainable features' expressed as vision and then identify a common end point at which many of them are compatible." The 2050 project attempted to delineate pathways to a sustainable future. It was concluded that 'a single, globally acceptable end point will either be so general as to invite the same old criticisms or so culturally specific that it will be rejected by many who do not identify with it' (Nagpal and Flotz 1995). In other words, the plea for a new vision and ethics is essentially a plea for a concrete body of theory on sustainable development.

Today, all of the primary threats to our collective survival are slow, gradual developments arising from processes that are complex, both in detail and in dynamics. In contrast to the overemphasis given to the role of 'new vision', overcoming these threats presupposes understanding them in the context of their dynamic complexities. In the present day world of organized complexity, 'vision without systems thinking ends up painting lovely pictures of the future with no deep understanding of the forces that must be mastered to move from here to there. Without systems thinking, the seed of vision falls on harsh soil' (Senge 1990). Hence, symptomatic solutions that do not consider structural complexity, however useful they seem to be, will never bring us nearer to the solution.

In general, the following can be said in response to the research questions posed at the beginning of this chapter.

- Contrary to the dominant belief of attributing ecological disaster exclusively to the industrial society, there is strong historical evidence that ecological factors were one of the key elements in the rise and fall of ancient civilizations and in two of the major social transformations namely, the agricultural and industrial transformations.
- An in-depth look at the different religious teachings, medieval philosophies, and traditional beliefs, as the major repositories of human knowledge besides modern science reveals that, aside from the variation in semantics, most of them contain a strong component of *living in harmony* with nature and with one another. This is the logical essence of what we, today, call sustainability.
- It is undeniable that the concept of "sustainable development" received higher currency and prominence after the publication of the "World Conservation Strategy" of IUCN (1980) and the report of WCED (1987), *Our Common Future*. Nevertheless, the earlier attempt of developing the "theory of environmental limits" and the theories on the "scale of organization" may be considered as precursors for the concept.
- The highly instrumental political expediency of the WCED definition of sustainable development has led to a diverse spectrum of definition and interpretation. Most of the effort of interpreting the concept is, to a large extent, influenced by the fundamental tenets of the specific group or organization. This has resulted in a narrow framework of interpretations and fundamental conceptual flaws in most of the definitions.

In conclusion, the definition of sustainable development that was provided by WCED in 1987 has made a major contribution in providing a new direction and promoting the concept throughout the world. Nevertheless, the need for a more coherent conceptual framework has become clearly evident as increasing numbers of stakeholders wrestle to promote sustainable development. This is a challenge that must be faced by the scientific community as it becomes increasingly involved in the sustainable development debate.

CHAPTER

THREE

3. Methodological analysis

It has been decades since the scientific community, as the principal powerhouse behind our knowledge and information structure, became a key element in determining the path of social development. Today, the influence of scientific thinking is so immense that it permeates through most of the day-to-day decisions of an ordinary life through the dominant mental models it has created. With an increasing awareness of the global environmental challenges, society expects a concerted intellectual leadership from the scientific community in terms of knowledge acquisition and solution generation. The scientific community has responded to the expectation of the society with respect to dealing with the environmental challenge. This chapter will address the following research questions with an objective of understanding the nature of the scientific responses: What are the major scientific paradigm shifts that have been observed in response to the environmental challenges? What are their strengths and weaknesses? Are there any theoretical bases that could be used for developing an alternative conceptual framework for sustainability and sustainable development?

3.1 Science and the environmental challenge

One of the major outcomes of the change in global environmental consciousness witnessed over the past three decades was its effect on the various disciplines of science. This resulted in an academic process that might lead to the 'ultimate breakdown of the entrenched systems of scientific disciplines' (Benton 1994). The process has been a two-way process helping the environmental debate to benefit greatly from the insights of sciences, and equally enabling the scientific communities to learn from their attempts to rise to these challenges. The role of science with respect to the environmental challenge has the following two facets. Primarily, as science and technology progress, our ability to recognize the complex cosmic interaction has developed, leading to a higher forecasting ability of long-term effects of today's activities. Secondly, as the reality of the potential immediate and long-term implications of our current development activities increasingly became evident, the scientific community has started to work on generating remedial measures and solutions for the environmental problems.

The response of the scientific community to the environmental challenges can be classified into two categories. The first stage was the period of disciplinary response during which each scientific discipline made an attempt to understand the causes of the environmental crises from their own disciplinary domain. This was followed by the inter- disciplinary response, which is the current dominant approach to environmental issues.

3.1.1 The (Mono-) disciplinary response

Science as we know it today, was created in the seventeenth century by Galileo, Newton, and others who, following Descartes inspiration, forged the view of nature as a great machine (Clarkee 1993). Since then, it has passed through the rugged terrain of conceptual ups and downs but has consolidated the reductionist simplification as its epistemological foundation. The initial response to the increasing level of environmental crises has, naturally, originated within the entrenched domain of the different disciplines. This has led to the creation of specialized areas of research and education within the mainstream disciplines. Fields such as environmental economics, environmental engineering, and environmental law are outcomes of the effort of the scientific community in response to the environmental challenges. Today, specialized environmental disciplines constitute the core elements of environmental education and research of major universities.

The disciplinary responses are, to a large extent, based on an extension of the basic principles and theories of the disciplinary domain toward the field of environment, which is inherently an area of dynamic complexity. This has led to two major constraints. Primarily, the effort of understanding the root causes of the environmental crises within the reductionist way of thinking has led to either a factual error in their premises, or to a logical error in their analyses or both (Mebratu, 1996c). These limitations are reflected in the source identification of the environmental crises and in the solution generation. As can be seen from Table 4, each of the disciplinary approaches provide a partial insight to the environmental crises and their solutions. But none of them, as a stand alone approach, can describe the nature of the environmental crisis and its solution. The second constraint, which is a natural outcome of the first, is that the independent solutions generated and proposed within the disciplinary domain have a limited scope of application and influence in dealing with the complexity of the environmental crises. Thus, despite the significant progress made in the field of environmental economics and environmental engineering during the last two decades, they have registered a limited success in terms of transforming societies into more sustainable production and consumption patterns.

Table 4: Comparative Analysis of the Mono-disciplinary responses

Disciplinary Version	Epistemological orientation	Source of Environmental Crisis	Solutions Epicenter	Mechanism of Solutions
Economics	Neo-classical reductionism	Market imperfections	Internalization of externalities	Market instrument
Ecology	Ecological reductionism	Human domination over nature	Reverence and respect for nature	Bio-centric egalitarianism
Engineering	Deterministic	Inefficient waste management	Improved waste management	Add-on technologies

Despite their limitation, the mono-disciplinary exercises have been very important for three reasons (Mebratu 1996c). Primarily, they have significantly expanded the knowledge base about the different aspects of the environmental crisis. Secondly, most of the serious attempts of coming to terms with the issues posed by the environmental crises have exposed some of the basic 'settled' assumptions of the 'mainstream' traditions of the sciences to critical examination. Calling into question these settled assumptions has opened up a research agenda for the sciences that extends well beyond the traditional environmental issues. And thirdly, and perhaps more importantly, as the impossibility of fully understanding, let alone resolving, any of the environmental issues has sunk down within the scientific community, it has opened the door for interdisciplinary dialogue that has led to the creation of new interdisciplinary fields of research and education.

3.1.2 The interdisciplinary response

During the late seventies and early eighties, a number of organizations and institutions dealing with environmental issues came to realize that the disciplinary approach has a serious limitation when it comes to dealing with environmental issues. The environmental challenges that are too complex to be treated within the narrow scope of the different disciplines led to the evolution of the multidisciplinary approach, as a matter of practical necessity. The multidisciplinary approach that emerged out of operational necessity led to the shift towards the interdisciplinary approach in environmental education and research.

In recent years, this approach has been embraced by an increasing number of academic institutions, leading to the establishment of many interdisciplinary environmental research centers and academic programs at different universities. This new breed of interdisciplinary approach within the academic community has been based on the transfer and adaptation of methodologies from one disciplinary area to another disciplinary domain. Although this approach represents a step forward in terms of reducing the barriers between the different disciplinary domains, it has also led to the following constraints with respect to effectively addressing the environmental challenges.

Primarily, in the absence of a concrete body of theory that serves as the thread of synthesis between the different parts, the interdisciplinary approach is, to a large extent, characterized by the mechanistic combination of concepts and tools that are generated under the different disciplinary domains. Thus, the fundamental epistemological shortcomings that are observed within the independent disciplines are transferred to the interdisciplinary packages. Secondly, the passive integration of the various conceptual principles and conclusions through the multidisciplinary approach has led us into an era of detailed complexity under which the underlying root causes of the environmental crises are overshadowed by a long list of symptomatic issues and their solutions.

Although all of the interdisciplinary paradigms attempt to be inclusive in their approach, all of them are mainly anchored within one or another dominant disciplinary domain depending on their individual and institutional affiliation. According to Leroy (1997,4), "the distances and differences between the disciplines involved - in terms of epistemologies, concepts, theories and methods, and in terms of priority and relevance to environmental problems - complicated the development of interdisciplinarity more than some had expected." Similarly, Ziegler (1997,3) said that, "the inside barrier to environmental interdisciplinarity is the split between ecological, social and economic lines of thought with the tendency of the ecological to follow the others in grouping separately, erecting a discipline above the other disciplines. Even if the intention is multidisciplinarity, often the organizational behavior is different."

Besides these major limitations, the growing institutional recognition of the interdisciplinary approach within the academic institution is accompanied by a subtle sidelining of environmental issues from the disciplinary domain and vice versa.

This trend is being propagated by both the interdisciplinary institutions, which underrate the contribution of other disciplinary sciences to the development of the environmental knowledge base, and by the so-called 'hard-core' disciplinarians who generally tend to brand the interdisciplinary approach as being unscientific. Neither is beneficial to the effort of moving towards a sustainable society.

The development of science and technology has been the major catalyst for the unprecedented speed and magnitude of change since the industrial revolution. Although nobody can deny the positive effect of these changes, it is equally true that 'science and engineering have been unable to keep pace with the second-order effects produced by their first order victories' (Weinberg 1975). The source of this inability is the inherent limitation within our scientific methodologies and ways of thinking rather than the devilish' nature of science itself as has been advocated by some environmental groups. The disciplinary and interdisciplinary responses of the scientific community to the environmental challenge have demonstrated that science is an important tool in our effort to overcome the environmental challenge. However, the full-scale utilization of science for sustainability will require addressing the limitations that have become evident during the disciplinary and interdisciplinary stages of responses.

3.2 The scientific paradigm shift

According to the dominant scientific thinking, science is the study of those things that can be reduced to the study of other things. Science, in other words, is essentially reductionist. However, it should be noted that the reductionists have not yet succeeded in reducing all phenomena to physical and chemical primitives (Weinberg 1975). Environmental issues are one of the complex and dynamic subjects that essentially fall beyond the reach of the reductionist scientific thinking. Scientific understanding of the environmental challenge will require overcoming the limitations of the reductionist approach that is inherent in our way of thinking. This implies the need for a shift of a paradigm. This chapter focuses on the evolution of an alternative scientific view, the paradigm shift in the field of environmental studies, and finally, the basis for moving towards developing a transdisciplinary environmental paradigm.

3.2.1 An alternative scientific view

The image of nature as an organism, ensouled and purposeful, created by God and replete with signs of His creative and loving providence, reached its culmination in the West during the Renaissance period. In the course of the sixteenth century, however, a new and dramatically different model of the universe began to emerge.

Copernicus replaced the old Ptolemaic geocentric universe with a heliocentric model, thereby destroying the image of a cosmos which, since Plato, had come to symbolically reflect the centralized position of humanity within the great chain of being. But, the main task of building a new model fell on Kepler, Galileo, and Newton, who reordered the concept of the solar system so that it no longer resembled an organism but rather a 'magnificent piece of clockwork' (Clarke, 1993). They showed that the processes of the natural world, whether in the heavens or on earth, could be understood without reference to soul or purpose. It could simply be understood in terms of material particles moving in infinite space in accordance with strict, mathematically precise, universal laws.

The culminating synthesis was laid out in Isaac Newton's Principia Mathematica, a work that became a model for all future scientific endeavors. However, according to Clarke (1993), it was the French philosopher René Descartes who gave the first clear articulation to the idea that all the workings of nature could be understood by analogy with the workings of a clockwork machine. Since then, the reductionist idea that is based on the notion that nature is not a great organism but rather a great machine has become the central inspiration of the scientific revolution, and as a potent metaphor it runs through the whole of modern thought and culture.

Since the late 19th and early 20th centuries, however, 'a subversive sub-culture has sought to keep alive and even amplify a more traditional and more metaphysical conception of nature' (Clarke 1993). The French philosopher, Bergson, and the Anglo-American philosopher, Whitehead, are representative of such an alternative view of nature. This view emphasizes creativity rather than a deterministic mechanism, process rather than substance, the whole rather than the parts. It links together the human and natural realms, and pictures the world as an ever-interacting flow of energy, thereby laying down the basis for what is called a 'holistic view'. This term has come to be widely used in the second half of the 20th century representing a new, if traditionally based, view of nature. It has arisen in part from developments within science itself and is vaunted by its supporters to overcome the limiting and dispiriting aspects of positivistic and mechanistic philosophies of nature.

The word 'holism' is a term that has played a central role in much subsequent discussion on environmental and ecological questions; according to Clarke (1993), it was first coined by the South African statesman and philosopher, Jan Smuts (1870-1950). According to holistic thinking, both matter and life consist of unit structures whose ordered grouping produces natural wholes that we call bodies or organisms.

This character of 'wholeness' meets us everywhere and points to something fundamental in the universe. Holism is the term that stands for this fundamental factor operative towards the creation of the universe. Its character is both general and specific or concrete, and it satisfies our dual requirement for a natural evolutionary starting point.

Table 5: Comparative analysis of the cosmic view

Factors	**Reductionist**	**Holistic**
Nature	as a machine (Clock)	as an organism
Focus	the parts	the whole
Mechanism	Deterministic	Creativity
The 'whole' as	mechanistic sum of the parts	dynamic interaction of the parts

Smuts (1993) emphasizes that the wholes are not merely artificial constructions of thought: they point to something real in the universe. Taking a plant or animal as a type of a whole, we notice the fundamental holistic characters as a unity of parts which is so close and intense as to be more than the sum of its parts. It does not only give a particular conformation or structure to the parts, but so relates and determines them in their synthesis that their functions are altered. The synthesis affects and determines the parts, so that they function towards the 'whole', and the whole and the parts therefore, reciprocally influence and determine each other, and appear more or less to merge their individual characters. Thus, the whole is in the parts and the parts in the whole, and this synthesis of whole and parts is reflected in the holistic character of the functions of the parts, as well as of the whole.

Furthermore, the holistic view asserts that natural wholes are always composed of parts; in fact the whole is not something additional to the parts, but is just the parts in their synthesis, which may be physico-chemical or organic or physical or personal. As holism is a process of creative synthesis, the resulting wholes are not static but dynamic, evolutionary, and creative. This is a universe of whole-making. Consequently the explanation of nature cannot be purely mechanical like the machine clock; and the mechanistic concept of nature has its place and justification only in the wider setting of holism.

A natural whole has its 'field', and the concept of field will be found to be most important in this connection also. An organism can only be explained by reference to its past and its future, as well as its present. The central structure is not sufficient and literally has not enough in it to go around in the way of explanation. The conception of the field becomes necessary and will be found fruitful in biology and psychology, no less than in physics (Smuts 1993).

Competitive existence of these two views may be observed in the fields of social science. For instance, individualists within the social science domain generally claim that (Redclift and Benton 1994) society is nothing over and above the individual people of which it is composed and tends to focus on individual demands, desires, or decisions. On the other hand the holist or 'social realist' approaches, within the same domain, tends to emphasize ways in which individual behavior is shaped by the wider collectiveness or normative frameworks within which individuals are situated. Fundamentally, the holistic view recognizes the validity of the reductionist way of thinking within the broader domain of the holistic view (Mebratu 1996c). In this context, disciplinary sciences, as reductionist as they are, will remain to be the best source of gaining in-depth knowledge about the parts. But, when it comes to complex systems, the limitation of the reductionist view needs to be rectified through the application of the holistic view. Recognizing the relationship between the holistic and reductionist view is one of the major challenges that must be addressed by the scientific community in its efforts of dealing with environmental issues.

3.2.2 Methodological shifts

The environmental discourse of the last three decades is marked by the shift from disciplinary methodologies to interdisciplinary methodologies. The major limitation of disciplinary methodologies is the fact that they are locked within the narrow compartments of their respective disciplinary domain that excludes dialogue with other disciplinary domains. This results in simplistic solutions that have a limited scope of influence as a stand-alone solution. Nevertheless, some disciplinary sciences are making the greatest contribution in terms of expanding our ability to understand the extent of the ecological damage that has been caused by human activity. Although, the contribution of the disciplinary domain to sustainable development seems to be currently overshadowed, it will continue to serve as the foundation of the scientific response to the environmental challenges.

The limitation of the disciplinary approach led to the evolution of the interdisciplinary approaches in the 1970s. Despite the huge effort over the last 20 years on the development of new concepts, models and methods, 'it is still uncertain whether the environmental sciences do have or will ever have a common and interdisciplinary body of knowledge or any other robust scientific foundation' (Leroy 1997). Although, the interdisciplinary debate gave rise to some scientific metaphors and modeling on the man-environment interaction – varying from the 'pressure-state/impact-response' model to the 'metabolism' metaphor – interdisciplinarity so far seems primarily a question of the transfer and integration of methods, rather than the forging of substantive theories (Leroy 1997). While fully recognizing the importance of interdisciplinarity, Leroy (1997,5) argues for a close link from environmental sciences to the classical basic disciplines. He further asserts that, "without such a link interdisciplinarity may lead to some superficial eclecticism."

Table 6: The disciplinary environmental paradigm shifts

Factors	**Disciplinary**	**Interdisciplinary**	**Transdisciplinary**
Paradigm basis	exclusive	Laterally inclusive	cross sectional
Methodology	reductionist	Mechanistic	systemic
Solutions	simplistic	Detailed complexity	dynamic complexity

It is this notion that has given rise to the evolution of transdisciplinary environmental paradigms that transcends disciplinary boundaries. Here it is important to note the distinction between interdisciplinary and transdisciplinary thinking. According to the International Center for Transdisciplinary Studies and Research (1999,1):

> *Transdisciplinarity is not concerned with the simple transfer of a model from one branch of knowledge to another, but rather with the study of isomorphisms between the different domains of knowledge. To put it another way, transdisciplinarity takes into account the consequences of a flow of information circulating between the various branches of knowledge, permitting the emergence of unity amidst the diversity and diversity through the unity. Its objective is to lay bare the nature and characteristics of this flow of information and its principal task is the elaboration of a new language, a new logic, and new concepts to permit the emergence of a real dialogue between the specialists in the different domains of knowledge.*

For instance, from the point of an ecological theoretician who starts with biological evolution theories and explores where one can find close analogies to the variables in other areas of inquiry, the distinction between ecological and evolutionary approaches might not be discernible. However, as was noted by Dosi and Nelson (1993,4), “the term “evolutionary” ought to be reserved for theories about dynamic time paths, that aim to explain how things change over time, or to explain why things are what they are in a manner that places weight on how they got there.” That is why the study of the adaptive dynamics of complex systems has become the analytical focus of the evolutionary school of thought, as applicable to both natural and man-made systems.

In short, the transdisciplinary paradigm is based on identifying and developing the general theories and principles that govern the evolution and functions of a given system. The main feature of this school is its cross-sectional nature running through all disciplinary domains. The systemic methodology upon which it is based enables it to look at the dynamic interrelationships between systems and generate solutions with maximum synergistic effects. Most importantly, the transdisciplinary paradigm does not dissociate itself from the disciplinary domains. It rather works within each and every domain serving as the synthesizing thread of our action in response to the environmental crisis. As such, it provides the basis to work with ‘competent rebels’ (Ziegler 1997) that do not emigrate with justified contempt for their discipline/area, but keep positions by changing them from the inside.

3.2.3 Transdisciplinary theories

The rivalry between the bivalent and multivalent interpretations of truth has been a long-standing one in the philosophy of science characterized by the dominance of the bivalent truth (Kosko 1994). Since the early twentieth century, however, this rivalry has taken on a new dimension giving an increasing recognition to the multivalent view. The recognition of the fact that our scientific knowledge is based on the establishment of partial and gray truths is a key element in understanding complex systems. This, also, has a significant bearing on our efforts to understand the environmental crises. In the past few decades, there are notable shifts within mainstream sciences that are dedicated to overcoming disciplinary boundaries and creating transdisciplinary research programs. First and foremost among them is the group of emerging fields collectively known as “systems sciences.” These new sciences deal with the appearance, development, and functioning of complex systems regardless of the domain to which they belong (Laszlo 1991).

In the context of this research, the 'General Systems Theory' and the 'General Evolution Theory', as theories of complex systems, are discussed as the basis for developing a transdisciplinary environmental paradigm.

3.2.3.1 General Systems Theory

According to the general systems theory, phenomena could be categorized into three different regions in terms of their complexity and randomness (Weinberg 1975). Systems that are simple and organized belong to the first region called "organized simplicity". This includes the region that could be simplified by organized scientific assumptions and exclusions. Region two is the region of "unorganized complexity" containing systems that are complex, but are sufficiently regular to be studied statistically. The majority of systems belong to the third region, which is the region of organized complexity. This is the region that is too complex for reductionist simplification and too organized for statistics and 'it can only be understood through systems treatment' (Weinberg 1975). Almost, all environmental issues fall under the region of organized complexity making them less amenable to reductionist simplicity and statistical treatment.

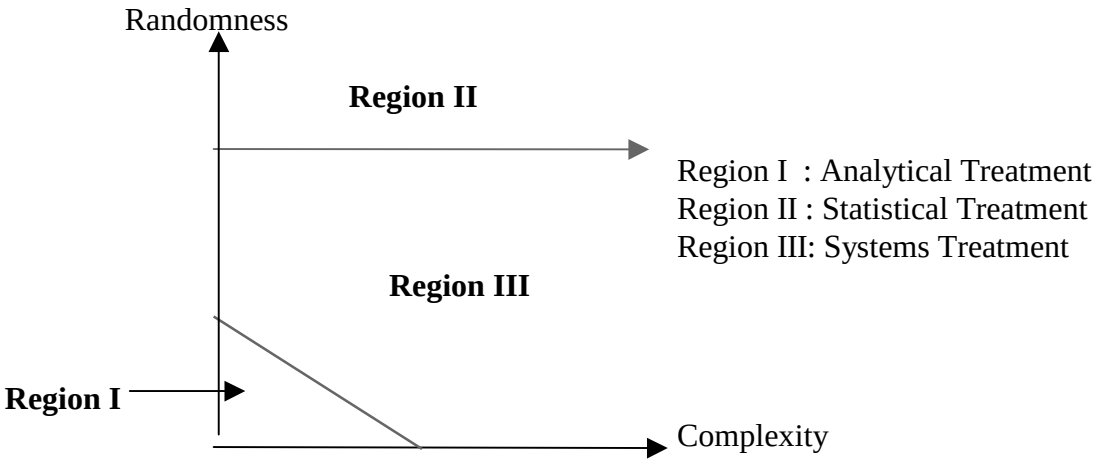


Figure 4: Types of systems with respect to methods of thinking

Systems thinking is a discipline for seeing wholes. It is a framework for seeing interrelationships rather than things, for seeing patterns of change rather than static "snapshots." According to Senge (1990), 'it is a set of general principles distilled over the course of the twentieth century, spanning fields as diverse as the physical and social sciences, engineering, and management.

It is also a set of specific tools and techniques originating in two threads: in "feedback" concepts of cybernetics and in "servo-mechanism" engineering theory dating back to the nineteenth century.

According to general systems theory, systems analysis should not be limited to the processing of many variables. Senge (1990) pointed out that, 'mixing many ingredients in a stew involves detail complexity, as does following a complex set of instructions to assemble a machine, or taking an inventory in a discount retail store. But none of these situations is especially complex dynamically'. Dynamic complexity is characterized by factors such as: dramatically different effects of an action in the short and long run, action with one set of consequences locally and a very different set of consequences in another part of the system with obvious interventions producing non-obvious consequences. In this context, one can conclude that the real leverage in management of complex situations lies in understanding dynamic complexity, not detail complexity (Senge, 1990). Unfortunately, most "systems analysis" focuses on detail complexity not dynamic complexity. Simulations with thousands of variables and complex arrays of details can actually distract us from seeing patterns and major interrelationships. In fact, sadly, for most people "systems thinking" means "fighting complexity with complexity," devising increasingly "complex" (we should really say "detailed") solutions to increasingly "complex" problems. Senge (1990) states that this is the antithesis of systems thinking.

As described earlier, the core of the systems theory is based on the understanding of a simple concept called "feedback" that shows how actions can reinforce or counteract (balance) each other. The systems thinking builds the ability to learn to recognize types of structures that recur again and again. Eventually, it forms a rich language for describing a vast array of interrelationships and patterns of change. Ultimately, 'it simplifies life by helping us to see the deeper patterns lying behind the events and details' (Senge, 1990). Developing systems thinking might seem to be a monumental task for some of us. Research with young children has shown that many learn systems thinking remarkably quickly. It appears that we have latent skills as systems thinkers that are undeveloped, even after being repressed by formal education in linear thinking. The challenge is to rediscover some of those latent skills and bring them to the surface.

3.2.3.2 General Evolutionary Theory

The second major general theory that is exerting a significant influence on our scientific thinking is the general evolution theory, which emphasizes that the common focus in nature and in society is evolution conceived as an irreversible and nonlinear change in domains far from thermodynamic equilibrium.

Scientists are becoming more and more convinced that evolution in nature and evolution in the human realm have more in common than mere analogies. As was indicated by Laszlo (1991), there are basic isomorphies that point to a consistency at the very heart of empirical reality. Classical science, which started with the "Newtonian paradigm," was centered around the idea of deterministic and time-reversible laws. The world was seen as a vast automation; man appeared as being outside nature, as a free agent in a mechanical universe, able to manipulate and exploit his environment. The classical image of science continues to be propagated with considerable authority. It permeates many aspects of the human sciences, in which rationality is identified with timelessness and equilibrium.

However, at present, our conception of nature is undergoing a radical change toward the multiple, the temporal, and the complex. A new paradigm is taking shape. It is now understood that the behavior of matter and non-equilibrium conditions can be radically different from its behavior at or near equilibrium. And, it is precisely this difference that introduces multiple choices, self-organization, and complex dynamics. According to this approach, 'rationality is no longer to be identified with certainty, nor probability with ignorance' (Laszlo 1991). The general evolutionary theory is based on the recognition of the constructive role that irreversibility plays in the universe. Thus, questions such as the origin of life, the origin of the universe, or the origin of matter can no longer be discussed without recourse to irreversibility. Indeed, irreversibility must exist on all levels, or it can exist on none; it cannot emerge in the transition from one level to another. Aside from theories of cyclical and eternal recurrence, and the positivist disclaimers of the meaningfulness of large-scale patterns, modern social science is firmly based on the concept of historical development. A comparison of contemporary techno-industrial information societies with the still-surviving remnants of hunter-gatherer tribes highlights the range, the dimensions, and the statistical irreversibility of the historical process. In general, there is a broad consensus amongst evolutionary scientists in that human beings, no less than cosmos and culture, change irreversibly, over time.

Although evolution is a study of change, it is not the study of all varieties of change. Purely random and entirely time-reversible patterns of changes are excluded: evolution concerns exclusively change that is, at least statistically, irreversible. But not even all varieties of irreversible change fall within its compass. To qualify, irreversible change must entail processes that lead to the emergence, or at least persistence, of ordered structure in space and time. In short, 'evolution is the study of progressive, ongoing change, leading with at least a statistical irreversibility from the origins of the cosmos to its present state - and to its future states' (Laszlo 1991).

In conclusion, the following can be said by way of responding to the research questions posed at the beginning of this chapter.

- Scientific thinking, born out of the development of science, constitutes one of the greatest tools of mankind in the transformation of the agricultural society to the industrial society. Scientific thinking that is mainly based on the reductionist way of thinking has passed through different stages of refinement before assuming its current status.
- The response of the scientific community to the global environmental challenges started within the disciplinary domains which later evolved towards the interdisciplinary response. The move from the disciplinary to the interdisciplinary response has been dictated by the inherent limitation of the disciplinary sciences in dealing with systems of organized complexity. The limitations of the interdisciplinary response are yet again dictating the need for transition to transdisciplinary paradigms in dealing with the global environmental challenges.
- Despite their limitations, the disciplinary and interdisciplinary responses to the environmental challenges have made major contributions in terms of expanding our knowledge base and opening doors for questioning some of the settled assumptions of the dominant scientific thinking.
- The transdisciplinary paradigm for environmental thinking is a cross-sectional paradigm that runs across the disciplinary domains and works throughout the natural and social science domains, serving as the synthesizing thread among them in dealing with environmental challenges of complex nature. By doing so, it helps us to overcome the 'scope limitation' of the disciplinary domains, and the 'detailed complexity' of the interdisciplinary domain.
- The evolution and development of the general systems theory and the general evolution theory is a process that has been dictated by both the success and failure of 20th century science. The core elements of both theories are aimed at overcoming the epistemological limitations of the traditional scientific thinking. Their instrumentality for treating complex systems makes them the most suitable points of departure in dealing with environmental systems and theories.

In conclusion, today, we are at a crossroad where the interface between science and society is being tested yet again. Problems that may arise at the science-society interface can only be solved by understanding the actual complexity of the societal transformation processes. Understanding sustainable development as a social transformation process will require us to begin a new form of dialogue on a transdisciplinary basis.

The scientific community is faced with the challenge of spelling out more precisely the form of this new dialogue, if we are to overcome feelings of alienation and frustration that might lead to an emotional rejection of science itself. In confrontation with the entrenched compartmentalization of specialized disciplines, progress in the transdisciplinary paradigm development must prove stronger than the territoriality that keeps the specialized disciplines apart.

CHAPTER

FOUR

4. The conceptual framework

We have seen from the preceding chapters that the efforts of defining sustainability and sustainable development have been suffering from the major shortcomings of the dominant methodological structure of the various disciplines. The environmental challenges of the twentieth century have increasingly become complex. These complexities do not make them amenable to reductionist approaches and mechanistic solutions. Any alternative conceptual framework should be developed in such a way that it would overcome the limitations of the various definitions and limitations. In this context, this chapter addresses the following research questions: What are the basic principles of sustainability that have a common application for 'natural' and 'man-made' systems? How can we define sustainable development on the basis of the sustainability principles?

Considering the complexity of the environmental challenges, it is proposed that the conceptual limitations may be overcome through the combined application of the 'General Systems Theory' and the 'General Evolutionary Theory'. The basic principles of systems and evolutionary theories that are adapted to this research are:

- Evolution is an irreversible and non-linear change of both natural and man-made systems in domains far from thermodynamic equilibrium (Laszlo 1991);
- The direction of evolution is characterized by an increasing ability of organisms and systems to sense and assess the state of the environment, to learn appropriate responses, and to transmit this to succeeding generations (Ayres 1994).
- Systems with organized complexity can only be understood by looking at their dynamic interrelationships (feedback), which is more than linear summation of cause-effect chains (Checkland, 1993).

These and other relevant principles of general systems, evolutionary and information theories are used as the basis to develop an alternative conceptual framework for sustainability and sustainable development that are presented in this chapter. This alternative conceptual framework is believed to provide a better conceptual basis to improve our understanding of the environmental challenge and to promote sustainable development.

4.1 Systems evolution and information

One of the most deeply buried metaphors of science is the concept of a "thing" or "part" that can be separated cleanly from other things or parts. The metaphor is so deep that we seldom know when we are using it (Weinberg 1975). Our use of the "part" or "thing" metaphor is closely allied to our experience of physical space, and particularly to our experience of "boundaries". Thus the "thing" is separated from its environment by an imaginary boundary and the interaction between the "thing" and its environment is described in terms of a distinct 'input-output' relationships.

Problems particularly arise due to the fact that the choice of boundaries will be very much influenced by the specialized way of thinking and principles, by past experiences, and, most of the time, by the purpose of the specific system exercise. Although the boundary metaphor easily permeates systems thinking more through diagrams than through analogical statements, it has led to the derailing of the very purpose of systems thinking: overcoming the limitation of the reductionist simplicity in the organized complex region (Weinberg 1975). According to the specialized systems thinking (Weinberg 1975), systems are thoroughly man-made and the definition of a specific system is the point of view of one or several observers. Utilizing systems thinking for the concept of sustainability requires revitalizing the specialized systems thinking based on the principles and spirit of general systems thinking. The key element of this revitalizing process, in this context, is the redefinition of the concept called 'system'.

With respect to the relationship between evolution and information, Ayres (1994) indicates that all physical processes and transformations (including phylogenic evolution) can be described in terms of two fundamental information quantities. These are, respectively, pure uncertainty-reducing or distinguishability information (D information) and evolutionary survival-relevant information (SR information). According to Ayres (1994), D information is a quantity that exists independently of any reference system or observer and hence it is an extensive variable. Thus it can be regarded as a fundamental variable for describing the natural world.

On the contrary, SR information is the information that is relevant to the evolutionary selection process and is definable only in terms of a specific local system. Hence, it is an intensive variable. The combined application of general systems thinking and general evolutionary theory provides a new framework of 'systems', which include the following variables.

- A unit is any organized physical entity with a specific functional purpose and manifestation. Each unit is characterized by the D information embodied within it.
- An environment is the field of significance of a unit within which it conducts its functional purposes and exhibits its manifestations. The field of significance (the environment) is characterized by the SR factors, which is of multiple dimensions.
- There is a dynamic linkage between the unit and its environment that is exhibited through the complex web of interaction. The interaction within and between the D factors and the SR factors defines the functional capacity of the system.
- A system is the totality of a physical unit, its environment as a field of significance and the interaction between the units and their environment.
- Evolution, as the processing, accumulation, and transferring of 'Survival-Relevant' (SR) information, maximizes the embodiment of D information (diversity, complexity and stability).

To illustrate the unit and system relationship with an example, an individual person can be described both as a unit and a system. His/her identity as a unit is defined by the distinguishability information that has been organized in the form of DNA[5]. This sets the boundary condition for what it can be and what it cannot be. The surrounding within which the individual exists will provide the field of significance within which the individual functions as a system. A similar analogies can be made for industrial and social units and systems.

[5] DNA is that part of the cell where all genetic information of a living organism is stored.

4.2 Hierarchy and interaction: source of dynamic complexity

According to the general model of organized complexity (Checkland 1993), there exists a hierarchy of levels of organization, each more complex than the one below, a level being characterized by emergent properties at the lower level. Thus, entities that are whole at one level of the hierarchy simultaneously become parts of the higher level of entities. Thus a given system exhibits the properties of being a whole and a part at a given moment in time. An individual person is a whole on its own and a part of the 'family', which is a higher system in the social hierarchy. Figure 5 depicts the cosmic hierarchy developed based on this principle. The model is based on having both horizontal and vertical hierarchy, clearly indicating that the existence of a specific level in the hierarchy is strictly dependent on the existence of the earlier level in the vertical and/or horizontal hierarchy.

- The horizontal hierarchy depicts the universe hierarchy that is divided into abiotic, biotic, social and economic cosmoses in the order of their precedence. Thus, the abiotic cosmos is the basis for the existence of the universe, while the economic cosmos is the last element in the hierarchy.
- The vertical hierarchy depicts the hierarchy within the cosmos. Each cosmos has a base element which serves as a basis to the specific cosmos and as a linking element of the specific cosmos with the earlier cosmos in the hierarchy.
- Thus, the basic units, which are the atoms of the abiotic cosmos, the cell of the biotic cosmos, the human being of the human universe, the firm of the economic cosmos, and the family of the social cosmos are the critical elements that keep the whole universe together through their vertical and horizontal functions.
- This leads to the conclusion that any tampering with respect to the core elements has to be done with utmost care since they have two-dimensional effects both in the horizontal and vertical directions of the cosmic hierarchy.[6]
- Market, as the socio-economic institution through which information is exchanged, holds a prominent position in defining the functional efficiency of any given socio-economic system.
- The key principle of the natural universe is evolution, while the governing principle of the human universe is social transformation. The combined principle of the natural and human universe is, however, coevolution.

[6] According to this model, one does not need to develop a complicated mathematical model or plead for ethics to show the danger of casual tempering with nuclear technology and genetic engineering.

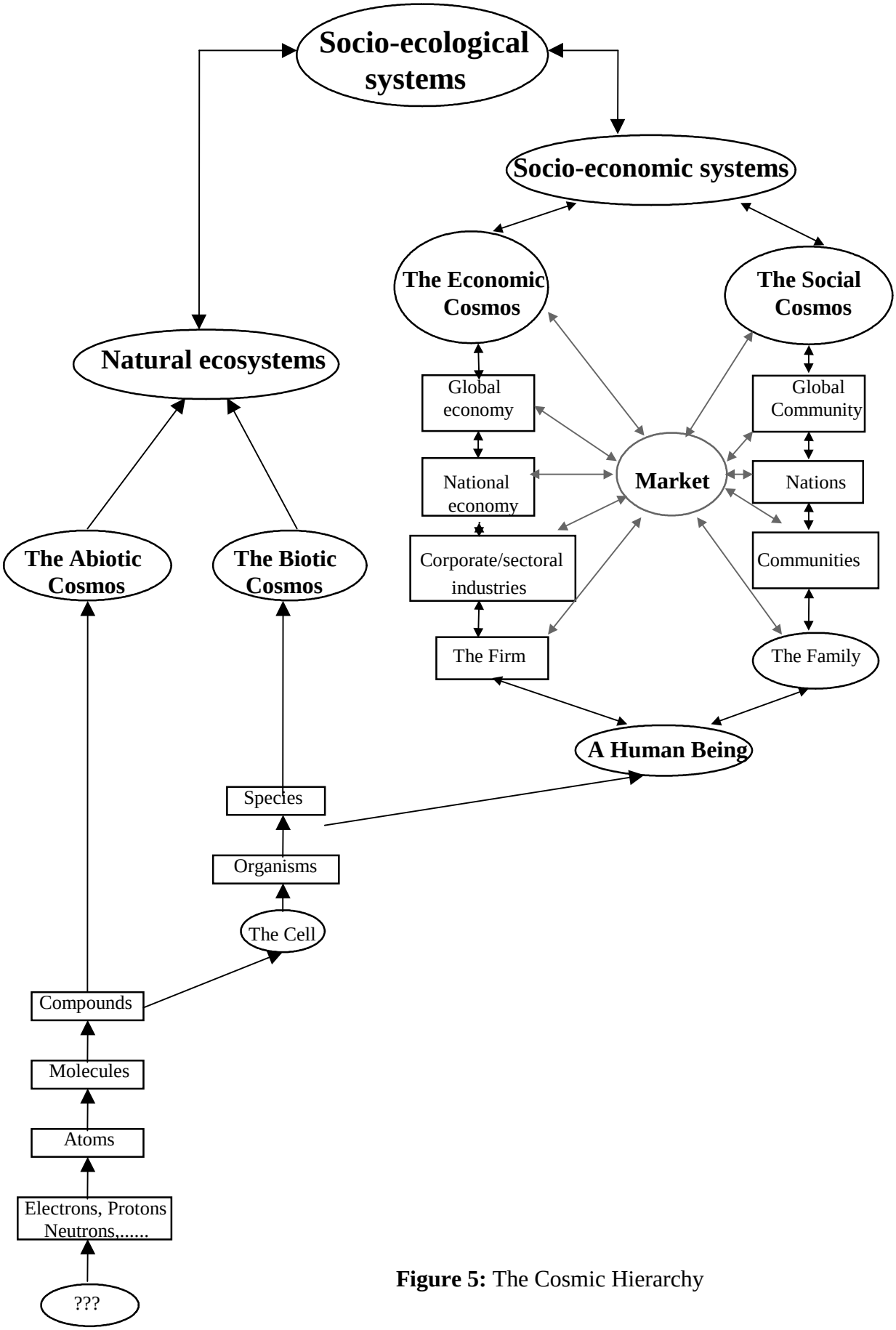


Figure 5: The Cosmic Hierarchy

The relationships and interactions between the different aspects of the cosmic universe is described by the cosmic matrix (Table 7). The cosmic matrix is composed of the cosmic processes, measurable flows, regulating mechanisms, non-stable parameters, and non-desirable outcomes. The cosmic processes are those processes that inherently determine stability within the cosmic regimes, while the measurable flows are characteristic parameters or flows that define the nature of the cosmic processes. The regulating mechanisms are the cosmic mechanisms through which a cosmic steady state is achieved within the cosmic regimes. The non-stable phenomena are indicators of effects of persistent offshoots of the measurable flows beyond the steady-state limit as a result of a feedback lag and/or cosmic interactions that override the ability of the feedback loop within the specific cosmos. The non-regulated outcome is the spontaneous corrective mechanism that brings back the system to a new level of steady state.

The cosmic process of the abiotic cosmos is described as the geo-physical regeneration that is based on thermodynamic principles and it has mass and energy as its major measurable characteristic flows. The cosmic performance of the abiotic cosmos is kept within the limit of a steady state through the various natural cycles such as the water, and nitrogen cycles. On the other hand, the cosmic process of the biotic cosmos is the combined effect of reproduction and metabolism guided by the principles of evolution, and it has population and consumption as the characteristic measurable flows. The cosmic performance of the biotic cosmos is kept within the limit of a steady state through the primary effect of mobility and succession. With respect to the economic cosmos of the human universe, production and exchange, guided by human needs and aspirations, are identified as its cosmic process having capital (both natural and human) and technology (both natural and human) as the measurable parameters. The cosmic performance of the economic cosmos is regulated by the continuous adjustment of the market.

Participation and distribution measured by the level of empowerment and welfare are identified as the cosmic processes that constitute the social cosmos of the human universe. The cosmic performance of the social cosmos is kept within the limit of sustainability through structural transformation of governance that goes hand in hand with the economic cosmos.

Table 7: The cosmic sustainability matrix

Cosmos	Cosmic process	Measurable flows	Regulating mechanisms	Non-stable parameters	Non-regulated outcomes
Abiotic	Geo-physical regeneration	Mass and energy	Natural cycles	Breakdown of cycles and seismic structures	Natural disasters
Biotic	Reproduction and metabolism	Population and consumption	Mobility and succession	Overshoots	Population crash /extinction
Social	Participation and distribution	Empowerment and welfare	Structural transformation	Social inequity	Revolution
Economic	Production and exchange	Capital and technology	Market adjustment	Economic inflation	Economic depression

Excessive accumulation and/or depletion, population and/or consumption overshoots, economic inflation, and social inequity are the non-stable parameters for the abiotic, biotic, economic, and social cosmos respectively, indicating an unstable situation. The corresponding corrective phenomena of these undesirable outcomes, from the point of view of cosmic stability, are natural disasters such as earthquake, droughts, and floods for the abiotic cosmos. Similarly, sudden population crashes and gradual extinction of species are the corrective mechanisms for the biotic cosmos, while economic depressions and revolutions are corrective mechanisms for the economic cosmos and the social cosmos, respectively. Although each cosmic system is treated separately for the sake of convenience and clarity, in the actual case there will be a varying second-degree effect of one cosmic system over the other depending on the level of hierarchy within the Cosmic Hierarchy (Figure 4). However, this does not rule out the possibility of the existence of an independent region of an abiotic cosmic system that is beyond the reach of the human universe.

4.3 Sustainability: as a systemic property

The properties at the system level will be quite different from the cosmic properties due to the fact that no unit system could be distinctly categorized in one or the other cosmos. In other words, systems exhibit a four dimensional property (abiotic, biotic, social and economic) with a varying degree of one or the other cosmic properties, as a manifestation of cosmic interaction.

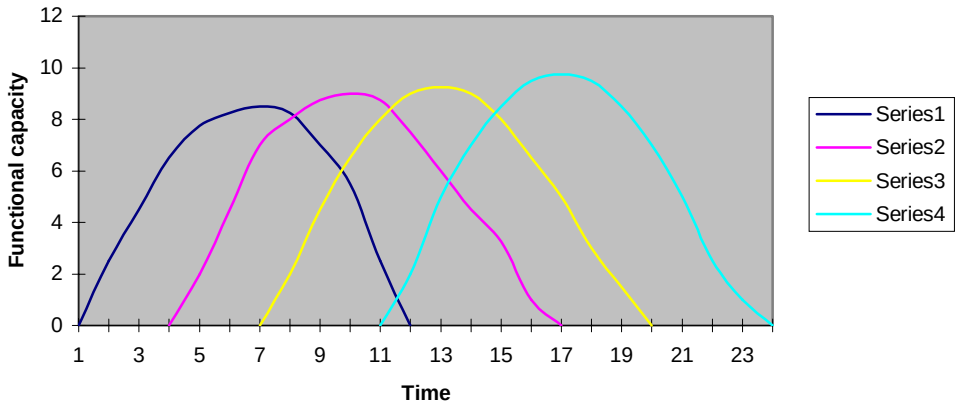
When we divide the cosmic interactions in accordance with the vertical hierarchy of the Cosmic Hierarchy (Figure 4), we find that the foundation for the cosmic interaction is the interaction between the abiotic and biotic cosmos, laying down the basis for any kind of systems sustainability.

The definition of the concept of sustainability within the context of this research is based on the following two assertions. First, every unit has a given functional capacity, which follows an initially increasing and later decreasing pattern with time. This is in line with the ontological (lifecycle) pattern of development that covers the ascendancy, climax and retrogression phases. The second assertion is that every system has a succession function that enables the system to sustain its functional capacity through alternative cycles of succession. Sustainability is, therefore, the maintenance of a given level of systemic function that reconciles with the principal feedback loops of natural cycles and succession through the proper combination of unit functional capacity and succession time. As such, sustainability could be considered as the driving force behind any systemic function.

Based on the preceding discussion, the following principles of sustainability can be proposed:

- Every system has an initially increasing and then decreasing unit functional capacity as a function of its lifetime. The path of ascendancy and retrogression is determined by the level of interaction between the D factors and the SR factors of the system that are defined by the field of interaction.
- A certain level of systemic function is maintained through an alternative succession of unit systems and this level of the systemic function could be affected by either the vertical movement of the unit functional capacity or the horizontal movement of the system succession time-frame.
- The SR information is transformed to D information through the successive cycles of evolution (for natural) and innovation processes (for man-made).
- Any systemic function that is within the limit of the stability factors of natural cycles and biotic succession is sustainable while any systemic function that exceeds the limits of the stability factors is unsustainable.
- Unidirectional phenomena that result in an increased unit functional capacity irrespective of the limits of the feed-back loops lead to unsustainable systemic function resulting in some type of a crash.

Figure 6: Functional capacity of successive systems



The area under each curve gives the functional capacity of a system over its lifetime. A given level of systemic function could be achieved in two different ways. The first way, which has an insurmountable physical limitation that is related to the SR factors, is pushing the unit functional capacity peak upward irrespective of changes in the physical limits. This could exceed the physical limits and lead to undesirable down-crashes of the functional capacity and a subsequent loss in capacity. The second option is keeping the functional capacity increment in pace with the change in the physical limits and manipulating the time frame of the succession cycle to keep the systemic functional performance at a steady-state level. Although, this approach might result in a lower functional capacity per unit time than the first option, it potentially enables the system to achieve a better level of systemic sustainability without facing the danger of crashes.

Units belonging to the natural universe have built-in mechanisms of feedback loops that balance the total effect of positive and negative feedback loops thereby maintaining systemic sustainability in accordance with the second option. On the other hand, the human universe has the tendency to generate units that lack such a balance between positive and negative feedback loops thereby leading to the tendencies of exceeding physical limits. The organizing principle that underlies sustainable systems is the presence, the maintenance, and the production of microscopic diversity that results in an ecological structure. According to Allen (1994), ecological structure emerges over time, as the types of behavior present in our possibility space increase and become more complex over time.

The survival of the whole system may depend on the system's effective adaptation to external events, while the survival of the individuals of which it is comprised may require success in the internal adaptive processes. As evolution proceeds, it gradually switches from introducing adaptations that deal with the external world to adaptations that succeed within the internal environment. This is just the normal process of the development of ecological structures (Allen 1994).

When some successful innovation occurs in the system, some new source of positive feedback has been discovered. Now, in natural ecosystems, this would result in the "success" of some populations for a time, during which their prey would decline in numbers and their wastes would build up. However, in the natural example, after some time, a variant of another population would "discover" that it could "use" this newly successful population and its accumulation of waste. This is because any special concentrations of matter having high free energy are potential sources of food for other populations.

After a further period, the initial innovative population would have been reincorporated into the ecosystem, and the challenge that it offered initially would have been met from the internal diversity of the population of the ecosystem (Allen 1994). This is lacking for human ecosystems. The first reason is the time gap between the human innovation process and the ecological evolution process. There is not sufficient time for an ecological response, particularly as we keep changing what we are dumping on the environment in a faster rate. The second reason, however, is the earlier tendency of using dispersion as our method of getting rid of wastes. So instead of accumulations building up and becoming a potential source of raw material for some unknown future process, the waste is dispersed into the soils, the oceans and the atmosphere.

Plotting the area under each curve for successive generations gives the sustainability curve for that system. The slope of the sustainability curve indicates the state of sustainability of the system. A negative slope stands for a decline in sustainability while a positive slope indicates an increase in the sustainability functions. In either of the cases, having a significant peak and trough is an indication for a persistent systemic dysfunction. Systems with a persistent negative slope are heading towards a crash or extinction. Almost all systems exhibit an oscillating curve of sustainability as a function of their systemic feedback lag.

Based on this model, one can identify the following three major possible scenarios in systemic evolution.

- *Scenario one:*
  Most systems are functioning under some level of feedback lags between the intensive factors of the SR block. Thus, most systems will exhibit an oscillating sustainability curve with positive and negative slopes. This is especially intense in the case of man-made systems.
- *Scenario two:*
  A persistent negative slope of function represents an increasing mismatch between the D factors and the SR factors. Such a scenario may lead to the bifurcation of the system resulting in a new level of compatibility between the D factors and the SR factors.
- *Scenario three:*
  In some cases, systems might be faced with a mismatch within the extensive factors of the D block that leads to the complete failure of the feedback mechanism as a source of corrective measure. Such a scenario is detrimental to the sustainability of the systemic function and will, in most cases, lead to extinction of the system.

Based on the preceding discussion, sustainability can be defined as a systemic property of maintaining an incremental functional capacity of a given system through successive generations. As such, every ecosystem strives to maintain a positive increment in terms of its functional capacity. The core element of sustainability is functional sustainability rather than systemic sustainability. The sustainability of systems can be achieved through an evolutionary succession of the systems that results in the maintenance of the functional capacities of the systems. Systems are always in a dynamic and an irreversible state of evolution while systemic functions are either progressing or regressing, depending on the evolutionary path followed by the system. In conclusion, it can be said that sustainability is the governing principle in any systemic interaction and sustainability is to systems what thermodynamics is to units.

4.4 Sustainable development as a societal process

The 1980s have shown us the disparity of the least developed countries in the world community, discouraging the belief in automatic development (Lemma and Malaska 1989). The expectation of, and demand for, something new has now entered the human spirit.

This results in the need for finding new meanings for the concept of growth as part of the process of human evolution to enable us to see the possibilities of a "slim quality of life," and to set them as valuable goals for human activity. Malaska (1991) argues that the concept of growth has many dimensions and thus we need not give up the use of the concept itself but only unidimensional interpretation of "gaining weight," or its meaning as extensive growth. Hence, attention should be given to the meaning of "intensive growth" and "regenerative growth" as the necessary elements of transformational dynamics of development.

According to Malaska (1991), each new stage of development has within it the seeds of further change. This is a basic idea of the transformational dynamics and it also underlies evolution and feedback. Accordingly, development means self-organizing, changing orders emerging as a result of non-linear, non-equilibrium processes triggered by local fluctuations, and not merely of perennial global equilibria. The onset of non-equilibria can be triggered by comparatively small local fluctuations, either originating within the local subsystem or coming from the outside. Once established, the fluctuations become amplified and spread in the domain of the subsystems. Then they constitute a sizable force capable of modifying macro-behavior. A mechanism for local nucleation and fluctuations is thus vital. Development nucleation can only materialize around some perceived needs so far left unsatisfied. The mode of production (agricultural, industrial, etc.) is merely a manifestation of changing material orders to fit with the desire to satisfy such needs (Malaska 1991). Bifurcation is introduced into social processes because of the inability of the faculty of the dominant social and economic orders to facilitate new emerging needs and values, thus creating the evolutionary dynamic, propelling humanity from the past toward the future.

One of the most significant evolutionary innovations of humans was the extra-somatic storage and processing of information. The first step in this direction, of course, was the invention of pictographs and written language, and the creation of books and libraries. This was followed only in the very recent past–historically speaking–by the introduction of technological devices to enhance the human sense, and to enhance the human brain. It is interesting to note that the economic system is effectively defined by the scope of its internal communication system: the price system. Market prices are the signals by which the market regulates itself. Ayres (1994,xvii) states that, "the economic system lacks a well-developed mechanism for sensing the condition of the environment in which it is embedded. This is a fundamental weakness that also threatens the long-run survival of human civilization, unless it can be rectified by the creation of new "sensory organs" via conscious socio-political processes."

According to evolutionary thinking, biological evolution is a process of accumulating "useful" genetic information. The best measure of evolutionary progress is the ability to store and process information in the brain and/or central nervous system. Similarly, social evolution is a process of accumulating "useful" cultural information that is used for social purposes, passed on via social processes, and stored in artifacts (for example, books) as well as in people's memories. In both cases the term useful must be understood as that which assists survival and growth. As stated by Ayres (1994,xv), "the direction of evolution is characterized by an increasing ability of organisms and systems to sense the state of the environment, to assess its risks and opportunities, to learn and remember appropriate responses, and to transmit this useful information to other individuals in the community and to succeeding generations."

Based on the above discussion, sustainability can be adopted as follows for social systems:

- The continuous transformation of survival-relevant (SR) information in the form of cultural transformation is the basis for social evolution.
- The pace and path of societal evolution is a function of the ability of sensing, processing, and accumulating SR information of the society.
- Ecological factors constitute the major, but not the only, part of the SR information that led to the agricultural and industrial transformations.
- The distinguishability information (D information) that was discussed in an earlier section constitutes the Entity Factors of a social system while the survival-relevant information (SR information) constitutes the Significance Factors.

The principal factors of the Entity (Distinguishability) factors of societal systems are ecological space, demography and culture. These factors define what a given social system is, its process of becoming and the nature of its evolutionary path. The ecological space defines the possibility space for societal evolutionary process. In terms of a society, this is given by the source and sink function of the natural environment. The source function includes the services provided by the natural environment as a source of material and energy inputs for societal activities while the sink function covers services provided by the natural environment as a recipient of emissions and discharges of socio-economic activities. Demography stands for the overall distribution of population and the nature of human settlements in a given ecological space. Culture constitutes the accumulated survival-relevant information of a given society through evolutionary succession. As such, culture can be considered as the DNA equivalent of societal systems.

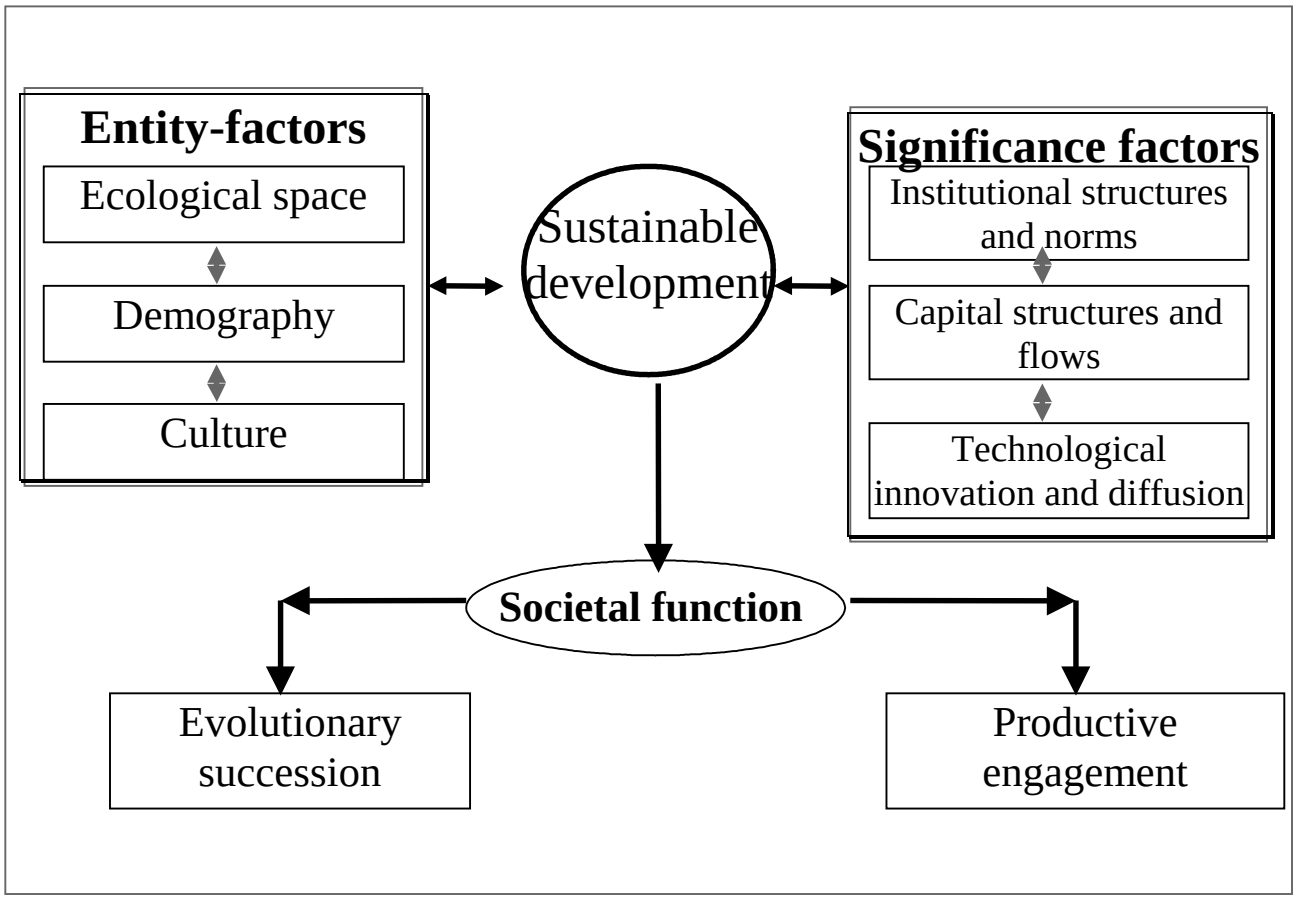


Figure 7: The sustainable development model

The Significance factors of a societal system are the factors that provide the field of significance for a given societal system to fulfill a given societal function. These factors determine the nature of information flow in different forms. The principal significance factors for a societal system are institutional structures and norms, capital structures and flows, and technological innovations and diffusions. The institutional structures and norms of a given social system provide the basis for the field of significance. But it also includes the hierarchical influence that is defined by the hierarchical requirements imposed by the different levels of the hierarchy within the social cosmos (Figure 5). The capital structures and flows, as determined by the kind(s) of the dominant property right regimes, is another significance factor that determines the nature of the field of significance. The technological innovation and diffusion factor, which has a direct linkage with the cultural aspect of the entity factor, is another factor that determines the nature of the field of significance for a given society.

The interaction between the Entity factors and the Significance factors of a given social system constitute the bases for fulfilling societal functions. While there are numerous attributes and functions that could be listed under societal functions, all of these functions can be broadly categorized under the function of evolutionary succession and productive engagement. As part of the broader universe that is driven by evolutionary succession, achieving evolutionary succession becomes the inherent cardinal function of any societal system. On the other hand, as a distinct entity from the natural universe, productive engagement becomes the other cardinal function of any societal system. The principal functions of evolutionary succession and productive engagement will take different forms of expressions and attributes depending on the nature of the entity factors and the nature of interactions between the entity and significance factors.

The productive engagement function of a given society is based on two fundamental processes. The first process is the process of preparing a given member of the society for the function of productive engagement. While this process takes different forms, the essence of the process is based on the transfer of the accumulated survival-relevant information and the building up of capacity to identify, process, accumulate and transfer survival-useful information to the next generation. Depending on the nature of the society, there are a number of parameters that determine the path of this process. Traditional and indigenous societies conduct this process mainly through “word of mouth”, while education and research is the major instrument for modern societies to conduct this process. The second fundamental process of the productive engagement process is the actual engagement of a social entity in socially useful and productive activities.

This is very much dependent on the socio-economic structure of the specific society which constitutes the basis for the division of labor/responsibility within the society. In most traditional and indigenous societies, every member of the society is responsible for some kind of responsibility. Gender and age hierarchy are the key elements that largely determine the nature of the division of labor in traditional/indigenous societies. On the other hand, education and specialized skill are the critical elements that determine the nature of the division of labor in modern societies and societies in transition. In either of the cases, it can be said that the ability to process and transform survival-useful information is the core element in determining the nature of the division of labor in a given society. The fundamental prerequisite for fulfilling the productive engagement function of a society is to avoid a mismatch between the process of preparing for productive engagement and the structure of productive engagement.

Similarly, the evolutionary succession function is composed of two fundamental processes. The first process refers to the process of evolutionary succession as a species. This involves maintaining the required socio-ecological balance between societal activities and the natural ecosystem that provides the basis for any socio-economic activities. The sustainability indictor principles that are applied by the Natural Step program covers this aspect of the evolutionary succession. The explicit principles are (Azar et al., 1996:): i) substances extracted from the lithosphere must not systematically accumulate in the ecosphere; ii) society-produced substances must not systematically accumulate in the ecosphere; iii) the physical conditions for production and diversity within the ecosphere must not become systematically deteriorated; iv) the use of resources must be efficient and just with respect to meeting human needs. The second process refers to the process of evolutionary succession as a society. This involves maintaining the required socio-economic balance within the global hierarchy. Thus, the fulfillment of both the socio-ecological and socio-economic requirements is essential for achieving the function of evolutionary succession for any society. Moreover, the continuous interaction between the functions of evolutionary succession and productive engagement determines the path of development of a given society.

The optimality of the interaction within and/or between the entity (extensive) factor and the significance (intensive) factor is defined by the effectiveness of the feedback and corrective mechanisms. An increasing weakness in the feedback and corrective mechanism indicates an increasing mismatch between and/or within the extensive and intensive factors. On the basis of the preceding discussion:

> *Sustainable development can be defined as a societal process of maintaining an optimum interaction between the entity and significance factors of a given society with an objective of providing productive engagement for its members and maintaining the necessary socio-ecological and socio-economic conditions for achieving evolutionary succession of the society.*

In parallel with the three systems scenarios of sustainability discussed earlier and the conceptual basis of sustainable development presented under this section, one can identify the following three prevailing global scenarios.

- *Scenario one*

The increasing mismatch between the intensive factors has become more evident between the rate of technological innovation and diffusion and the corresponding changes in institutional structures and norms. More specifically, the advance that has been made in information technology in recent years is causing a major shake-up in the domain of institutional structures and norms at the global level. The on-going controversy on the corporate desire to patent 'genetically modified organisms' can be cited as a case of mismatch between all three elements of the significance factor. This issue has a strong North-South elements with respect to the relationship between indigenous and modern knowledge. The technology transfer and diffusion process in the South is also influenced by the gap between technological innovation and diffusion factors and institutional structures and norms. In this context, reorienting the technological innovation and diffusion processes with the necessary changes in institutional structures and norms is one of the key steps for promoting sustainable development at the societal level.

- *Scenario two*

The liberalization trend that is mainly driven by the goal of maximization of profit as its principal goal, is intensifying the mismatch between the intensive and extensive factors of societies at different levels. This is manifesting itself in a wide range of crises including increasing unemployment due to corporate down-sizing and shrinking national economies due to international debt burden. The creation of global alliances through strategic integration is costing thousands of jobs, especially in the industrialized countries. The increasing power of the World Trade Organization in the name of trade liberalization is affecting the lives of millions throughout the world, and more significantly, farmers in the developing world[7]. These aspects are very critical, especially for the situation in developing countries.

[7] Recently, WTO ruled against the market preference given to small-scale banana producers from developing countries exporting their product to the EU, in favor of multinational companies based in US.

In this context, there is a strong need to overcome some of the major global constraints that are currently in place, in terms of international trade, in order to make progress towards global sustainability.

- *Scenario three*

There is strong evidence that indicates that we are moving towards having a mismatch between the extensive factors of our society. The mismatch between ecological space and demography has already started to become a global threat manifesting itself in population growth, global warming, and desertification, to mention some of the problems. Furthermore, the mismatch within the intensive factors is being further aggravated by the mismatch between the intensive and extensive factors and within the extensive factors. Thus, the sustainable development agenda should address all three levels of mismatch, both within the global and local contexts.

While the promotion of sustainable development may take different forms depending on the kind of the social system, the fulfillment of the following conditions is a fundamental requirement for achieving sustainable development by any society.

- **reducing** the mismatch between the major factors of significance by avoiding any significant feedback lag within the social system
- **resolving** the mismatch between the entity and significance factors of the system
- **avoiding** any mismatch within the entity (extensive) factors of the social system

In conclusion, the following can be said by way of responding to the questions posed at the beginning of this chapter.

- Understanding the concept of distinguishability information (D information) and survival-relevant information (SR information) provides the basis to understand the relationship between units and systems.
- The interaction between the D information and the SR information defines the functional capacity of the system while the transformation of the SR information to D information, through evolutionary and innovation process, determines the sustainability of the system.
- The D information constitutes the 'Entity factors' of a social system while the SR information constitutes the 'Significance factors'. The principal Entity factors of a social system are ecological space, demography and culture while the principal Significance factors are institutional structures and norms, capital structures and flows, technological innovation and diffusion.
- Avoiding a significant mismatch within and between the Entity factors and the Significance factors through an adaptive feedback mechanism is a fundamental prerequisite for achieving sustainability.

In general, it is important to note that humans have no single instinctively prescribed mode of life, but a range of variable 'material cultures'. The socio-ecological consequences and conditions of human/environmental interactions are a function of each specific mode of social life as defined by the interaction between the Entity and Significance factors. Thus, as stated by Redclift and Woodgate (1994), it is entirely feasible that there may be numerous possible, but qualitatively distinct, directions for future sustainable development. Each will have to observe the boundary conditions that are defined by the entity factors; but there is no necessity that any will require a return to rustic simplicity, material deprivation or narrow-minded localism.

Finally, the history of science shows that new ways of scientific thinking are related to the development of new paradigms. The discussion presented in the preceding chapters introduces a new version of scientific thinking in the sustainability debate by using the general systems, general evolutionary, and information theories as the bases. As a new paradigm, it should not be expected to give an explanation for all possible questions. As pointed out by Thomas S. Khun (1962), ‘ to be accepted as a paradigm, a theory must seem better than its competitors, but it need not and in fact never does, explain all the facts with which it can be confronted’. The conceptual framework presented in this chapter provides a better alternative than existing definitions of sustainable development and it is used as the basis for developing the sustainable industrial development strategies for sub-Saharan Africa, presented in subsequent sections of the thesis.

CHAPTER

FIVE

5. Evolving tools for sustainable industrial development (SID)

Since the middle of the twentieth century, there have been numerous efforts to address the environmental impact of industries. Initially, most of the effort was limited to the reduction and/or containment of the adverse impact of industrial activities on human health. Starting from the mid-1970s, the focus shifted to the broader objective of reconciling industrial activities with the ecological balance of natural systems. This required a fundamental rethinking of industrial structures and operations. The rethinking process led to the evolution of a number of concepts and tools related to sustainable industrial development. While most of these concepts are still at early stages of evolution, some have started to gain a higher ground of application at policy and industrial operation levels.

While the concepts and tools that are beginning to be used as the basis for developing national and international policies and strategies are well developed, little has been done with regards to developing a framework for their combined application and utilization. This chapter identifies the major evolving concepts in the field of promoting sustainable industrial development and analyses how these evolving concepts influence the industrialization process in sub-Saharan Africa. In the context of this research and the possible relevance of the concepts to Africa's industrialization effort, the concepts are organized in the following three categories: Macro system concepts, Sectoral system concepts and Industrial system concepts.

5.1 Macro systems concept

These categories of concepts are concepts and tools aimed at reorienting socio-economic systems at the macro level by incorporating ecological factors in the policy- and decision-making process. Two of the most important concepts that are aimed at macro policy environments are the concept of economic tax reform and the concept of proactive environmental policy regimes.

5.1.1 Economic tax reform

Environmentalists have long advocated a switch of taxes from economic 'goods', such as employment, enterprise and savings, to environmental 'bads', such as pollution and the inefficient use of energy and resources. But the possibility of achieving multiple gains from such an 'Economic Tax Reform' (ETR) is of more recent origin (Gee 1997). The following working definition has been produced as part of a European-wide program of raising awareness on ETR. Economic tax reform involves shifting a large proportion of taxation from the value-adding activities of people (employment and savings) to the value-subtracting use of energy and resources and associated creation of wastes and pollution.

An ETR package would include complementary measures such as removal of subsidies on unsustainable activities, regulations to promote energy efficiency, investment incentives to encourage eco-efficiency, adjustment measures for energy intensive sectors, and information campaigns. It would be based on revenue recycling and budget neutrality, resulting in the wiser use of nature and the wider use of people. Key features of this definition are its comprehensive nature; the complementary measures, such as subsidy removal, investment incentives and regulation; the need for gradual change over long time periods; extensive consultation; and revenue recycling.

According to Gee (1997), there are several reasons why ETR is beginning to attract the attention of politicians and the public: First, the combination of ballooning budget deficits, tax revolts and declining conventional tax bases is further concentrating the minds of politicians and policy-makers on tax reform. Secondly, the distortionary effects of current taxes are receiving greater attention. There is a broad agreement about the distortions caused by subsidizing economic activities that cause environmental losses, such as subsidies on coal or agriculture, or taxes that encourage unsustainable behavior, such as company car use. Thirdly, the failure of market prices to capture the full costs of production, use and disposal was noted over 70 years ago by the economist Pigou. However, little has been done in practice to implement Pigou's recommendation for 'extraordinary constraints', in the form of taxes (Gee 1997).

There are many examples of individual environmental taxes, and these have been extensively reviewed. It is clear, from these reviews, that well-designed and presented environmental taxes and charges, particularly if they are supplemented with complementary regulations and support for innovation, can be very successful at achieving cost-effective environmental gains. The lessons and success factors that emerge from these reviews of specific environmental taxes are (Gee 1997):

- They can be very effective at both changing behavior and generating revenue, particularly if they involve predictable increases over several years.
- Reform packages with complementary elements are much more successful than isolated taxes.
- New markets and innovations can be stimulated by appropriate price signals and incentives.
- For particular pollutants, the combination of charges and subsidies can be cost-effective and politically acceptable to industry.
- Institutional cultures and policy styles will strongly affect the design and political fate of tax reforms.
- Achieving political and public support by informed discussion and consultation seems essential for reforms which tax goods that have been perceived as 'free' or 'cheap'.
- Policy creation through decentralized experimentation can lead to better results.

5.1.2 Proactive policy regimes

The second category of Macro-systems concepts covers the concepts and tools that are aimed at transforming the environmental policy regimes in tandem with transformation in macro-economic and technological regimes. The major trend of environmental policy regimes with respect to sustainable development is the shift from 'coercive regulation' to proactive 'co-regulation'. Most of the evolving concepts and tools on environmental policy regimes are based on fostering:

- industrial shift from reactive to proactive environmental management;
- partnership between industries and regulatory bodies;
- voluntary initiatives by industry, government or joint government-industry;
- transparency and stakeholders' participation in environmental management.

The key element of the evolving proactive policy regime at the national and international level is the promotion of Precautionary Principle (PP). The PP is a culturally framed concept that takes its cue from changing social conceptions about the appropriate roles of science, economics, ethics, politics and the law in proactive environmental protection and management (O'Riordian and Campbell 1994). The adoption of the precautionary principle in a range of environmental policy arenas reflects growing attention to the identification and management of scientific uncertainty (Hunt 1994).

Implicit in most interpretations of the PP is the recognition that scientific knowledge cannot adequately predict the potential environmental consequences of human activities.

Scientific uncertainty and its management is now a major consideration for environmental policy. In the conventional classification, risk and uncertainty are perceived as amenable to resolution by the production of 'more science' to fill the gaps. Risk, uncertainty, and ignorance can be conceived as a linear scale from more to less knowledge. However, Wynne (1992) argues that indeterminacy, particularly that of a social kind is implicated in risk, uncertainty, and ignorance, and is a feature of all forms of scientific and technical knowledge. Wynne (1992) has characterized uncertainty in four ways: as risk, uncertainty, ignorance, and indeterminacy. Risk is considered as knowing the boundaries of the system under consideration and being able to quantify the factors involved. Uncertainty represents knowledge of the parameters of a system, but not of the quantitative significance of the factors involved, that is, uncertainty is constrained within a framework of understanding. Ignorance is that which is not known; however, in order for ignorance to be identifiable, new knowledge must be discoverable. Indeterminacy is a more complex concept, involving recognition of the essentially open-ended and conditional nature of all knowledge and its embeddedness in social contexts.

Throughout the late 1970s and early 1980s the notions of care and wise practice have been extended to the following six basic concepts now enshrined in the Precautionary Principle (O'Riordian and Campbell 1994):

- Preventative anticipation: a willingness to take action in advance of scientific proof of the need for the proposed action on the grounds that further delay will prove ultimately most costly to society and nature, and, in the long term, selfish and unfair to future generations.
- Safeguarding of ecological space or environmental room for maneuver based on the recognition that margins of tolerance should not even be approached, let alone breached.
- Proportionality of response or cost-effectiveness of margins of error to show that the selected degree of restraint is not unduly costly.
- Duty of care, or onus of proof on those who propose change: this raises profound questions over the degree of freedom to take calculated risks thereby to innovate, and to compensate for possible losses by building in ameliorative measures.

- Promoting the cause of intrinsic natural rights: the legal notion of ecological harm is being widened to include the need to allow natural processes to function in such a manner as to maintain the essential support for all life on earth.
- Paying for past ecological debt: precaution is essentially forward looking but there are those who recognize that in the application of care, burden sharing, ecologically buffered cost effectiveness and shifting the burden of proof, there ought to be a penalty for not being cautious or caring in the past.

Precautionary measures may not remain precautionary. Advances in scientific capability, for instance, can resolve the uncertainties that a specific precautionary measure was designed to address; in such case, the measure is translated into a purely preventive strategy as the epistemological context of regulation is altered. The Precautionary Principle has evolved into a general principle of environmental protection at the international level. Two conventions, containing many developing countries signatories and ratification, numerous references in Agenda 21, and principle 15 of the Rio declaration have elevated the principle onto a truly international plane. According to Cameroon (1992), UNCED was the crystallizing moment in the development of the principle from one that was emerging to one that is legally binding.

5.2 Sectoral systems concept

The category of Sectoral systems concepts covers concepts and tools that are aimed at industrial restructuring at the sector level by focusing on the possible beneficial linkages between the different actors in the sector. The foci of 'Sectoral concepts and tools' are operational linkages between different entities of an industry sector. Two of the major sectoral concepts that are of particular relevance to the developing world are the concept of eco-industrial development (or eco-restructuring) and the concept of extended producer responsibilities.

5.2.1 Eco-industrial development (Eco-restructuring)

According to Ayres (1994), the industrial system as it exists today is *ipso facto* unsustainable. On the basis of material cycle analysis, it would appear that industrial society has drastically disturbed, and still is disturbing, the natural system (Simonis 1994). Ayres (1994) further proposes two main criteria or measures of an approach towards sustainability: recycling ratio and materials productivity. In the form of policy suggestions, this means reducing the dissipative losses by near-total recycling of intrinsically toxic or hazardous materials, and/or increasing economic output per unit of material input.

In the last few decades, industrial experts have been seeking solutions to the problem of how to modify or restructure the existing patterns of energy and material use, to switch from 'high volume production to high value production' (Simonis 1994). This reorientation reflects new and potentially strong environmental priorities. The hope of the reconciliation between economy and ecology and the envisaged "industrial metabolism" relies on the premise that a reduction in the energy and material input of production will lead to a reduction in the amount of emissions and waste.

This will help to facilitate the potential for recycling and promote the option of intentionally closing cycles in industrial society. According to Simonis (1994), environmentally benign effects of structural change are to be expected by actively de-linking economic growth from the consumption of ecologically significant resources, like energy and materials. Such de-linking, achievable in particular by decreasing the input coefficients of these resources (dematerialization, re-use, recycling) or by increasing their effectiveness (energy and materials productivity) through better use. This (Simonis 1994,36):

- would result in a decrease in resource consumption and probably also in production costs, at least in the long term;
- would mean ex ante environmental protection, which is cheaper and more efficient than ex post installation of pollution abatement equipment (end-of-pipe technology);
- would be environmentally more effective, since end-of-pipe technologies normally treat only single outstanding pollutants whereas integrated technologies touch upon several environmental effects simultaneously; and
- would open up a broad range of options for technological innovation or be the result of such innovation.

The industrialization process involves different kinds of network relationships that are defined by the input-output relationships. Such a relationship leads to the formation of clusters of industries that could be used as a basis for the introduction of Eco-Industrial Programs. Porter (1998) described clusters as geographic concentrations of interconnected companies and institutions in a particular field. Clusters encompass an array of linked industries and other entities important to competition. They include, for example, suppliers of specialized inputs such as components, machinery, and services and providers of specialized infrastructure. Clusters also often extend downstream to channels and customers and laterally to manufacturers of complementary products and to companies in industries related by skills, technologies or common inputs.

Finally, many clusters include governmental and other institutions that provide specialized training, education, information, research, and technical support. While most clusters are an outcome of casual input-output relationships, some are an outcome of regional and national planning. The industrial clusters developed through macro planning are called industrial estates. According to UNEP estimates, there are about 16,000 industrial estates spread throughout the world (UNEP, 1996).

The concept of cascading as a tool for resource conservation is promoted as a way for repeatedly utilizing the quality of resource on its path to equilibrium. The theory of resource cascading builds upon the following four principles (Sirkin and ten Houten 1993). The first is 'appropriate fit', which means that the quality of a resource should be in harmony with the scope and difficulty of the required task. The second is 'augmentation' which relates resource quality to utilization time. The third is 'consecutive re-linking which deals with the salvaging and recirculation of substances. The fourth principle is the issue of 'balancing resource metabolism', which calls for a balance between the volume and flow rate of resources entering and circulating within the system and the amount of resource regeneration effectuated by it.

The conceptualization of Eco-Industrial Development (EID) is based on relating the 'Ecosystems' concept with industrial clusters and the resource cascading theory. Fundamentally, Ecosystems are, more or less, self-sustaining communities of organisms interacting with one another and with the environment within a defined area. Ecosystem structure is a function of both the abiotic environment and the biotic community (Cornell University 1995). According to Ecosystems thinking, ecosystems are composed of communities that are definable and interdependent assemblages of populations of different species. These populations tend to be structured in chains and webs from producers, primary consumers, secondary consumers, tertiary consumers, and scavengers to decomposers. Feedback loops are an integral part of ecosystems attempting to maintain balance between inputs and outputs. These loops may be positive or negative, linking the biotic and abiotic aspects, or populations and species (Coté et al. 1994).

Taking the Ecosystems concept as a basis, an Eco-Industrial Development can be defined as a community of local administration, manufacturing and service businesses seeking enhanced socio-economic and socio-ecological performance through collaboration in managing environmental and resource issues including energy, water, and materials. By working together, the community of businesses seeks a collective benefit that is greater than the sum of the individual benefits each company would realize if it optimized its individual performance only.

The goal of an EID is to improve socio-economic performance of the participating companies while minimizing their socio-ecological impact. Eco-Industrial programs could be developed at different levels of municipality, region, and national. Besides the desirable socio-ecological and socio-economic perspectives, an Eco-Industrial development program seeks to demonstrate the proposition that business and environmental success can be linked and be mutually supportive in ways that enhance the surrounding communities and the natural environment.

The implementation of an EID program is based on the fulfillment of the following conditions:

> *Resource stewardship:* a fundamental step in the development of an environmentally progressive industrial system is continuous improvement in the use of resources. This improvement includes the reduction of waste through waste reduction at the source, waste exchanges or the improvement of waste disposal methods through recycling. In all industries, waste represents an expense that companies have incurred. To minimize waste is to minimize an expense. Improvement of the infrastructure around the cluster both physically and through the sharing of information will link the companies in a more effective manner. EID might focus on working with niche industries that have been created through cooperation between companies or it might concentrate on selling common waste products. In either of the cases the net expense would be reduced while the ecological efficiency of the region will be improved.
> *Service sharing:* industrial activities require different kinds of service inputs. EID can be instrumental in meeting the service requirement of industries on a more cost-effective and environmentally sound basis. For instance, transportation diversity and efficiency could be an essential feature of a successful EID. Expanded multi-modal transport capabilities that builds upon existing routes, systems, and infrastructure will not only improve employer and employee access, but also reduce the overall environmental impact and cost of transportation. The best of the new transportation technologies being implemented around the world focus on improving the linkages that define an industrial hub. These linkages integrate least impact/high efficient methods, as measured by the path resources invested to travel to and from as well as within surrounding locations (Cornell University and USFM 1997).

Training and education: expanding education and training opportunities to benefit both EID employers and employees is an essential element to the EID concept. These opportunities will provide participants with the fundamental skills required to achieve entry level as well as advanced placement within a variety of existing and emerging occupations. The match between the type of training provided and a firm's business requirements could be significantly improved through an integrated learning experience with concentrated focus on the acquisition of basic skills and competencies. The education and training techniques should be based on ensuring that employees remain adaptable to future changes and requirements. It requires partnerships at all levels of education and assurance of strong vocational linkages to local schools (Indigo Development 1996).

Business-community partnership: an EID fosters strong partnership between business and community. Companies, developers, agencies, and citizens will need to work together closely to capture the benefits of the program. An EID will be more likely to succeed if it is part of broader community initiatives such as (Cornell University 1997):

- development of a highly effective industrial resource exchange providing markets for materials now discarded as waste;
- creation of a community strategic plan for reducing the total waste stream (residential, commercial, public, and industrial);
- strengthening economic development planning to encourage businesses that turn wasted resources into products and jobs; and
- mobilizing educational resources to support the community's business and government operations to increase energy efficiency and prevent pollution.

Such initiatives will build a strong context for an Eco-industrial Program and facilitate its evolution leading to a number of community benefits including a cleaner environment, an efficient economy, new jobs, and a reputation as a good site for starting a new business.

Regulatory shift: the need for shifting from strictly regulatory policing to a co-regulatory approach has increasingly become important in the last few years. EID can be a useful platform to develop partnerships between businesses and regulatory agencies. Such partnerships reduce the burden on regulatory agencies, through increasing the technical capability of those responding and reducing the time to process regulatory responses and permits. It can be a one-stop shop for permits across agencies and environmental media.

> It could include a more comprehensive but streamlined community input process that looks more to ecosystem health than piecemeal responses. The net effect of such shifts would be to focus energy on resolving environmental problems and setting new standards of performance rather than on paperwork and duplicatory compliance activities. It would help companies of all sizes move beyond compliance to environmental excellence.

These and other broad opportunities related to EID lead to a number of socio-economic and socio-ecological benefits. Socio-economic benefits from EID implementation are direct and indirect, broad based and project specific. These benefits can also be segmented according to who gets the benefits, individual companies or communities. The following are the main socio-economic benefits of EID that can be gained by the respective segments and the major ecological benefits.

Company economic benefits

- ◊ Wide range of potential cost-savings
- ◊ Revenue generation from recycling/reuse (sales) of by-product and waste
- ◊ Promotional/marketing opportunities
- ◊ Improved opportunities for new investments
- ◊ Costs saving from regulatory flexibility

Community economic benefits

- ◊ Increased local employment and tax revenues
- ◊ Image improvements for development
- ◊ Promotion of innovation and diffusion
- ◊ Reduced infrastructure development costs

Ecological benefits

- ◊ Improved resource utilization
- ◊ Reduced ecological pressures

The introduction of a system of continuous improvement both at the firm level and at the industrial ecosystem level is a fundamental prerequisite for the progress towards a more sustainable society. This provides the foundation for fulfilling emerging socio-economic and socio-ecological conditions on a continuous basis. Eco-Industrial Development as a strategic framework is a useful concept that can be instrumental in facilitating total factor improvement at all levels of industries.

The specific application of the concept might take different forms and depth depending on the scope of the region, the nature of industrial activity in the region, and the desirable objectives to be achieved. In some cases, a single resource or branch-activity focused approach might be more fruitful. But in most cases, a comprehensive and integrated approach is essential in order to bring about a long-term and sustainable impact in any region.

5.2.2 Extended producers responsibility (EPR)

Extended Producers Responsibility (EPR) is an emerging principle for a new generation of pollution prevention policies that focus on product systems instead of production facilities. The aim of EPR is to encourage producers to prevent pollution and reduce resource and energy use at each stage of the product life cycle through changes in product design and process technology. In its widest sense, EPR is a principle in which producers bear a degree of responsibility for all the environmental impacts of their products.

The expressions of the need for getting the manufacturer and product developer involved in finding solutions to the waste and recycling problems are found in policy documents dating back to the mid 1970s and the 1980s (Lindhqvist 1997). However, no policy measures were formulated and implemented during this time. Instead the problems were viewed as waste management issues that should be solved by the authorities at local, and, to some extent, central levels. In the 1980s, a limited number of products were discussed in the public debate, notably the use of one-way beverage packaging such as aluminum cans and PET-bottles instead of refillable glass bottles. The political dimensions of this debate forced, otherwise reluctant governments to take action. Special legislation and voluntary agreements were introduced in several countries.

The rationale for the Extended Producer Responsibility was introduced in Sweden in 1988 through a report to the Swedish Environmental Protection Agency (Lidhqvist and Lindgren 1990). But it was in a report to the Ministry of the Environment in 1990, that the concept was formally introduced. According to this report (Lindhqvist 1997):

> *"Extended Producer Responsibility is an environmental protection strategy to reach an environmental objective of a decreased total environmental impact from a product, by making the manufacturer of the product responsible for the entire life-cycle of the product and especially for the take-back, recycling and final disposal of the product. The Extended Producer Responsibility is implemented through administrative, economic and informative instruments. The composition of these instruments determines the precise form of the Extended Producer Responsibility."*

The producers' responsibilities include:

- physical responsibility: where the producer is involved in the physical management of the products, used products, or the impacts of the products through development of technology or provision of services;
- economic responsibility: where a producer covers all or part of the costs for managing wastes at the end of a product's life;
- liability: where responsibility for environmental damages caused by a product in production, use or disposal is born by a producer; and
- informative liability: where the producer is required to provide information on the product and its effects during various stages of its life cycle.

In the later report (Lindhqvist 1992), a model for characterizing different schemes of implementing Extended Producer Responsibility were further developed from the 1990 report. The model, illustrated in Figure 8, distinguishes different forms of responsibility.

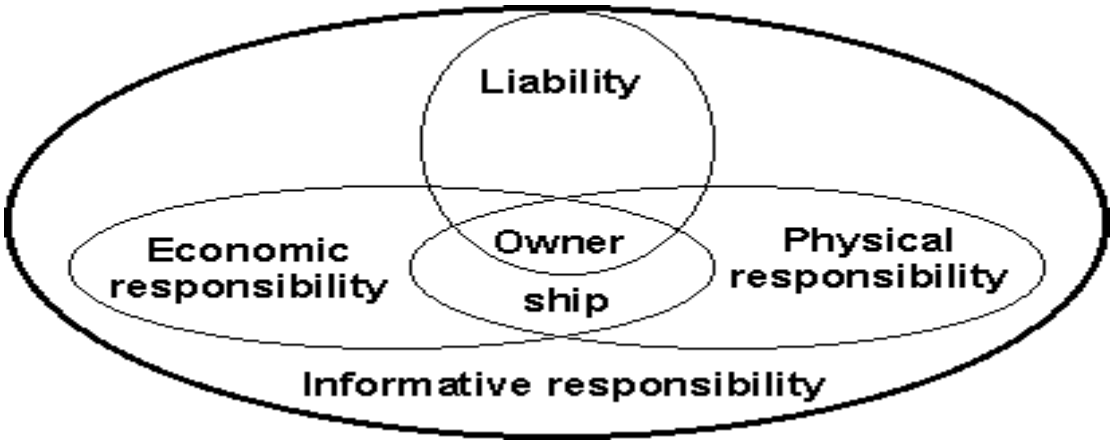


Figure 8: Model for Extended Producer Responsibility

(Source: Lindhqvist, T. and Lidgren, K. 1990. Models for Extended Producer Responsibility. Stockholm: Ministry of Environment)

According to Lindhqvist (1997), the above classification has proven to help to make the discussions concerning Extended Producer Responsibility more focused in Sweden. It has illustrated the need for specifying the responsibility in terms of both who is responsible for what.

In the longer term, the goals of EPR are to promote the development of sustainable production-consumption systems through more efficient resource use and a drop in the consumption of resources. Most of the EPR objectives can be factored into the product design that is the most crucial step in determining the nature and quantity of resource use and pollution emissions throughout the product's life cycles.

5.3 Industrial systems concepts

The publication of Rachel Carson's, "Silent Spring" a book on the global problems of pesticides published in 1962, heralded the arrival of the contemporary environmental era that was characterized by a flurry of environmental activities in the developed world. As a result, the improvement of the environmental performance of industries at the plant level had been the primary focus of environmental management experts. The process that started as an end-of-pipe management exercise has subsequently led to looking back at the whole process of production. This has led to the evolution of numerous concepts that are aimed at improving operational performance at various levels. Three major aspects of industrial operations have emerged as the principal foci of the environmental performance improvement at the plant level. These are the organization, product and processes.

5.3.1 Environmental management systems (EMS)

The increased recognition of the concept of sustainable development as the dominant worldview with respect to development has led to the re-thinking of conventional management practices in all spheres of development activities. This, in turn, resulted in the evolution of a number of organizational concepts that are considered to be essential elements for the realization of sustainable development objectives. The concept of environmental management systems is one of these organizational concepts that emerged as a result of the re-thinking of corporate management practices with respect to the rising global environmental challenges.

An environmental management system is the system by which a company controls the activities, products and processes that cause, or could cause, environmental impacts and in doing so minimizes the environmental impacts of its operation. The EMS approach is based on the management of 'cause and effect', where a company's activities, products and processes are the causes or 'aspects' and their resulting effects, or potential effects, on the environment are impacts (Roberts and Robinson, 1998). Consequently, environmental management is essentially the tool that enables the control of aspects and thus minimizes and/or eliminates impacts.

The development of new organizational tools such as the concept of environmental management systems has given governments the opportunity to stipulate new regulatory and enforcement measures. These emerging governmental measures represent a new generation of environmental regulations with a very strong proactive orientation as opposed to the reactive nature of the conventional environmental regulation measures. The first national initiative in this context was the British Standard for Environmental Management Systems, BS7750, that was followed by the standards of other countries in Europe and Northern America. The growing interest in environmental management systems at the national level has given rise to the interest in standardizing environmental management systems at the regional and international level.

The regional initiative led to the development of the European Eco-Management and Audit Scheme (EMAS), while the international initiative led to the ISO14000 series developed by the International Organization for Standardization (ISO). Environmental management systems can be formal and standardized, such as ISO14001 and EMAS, or they can be informal, such as an internal waste minimization program or the unwritten means and methods by which an organization manages its interactions with the environment.

ISO14001 specifies the requirements of such an environmental management system. It has been written to be applicable to all types and sizes of organizations and to accommodate diverse geographical, cultural and social conditions. The system is based on continuous cycle of improvement. A system of this kind enables an organization to establish, and assess the effectiveness of procedures, to set an environmental policy and objectives, achieve conformance with them, and demonstrate such conformance to others. The overall aim of the standard is to support environmental protection and prevention of pollution in balance with socio-economic needs. It has the following requirements that may be addressed concurrently or revisited at any time:

- Establish an environmental policy appropriate to itself.
- Identify the environmental aspects arising from the organization's past, existing or planned activities, products or services, to determine the environmental impacts of significance.
- Identify the relevant legislative and regulatory requirements.
- Identify priorities and set appropriate environmental objectives and targets.
- Establish a structure and (a) program(s) to implement the policy and achieve objectives and targets.

- Facilitate planning, control, monitoring, corrective action, auditing and review activities to ensure both that the policy is complied with and that the environmental management system remains appropriate.
- Be capable of adapting to changing circumstances.

There is an important distinction between this specification which describes the requirements for certification/registration and/or self-declaration of an organization's environmental management system and a non-certifiable guideline intended to provide generic assistance to an organization for implementing or improving an environmental management system. Environmental management encompasses a full range of issues including those with strategic and competitive implications. Demonstrations of successful implementation of the standard can be used by an organization to assure interested parties that an appropriate environmental management system is in place.

It should be noted that this standard does not establish absolute requirements for environmental performance beyond commitment in the policy, to compliance with applicable legislation and regulations and to continual improvement. The adoption and implementation of a range of environmental management techniques in a systematic manner can contribute to optimal outcomes for all interested parties. ISO 14000 shares common management system principles with the ISO 9000 series of quality system standards. Organizations may elect to use an existing management system consistent with the ISO 9000 series as a basis for its environmental management system. It should be understood, however, that the application of various elements of the management system may differ due to different purposes and different interested parties. While quality management systems deal with customer needs, environmental management systems address the needs of a broad range of interested parties and the evolving needs of society for environmental protection.

The advantage of improved environmental management can be divided into two broad categories (Roberts and Robinson 1998). The first category addresses the fact that improved environmental management is good for our planet and a fundamental requirement of global sustainability. The second category addresses the fact that improved environmental management could be seen as a future requirement of sustainable commerce. Poor environmental practices lead to higher manufacturing and non-manufacturing costs, higher quantities of spoils and waste, increased cost of waste treatment and disposal, environmental fines, and higher insurance premiums.

Some of the benefits that can be expected from improved environmental performance are (Roberts and Robinson 1998): cost savings, increased efficiency, increased market opportunities, increased ability to comply with environmental legislation and regulations, customer satisfaction, improved relation with stakeholders, and increased motivation, loyalty, and commitment from and communication with employees.

Environmental management has been an integral part of most, if not all, indigenous cultures of the world, albeit in its crudest sense. Likewise, quality management has been around since the Egyptians built the pyramids. Nevertheless, formal and documented management systems for quality started to emerge as an element of industrial operation only after WWII. By 1979 the British Standards Institution (BSI) published the three-part quality series, BS 5750. As the international importance of a standardized approach to quality management grew, the ISO developed ISO 9000 in 1987. Following closely behind the development of BS 5750 was BS 7750, which was published in March 1992 as the first formal, systematic and standardized approach to environmental management. The British standards BS 5750 and BS 7750 have served as the basis for developing the international quality and environmental management standards respectively.

The introduction of an Environmental Management System for a given industry can take one of the following four forms depending on the organizational purpose of the system (Mebratu 1996b):

- *Self-declaration*: self-determination and declaration of conformance with the standards;
- *Second party recognition*: implementing environmental management principles to be verified objectively by another industrial cutomer;
- *Third party certification*: an independent certification supported by an environmental seal of approval;
- *ISO certification*: EMS implementation with full accreditation as per ISO 14001.

Continual improvement, as the core element of the environmental management system, is an outcome of system-oriented management review that covers:

- the determination of the root causes of systemic deficiencies,
- the identification of opportunities for improvement of environmental performance,
- the development of corrective actions targeted on addressing the root causes,

- the verification of the effectiveness of the corrective and preventive measures,
- the documentation of any changes in procedures resulting from process improvements.

The conceptual parallel between total quality management systems and environmental management systems and the structural similarities between ISO 9001 and ISO 14001 could be used as an advantageous factor in preparing companies of any scale for ISO 14000 certification process. Nevertheless, the introduction of an environmental management system in an SME should be based on step-wise scaling in conformity with the operational requirement and the organizational capability of the companies. The requirement for an EMS is being pushed through the supply chain management channels as more and more corporate companies get ISO 14000 certification that requires ensuring the environmental performance of suppliers too. As a result, the number of industries and consumer markets that are requiring some form of an EMS is on the increase. African industries, as suppliers to the global market, need to prepare themselves for these changes in the global market by developing their environmental management capacity.

5.3.2 Product subsystem concepts

From a consumption perspective, the basis for any product system definition is determined by the level of synthesis between two major functions: the need function and the availability function reflected in the production and consumption culture (Mebratu 1996a). The human dimension of need could be divided into physiological needs and psychological needs. The physiological needs include the basic material requirements for the survival of humanity as a species, while the psychological needs refer, in most cases, to the quality of life expressed through varying degrees of satisfaction.

In a similar analogy, Schitovsky (1992) distinguished two broad classes of objects of consumption: on the one hand, those products that are intended to prevent or remedy pain, injuries or distresses, and on the other, those which are intended to supply some positive gratification or satisfaction. He states that they may be conveniently named as defensive products and creative products. Making a clear distinction between the physiological and psychological needs is very difficult since the psychological need would have a significant influence on the physiological need. According to Schitovsky, one product often fulfills purposes of both defensive and creative products.

Food, for example, is needed to guard against hunger, weakness, and ultimately death by starvation, but at the same time different kinds of food are designed to give the consumer positive satisfaction. This duality, however, does not invalidate the distinction.

Although the physiological needs of human beings, as a species, are to a large extent similar, the psychological needs could exhibit a higher variation depending on the specific socio-economic and cultural situation under consideration. Furthermore, it is not easy to draw the line between products that prevent pain and those that promote physical pleasure. Because, it is characteristic of any physical need, which causes distress while it is unsatisfied, to cause positive psychological pleasure as soon as it is in the course of being satisfied (Schitovsky 1992). That is what makes the effort of defining "need" a challenging one. What is considered to be a need of necessity for a community in a developed country could be affluence for a community in a developing country.

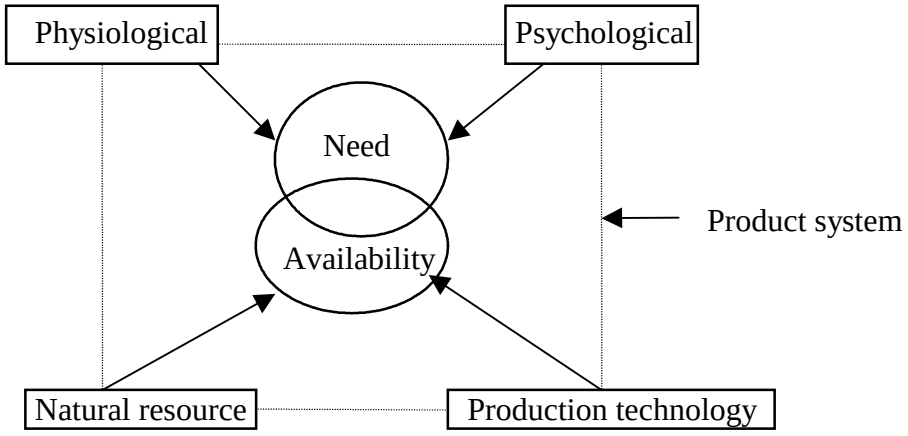


Figure 9: Interaction between the need and availability function

(Source: Mebratu, D. 1996. Sustainable product development: Issues and prospects. Lund.)

The second major factor that defines a given product system is the availability function, which is influenced by two major factor inputs: resource availability, and production technology. Most of the basic physiological needs are elements of need that could be satisfied with the consumption of the naturally available resources. However, the satisfaction of psychological needs and physiological needs influenced by the psychological needs, calls for improvement in the availability function. The history of social development is based on the continuous improvement of the availability function with the changing psychological needs of humanity.

This development was gradual until the beginning of the industrial revolution. The dramatic development in the scope of human knowledge since the beginning of the industrial revolution led to a high rate of improvement in the availability function.

The period since the industrial revolution could be divided into two periods in terms of the need-availability function relationship (Mebratu 1996a). The period until the Second World War could be characterized as the initial stage during which product systems were still defined based on needs as the basic driver. However, during the second period that starts from the 1950s, it seems that the availability factor has become the major determining factor in defining product systems. This availability driven product system is supported by the multi-billion dollar commercialization activities aimed at creating new psychological need. This is the typical feature of the high level of affluence and wasteful consumption culture that is being observed in the western society.

In light of the preceding analysis, the global community is currently faced with two principal challenges with respect to promoting sustainable production and consumption. On the one hand, the increasing dependence of billions of people in the developing world on the natural environment to meet their survival needs is exceeding the regenerative capacity of the natural environment thereby causing a major imbalance in the source function of the natural environment. On the other hand, the increasing affluence based on product systems driven by the availability function in the developed world is exceeding the assimilative capacity of the natural environment leading to an imbalance in the sink function. Thus, the promotion of sustainable production and consumption would require addressing both challenges through the development of product systems that are responsive to the source and sink functions of the natural environment. From a sustainable industrial development perspective, the most rational way of reorienting the existing product system that is mainly driven by the availability function would be making sustainable products available. Such products would satisfy the basic elements of the psychological need function without threatening the satisfaction of the physiological need. Thus, the move towards sustainable products does not necessarily require denial of an already achieved and socially assimilated level of need satisfaction. It is rather a question of qualitatively reorienting the availability-based satisfaction through sustainable product development.

Product design is a relatively recent culture that is more related to the industrial society, although production culture is as old as human history. The product culture of human history could be broadly categorized in three distinct phases. The first one, which constitutes the period until the early stage of industrialization, is the period during which one cannot witness a distinct product design practice from the production process that is defined by the need function. In the second phase, the combined principle of profit maximization for the firm and customer satisfaction for the consumer has been the major basis for the emergence of an industrial society that is based on mass production. It is during this period that the shift from a product system that is defined based on the need function to a product system that is defined based on the availability function is observed. The pressure caused by the above transition on the carrying and resource capacity of the natural system is one of the reasons that led to the issue of sustainability. This led to the evolution of the concept of sustainable product development that incorporates ecological factors, as the third dimension, within the product development process that is currently being practiced in industries.

According to the sustainable product development concept (van Weenen 1997), products should be viewed in the context of the systems in which they have been realized, in which they will function and those that have been established for their treatment once they have become waste products. What this implies is that the product should not be seen in isolation from its societal, cultural, and technological context. A product can be considered the expression of the transfer and transformation processes through which it is produced. Before a product can be manufactured, both the product itself and the manufacturing process have to be designed. Hence, it can be concluded that the environmental effects of the product are already, to a large extent, fixed in the design phase. Environmental concern and design are intrinsically linked. As a result, ‘eco-design’ (designing products with applied environmental criteria) has evolved in reaction to growing ecological concerns.

One of the key tools that have evolved in parallel with the concept of eco-design is Life Cycle Analysis (LCA). LCA evaluates a product’s cumulative environmental impact, from the extraction of primary materials up to its final disposal. The LCA tool and eco-design concepts are inherently integrative and preventative in their contribution to environmental protection.

Life cycle analysis and eco-design/design for the environment can aid in (Jansen 1995):

- better material management, reduction/optimization of the use of (non-renewable) resources;
- prevention of wastes and emissions and promotion of higher energy efficiency standards;
- assurance that produces are composed of materials suitable for reclamation, recycling and reuse;
- product quality improvement/durability ensuring that faulty or obsolete components are replaceable, contributing to longevity and use-intensity.

Hans van Weenen (1997) identified the following stages of development in the field of product development in response to the environmental crises. The first stage includes the design approaches that are mainly focused on reducing the impact of products at the waste disposal stage. It includes:

- "Design for Pollution Prevention": eliminates a specific pollutant through change in composition;
- "Design for Recycling": reduces material recycling problems by changing the design;
- "Design for Reuse": facilitates multiple use of packaging;
- "Design for Disassembly": facilitates the disassembly of complex products for further reuse or recycling.

The objective of the second level of eco-design is to reduce the environmental impact at every stage of the product life cycle. An important change in perspective is to consider products as material objects that have a history as well as a future. Products have a life from resource extraction to product disposal. Their life cycle consists of various transformation stages, beginning and ending with the environment. Thus, the second stage of eco-design focuses on the environmental optimization of a product throughout its life cycle. The third level of eco-design is the stage in which a product's function is considered and discussed, including alternative, more sustainable ways of providing it. Examples are the replacement of a product with a service, or questioning whether a product is really needed in the first place. In this case a theoretical framework might exist, but practical implementation is still rather scarce. Sustainable product development (SPD), the fourth and most demanding level of eco-design, goes well beyond environmental optimization of products, which is currently the central objective of eco-design.

Eco-design provides a unique preventative leverage to address the environmental impacts of products at the roots by altering design decisions. SPD focuses on the functions to be delivered through producers, systems and services. Hans van Weenen (1997) emphasizes that the concept of sustainable product development integrates the aspects of society needs, technology and natural physical conditions. It also addresses the origin and design of products that can be either "northern" or "indigenous" or combinations thereof. Thus, indigenous knowledge and skills are central to SPD implementation. SPD can be locally oriented and merge local traditional solutions with components of international industrial technology, thereby giving it global orientation. It considers the various regional physical and ecological conditions that strongly influence the availability, quantity and quality of resources and energy. Thus sustainable product development is defined as (van Weenen 1997) 'resource-, context-, and future-oriented product development, aimed at the fulfillment of elementary needs, better quality of life, equity, and environmental harmony'.

In the context of developing countries, the issue of sustainable product development includes subjects such as development, poverty, trade, population, and social/cultural conditions. In order to comprehend sustainable product development, technological components and psychological, political and economic elements must be assimilated in a holistic view. In this way, sustainable product development addresses both the demand and supply side of the economic equation (Jansen 1995). Modifying Jansen's product classification, products found in the developing world can be categorized into the following four groups based on their design and material base:

1. Indigenous Products are those of which both the product and the design are intrinsic to the region. Often developing country products, by their nature, underscore an ecological component, evident in many native cultures. The products concerned will mostly be based on locally available and ecosystem derived and compatible resources. Allowing developing countries to expand their manufacturing capabilities of these products will be beneficial for sustainable development.
2. Indigenous-Western hybrids are products that are indigenous by product design and western by their material base. The PVC sandals that are replacing the local leather-based industry can be cited as an example to this category of products. Such trends are having a significant effect on the traditional local-skill based industries with associated social, economic and environmental consequences.

3. Western-indigenous hybrids are industrialized country product designs and materials that are often incorporated into locally developed (artisanal based) products. The bulk of mineral-based products belong to this group.
4. Western products are Western products with Western design that are introduced into developing countries with their associated socio-ecological impacts. The automobile industry and the electronic industry are typical suppliers of these kinds of products.

Looking at the possibilities for sustainable product development in Africa, it was found that much knowledge exists about utilizing plant products, clay and the use of bio-fuels. According to Hans van Weenen (1997), a very sophisticated system exists in Benin, central to which is the use of leaves for the packaging of food. At least ten different types of leaves are used for this purpose, some of which have a flavor of their own. However, the knowledge concerned is not acknowledged as important and, gradually, plastic bags are being introduced into the market. On the other hand, it was found that pottery making is quite diverse and included the production of pots for diverse utilities. These indigenous processing technologies provide source of livelihoods for millions of people in sub-Saharan Africa.

The rediscovery of local raw materials and the upgrading of indigenous processing technologies can provide new opportunities for the field of product development in developing countries. According to El-Mosley (1997), the rediscovery of local raw materials means imagining, thinking, designing, carrying out research and producing prototypes with the objective of developing new uses of local raw materials. Returning to the local community level means the creation of a new form of sustainability and the transition from subsistence to market economies and from the traditional to a form of modernity for the local community. This provides many developing countries with a very strong stimulus for building or rebuilding their endogenous scientific and technological capabilities within a new vision of sustainable development. Moreover this trend opens new opportunities for trade between developing and industrialized countries. The above discussion indicates that principles, ideas and technologies from the North can be merged or combined with those of the South to further improve product development prospects. Such an approach may provide a sound basis for promoting sustainable livelihood in the developing world.

5.3.3 Processes subsystem concepts

Awareness of the global environmental impacts of modern technologies is motivating many industrial organizations to ask questions about their processes and products. They are asking questions they seldom asked in earlier years. The responses and degree of success vary tremendously among different types of industrial firms, as well as among firms within particular industrial branches. In general, the approach being used is to seek ways to modify manufacturing processes by raw material substitutions or process modifications so as to produce present-day products more safely and with less waste. In other situations, product designers are beginning to design new products with nature in mind. In doing this they are seeking to develop and utilize product-design criteria that incorporate consideration of life cycle impacts into the product's design.

Depending upon the product and the environmental problem under consideration, waste and risk reduction may most appropriately be effected by making changes at different levels within an industry and/or within the society as a whole. It is then important to note that substitution can occur at a variety of "levels". The following are the major levels of substitution that were identified by Huisingh (1989):

- *The process level:* in which the production process is rearranged to provide a more environmentally sound technique, e.g., in terms of increased restriction of waste to outside recipients such as water and air;
- *The materials level:* This is the case in which one substitutes an element in the product for another of hopefully more "benign" character. The substitution for mercury in batteries by other substances is such an example;
- *The component level:* A new technical design could provide a new plug-in function without changing the overall 'old' technical solution. The use of catalytic emission control of automobile exhausts could fall to this category;
- *The subsystem level:* If the car is the system, then the varying engine solutions could be seen as subsystems. The substitution of the gas motor by an electric one could serve as an example;
- *The system level:* People in a big city setting willmove every day between their homes and workplaces, wherever these might be situated. The substitution (or shift of emphasis) between a private car solution as systems design to that of mass transport, exemplifies this level;

- *The strategy level:* The manipulation of the structural design in town planning in considering closer affiliation between homes and workplaces provides a substitution from a solution built on a random distribution to one built upon a systematic approach. Such a change could result in reduced transport loads overall and in energy use reductions that benefits the environment;
- *The value level:* This level could be exemplified by questioning the need for physical transport as part of society's goal. At a more modest level of change, solutions emphasizing more local/regional production of agricultural products that connect production and consumption geographically, belong to this realm.

The concepts and tools that are focusing on production processes have provided the foundation for the shift from the so-called reactive environmental management to proactive environmental management. These concepts are known as: cleaner production, cleaner technology, pollution prevention, waste minimization, eco-efficiency, etc. Although they have slight variation in terms of terminologies and approaches, the core element of all these concepts is the shift of emphasis from how to treat waste to how to reduce and eliminate waste at the source of generation. In the language of economists, 'this suggests the objective of maximizing value added per unit resource input. This idea is essentially equivalent to maximizing resource productivity at the firm level (taking into account scarce environmental resources as well as energy and raw materials), rather than simply minimizing wastes or pollution associated with a given product' (Ayres and Leynseele, 1997).

Contrary to popular belief, Pollution Prevention (P2) was not invented around 1980. According to Hirschhorn (1997), people had been talking about it and trying to implement it for more than a decade earlier. While P2 existed for many years in various forms, it had not been packaged as a bold new paradigm as happened in the 1980s. Hirschhorn (1997) asserts that some environmental professionals had a bold vision in the late 1970s and 1980s. They realized that environmental protection has become nearly totally dependent on a reactive end-of-pipe way of thinking. The inevitability of industrial waste and pollutants had become ingrained in people's minds, in government regulations, and in technologies. Environmental protection was equated with pollution control (PC) and waste management.

The bold vision was that a fundamentally different approach was possible and necessary. It would not be based on producing wastes and pollutants in the first place and then trying to reduce their harmful impacts. Instead, waste and pollutants would be prevented where they originated. This upstream strategy would be a new intellectual framework or paradigm for environmental protection. The P2 vision was broad, encompassing changes in manufacturing technologies and even products and packaging. It also covered resource and energy conservation. To a large degree, the original P2 visionaries were driven by observations that the political correctness of pollution control was not matched by continued environmental gains some two decades after the environmental movement had emerged (Hirschhorn 1997). Traditional PC solutions were not as effective as they seemed. End-of-pipe technology often just shifted wastes from one environmental medium to another, such as from air and water pollution control devices that produced concentrated hazardous waste for leaking landfills.

Cleaner production (CP) is defined as "the continuous application of an integrated preventive environmental strategy applied to processes, products and services to increase eco-efficiency and reduce risks for humans and the environment" (UNEP-WBCSD 1994). CP captures the idea of pollution prevention and reduction at the source through process changes instead of end-of-pipe approaches. CP implies changing attitudes, developing preventative environmental management systems, creating conducive national policy environments and evaluating technology options. UNEP-WBCSD (1994) states that, just like the concept of eco-efficiency, CP represents a win-win situation for businesses since the actions resulting from the implementation of the concept generally make "business sense" due to the positive gain in the bottom line.

The application of Cleaner Production covers:

- Production processes: conserving raw materials and energy, eliminating toxic raw-materials and reducing the quantity and toxicity of all emissions and wastes.
- Products: reducing negative impacts along the life cycle of a product, from raw-material extraction to its ultimate disposal.
- Services: incorporating environmental concerns into designing and delivering services.

Hirchhorn (1997) argues that when opportunities for P2 are lost, they may be lost for a long time. A good example is the global environmental market in developing countries, where new industrial facilities are being built at a staggering rate.

In theory, these countries could leapfrog the industrialized nations by avoiding or reducing the PC system, with its inevitable high costs and limited effectiveness, through the integration of P2 systems at the project development stage. Industrialized countries could also benefit by exporting P2 products and technologies rather than traditional PC solutions.

The introduction of cleaner production practices in developing countries will enable industries to achieve optimum resource (energy and raw material) consumption per unit product through improved production efficiency. This is due to the fact that, as an integrated industrial intervention, CP would be based on the utilization of the existing local industrial skill and capacity that is reflected in the combined form of the simplest common sense with the highest level of creative thinking. This will improve the competitiveness of industries in the developing world and lead to an improved environmental quality. Besides the above major opportunities and benefits at the factory level, the promotion and implementation of cleaner production in developing countries, can serve as an important catalytic instrument for the development of national science and technology capacity which would be responsive to the countries' specific needs and demands.

In conclusion, it can be said that the concepts and tools discussed in this chapter are still in a dynamic stage of evolution. Nevertheless, they are influencing the overall process of industrialization in different ways. The major influences of these and other evolving concepts can be categorized under the following points.

- Market restructuring: some of the evolving concepts and tools are enhancing the market restructuring process by facilitating the creation of a new segment of consumer behavior that has preference to environmentally friendly products. In this context, the number of consumers that demand a certain level of environmental quality from products and services is on the increase. The recognition given to different kinds of Environmental (eco-) labeling schemes as a marketing tool is an outcome of this change. This is expected to have an influence on the global market structure
- Technological innovation: environmental considerations promoted through the various concepts and tools are acting as one of the major drivers of technological innovations in product design and processes development. This has led to the evolution of a new generation of technologies that are both ecologically and economically efficient. The advance that is being made in product and process development is expected to influence the nature of technology transfer from the industrialized world to the developing world and vice versa.

- Organizational innovation: most of the concepts that are evolving in response to the environmental challenge have triggered a corresponding organizational innovation process. The key element of this organizational innovation process is the development of a learning organization that is responsive to the dynamic changes. This is posing a challenge to all levels of organization including the demand for organizational change in the major global institutions.

In general, the evolving tools and concepts and their subsequent influence on the industrialization process are clear indicators of a beginning of a new transformation process. This process is going to pose a significant challenge to sub-Saharan African economies in terms of keeping and increasing their industrial product's share in the global market. In this context, SSA needs to keep pace with these evolving concepts and tools and make its contribution to the transformation process, if it desires not to be left behind.

CHAPTER

SIX

6. Development strategies in sub-Saharan Africa (SSA)

In the 1950s and 1960s, sub-Saharan Africa held great promise. Two world wars left SSA generally unscathed, destructive civil wars had been uncommon and independence brought a wave of optimism that anything could be achieved. Since the 1960s, there have been a plethora of development strategies that have been prescribed for promoting development in sub-Saharan Africa. Based on the conceptual basis presented in the preceding chapters, this chapter addresses the following questions: What are the most relevant criteria for reviewing sub-Saharan Africa development strategies from a sustainability perspective? What are the major kinds of industrial development strategies currently in practice in sub-Saharan Africa and how have they performed? What are the strengths and limitations of the principal industrial development strategies in the region from a sustainable development perspective?

6.1 The analytical framework

As much as there are many development strategies prescribed for SSA, there are many analytical frameworks that have been employed in reviewing the numerous development strategies and developing solutions. Apparently, all of the analytical frameworks are influenced by the specific epistemological orientation that serves as the foundation of the analysis. In the context of this research, the key requirement to promote sustainable development is the understanding of the interaction between and within the ‘Entity factors’ and the ‘Significance factors’ in pursuit of evolutionary succession and productive engagement.

The following are used as the major elements of the analytical framework based on the epistemological foundation laid in the first part of the dissertation.

- *Pre-analytic vision*[8]*:* every process of policy and strategy development involves one or another form of 'situation analysis' that is highly influenced by the pre-analytic vision employed. In a way, one can say that development strategies are reflections of the pre-analytic visions employed since they determine the principal factors that will be the focus of the strategy development process. In this context, understanding the pre-analytic vision on which the development strategies are based will help to understand the strengths and limitations of any strategy.
- *Local-global responsiveness:* development, as a social transformation process, gets its meaning from the local and global dynamics that constitute the field of significance. The effectiveness of development strategies is measured by their treatment of the local and global factors and their responsiveness to changes in the local and global environment. In this context, the major development strategies are reviewed in terms of their consideration of the internal and external environment.
- *Factor variation:* Based on the systems dynamics approach, Saeed (1994) identifies two types of instruments for change: those generating fundamental forces of change and those facilitating changes. The former is difficult to conceive unless the feedback structure of the system creating the dysfunction is understood. The latter, though easy to conceive, can be quite ineffective and sometimes dysfunctional, in the absence of the former (Meadows, 1994). The quality of a policy design effort is seen to lie in the intelligent combination of fundamental and facilitating factors to achieve desirable patterns. In this context, the strategies were analyzed in terms of their focus and treatment of the fundamental and facilitating factors.
- *Socio-Ecological consideration:* Socio-ecological factors constitute one of the entity factors that define the boundary condition for any development process. Empirical evidences have shown that any macroeconomic policy will entail one or another kind of socio-ecological impacts.

[8] The pre-analytic vision is the philosophical preconceptions that guide the researcher concerning research objects, applicable methodology for the research, and the interpretations of the result.

Hence, development strategies can promote either sustainable or unsustainable development depending on the level of their conformity with socio-ecological factors. In this context, the major development strategies prescribed for SSA are reviewed in terms of their consideration for socio-ecological factors.

- *Socio-economic impacts:* the success of any development strategy is measured by its ability to ensure socio-economic succession with an improved productive engagement of the society. In this context, improvement in socio-economic conditions reflected in an increased productive engagement may positively imply the correctness of the development strategy from a socio-economic perspective. The major development strategies that were promoted in SSA during the last two decades are reviewed in the context of their socio-economic impacts.
- *Adaptive mechanisms:* Development is a dynamic societal process that involves a continuous change of multiple variables. For a development process to be sustainable, society must continuously upgrade its capability of sensing, processing and accumulating survival-relevant information through a dynamic adaptive mechanism. In a nutshell, the effectiveness of any development strategy is a function of its adaptive mechanism to the continuously changing variables. The principal development strategies in SSA are reviewed from their adaptive mechanism perspectives.

6.2 Major categories of development strategies

An overview of development efforts in SSA shows that there are three major groups of development strategies that have been influencing national development strategies in SSA. The first group consists of strategies adopted and promoted by the UN agencies on the basis of the concept of development decade. The concept of development decades had emerged as the United Nations sought to promote active programs of development for the third world countries that would halt the widening of the gap between developed and developing countries. The United Nations Third Development Decade, which began in 1981, was based on the assumption that a reform of the international economic system was essential for the health of both developed and developing countries. Since then, there have been numerous development initiatives adopted specifically for Africa by the UN General Assembly.

Some of the major industry related development initiatives adopted by the UN include:

- UN Industrial Development Decade for Africa (UN-IDDA), 1980;
- UN Transport and Communications Decade in Africa (UNTACDA), 1980;
- UN Program for action for African Economic Recovery and Development (UNPAAERD), 1986-1990;
- UN System-Wide Special Initiative for Africa, 1995 Alliance for Africa's Industrialization (initiated by UNIDO), 1996.

In parallel with these UN initiatives, there have been numerous regional initiatives promoted by the Economic Commission for Africa (ECA) and the Organization of African Unity (OAU). These constitute the second group of strategies. The regional development initiatives were guided by the principles of the Lagos Plan of Action (LPA) which was adopted by the Summit of African Heads of States in 1980. Some of the major development initiatives that belong to this group are:

- First Industrial Development Decade for Africa (IDDA I), 1982-1990;
- Africa's Priority Program for Economic Recovery (APPER), 1986-1990;
- African Alternative Framework for Structural Adjustment Programs (AAF-SAP), 1989;
- Second Industrial Development Decade for Africa, 1991-2000;
- Treaty for African Economic Community, 1991;
- The Cairo Agenda for Action, 1995.

The third major group of initiatives that has affected the course of events since the eighties has been the interventions made by the World Bank and the International Monetary Fund (IMF) in economic policy making of most African countries. The African economic crises were exacerbated, in the beginning of the 1980s by the collapse of their balance-of-payments situation, their growing indebtedness and their urgent need of resources and foreign currency for developmental purposes. This has left African countries with no option but to approach the World Bank and IMF for "bail out" support (UNECA and UNIDO 1989).

In response to these crises, the Bretton Woods Institutions (BWIs) came with a package of assistance that contained key policy and institutional reforms as conditions of participation. These included:

- Structural adjustment program (SAP), since 1982;
- Enhanced structural adjustment facility (ESAF), since 1988;
- Highly Indebted Poor Countries (HIPC) initiative, since 1996.

The development decade of the UN has been limited to the broad recognition of the need for promoting social development in SSA. Starting from 1980, it was the Bretton Woods initiatives led by neo-liberalism and the regional initiatives led by the Lagos Plan of Action that were competing for dominance in influencing SSA's development policies and strategies. A closer look at the philosophical and epistemological foundation of these groups of strategies shows that the initiatives promoted by UNECA and the Bretton Woods initiatives were fundamentally different. The regional, strategic initiatives spearheaded by the UNECA were based on the achievement of self-reliance and self-sustainment through active state intervention (UNECA and UNIDO 1989). On the contrary, the initiatives promoted by the BWIs were based on the promotion of a "laissez-faire" approach governed by the market. Until the early 1980s, the national development strategies of most African countries were promoting active state intervention in development planning and implementation. The financial crises of the 1980s, forced most African countries to accept the policy reform requirements of the Bretton Woods Institutions (BWIs). As a result, an increasing number of sub-Saharan African countries participated in one or another form of Structural Adjustment Programs. According to the World Bank (1989), however, lack of full-fledged political commitment to the reform process at the national level did not lead to the desired results in most of the countries where SAP was implemented. By 1993, a total of 35 sub-Saharan African countries had implemented structural adjustment programs (Stein 1998).

6.3 Major industry-related strategies

In the early 1960s, African political leaders in some countries made strong representation to the colonial governments for a form of industrialization that placed emphasis on the local processing of the dominant primary commodities. The objective of that first African approach to industrialization was to seek increases in public revenue by raising the level of export earning. These proposals were vehemently opposed by the powerful merchants and colonial administrators in the metropolitan countries (UNECA/UNIDO, 1989).

By the mid-1960s, African governments had conceived bolder plans and programs for industrialization and had accepted, from external advisers, the guiding principles of selecting products for local manufacture for which an import market had already been established. Thus import substitution was the most common approach to industrialization in sub-Saharan Africa in the 1960s, whether explicitly stated or as a consequence of protectionist policies. However, the weak link of the industries with local resource capabilities and inputs meant that employment and income multiplier effects of the factor inputs use remained external to the country paying for the final product. In general, import substitution policies and practices did not positively contribute to the development of national capabilities for industrialization and development management.

African leaders' interest in industrialization to achieve greater economic independence stems partly from colonial policies that fostered the dependence of the colonies on the colonial country, especially for manufactured goods. African countries achieved political independence at a time when their economies were still highly dependent, both internally and among countries. Four principal categories of dependency were identified (Roemer, 1981):

- market dependence: trade imbalance and limitation of exports to primary commodities;
- technological dependence characterized by foreign technologies, absence of capital goods industries;
- managerial and entrepreneurial dependence; and
- foreign capital dependence.

The post-independence emphasis on industrialization and the objective set for it were, to a large extent, reactions to these types of dependencies.

6.3.1 The Lagos Plan of Action (April 1980)

A thorough assessment of the state of African socio-economic development, towards the end of the 1970s, prompted the member states of the OAU to adopt the Lagos Plan of Action and the Final Act of Lagos for the collective industrialization of Africa. The adoption of LPA was based on the two principles of self-sustained and self-reliant industrialization. The principles of self-reliance involve the use of indigenous raw materials, indigenous labor and management, domestic and regional markets etc. Self-sustainment relies on internal as opposed to external requirements and stimuli.

The Lagos Plan of Action not only emphasizes industrial growth but, more specifically, self-sustained industrialization designed to meet domestic needs. A number of strategic measures were proposed such as (UNECA 1980):

- The building up of an industrial production structure capable of meeting changing domestic needs through the preparation and implementation of an integrated industrial development program;
- The establishment of a core of production, marketing, research and development activities which provide impetus for economy-wide growth processes;
- The selection of products appropriate to the satisfaction of the basic needs of the mass of the population and to the promotion of self-sustaining development;
- The expansion and restructuring of domestic markets by integrating the rural economy with the modern sector through the construction of the necessary infrastructure;
- Sub-regional economic integration aimed at developing basic and capital goods industries in integrated sub-regional markets;
- The generation and use of information and data as required by governments in their economic planning and decision-making.

The full implementation of the Lagos Plan of Action as a strategy for promoting self-reliant and self-sustained development in Africa presupposes an active state intervention through:

- organized and conscious national planning;
- state-guided resource allocations; and;
- promotion of the public sector as an instrument of development.

The Lagos Plan of action, designed jointly by all countries of Africa, constitutes a charter for the development of the continent, for the period 1980–2000. The 'Final Act of Lagos', adopted in 1980, generated a feeling of optimism and expectation that the last two decades of the century would witness a major breakthrough in African economic and social development and establish a firm foundation for progress in the twenty-first century. The core element of the Final Act of Lagos was the promotion of regional integration as the principal instrument for Africa's self-sustainment. However, as was pointed out by UNECA (1998:21) "the African experience in economic integration has so far produced very limited results. Progress is scanty in the areas of production, infrastructure and other elements that could sustain development efforts.

The institutional framework for integration is faced with several difficulties that are far from being resolved. In addition to the lack of funds for their implementation, integration programs and schemes are so discordant from one sub-region to another that they give rise to hopeless situations. All actors are not allowed to participate in the integration process, which is seen so far as an affair of governments."

However noble the principles of self-reliance and self-sustainment are, the Lagos Plan of Action (LPA) and the subsequent development strategies that were developed based on taking LPA as the guiding development philosophy have suffered from the following two major shortcomings. Primarily, as the collective expressions of the political will of governments that have emerged from the struggle for political independence, it lacked the appropriate mechanisms for the mobilization of both local and global principal stakeholders for a self-sustained economic development process in the region. This has made it more of a 'supply-driven' and 'top-heavy' initiative. Secondly, the regional integration efforts that have been undertaken so far, lack the necessary socio-economic foundations, such as a dynamic production sector, and infrastructural capacities, such as the presence of developmental states, at the national levels. As a result, some of the achievements that have been made in regional integration have a limited contribution to the promotion of a homegrown industrial development process at the national level.

6.3.2 Industrial Development Decade for Africa (IDDA)

The IDDA was developed on the basis of the LPA and the concept of UN Development Decade. The following are some of the factors that determined the concept and purposes of IDDA. The first factor was the recognition of the failure of previous "cures" for the weakening North-South engine of growth. Another factor was the growing conviction, among policy makers, economic planners and publicists in Africa that no region so well endowed with natural resources could justify the growing poverty of its populations and its own increasing dependence on the weakening North-South engine. A third factor was the persistence of at least three great structural weaknesses, which are (UNIDO 1982):

- dependence on a few primary export commodities;
- dependence on broadly the same markets for selling primary commodities and for buying capital and consumer goods and services;
- persistence of market enclaves and dysfunctional relations within national economies.

IDDA was based on the much wider concept of designing and constructing internal engines of growth in Africa to replace the long and accelerating weakening of an external engine of growth resting on trade and economic relations with the developed economies of Western Europe and the United States. The IDDA program that consists of objectives, principles and priorities constitutes one small but crucial component in the design, construction and working of the internal engine of growth that was enshrined by the LPA. The heart of the program was the production, supply and use of factor inputs for designated core industries and the use of the outputs of core industries for promoting the growth of strategic sectors.

The First Industrial Development Decade for Africa (IDDA I) strategy document which was jointly developed by UNIDO, UNECA and the OAU included (1989:119):

- a proclamation of goals and objectives;
- a set of guidelines addressed to governments;
- a set of guidelines relating to regional and sub-regional co-operation;
- techno-economic guidance regarding core and strategic industries;
- expert-estimates of the quantum and direction of required industrial investments.

IDDA-I accorded high priority during the preparatory phase (1982–1984) to measures aimed at attaining self-sufficiency in food production, building materials and textiles and other objectives of the decade and thereby making the industry sector of the LPA operational. Hence, hundreds of projects were identified in the priority subsectors of food and agro-industries, building materials, textiles, energy, forest, metallurgical, engineering and chemical industries. It also covered supporting areas such as building capabilities in institutional infrastructure, technology, industrial financing, information and management.

According to the report of the program evaluation, this comprehensive approach had its strengths and weaknesses. The basic strengths include (UNECA, 1989:119):

- the definition of goals arising out of the LPA, namely self-reliance and self-sustainment and the creation of internal engines of growth;

- the provision of a framework within which individual countries could design their industrial development strategies;
- the flexibility left to individual countries to prepare their industrialization plans to suit their own circumstances.

The evaluation report further identified the following as the weakness as of the comprehensive approach followed in developing IDDA-I.

- It lacked a program identity;
- It was too diffuse and amorphous to become an operational instrument;
- It was too over-optimistic in its assumptions of the practical possibilities of major industrial investments in the decade;
- It was equally over-optimistic about the practical possibilities of regional cooperation;
- It lacked quantitative targets;
- It paid inadequate attention to the economics of investment and to resource availability;
- It lacked a budget.

During the earlier part of the first IDDA, some public investments were made in industrial projects, although funding and other constraints did not permit investments of the desired scale. Well-intentioned as these investments were, they were not successful. According to a report by the Economic and Social Council of the UN (1992), massive problems have arisen in technology absorption, machinery maintenance and management. The net results were that input-output ratios were sub-optimal, consumption coefficients were below standard, productivity was low and capacity utilization was below the break-even point. According to this report (UN 1992), it was roughly assessed that the average capacity utilization of the African industries ranges between 30 to 40 percent. As a result, many of the industries set up were running at a loss and some were at a point of bankruptcy. Since many of these plants were in the public sector, they were kept going through State subsidies and thus became a burden to the nations.

The basic goals of the second IDDA are not fundamentally different from those adopted for the first decade. They also emerged from the concepts of the LPA. The vision continues to be that of a program to end the over-dependency which African countries have on the industrialized world, to promote internal engines of growth, to build on Africa's wealth and natural resources and progressively to achieve self-reliance and self-sustainment.

However, it was claimed that 'there has been a major departure in the "modus operandi" of preparing the program for the second IDDA' (OAU,ECA &UNIDO, 1997). According to this report, the first IDDA was conceptualized and articulated at a centralized level. OAU, ECA and UNIDO took the leading role in drafting the program for the first IDDA and the Conference of African Ministers of Industry in endorsing it. The member states were at the receiving end of strategies, priorities, and programs prepared at these centralized levels. They played no direct or participatory role in the process.

Preparations of the program for the second IDDA have moved to the national level. Each Member State has undertaken the task of framing a national program for the second IDDA using the services of local experts. This has ensured a sense of pragmatism. The Program are designed keeping in mind the realities, environmental circumstances, natural resources and priorities of each member state. The national programs on the basis of which this document has been prepared have all reiterated the LPA objectives. In most of the national development plans, these goals have been explicitly articulated. There is, however, a perceptible change in the strategic approach to achieve these goals that clearly emerges from a perusal of the national programs. This is largely due to the experiences of the first decade, the changing world environment and the adoption, by a large number of African countries, of World Bank sponsored "Structural Adjustment Programs."

Among the important components of this modified strategic approach, the following are the most significant ones (UN 1992:18-23):

- *Agro-industrial linkage:* The second IDDA recognizes that it is a grave fallacy to view agriculture and industry as competing sectors, one growing at the expense of the other. The national programs have incorporated wide-ranging schemes to promote the agro-industrial linkage and to develop agro-based and food processing industries.
- *Public enterprises' performance improvement:* During the first IDDA and in earlier years, investments were made in industrial projects, although funding and other constraints did not permit investments of the desired scale. Well intentioned as these investments were, they did not pay off. Massive problems have arisen in technology absorption, machinery maintenance and management. The net result has been that input-output ratios are sub-optimal, consumption coefficients are below standard, productivity is low and capacity utilization is below break-even point.

All the national programs have voiced their concern at this situation and have therefore, placed the highest emphasis on rehabilitation and reconstruction of existing assets. It is recognized that industrial output can be doubled on the basis of existing assets with marginal investments in de-bottlenecking.

- *Strengthening the entrepreneurial base:* At the commencement of the second IDDA, one trend was clearly noticeable, namely a policy direction in favor of liberalization, opening-up of over-sheltered economies and lessening of State controls. The success of the second IDDA was noted to depend, to a very great extent, on Africa's ability to widen and strengthen its national entrepreneurial and managerial base.
- *Informal and small scale sectors:* a study of the recent economic history of many African countries which have gone through periods of internal turmoil shows that it is the informal and small entrepreneurs that have kept the economies going. As it stands today, the bulk of their activity is in the nature of trading. But in the process, business skills and cost-effective management of men, materials and money have been developed. What is needed is to transfer these skills to the industrial sector. Most of the national programs have recognized this potential and have proposed measures for strengthening and developing the small and medium sized industries. What is contemplated is a progressive process of graduation to larger scales of industrial activity.
- *Emphasis on market orientation:* The first IDDA laid strong emphasis on the need for industrial investment, the growth of manufacturing value added and the utilization of domestic factor inputs. While the second IDDA will continue to stress these aims, which continue to be valid, a consciousness has grown about the necessity of developing marketing strategies for industrial outputs and the need for cost-effectiveness, international competitiveness, quality control and consumer service. As a first step in this direction, the second IDDA will endeavor to promote inter-African trade and to build up regional and sub-regional common markets.
- *Stimulating an industrial culture:* On the basis of past experience, African planners and policy makers have been asking themselves the questions "what is the key to industrialization? What is it that has created successful industrial societies?" The simplistic answer that industrialization will be achieved through acquisition of technology, investments in plants, equipment and machinery and by aiming to enhance industrial output, has not been found to be satisfactory.

- *Promoting regional and sub-regional co-operation:* The concept of regional and sub-regional co-operation was an integral element of the Lagos Plan of action and the first IDDA. Considerable progress has already been made in setting up regional organizations and institutions. However, the establishment of joint ventures of African countries to set up industrial projects has not so far met with adequate response. A major thrust of the second IDDA will be the promotion of such African multinational enterprises along with co-operation in support services such as technology and informative services.
- *Environmental considerations:* while industrialization is an imperative for Africa's economic development, it was noted that it is necessary to have an awareness of the dangers to the environment arising out of haphazard and unplanned industrial expansion.

Based on the above conclusions, an action-oriented program was developed for the second IDDA having the following major components:

- Rehabilitation and regeneration of existing industries;
- Improving the performance of the public sector enterprises;
- The complementary role of the public and private sectors;
- Industrial expansion for major sectors;
- Promotion of small- and medium-scale industries and entrepreneurship development;
- Physical, institutional and human resource development.

The two industrial development decades for Africa have been central to Africa's strategy for economic diversification. Despite the acclaimed lessons learnt from the process of implementing IDDA-I and the numerous efforts made to improve the design and implementation of IDDA-II, its implementation has a limited success in terms of promoting industrial development in SSA. The following are some of the factors that were discussed in the report of the mid-term evaluation (UNECA 1997) as limitations of IDDA.

- Owing to its structure and all-encompassing character, the program could hardly create the identity required. Its all-encompassing structure, which seemed to be its strength, has become its weakness.
- The program's vision of industrial development is too technical, administrative and centralist.

- Self-reliance and self-sustained industrialization are key goals of the LPA as well as the IDDA program. However, to interpret these goals in a static manner, having regard to the structure of the industrial sector, whether in a national or a broader sense (e.g., as collective self-reliance, encompassing a sub-region or the whole of Africa) missed the point.
- Industrial planning: According to the IDDA program, the implementation of a well-defined self-reliant industrial development strategy requires the elaboration of a coherent industrial development plan. This approach reflects the thinking of the 1960s and 1970s and would be difficult to pursue in a period of rapid and sometimes fundamental change of the kind characteristic of the 1980s and probably the 1990s, where much flexibility is needed.
- Integration and linkage: Lack of integration within the industrial sector and between that sector and other sectors represents a major area of concern for IDDA program. However, while the IDDA program has correctly placed emphasis on the technical aspects of linkages, it has failed to draw attention to the economic, managerial and market-related conditions of their transformation into effective production.
- Informal sector: the informal sector is of great importance in creating and distributing revenues, training young people at low cost, and ensuring employment once qualifications are acquired. The attention given and effort made to utilize the informal sector as the transformation base of the African economy is minimal.

In general, the IDDA process was highly influenced by the philosophical foundation of the LPA which promotes the interventionist approach with heavy reliance on state planning and control. This approach has led to the continuous undermining of the development of the private sector and the marginalization of the existing private sector from the development process. Furthermore, as an industrialization process that is technically oriented, it was mainly focused on the establishment of large-scale industries. As a result, in the earlier years of the implementation of IDDA, some industrial projects were launched that were intrinsically uneconomical, while others that could have been competitive were not given sufficient capability and institutional support (World Bank, 1989). This has contributed to the further weakening of national economies in SSA.

6.3.3 Structural Adjustment Programs

The concept of structural adjustment, as commonly used in the 1980s, has its origins in the global economic events of 1973–1974 and the first oil shock (Reed 1992). The 350 percent rise in oil prices hit developing country's economies more severely than it hit the OECD countries. The ensuing 1974–1975 recession led to a 10 percent contraction in world trade and a sharp decline in export prices of many commodities, thus aggravating the ability of many developing countries to meet outstanding financial obligations (Cline and Weintraub 1981). In keeping with its division of responsibility, the International Monetary Fund (IMF) assumed near-exclusive responsibility during this period for providing short-term stabilization lending to help countries compensate for trade imbalances often caused by additional costs of imported energy sources (Mosley et al 1991). IMF's response to the economic events of 1973–1974 reflected broader changes that took place in international financial relations. First and foremost, the disequilibria for which IMF resources were being used were no longer caused primarily by factors internal to borrowing countries. On the contrary, increasingly, IMF funds were required primarily to respond to exogenous factors over which most developing countries had little, if any, control. Second, the IMF soon ceased being the principal source of 'Balance of Payments' (BoP) lending. By the mid-1970s, commercial banks, offering easy credit terms as they sought to recycle petrodollars, replaced the IMF.

Between 1973 and 1981, private financial creditors increased their lending to non-oil-exporting developing countries six fold, to more than $220 billion. Whereas 66 percent of less developed country debt was owed to official lenders in 1971, 70 percent was owed to commercial banks by 1981. However, commercial credit began to dry up with the increase in the costs of servicing outstanding debt (Kolko 1988). In a few years, commercial loans were no longer available to finance development projects or to refinance existing short-term obligations. Throughout the later parts of the 1970s, there were a number of crisis management measures that were taken by IMF and national governments but with few positive results (Reed 1992). It is under such a circumstance that the World Bank decided to commit its own resources to help correct the pervasive macroeconomic imbalances (Mosley et al. 1991).

The Bank's initial approach to structural adjustment lending contained two basic components. In tandem with the IMF, the first component was to stabilize the country's macroeconomic situation by relieving pressure on BoP. Structural adjustment loans were front-loaded, quick-disbursing loans that helped ease the short-term pressure on available capital. This quick infusion of resources was accompanied by immediate measures to reduce domestic demand.

The second component of the World Bank policy was designed to increase overall economic efficiency and promote growth objectives by reforming macroeconomic policy and strengthening national institutions. This growth objective was an essential counterweight to the immediate contractionary impact expected from the austerity measures required by the IMF and included in World Bank stabilization program.

Based on the above conceptual premises, the World Bank's first structural adjustment program, a $200 million loan to Turkey, became effective in April 1980. Adjustment programs for Kenya and Bolivia, then as many as a dozen other countries, received funding from the World Bank before the end of 1981. During the ensuing 10 years of adjustment lending, more than $28.5 billion flowed to 64 countries through 187 separate lending operations (World Bank 1990). That, as much as 25 percent of the Bank's annual loan portfolio was committed to adjustment packages, reflects the importance of this new policy-based lending in Bank operations during the 1980s. Regional development banks and bilateral aid agencies, following World Bank priorities, shifted their lending and grant-making activities accordingly to support structural reforms in selected countries.

The first presentation of the lessons from Asia for African consumption was the 'Berg Report' (World Bank 1981) which was written from the neo-liberal perspective. According to Mkandawire (1998,3), 'this report has been the definitive document on adjustment for 17 years'. There have been amendments, subtractions, additions and refinements of the argument, but as 'Adjustment in Africa' (World Bank 1994) clearly suggested, the World Bank was almost congenitally tied to the core argument of the Berg report with its faith in the market and the minimalist view of the state. The African Structural Adjustment Program began in 1980 in Kenya. By 1993, a total of 35 sub-Saharan African Countries had implemented structural adjustment programs (Stein 1998). Structural and sectoral adjustment loans predicated on policy changes in specific sub-sectors were also initiated at the same time. Closely tied to adjustment lending were the International Monetary Fund (IMF) facilities, which typically lay down the targets necessary to maintain an inflow of stabilization funds. IMF introduced Extended Fund Facility in 1974, Structural Adjustment Facility (SAF) in 1986 and the Enhanced Structural Adjustment Facility (ESAF) in 1988.

Structural Adjustment Program (SAP) is based on the elements needed to promote development based on the experience of the institutions over the years. The SAP package is based on the belief that the market is a more efficient mechanism for promoting optimum resource allocation than state planning and "dirigism"[9] and it covers:

- the adoption of realistic exchange rates that reflect the true value of a country's currency and the promotion of exports without placing a premium on imports;
- interest rates that are higher than the inflation rates and that will, consequently, encourage savings;
- trade liberalization and the removal of bureaucratic constraints and controls on exports and imports;
- the avoidance of large budgetary deficits;
- the avoidance of artificial subsidies.

Programs of Structural Adjustment Lending (SAL) and Sectoral Adjustment Lending (SECAL) were introduced in the early 1980s in SSA in order to help countries in the region minimize the initial cost of stabilization while implementing economic policy and institutional reforms. Adjustment loans to SSA have accounted for a large proportion of World Bank adjustment loans. Out of the 183 SALs and SECALs as of 1989, SSA accounted for 84. The policy prescriptions in SALs and SECALS strongly emphasize the adoption of outward-oriented development strategies as the primary channel for eliminating balance of payments and debt problems. Nominal devaluations, macroeconomic retrenchment, and reforms in foreign trade and institutions are the main vehicles for eliminating overvaluations in the real exchange rates and creating a structure of incentives consistent with this strategy (World Bank 1989).

One of the major shortcomings of policy lending sponsored by multilateral financial institutions and individual governments during the 1980s is its failure to address environmental deterioration that, when coupled with burgeoning populations, threatened to erode improvements in economic performance brought about by the restructuring process. Clearly, however, adjustment lending in the 1980s was not intended to address the environmental dimension of development (World Bank 1989). According to the response of the World Bank staff to an interview held by David Reed in 1992, there were several basic reasons why the World Bank failed to incorporate environmental concerns into the design of policy-based lending.

[9] Dirigism is a kind of development administration that is plan-oriented, prescriptive, programmatic, and exclusive (Rasheed & Luke 1995).

First, neither the World Bank nor borrowing countries viewed the environment as a priority investment area at the time. Second, when a negative environmental impact was identified in a country or was associated with a specific development project, the prevalent assumption was that either inappropriate macroeconomic policy or a sectoral economic policy failure was the cause. Hence, the Bank viewed the remedy far too simplistically−as a matter of correcting the economic failure. Third, environmental protection seemed to indicate the need for more budget- outlay that was not appreciated by the borrowing countries either. A fourth reason is that many quarters viewed macroeconomic crises and environmental degradation as essentially unrelated problems that had to be treated with separate and essentially unrelated remedies.
These reasons, articulated by Bank staff, help explain the failure of the World Bank to anticipate and address the potential environmental impacts of policy-based lending. According to Reed (1992,17), "the underlying theme of this reasoning is that economic growth, unencumbered by ancillary concerns, remains the unquestioned imperative of development strategy and that the benefits derived from economic growth can best provide the means for addressing ancillary concerns, whatever they may be."

Another issue that needs to be considered in the context of SAP is the privatization process. Almost, all African countries that have adopted SAPs are undertaking the privatization. Experience from other parts of the world shows that the development of the domestic private sector is a crucial element for developing national capacity and promoting industrial development. In this context, privatization in Africa should have been used as a strategy for the transfer of state assets to a strategically placed domestic private capital or as an instrument of creating a broad national entrepreneurial base. However, empirical evidence shows that privatization in Africa has not been premised on that objective. According to Mkandawire (1994), privatization in Africa has been largely driven by fiscal concerns of the state, the pronouncements on the inefficacy of public enterprises and ideological aversion to state ownership and the unfounded belief that state investment always "crowds out" private investment or is inherently inferior in performance to private investment.

The big question is why has adjustment not led Africa to its intended consequences. From the perspective of the World Bank and IMF, the cause of Africa's malaise was directly the result of the policies pursued by the governments of Africa before the introduction of SAP. Some of the major policy failures pointed out are:

- Over extension of public ownership relative to their economic justification and existing management capacity leading to inefficiently run enterprises;
- The neglect of agriculture through low production prices and government controlled marketing boards, reflecting the broader policy of urban bias;
- Overvalued exchange rates that encouraged imports at the expense of exports that caused imbalances in the current accounts;
- Overspending on government, usually to support bloated bureaucracies leading to high government deficits;
- Artificially low interest rates leading to discouragement of savings while encouraging investment in capital intensive production at the expense of more suitable labor intensive operations;
- Price controls on many products leading to disincentives to produce, shortages and corruption;
- Foreign exchange controls with central allocation of foreign exchange also leading to corruption and usage that was of little benefit to the country;
- Excessive use of tariffs and other forms of protection leading to paucity of competition and inefficient production.

Others argue that, the reason is more than policy failures on the African Government side, even if this has contributed. Howard Stein argues that the reason is largely theoretical. According to Stein (1998,12), "adjustment theories have their roots in neo-classical economic theory which is badly flawed as a guide to understanding how to build economies capable of structural transformation and sustainable development." In other words, it is not an implementation problem but a conceptual problem. According to Stein (1998), the thinking behind the model is rational deductive and axiomatic. It is rational-deductive in the sense that the behavior of agents is predetermined by a set of rational rules that are deductively posited. This rationally predictable behavior arises from a set of market signals. It is axiomatic in the sense that consumers and private producers are presupposed to be utility and profit-maximizers that rationally respond, in an efficient manner, if the market signals are correct. "The obvious problem with the approach is that the need for adjustment is a product of the model of adjustment. The model of adjustment is a product of a series of theoretical premises of abstraction.

Thus any divergence of the real cause from the premised cause will lead to serious errors in the realm of policy formulation and implementation" (Stein 1998,13).

Similarly, UNECA (1989) argues that conventional SAPs that are promoted by the World Bank and IMF are inadequate in addressing the real causes of African crises that are structural in nature. According to UNECA (1991,23), "the analysis of the evaluation carried out by the World Bank in 1988 indicated that sub-Saharan African countries implementing structural adjustment programs, experienced, after adoption of SAPs: GDP growth declines from 2.7 percent to 1.8 percent; a decline in the investment/GDP ratio from 20.6 percent to 17.1 percent; a rise in the budget deficit from – 6.5 percent to – 7.5 percent of GDP; and a rise in debt service/export earning ratio from 17.5 percent to 23.4 percent. The figure also shows that there has been only a minor improvement in the current account/GDP ratio from –9.4 percent to –6.5 percent." UNECA (1991,25) concluded that, "both on theoretical and empirical grounds, the conventional SAPs are inadequate in addressing the real causes of economic, financial, and social problems facing African countries which are of a structural in nature." UNECA further proposed an alternative framework for structural adjustment program that advocates the need for adjustment programs to emphasize structural transformation in the case of Africa and take into consideration the structure of production and consumption and the people.

SAP is characterized by its package of reform measures that are developed based on the theoretical assumptions of the neo-classical economic model which includes the presence of a uniformly functioning market. In the face of multiple complexities with significant variation of local realities from the basis of the theoretical assumptions, this 'one-model-fits-all' approach fails. Degefe (1998,14) noted that, "while this modality may be correct for those economies where markets are very well developed and are at the full employment level, this one-model-fits all approach is wrong for those countries suffering the consequences of high unemployment of natural and human resources and the market is in the process of development."

The limited success of structural adjustment programs in Africa has compelled even the major financing institutions to recognize the positive role the state can play in the process of development, beyond acting as a night watchman. For instance, the book entitled 'Sub-Saharan Africa: From Crisis to Sustainable Growth' that was published by the World Bank (1989) acknowledged the importance of the state in managing development and social change, and attempted to bring the pro-active role of the state in development back on the agenda. Nonetheless, this assertion does not seem to be a wholehearted assertion.

Mkandawire (1998,13) notes that "In 'Adjustment in Africa' (World Bank 1994) and 'Bureaucrats in Business' (World Bank 1995), the World Bank reverted to its more familiar ideological terrain in which a developmental state borders on an oxymoron."

6.4 Development trends in Sub-Saharan Africa

History is about change in the environment, not about the status quo. Throughout most of human history, the growth of population, the rise in income, the degradation and depletion of resources, the restructuring of societies and the development of new technologies were usually slow. In contrast, the pace of change in all of the above factors during the last several decades has been very rapidly. Population growth at the rate we know today has no historical precedent. The global growth in output of goods and services in just one decade, from 1984 to 1994, totaled more than $4 trillion–more than from the beginning of civilization until 1950 (Brown et al. 1995).

As can be seen from Table 8, the annual production of the world economy has grown by six times in a period of less than half a century, since the year 1950. Due to the unprecedented level of mass production and globalization of the international trade, the export market has grown by more than eleven fold during the same period. Although this side of the economic trend seems to reflect a generally positive trend in terms of global economic growth, the situation is very different when we consider the effect of this global economic growth on developing countries.

Table 8: Global economic Trends

Year	**Gross World Product**		**World exports**	**External debt ***	
	Total	Per person		Debt	Debt service
	(bill. 1987 dollars)	(1987 dollars)	(bill. 1990 dollars)	(bill. 1993 dollars)	
1950	3,800	1,487	328		
1955	4,900	1,763	451		
1960	6,100	2,008	586		
1965	7,900	2,362	799		
1970	10,100	2,727	1,263	217	33
1975	11,900	2,912	1,640	512	56
1980	14,100	3,165	2,211	1,140	171
1985	16,000	3,297	2,475	1,453	193
1990	18,800	3,549	3,337	1,687	195
1994 (prel)	20,100	3,577	3,924	1,945	199

(Source: Mebratu, D. 1996. Sustainability as a scientific paradigm. IIIEE, Lund University. Lund.)

For instance, the debt and debt-servicing burden of developing countries has shown a significant increase since 1970s exacerbating the state of poverty in the developing world. This reflects the extremely polarized effect of the global economic growth observed in the post-World War II era and forms the nucleus of the global economic crisis faced by humanity in the post-industrial era. Coming to the specific case of SSA, its economy declined from the 1970s through to the mid-1990s. Tables 9 and 10 show how the SSA economy declined in terms of Gross Domestic Product (GDP) and per capita GDP after an impressive start at independence. As can be seen from Table 9, SSA had an annual average real GDP growth of 4.7 percent between 1966-73. This has declined to 1.5% between 1990 and 1995. For the first time in the last two decades the average growth in GDP reached 4.4% in 1996. This was due to a number of favorable conditions that includes good harvest and a price increase in major primary commodities exported from Africa.

Table 9. Growth in GDP in SSA (Annual percentage change in real GDP)

1966–73	1974–80	1981–90	1990–-95	1996	1997
4.7	2.8	1.9	1.5	4.4	3.0

(Source: World Bank, 1998)

Similarly, SSA registered 2.0 percent average per capita growth between 1966-73. This figure has declined to -1.1 % for the period between 1991-95. The figures have shown some improvement in the years 1996 and 1997 as a result of the improvement in GDP during those years.

Table 10. SSA's Gross Domestic Product Growth Per Capita (Annual % change)

1966–73	1974–90	1991–95	1996	1997
2.0	-0.7	-1.1	0.8	1.8

(Source: World Bank, 1998)

Contrary to (or as a result of) the dismal state of economic growth, Africa's debt has grown geometrically during the last three decades. In 1960, SSA's external debt amounted to less than 3 billion USD and the average debt service ratio was only 2% of exports. During the 1970s and 1980s indebtedness advanced rapidly, from $84,049 million in 1980 to 223, 298 million in 1995.

In 1996, the total debt increased by about 5%, to $235, 400 million. The region's aggregate ratio of debt to exports was estimated at 239.9%, in 1996. Table 11 shows the extent of Africa's debt in measurement with its GDP and export earnings.

Table 11. External debt and related statistics (for the whole Africa)

Indicator	**1996**	**1997**	**1998**
Total debt (billions of US$)	340.6	344.1	350.1
As a percentage of GDP	67.8	64.7	65.5
As a percentage of Exports of Goods and Services	293.4	283.9	302.8
Debt service (billions of US$)	31.0	33.0	35.7
As a percentage of exports of goods and services	29.3	21.3	30.9

(Source: UNECA, Economic Report on Africa, 1999.)

Africa has also been missing the large expansion of international trade. Africa's share of global trade has fallen from around 3% in the 1950s to around 1% in 1995. Its contribution to global manufacturing was a mere 0.3% in 1995 (ARB, March–April, 1998). The problem is not only in relative terms to the rest of the world, but also in absolute terms. In 1995, total African exports in nominal dollar terms were actually 10% below the level of 1980 (ADB 1997). Unlike much of the rest of the world, the exports relative to GDP ratio, has actually declined from 31% in 1980 to 28% in 1995 (World Bank 1997). What is particularly interesting is the structure of exports. In 1970, 92% of African exports were in primary commodities (fuels, minerals, metal, and other primary commodities). In 1991, the figure was exactly the same (World Bank 1993a).

Terms of trade for Africa have been declining increasingly in the past fifteen years. The average annual declines were – 6.2, - 2.5 and – 3.2 respectively for the periods 80–85, 86–90 and 91–95 (ADB 1997). The relative decline in the terms of trade in Africa is also directly related to the shifting nature of global production. The emphasis on raw material and primary product's export is very problematic in an era in which knowledge becomes a larger proportion of the value added to commodities (Stein 1998). The poor performance on the export side of manufacturing is also reflected in the production side. Between 1980 and 1993 manufacturing in sub-Saharan Africa increased by only 0.9% per annum compared to the pre-adjustment decade when it increased by a reasonable 4.3% per year (World Bank 1995).

Relative to GDP, industry has fallen in sub-Saharan Africa between 1980 and 1995. One indicator of the lack of progress in this area is the percentage of the labor force in industry that was 9% in 1994. In 1960, the figure was 7% (UNDP 1997).

In general, the preceding discussion indicates that SSA is in a worse position than it was in 1970s by all major economic indicators. The economic malaise facing SSA today is serious. About three fourths of the countries in the region are classified in the low-income category. From all the developing regions in the world, SSA is the most overburdened by foreign debt, the most dependent on foreign financial and technical assistance, the most dependent on food aid and imported food. On the social front, the social development efforts undertaken by African national governments, bilateral development agencies and international organizations have led to some positive, but limited, results. For instance, between 1960 and 1994 life expectancy increased from 40 years to 52 years, while since the mid-1980s the proportion of the population with access to safe water has almost doubled, from 25% to 43% of the total (Spark 1998). During the past two decades adult literacy advanced from 27% to 55%. Between 1960 and 1991 female enrollment at the secondary level quadrupled, from 8% to 32%. Over the past three decades, the infant mortality rate fell from 167 live births per 1000 to 92 per 1000. Even if there are some improvements in the sphere of social development, SSA still has the worst record on social indicators.

6.5 Reasons for SSA's development failure

There is very little disagreement regarding the severity of the economic crises facing most African countries. However, there are divergent views regarding the causes of such poor economic performance. As discussed in chapter 6.3, the World Bank and IMF relate the failure of development strategies in SSA to the macro-policy distortions that are induced by African governments. According to this group, the situation is aggravated by endogenous factors such as inappropriate economic development policies and market distortion, lack of political will to make the necessary economic reform, lack of skilled manpower for public sector management and entrepreneurial development, and high population growth which exceeds 3% per annum for many African countries.

There are others who blame forces beyond the control of economic policy makers in the region for the poor performance. According to this group, the following are some of the exogenous factors that are, most commonly, cited as reasons for Africa's economic failure.

- Inequitable global trading system, which led to the continuous decline of the prices of primary commodities;
- Increasing debt burden for which debt servicing will require up to 85% of export earnings;
- Lack of foreign direct investment in African economies;
- Continuous decline of overseas development assistance; and,
- Natural calamities, such as drought.

However, when one looks at the better performance of SSA in earlier periods, where there were similar external shocks, and the faster growth of low-income countries in other regions that have faced similar external conditions as SSA, the contribution of disoriented domestic policies to economic problems seems to weigh more heavily. Even if the exogenous factors exacerbated the situation, what makes the economies of SSA particularly vulnerable to exogenous shocks and natural disasters are the peculiar domestic conditions prevailing in SSA. Factors such as the rudimentary nature of its infrastructure, its limited technological base, and the structural disarticulation of its economies with domestic production almost totally dependent on imported capital and intermediate goods do contribute to underdevelopment.

In addition to the above, the neo-Weberian critique has focused on the failure of African states to establish themselves as rational-legal institutions and to rise above the "patrimonialism" that affects all of them, regardless of their ideological claims and the moral rectitude of individual leaders. Going back to the functions that modernization had assigned to the state, the neo-Weberian highlights the flawed nature of the performance of the post-independence state, especially in its relationship with a society at large. In these accounts, "market failure", that is central to development economics, and "government failure", that is central to neo-classical economists, are replaced by something more debilitating and more recalcitrant – "societal failure". It was signaled not only by lack of "social capital", but also by the disease-like spread of this societal malaise into both market and state structures (Mkandawire 1998).

In post-colonial Africa, there has been a strong inclination to argue Africa's case in relation to global or external rather than local and internal forces. It is true that today, each country is much more affected by what is going on in the rest of the world, and notably with what is happening to the world economy. However, as pointed out by Hyden (1983), 'changes in the international environment may accelerate or impede social and economic processes within a given country but these factors are not determining elements'. Many authors have tried to analyze the limitations of development strategies promoted in SSA from different perspectives. Most of these analyses do not go beyond finding an explanation as to why a specific development strategy failed due to factors that fall outside the process of developing the strategy in the first place. In the context of this research, the following can be said in line with the analytical framework that was presented at the beginning of this chapter.

1. *Pre-analytic vision:* Self-reliance and self-sustainment as described in the Lagos Plan of Action have been the key elements of the pre-analytic vision for most development strategies developed at the regional level. While self-reliance and self-sustainment that takes the internal and external environment into account are very much desirable, the interpretation given to them in the African context seems to be very much influenced by the desire to be independent from the colonial vestige. Furthermore, its implementation has had limited success due to the lack of the necessary prerequisites for its implementation at the national level. On the other hand, neo-classical economics has been the dominant school of thought that has provided the pre-analytic basis for most of the strategies that have been developed by the BWIs. The success of the neo-classical economic model is dependent on the fulfillment of the basic assumption of a perfectly competitive market and a rationally deductive behavior of consumers that exist (if they do) in a very different context in SSA. Most of the development efforts that have been undertaken so far are based on imposing a development model which has been thought to be successful somewhere else with the general assumption that it should work for promoting development in Africa. The effort of imposing the dominant model in Africa has failed due to the absence of the basic prerequisite for the success of the neo-classical model.
2. *Local-global responsiveness:* Both the regional initiatives and the strategies promoted by the BWIs suffer from a lack of understanding of how the local socio-economic dynamics function. Africa's primordial and patrimonial relationship, which has been referred as the "economy of affection" by Hyden (1983) has never been given due consideration in any of the economic analyses and strategy development. According to Hyden (1983) the "economy of affection" is an underestimated threat to the macro-economic ambitions of either capitalism or socialism in Africa.

Derived from a mode of production in which the structural interdependence of the various production units is minimal or nil, it has no provision from a systemic superstructure to keep it together. Instead the economy of affection is a myriad of invisible micro-economic networks which, if allowed to penetrate society, gradually wear down the macro-economic structures and eventually the whole system. The threat of the affective networks stems from their invisibility and intractability. It is the lack of consideration to this important aspect of the African Socio-economic fabric that has led to failure after failure of development strategies promoted by the various national and international organizations. This has led to a serious disregard of the local dynamics of the African socio-economic structure that is the basis for any meaningful transformational process. Even if Hyden presented the "economy of affection" as a threat to modern economic development, it may have some positive elements that could be useful to promote 'development with a human face' that is an important attribute of sustainable development.

3. *Factor variation:* Even if there are numerous factors that influence the development process, all of these factors can be categorized into fundamental and facilitating factors depending on their level of influence in the whole process. From a development strategy perspective, the fundamental factors are the factors that determine the interaction between the 'Entity factors' and the 'Significance factors' discussed in Chapter 4. The level of distinction made between, and the treatment given to, fundamental and facilitating factors of the development process is a critical element in determining the effectiveness of a development strategy. The dominant strategies that have been promoted, so far, in SSA do not make any distinction between the fundamental factors that determine the nature and direction of the development process and the facilitating factors that determine the pace of the development process. Thus, the enormous effort that has been put into creating the facilitating factors have had limited success in the absence of having the fundamental factors in place.
4. *Socio-Ecological consideration:* The predominant notion of socio-ecological consideration in the policy arena is to address them in the context of developing add-on environmental policies. Studies conducted in different countries have, however, indicated that all macroeconomic policies have different forms of socio-ecological impacts. In order to avoid adverse socio-ecological impacts, it is advisable to give early consideration to socio-ecological factors in the process of generating development strategies. The consideration given to socio-ecological issues is virtually nil in most cases of the development strategies. Even those that give minor recognition to these factors have not gone beyond a brief statement about the importance of giving due consideration to socio-ecological factors.

5. *Socio-economic impacts:* prescribing development strategies for SSA has increasingly become a common exercise since the end of the 1970s and the beginning of the 1980s. All of the major regional development strategies that have been reviewed under this research were generated since then. As can be seen from the data presented in Chapter 6.4, socio-economic development in SSA has continuously declined from the situation it was in the 1960s and 1970s. Even if some sub-Saharan African countries have registered limited improvement in terms of some of the socio-economic indicators in 1996 and 1997, according to UNECA (1999,51), "over two thirds of the African countries are still classified as having a low economic sustainability index."
6. *Adaptive mechanisms:* The failure of the principal development strategies prescribed for Africa has been evident since the early years of their implementation. There have been some attempts to learn from the lessons. But these attempts were not aimed at reviewing and reorienting the whole process of the strategy development process. The process of strategy development involves a sequence of interacting stages that determine the whole effectiveness of the strategy. This process includes the pre-analytic vision, the procedures, the model, detailed strategies, implementation and indicator parameters for evaluation. Most of the review processes in SSA were limited to the manipulation of the indicator parameters, implementation factors and some of the strategy elements. It has never gone to the level of reviewing the whole process of the strategy development. Considering the chronic nature of strategic failure in SSA, a review process that is limited to the lower end of the strategy development process cannot lead to any improvement.

According to the conceptual framework presented in Chapter 4, the capacity of any society to promote sustainable development is ultimately dependent on its ability to identify, process, accumulate and transfer survival-relevant information. This, in turn is very much dependent on ensuring an efficient interaction between the entity factors and the significance factors of that specific social system. It is this process that leads to any form of social transformation. The development strategies that have been promoted in SSA so far are more 'transplanting' rather than being 'transforming' in nature. As a result, there are fundamental mismatches between strategy frameworks proposed and local operational realities on the ground. This is the major reason behind the limited success of most development strategies promoted in SSA.

CHAPTER

SEVEN

7. Framework for SID strategies in SSA

During the twentieth century, human endeavor has been directed largely to the creation of economic growth through the use of natural resources and to sustaining expansion by subordinating nature to satisfy human needs. Practiced both in the industrialized world and the developing countries, this endeavor has not only strained the physical resources that sustain human organizations, it has also created many social tensions that threaten mankind today. Consequently, a number of new problems have appeared as the twentieth century drew to a close. The problems have manifested themselves in social and ecological limits to realizing and maintaining widespread public welfare. They call for finding ways to achieve organizational stability and social equity, and adapting society to live as a part of the global ecosystem (Meadows, 1994)).

From a policy perspective, the distinction to be made between growth and development has been holding a prominent place in the debate. In this context, it will be important to understand the distinction and relationship between economic growth, social development and sustainable development. In the context of this research, the distinction and relationship between these three concepts can be depicted by the scheme given in Figure 8. According to this scheme, productive engagement constitutes the basis for the diagram, without which neither growth nor development will be conceivable. Thus, productive engagement constitutes the common denominator for economic growth, social development and sustainable development.

Neo-classical economics, which has been the theoretical underpinning of economic growth, assumes that the issue of wealth distribution and equity can be met through the 'trickle-down' effect of wealth accumulation while ecological factors are going to be addressed through resource substitutability and internalization of externalities through market instruments. While both the 'trickle-down effect' and 'internalization of externalities' may make some positive contribution, recent trends and the current state of the world clearly shows that these instruments are far from being sufficient to address the problem.

The recognition of the limitation of exclusively 'growth-centered' policies in terms of addressing the issue of wealth distribution has led to a second form of policies that are 'development-centered'. The evolution of other schools of economic thought have played a significant role in the promotion of 'development-centered' policies that combine competition-based economic growth with social welfare. In these kinds of policy systems, an improved environmental quality for living is addressed as one of the elements of social-wellbeing. As a result, countries that have adopted 'development-centered' policy have a better record in environmental quality and management besides having an improved social equity when compared to countries that promote 'growth-centered' policies.

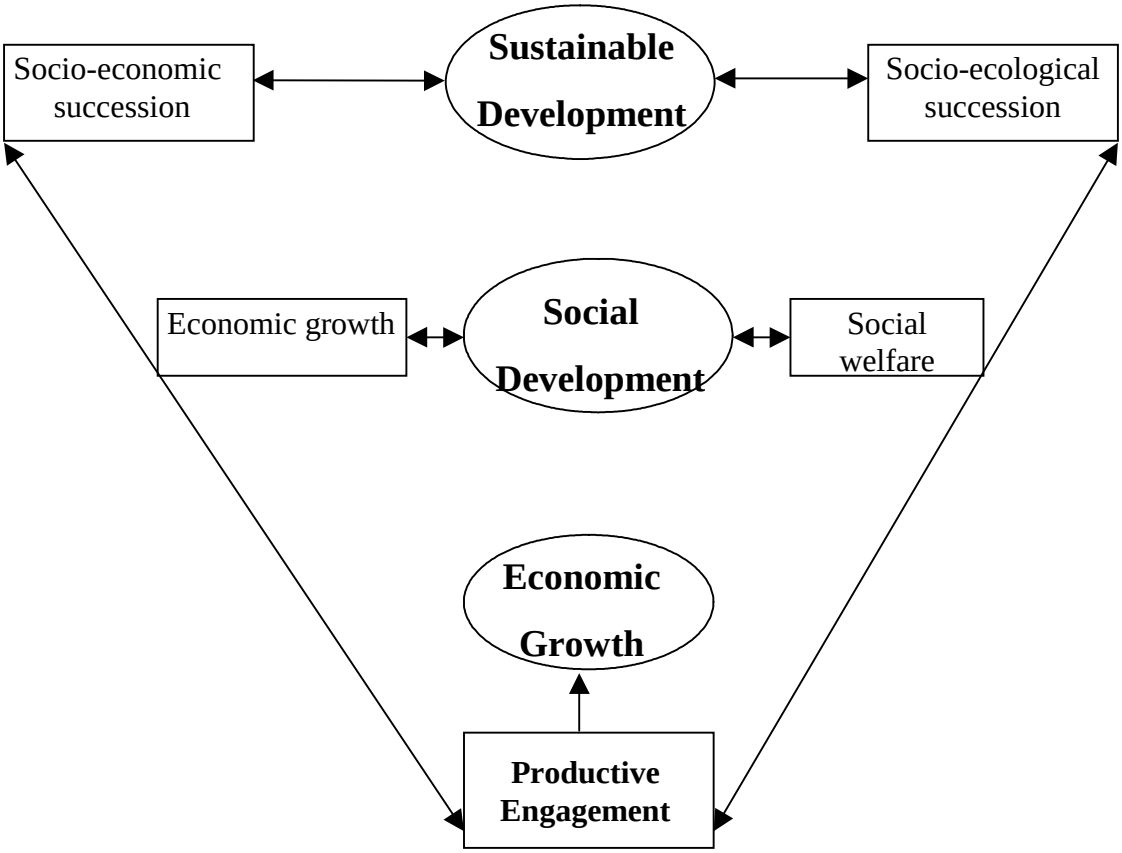


Figure 10: Distinction of and relationship between economic growth, social development and sustainable development

However, the increasing evidence showing different aspects of global ecological imbalance and the growing global economic disparity has necessitated the evolution of a third generation of policies that are 'sustainability-centered'. These kinds of policies will focus on promoting a productive engagement that ensures socio-economic and socio-ecological succession of societies. This does not, in any way, exclude competition-based economic growth. But it promotes a qualitatively different kind of economic growth that is responsive to socio-ecological and socio-economic requirements.

The ability of a country to move towards 'sustainability-centered' policies and strategies is dependent on understanding the dynamics of the entity and significance factors that are described under the sustainable development model. In the context of SSA, the first step is to identify both factors that are undermining countries' capacity to identify, process, accumulate and transfer survival-relevant information related to socio-economic and socio-ecological succession. This chapter focuses on identification of the fundamental factors that are posing developmental challenges in SSA. Based on the principles discussed in the previous chapters and the challenges presented in the first section of this chapter, a framework for sustainable industrial development is proposed. The framework can be used as a guide to develop national policies and strategies that are responsive to local and global dynamics. Finally, the Framework is utilized to evaluate current development strategies in Ethiopia as an illustration.

7.1 The sustainability challenges of SSA

Most documents written on development challenges in SSA include a long list of factors that are influencing development in SSA. The emphasis given to the factors vary widely from one document to another, depending on the specific school of thought or pre-analytic vision embraced by the authors. In the context of this research, the major challenges that are undermining the ability of Sub-Saharan African countries to progress towards sustainable industrial development are resource depletion, disoriented property rights, sectoral dichotomy, and global disorientation.

7.1.1 Resource depletion

Standard growth analysis suggests that it is the accumulation of factors of production, both physical and human capital, along with the increasing productivity of these factors, that determines how quickly GDP per capita will grow (Freeman and Lindauer 1998).

Based on the definition and interpretation of sustainability and sustainable development discussed in Chapter 4, the relationship between ecological space, demography and culture accumulated in the form of both natural and human capital provides the basis for sustainable development. These relationships, expressed as an accumulation of survival-relevant information, are reflected by the state of the natural resources, financial resources, human resources and infrastructural resources, including the physical and institutional infrastructure.

7.1.2.1 Natural resources in SSA

Africa has three distinctive features that help to create special circumstances in relation to the issues of environment and resource management. The first is the basic geologic and geomorphologic history, the second is the distinctive climatic environment, and the third is the history of climate and environmental change (Lewis and Berry 1998). Geologically, Africa is an old continent that achieved its basic form over 200 million years ago when a major break-up of a land block occurred in the Southern Hemisphere. Climatically, Africa can be distinguished as one of the driest continents. About 50 percent of the continental surface has a rainfall deficit season of sufficient magnitude to restrict agriculture and make the area arid or semi-arid. Over 20 percent of this dry land area is classified as arid. Surplus rainfall is generated only from a small part of the continent. The Zaire Basin, mountains and highlands in the northwest, eastern, and central Africa, extreme southern Africa, and the uplands and coastal areas of West Africa make up the bulk of water surplus territory. For much of the continent, however, rainfall variability is the biggest problem in agriculture and utilization of water resources. Rainfall regimes in all but the year-round wet areas, produce a highly variable pattern of precipitation from year to year and, within years.

Major changes in terms of resource management occurred in Africa south of the Sahara with the beginning of colonial interest in this part of the world. According to Lewis and Berry (1988), the colonial division of Africa during the 19th and 20th centuries brought about many different disruptions in normal life patterns. Among the most important were:

- the division into many, often small, territories, frequently with boundaries cutting across cultural groups;
- development of export crops;
- dislocation of the local people from the best land in some parts of Africa, especially in South Africa, Zimbabwe, Kenya, Tanzania, and Zambia; and
- the beginning of a period of population growth and urban growth which was especially rapid from the 1950s onward.

Nigeria, Sudan, and Zaire are the largest countries in SSA. However, many states are small in area and population. Of all African countries, Nigeria and Sudan have the widest range of ecological conditions, Ethiopia, Kenya, and a few others have a good diversity of ecosystems within their borders, but many others are single-ecosystem countries or countries that are dominated by one ecosystem (Lewis and Berry 1988). An example is Niger, a relatively large country in area, made-up almost completely of arid and semi-arid lands. The low level of economic development combined with the common lack of diversity in many states, creates many difficulties in resource development and may be a significant factor in the widespread problems of natural resource utilization.

Although precise data are not available, it is likely that Africa had a steady, albeit slow, population growth until 1900 (Table 12). The population of the continent in 1900 is estimated to have been between 115 and 155 million. After the colonial intrusion, population growth appears to have been checked, perhaps through a combination of circumstances, including the impact of rinderpest in East Africa. Beginning around the 1930s, population growth again took place, perhaps, partly due to changes in colonial policy, as well as due to the diffusion of medical care and public health programs. Around 1950, there was a more rapid growth rate, and annual rates of 2–3 percent became established. In specific countries such as Kenya, the annual growth rate is as high as 4 percent (Lewis and Berry 1988).

Table 12: Population in Africa in millions from 1650 to 2000 (estimated)

1650	1750	1800	1850	1900	1930	1950	1971	2000
100	106	107	111	133	164	222	354	865

(Source: African Environments and Resources, by L.A. Lewis and L. Berry. Boston: Unwin Hyman.)

For decades to come, most Africans will derive their living from the productivity of the soil, water, and vegetation resources of the continent. Yet this continent, perhaps more than others, has real physical constraints on the productivity of the environment. The constraints have been further compounded by different kinds of misuse and mismanagement. In terms of resource characterization, Africa is often misunderstood. There are numerous broad generalizations, yet few are valid when examined within the diverse realities of the continent. This situation often arises because a ‘single specific case has been extrapolated to represent the whole of the continent’ (Lewis and Berry, 1988).

Overriding all resources issues in SSA is the dilemma of two potentially conflicting scenarios: the need for continued economic development and the need for maintaining the natural resource base that is fragile in the light of rapid population growth. In the long run, the sustainability of economic development will depend on the maintenance and enhancement of the resource base. Those parts of the resource base that are most vulnerable at present are woody resources, especially in semi-arid and savanna areas, water resources in dry areas, and soil resources, especially in the highland, savannas, and semi-arid locations. Most of the energy needs for the majority of the people in Africa are still met by the use of traditional fuels, especially wood and charcoal. Woodland resources are most threatened when areas of high demand for wood and charcoal are coincident with areas of low supply and slow plant growth. Water is obviously a critical component in the economic life of most African countries. The last few years have heightened the realization of the delicate balance between water availability and need as drought laid bare the fragile nature of many semi-arid and savanna production systems. The water problem of some sub-Saharan African countries (such as Ethiopia) is a question of uneven geographical and time distribution rather than being a net shortage. Soil resources in SSA start off with generally modest levels of productivity, though some localities have a combination of soils and climate potentiality as productive as any part in the world. Of greater immediate concern is the problem of land deterioration in the more highly productive parts of Africa. These areas are much smaller, but they produce a very high percentage of most nations' food and export crops. A drop in their productivity through environmental degradation is hard to replace since most high-potential areas are already under cultivation. Once land degradation occurs in these areas it is difficult and costly to reverse. The overall situation of natural resource indicates there is an urgent need for people-based conservation effort. Moreover, such conservation efforts must be supported by structural transformation (including demographic transition) that eases the burden on the carrying capacity of the potentially fragile natural resource base of SSA.

7.1.2.2 Financial resources in SSA

During the liberation decades of the sixties and seventies, the politics of "nation building" have been the primary focus of the first generation of African leaders. This has been followed by decades of economic independence that has been pursued with the desire of being 'fully independent'. The 1990s have seen signs of a new leadership whose focus is in the economics of "nation building." These new leaders are prepared to promote economic growth and seem to view good growth indicators as the main source of their legitimacy. In addition, the new leadership seems much less preoccupied with national control. They have embraced privatization and attraction of foreign capital as central to their policies.

The majority of these leaders are more attentive to the apprehensions and appreciation of international organizations than to their domestic capitalists. "While, assiduously, cultivating a good image in the eyes of international financing institutions and seeking out foreign capital, they tend to have a jaundiced view of domestic capitalists, whom they hold in spite and incessantly vilify for parasitism, and failure to set up modern enterprises able to compete internationally" (Mkandawire 1998,6).

Despite this bias, Africa's participation in the flows of foreign direct investment is minute and has actually been shrinking in recent years. According to UNCTAD, Africa's share of developing country's FDI has fallen from 11% in the 1986–90 period to 5% during 1991–96, and decreasing to a mere 3.8% in 1996. In the period 1991-95, the total investment going to Africa was only 2% of the world's total FDI. Nigeria, with its foreign dominated oil industry, accounted for 44% of the total in 1996 with the other 46 countries receiving only 0.6% of the world's total. In comparison, in 1996, Malaysia and Poland received more than the total of the entire continent (ARB June–July, 1997; ARB March–April, 1998).

For all the talk about "globalization", the process of capital accumulation in a specific country ultimately depends on national characteristics and policies towards both foreign and domestic capital (Mkandawire 1998). A stable foreign investment flow can only be achieved, if the private domestic capital plays its catalytic role. It has become clear that capital does not flow from the developed to the developing countries on the scale implied by the relative factor endowment doctrine (Eastwell, 1996; Krugman, 1992). There is growing theoretical and empirical evidence suggesting that the current segmentation in global markets is such that certain regions may not benefit from capital movements. The region that is invariably cited is SSA.

Incidentally, capital accumulation will be largely national for much of Africa. Indeed, given Africa's tarnished image, increased confidence by Africans in the continent's future will be of prime value in resuscitating investment. Under the prevailing conditions in most of the sub-Saharan African countries, 'it is unrealistic to expect a turnabout in private foreign capital inflows, even with reforms. In this context, African governments must first cultivate the confidence of their own domestic investors' (Chege 1992,159). As with good governance, sensible economics begins at home. Kennedy (1988,191) pointed out that, 'in the final analysis, only powerful and capable local interests - public as well as private - possess a degree of permanent and profound commitment to a national need sufficient to generate the momentum required for a successful onslaught against the condition of dependent, distorted and restricted development'.

This has been recently echoed by Prime Minister Meles Zenawi (1999b) of Ethiopia who underlines that unless the domestic private sector leads the way with enthusiasm and confidence, it is unlikely for foreign investment to take part in African economies with any degree of effectiveness. Zenawi (1999b,2) further states that "the reason for emphasizing the role of domestic private sector is neither philosophical nor political. It is merely practical."

The problem with African capitalists is not lack of "thriftiness" but lack of faith in their own countries as investment sites and the consequent propensity to expatriate capital abroad. One should stress here that funds held by Africans abroad amount to hundreds of billions US dollars. Africa has a larger portion of wealth held overseas by residents than any other continent; 39 percent compared to 6 percent for East Asia before the crisis (UNECA 1999). The possible stemming and reversal of capital flight, which has devastated Africa's development over the years is, therefore, another possible non-conventional source of financing development which has not been adequately explored. Notwithstanding definitional problems, there is ample evidence that the amount of capital flight is significant. Between 1982 and 1991, capital flight from the severely indebted, low-income countries in sub-Saharan Africa was about $22 billion (Ajayi 1997), equivalent to about half the external resources required for development, as estimated by Amoako and Ali (1998). It should also be noted that as Africa struggles to cope with debt, the average capital flight /debt ratio was over 40 percent for about eighteen SSA countries. For some countries it is even much higher (94.5 percent for Nigeria, 94.3 percent for Rwanda, and 74.4 percent for Kenya) (UNECA, 1999).

Capital flight constitutes a menace to and a diversion of resources from Africa's development. According to Ajayi (1992), there are serious negative consequences of capital flight. First, money sent away to foreign lands cannot contribute to domestic investment. Thus, capital flight is a diversion of domestic savings from domestic real investment. Second, income and wealth generated and held abroad are outside the purview of domestic authorities, and therefore cannot be taxed. Thus, potential government revenue is reduced, thereby constraining project execution and debt servicing capacity. Third, income distribution is negatively affected by capital flight. The poor citizens of African countries are subjected to austerity measures in order to pay for external debt obligations to international creditors.

Although global flows of capital are much in the news, there is strong evidence that suggests that industrial investment is correlated with domestic savings. This home country bias in investment highlights the importance of domestic market conditions and institutions in capital accumulation. Relative to other regions, SSA invests less of its own capital at home than other developing areas. Ajayi (1992) indicated that despite a lower level of wealth per worker than in any other region, Africa's wealth owners have relocated 37 percent of their wealth outside the continent. This compares to a ratio of 17 percent in Latin America and only 3 percent in East Asia. They note, 'if Africa reduced its capital flight to that of Asia, its capital stock would increase by a half'.

Given the magnitude of capital flight and its macro-economic significance, the policy challenge is how to stem capital flight and cause its reversal. In order to achieve this objective, there is a need for an understanding of the causes and means of reversing capital flight from Africa. As usual, most of the analyses regarding the causes of capital flight are focused on facilitating factors such as macro-economic stability (Ajayi 1992), political stability, relaxed regulation of banks in developed countries (UNECA 1999). It is true that these factors aggravate the capital flight situation in Africa. However, as pointed out by Freeman and Lindauer (1998), protection of property rights and an overall reduction in the riskiness of the domestic economic environment are probably more important factors in encouraging domestic savings to be invested in SSA's economies than more open economies.

7.1.2.3 Human resource depletion

Human capital plays a decisive role in the process of economic development and investment in this field constitutes a prerequisite for sustained economic growth. Most developing countries suffer from a low level of investment in human capital and to make things worse, public education has been one of the sectors that has suffered a major setback during the adjustment periods of the 1980s and the 1990s. This has been further aggravated by a massive outflow of the few skilled manpower they have trained using scarce domestic resources. This form of resource loss has not received much attention from policy-makers, researchers and the international community at large. Given increasing brain drain from developing countries, it is therefore, difficult to conceive of sustained economic development taking place in these countries based on the assistance of highly paid expatriate and foreign based national experts.

Many in the West maintain the view that 'brain drain is a myth' while empirical evidence shows that brain drain is causing a serious problem for developing countries (Aredo and Zelalem 1998).

The theoretical underpinning of international migration of skilled labor from developing countries has remained controversial since the 1960s, but can largely be traced to two schools of thought, i.e. the neo-classical school and the structuralist/center-periphery school (Aredo and Zelalem 1998). The neo-classical school, which introduced a degree of refinement to classical economic theory, recognizes the presence of both winners and losers in migrant-receiving and sending countries. It basically, argues that migration of workers from low to high wage countries ensures a more efficient use of labor and narrows inter-country wage disparities. This school usually emphasizes the significance of skilled labor out-migration from developing countries in lowering unemployment, raising wages, boosting economic growth and household welfare in developing countries, through greater access to resources like remittances and skills of potential returnees to home countries. Ricca (1989) argues that, in many countries, migration of qualified personnel is not a one-way flow, but rather a two-way flow benefiting both the migrant-sending country and the individual immigrant. Closely related to these views, human right's activists consider skilled labor migration as the "free flow of people and ideas", "the free exchange of information" or "the free movement of scientists" (Vas-Zoltan 1979).

In contrast to the above, the structuralist and center-periphery school of thought argue that international migration of skilled labor takes place between economically and politically unequal partners and, as a result, widens rather than narrows inter-country wage and income disparities. In line with the above, Todare (1989) argues that brain drain from poor to rich countries only occurs to reap the benefits from and contribute to the further development of already affluent nations. Ghosh (1996) also notes that, skilled labor migration from developing countries may actually lead to the postponement of structural changes needed to generate and sustain a process of dynamic and broad-based development, since the sending country loses some of its most innovative and enterprising workers. According to Fadayomi (1996), the direction and magnitude of migration in Africa changes with fluctuations in economic growth. ECA estimates that, between 1960 and 1975, about 27,000 high-level African professionals left for developed Western countries. In a 1995 World Bank study, it was noted that some 23,000 qualified academic professionals emigrate from Africa each year in search of better work conditions. On the other hand, a sizable number of highly skilled individuals and artisans in Africa migrate from one African country to another, or to the gulf states, due to a combination of economic, social and political factors (Fadayomi 1996). As a result of the above, African countries have lost as much as one-third of their highly skilled personnel in recent decades, the region having lost an estimated 60,000 middle- and high-level managers between 1985 and 1990 (Aredo and Zelalem 1998).

Table 13 shows the number of African professionals admitted into the USA between 1982 and 1989. It provides some additional information on the magnitude of brain drain from Africa to the USA, one of the wealthiest nations in the world. Africa's share in the total number of skilled migrants admitted to the USA may appear relatively small. However, such outflows can be viewed as substantial when viewed in relation to their potential contribution in Africa or when compared to the number of professionals currently working in African countries (Aredo and Zelalem 1998). This situation has been made worse, where the emigration of African professionals has necessitated their replacement by more expensive expatriate experts, who in Africa alone, numbered 30,000 in 1993. The World Bank estimates that 100, 000 expatriates from the industrialized countries are employed in Africa at a cost of U.S. $4 billion per year, amounting to nearly 35% of official development assistance directed to the continent (Aredo and Zelalem 1998).

Table 13: Total number of African professionals admitted into the USA, 1982-1989

	1982	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**
Ethiopia	202	188	190	171	157	144	198	372
Cape Verde	27	25	23	24	25	23	26	42
Ghana	138	165	152	182	175	159	164	309
Kenya	162	192	212	196	201	203	207	261
Liberia	85	46	52	63	95	75	78	136
Sierra Leone	47	44	47	55	45	59	55	96
Tanzania	110	94	128	102	102	121	103	156
Uganda	92	101	107	63	81	63	41	124
Nigeria	340	278	277	339	435	492	547	1,015
Total Africa	2,855	2,569	2,737	2,864	3,161	3,331	3,353	4,783
Total World	64,740	58,690	58,840	62,280	63,370	54,099	65,202	90,739
Africa as % of World	4.4	4.4	4.7	4.6	5.0	5.2	5.1	5.3
Ethiopia as % of Africa	7.1	7.3	6.9	6.0	5.0	4.3	5.9	7.8

(Source: Aredo, D. and Zelalem, Y. 1998. Skilled Labor Migration from Developing Countries: An Assessment of Brain Drain from Ethiopia. Addis Ababa: Ethiopian Economics Association.)

Authors belonging to different schools of thoughts have identified a number of factors as the major causes for brain drain. These authors divide the factors into the push factors that are related to the condition in the developing world and the pull factors that are related to the situation in the developed world. In most cases, the factors' analyses are limited to the presentation of facilitating factors without addressing the fundamental factors that drive the brain-drain process. The following are identified as the major fundamental and facilitating factors in the context of this research.

Table 14: Fundamental and facilitating factors of the brain-drain process

Fundamental factors	Facilitating factors
Mismatch between African educational curricula and national socio-economic realities	Lack of conducive working conditions and research facilities
Mismatch between training and job-opportunity	Lower payment, weak institutional incentive and recognition system
Heavy reliance on foreign and international expertise and bias against local expertise	Running away from political harassment and persecution

There have been few international efforts aimed at luring back nationals from abroad by addressing some of the facilitating factors. One such recent endeavor was to encourage Ethiopians living abroad to return to their home country for a limited period of professional service through the program of 'Transfer of Knowledge through Expatriate Nationals' (TOKTEN). This program was financed by UNDP, with about US $400,000, but appears not to have been very successful. According to Minas (1993), out of the 30 Ethiopians who came back to Ethiopia under TOKTEN, only one decided to remain in Ethiopia, all the other 29 have gone back to their respective countries of residence. This shows that, even if addressing the facilitating factors is necessary, in the absence of a mechanism which deals with the fundamental elements, it will not lead to the desired result of reversing the current trend of brain drain. Reversing the flow of highly skilled human resources of African countries is a challenge that has to be faced by all sub-Saharan African countries as high priority. Without being able to achieve this reversal, the numerous capacity-building initiatives by the developed world could be no more than a fad and Africa will continue to be dependent on the expertise of the developed world.

Another major development challenge that has been faced by SSA from human resource perspective is the alarming spread of AIDS (Acquired Immuno-Deficiency Syndrome) epidemic in the region. According to a report released by the World Bank (1999), in 1982 there was only one country in SSA that had the prevalence rate of above 2%. By 1998, 21 countries in SSA had a prevalence rate that is above 6%. It is not only the sheer size of the population affected by AIDS that becomes a grave concern for SSA, but its attack on the most productive segment of the society aged between 18 to 45, makes it detrimental to the overall development efforts in SSA.

7.1.2.4 Infrastructural resources in SSA

The two major categories of infrastructural resources that are critical to any country's development efforts are the physical infrastructure and the institutional infrastructure. One of the principal causes of weak performance of existing African industrial enterprises and equally a reason for the hesitation of foreign investors is the lack of adequate supporting physical infrastructure. The term 'physical infrastructure' covers a wide range of supporting services that are required for an effective movement of materials and information and the availability of utilities for production and consumption activities. The impact of these services on the health, productivity, profitability, and even the very survival of industries is self-evident. The availability of regular supplies of power and water determine production and capacity utilization. Effective postal, telephone and telecommunications services influence the speed and reliability of information exchange and decision making.

The coverage of physical infrastructure in SSA Africa is significantly low in terms of providing adequate physical infrastructure for the development process. Moreover, poor administration and maintenance of already existing infrastructures have led to the continuous deterioration of existing physical infrastructures resulting in increased operational costs. For instance, due to poor road conditions, costs are generally so high that road transport costs in Africa are estimated to average 2.5 to 3 times higher than those of other regions in the world (UNECA 1991). A large part of the deteriorating road network can be saved at reasonable cost if timely periodic maintenance is undertaken. However, the cost of restoring deteriorated roads is three to five times greater than that required if effective maintenance had been undertaken. According to UNECA (1991, 9-10), "by failing to redirect public spending to maintenance and by constructing new roads instead, some African countries have been found to lose 3 to 4 km of potentially good roads for every kilometer of new roads constructed."

This indicates that African countries and their development partners should place as much emphasis as possible on building local capacities for maintenance and administration of existing infrastructures as they are putting on building new ones.

Another important physical infrastructure that is critical to sub-Saharan Africa's economic development in the following decades is the dynamic evolution of information and communication technology (ITC). The transformation of the global economy towards a knowledge-based economy has been enhanced by the fast development in ITC in recent years. Unfortunately, SSA is lagging very much behind in terms of catching-up with the development in ITC. The number of telephone lines that exist in SSA is comparable to that of Manhattan City in the US, and Lithuania has more Internet providers than SSA (Samara 1999). This shows the enormity of the challenge for SSA to compete in the global economy that has increasingly become information affluent. While Africa's weak infrastructural base may be a source of concern in terms of catching-up with the global information trend, the digital satellite that was launched by the World Space Foundation[10] to provide an information links for Africa is a major source of hope that has to be utilized by SSA.

While the physical infrastructure together with other resource bases provide the material base for industrialization, the institutional infrastructure provides the brains, the thinking process and the impetus for stimulating industrial development. The term "institutional infrastructure" covers a variety of institutions that directly or indirectly affect the process of industrialization. Clearly, the most important of these institutions is the Government itself. The framing of policies determines whether there exists an "enabling environment" for industrial growth. The policy framework covers fiscal and monetary policies, import-export regulations, investment codes, licensing procedures and so forth. But even an optimum set of policies would not produce results if the institutional mechanisms of implementation do not function effectively.

The pre-independence period witnessed the establishment of agencies to handle modest programs of socio-economic development. On independence, the government responded to the popular yearnings for material benefits by creating new institutions and launching new programs. Institutional expansion was an indicator of growth during the post-independence period. Corresponding to the increase in the number of government agencies is the growth in the public sector employment.

[10] World Space Foundation is a US-based private foundation which was established to provide information to the developing world. Accordingly, it has already launched a satellite for Africa.

Kenya's public service employed 45,000 persons in the mid-1950s, 63,000 in 1965, 84,500 in 1971, and 170,00 by 1980. The Senegalese government employed 10,000 shortly before independence in 1960, 35,000 in 1965, and 61,000 by 1973 (Luke 1991). Ghana's public service employment grew between 1975 and 1982 at a rate five times faster than the growth of the labor market (Luke 1991). Tanzania offered employment to 113,171 persons in 1970 and 256,754 in 1985. According to Balogun (1995), a critical assessment of the role of Africa's civil service over the past three decades reveals a pattern of qualitative decline in institutional capacity.

Overcoming the inefficiency of the public service was one of the foci of SAP. The entire exercise has been aimed at removing impediments and reducing what the 'World Bank's Long Term Perspective Study' graphically describes as the 'high cost of doing business in Africa'. One central tenet that structural adjustment has involved is 'rolling back the state'. Mkandawire (1998,17) argues that "while it is true that any kind of response to the fiscal crisis of the state may have justified drastic reductions in state expenditures, both the cognitive framework through which the problem was based and the actual solutions proposed led not so much to the rolling back of the state. It rather led to the erosion of its capacity as a state." The literature informing these possibilities has suggested that the public expenditure in Africa is too high largely because of a bloated bureaucracy that drains the state coffers. The standard policy prescription was retrenchment of the civil service. While the literature on "downsizing" has always assumed the simultaneous introduction of performance enhancing measures, the reduction of the civil service in Africa has usually gone hand in hand with declining real wages and uncertainty even for those that remain on the payroll.

The inefficiency of civil service or public administration in SSA is not only related to the sheer size of the machinery. It is rather more related to its disoriented objectives that are predominantly oriented towards serving the political system in power rather than providing services to the general public. This is due to the highly politicized base of the civil service in Africa that has its roots in the colonial era of public administration. As a result of this disoriented objective, civil service structures in SSA have become instruments for consolidating power rather than promoting development and providing services to the public. The dominance of its political function has given it the tendency to turn even the simplest procedure into a "ritual object" that its clients must worship. This combined with the lack of balance between bureaucratic and non-bureaucratic elements in the emerging societies of Africa has opened the door to 'ego-centric normlessness' and 'administrative prodigality' (Riggs 1964).

This situation has been unwittingly exacerbated by the bilateral and multilateral development aid policies that placed an exclusive emphasis on partnership with governments, until recently, with little effort on developing civil societies as development partners. Balogun (1995) argues that, apart from the difficulties facing relatively inexperienced officials in managing and controlling a rapidly growing bureaucratic empire, the steady erosion of the inherited values and norms accelerated the pace of institutional decay, which, in turn, undermined the effectiveness of the public service.

An equally important component of the institutional infrastructure is the educational system. The strength and capability of the system assumes particular importance in light of the objective to build up African skills as a basic element of the industrialization process. In modern societies, it is almost axiomatic that the level of economic development is directly proportional to the level of human resources. The economic prosperity of the industrialized world is no accident. It is the result of a high level of human capability. Underdevelopment of the African continent, in large measures, reflects the underdevelopment of its human resources.

Modern education in Africa is an activity that was started by the colonial powers. Its main objective was to generate the required manpower for the expanding public administration services. Hence, their primary focus, especially, at a higher level, was on the field of social sciences with limited attention to the science and technology fields. As a result, the educational system in most of the sub-Saharan African countries is still lagging behind in terms of providing sufficient numbers of graduates in the fields of science and technology. Stein (1998) notes that, there has been very little progress but considerable retrogression in these areas during the structural adjustment period. For instance, Ghana has only one college that grants engineering degrees, the University of Science and Technology in Kumasi. In 1984 they graduated only 125 students. By 1991 the numbers were up to only 193 students (Stein 1998). What is even more disturbing is, like much of the rest of Africa, enrollment rates at both the primary and secondary school level in Ghana have fallen significantly between 1980 and 1993 (Stein, 1998).

Getahun (1998) presented a number of factors that are influencing education in Ethiopia. The major one is the issue of theoretical focus. According to Getahun a large number of students in Ethiopia are getting general and theoretical education when the society is crying out for skills. This tendency, which is prevailing in most developing countries, is due to distorted priorities, a distaste for manual work and wrong incentives.

As pointed out by Getahun (1998), given that the existing curriculum may not generate the required demand response, even when schools are available and accessible, households, particularly in rural areas, may prefer to keep their children on the farm instead of sending them to school. Getahun further argues that the existing system of education emphasizes wrong values of submissiveness, obedience and conformity. As such, it lacks the capacity to develop openness, assertiveness, dynamism and creativity among students.

The level of competence of a country's workers and technicians at the middle level is as important as the availability of high level technicians to promote industrial development in any country. The secondary level education in most sub-Saharan African countries does not have a broad base in terms of vocational and technical education. As a result, high school graduates that do not have any productive skill constitute the bulk of the unemployed in urban areas. For instance, in Ethiopia the total number of secondary level manpower estimated to be generated in 1994 was 154,305, out of which only 10,923 were absorbed by the job market (Solomon and Goitom 1998). Addressing these and other issues related to the African educational system, should be one of the major elements of development strategies in SSA.

In response to the institutional weakness that is prevailing in SSA, "capacity building" has become a major buzzword in the donor community. Most of these capacity-building programs were focussed on increasing the number of professionals 'specializing' in different fields. Considering the severity of the 'brain drain' problem, the primary focus of capacity building in SSA should be on valorization of existing capacities. This can be achieved through better "capacity utilization" and "retooling" of the civil service, reversing the brain drain and 'repairing the main institutions of training that have been starved to death even as donors set up new ones to produce skills required in their new projects' (Mkandawire 1998).

In general, if SSA desires to promote sustainable development it requires to reorient its institutional arrangements by focusing on the public service and educational institutions as the major vehicles of development. In the words of Evans (1992), East Asian bureaucracies are neither gifts from the past nor easy outgrowths of surrounding social organizations. They are hard won edifices constantly under construction. Lessons from other parts of the world clearly suggest that appropriate institutional structures did not always exist, but that they could be socially engineered. The aprioristic dismissal of possibilities of developmental states can only be attributed to prejudice. Sub-Saharan African countries need to realize that developmental states are social constructs consciously brought about by the action of their societies.

As difficult as the task of establishing such states may be, it is within the reach of many countries in SSA. The way forward does not lie in the wholesale neglect of existing capacities in the quest for "new" ones. It rather depends in the utilization, retooling and reinvigoration of existing capacities and in the rebuilding the educational and training institutions in light of long-term developmental needs.

7.1.2 Disoriented property rights

Throughout history, patterns of land ownership have shaped patterns of human relations in nearly all societies. They have also helped to determine the possibility and pace of economic change. In agrarian societies, land is the primary productive asset, the tangible expression of economic and hence political power. Some tenure patterns have manifested and solidified social inequality while others have promoted social mobility or, even in some cases, equity. Some tenure patterns have blocked technological progress while others have encouraged it. In essence, changing the relationship of people to the land has meant changing the relationship of people to one another, which, in most cases, forms the essence of 'political struggles and sometimes of wars or revolutions' (Eckholm 1979).

The pre-colonial land tenure system in Africa was largely based on the communal land tenure system. Thomas Basset (1987) identifies three periods of land tenure in Africa. The first period (late nineteenth century to 1930) was marked by little interest on the part of colonial authorities in transforming the African communal tenure systems into individual holdings. A major objective of land policies during this period was to promote colonial agricultural development. Despite the tremendous diversity of policies within the colonies, common in both French and British colonies was the monopolization of rights through confiscation of land by the state. The creation of Crown Lands in the British colonies and state ownership of "vacant lands" in the French colonies sought to promote political stability and to provide European settlers and companies with sufficient land.

According to Basset (1987) the common prohibition of freehold tenure in the reserves was typically rationalized on the paternalistic and racist grounds that Africans were incapable of looking out for their own best interests. The state would serve as the Africans' "protector" to make sure they did not sell off the little that they possessed. Although some authorities were sincere in their interest to shield indigenous peoples from the settler onslaught, the ideology of the protector was transparent. Its practical implications for the maintenance of colonial rule are equally clear.

An exclusive right to alienate reserve land enabled the state to initiate resettlement schemes and soil conservation works as well as to expropriate land for settlers for future agricultural and industrial development. In summary, despite the official interest in preserving "native law and custom" the interpretation of customary tenure was quite narrow, influenced as it was by European notions of proprietary ownership (Basset 1987).

During the second period (1930–1960), a series of economic and political crises forced colonial officials to take a closer look at African land use patterns and tenure systems. In repeated efforts to stabilize their regimes during these crises, officials encouraged the expansion and intensification of African agriculture. Despite local differences, a common model of agrarian change, in which agricultural progress was measured by the gradual dissolution of "communal tenure" into individual rights in land, guided these reformist policies. Although recognized by many administrators to have social and political advantages, customary tenure was increasingly viewed as an impediment to agricultural growth. In eastern and southern Africa, this position was more attenuated. Some administrators opposed freehold because it would mean the loss of the right to expropriate land and the ability to regulate agricultural practices in the reserves. Colonial authorities were particularly reluctant to grant freehold status to Africans in Eastern and Southern Africa on the grounds that if their agricultural practices went unchecked, they would destroy the land. As pointed out by Blaikei (1985), the official reaction to soil erosion and the subsequent conservation policies followed the classic blaming-the-victim approach. The fact that a minority of colonial settlers occupied the most fertile land and that the majority of the Africans were forced to work marginal soils did not enter the analysis. According to Okoth-Ogendo (1993), the colonial soil conservation policies, reflected in the land tenure system, were diversionary in that they failed to address the pressures compelling peasants to mismanage natural resources.

The third period of interest in transforming African customary tenure systems covers the liberation years of the 1960s and 1970s. According to Basset (1987), the reform initiatives during this period reflected considerable continuity with the past in three respects. First, many post-colonial governments simply retained or revised colonial land laws. Second, ideologues everywhere continued to perceive indigenous tenure systems as hindering the formation of agrarian structures that were both highly productive and congruent with doctrinal principles. To capitalist-oriented regimes, the now-familiar litany of criticisms ranging from farmer insecurity to environmental degradation were basic assumptions behind land law promoting freehold tenure.

To socialist-inclined governments, indigenous tenure systems were condemned not only as inefficient but also as conducive to capitalist class formation if allowed to evolve on their own. Third, the new land laws reflected what is referred to as the "broad-spectrum approach" of land reform. The curative powers of such prescriptions were, and continue to be based on the problematic view that land reform in itself is sufficient to transform the production structure.

Despite the issue of land reform being at the core of political reforms in the last three decades, most of the sub-Saharan African countries are still lacking an appropriate property right framework that promotes development. Free access of 'common properties' and absentee ownership are still dominantly practiced in most parts of SSA. As a result, the problem of free-riders is rampant, causing significant damage on the environment. A case study conducted in Botswana revealed how a fall in global diamond prices led to environmental degradation in Botswana due to the shift of investment to the expansion of cattle farming. According to this study (Mäler and Munasinghe 1996), the presence of open access to grazing land led to surpassing the carrying capacity of the environment, which subsequently led to environmental degradation. The study indicates that a lack of appropriate property rights regime was basically responsible for the failure rather than the original decrease in diamond prices.

Harrisson (1987) states that most of Africa is in the transition phase between communal and individual ownership. It is a no-man's land in which farmers have permanent rights over an area, without legal title to it; their tenure is uncertain. They cannot offer their holding as collateral for loans, because it is not fully theirs to forfeit if they default. They cannot be sure they will still be farming the same areas in ten or twenty years time, and so they are more reluctant to invest in permanent improvements to the land, from tree planting to soil conservation works.

Most of the literature written on property rights in sub-Saharan Africa revolves around the merits and demerits of the shift from communal to private ownership. In a number of articles and reports, communal tenure systems continue to be cited as a structural feature of environmental degradation in Africa. A review of the anti-pastoralist literature indicates that that the long-standing condemnation by colonialists for destroying the environment is reiterated today in the discourse on common property resources, which blames herders for abusing the privilege of grazing their (private) animals on (communal) ranges by overstocking. The resulting 'tragedy of the commons' becomes manifest in land degradation. The proposed solution for such a situation is the privatization of the commons (Blaikei and Brookfield 1987).

The theory of the 'tragedy of the commons', that was forwarded by Garett Hardin in 1968, forms the core element of this argument. Since then the general interpretation of Hardin's argument was that collectively owned property provides the basis for environmental resource depletion and that introducing private property regimes is the most efficient way to sustain environmental resources. However, as pointed out by Hanna and Munasinghe (1995,4) "a rapidly expanding body of scientific evidence indicates that sustaining environmental resources is not dependent on a particular structure of property regime, but rather on a well-specified property rights regime and a congruency of that regime with its ecological and social context." In this context, the 'tragedy of the commons' perspective is flawed by its assumptions about 'unregulated' access to productive resources and the corollary that 'improved' land use results from privatization (Peters 1987). There is much historical evidence showing that pastoralists have regulated access to rangelands, as in the case of the interior delta of the Niger during the early nineteenth century (Bassett, 1987). In addition, there are cases in Africa and other parts of the world (De Groot 1995) where common property management has been demonstrated to be even better than private property practices in terms of promoting sustainable development.

As pointed out by De Groot (1995) 'the crux of common property management is to counteract the logic of the free rider with a logic of the common good, worked out in collective rules for decision-making and enforcement'. In essence, it is the presence of 'open-access' under a condition of 'resource scarcity' that leads to the 'tragedy of resource degradation' rather than the mere fact of having a 'common property'. In this context, the fundamental requirement of a property right regime that promotes sustainable development is to have a regime that avoids the prevalence of open access and absentee ownership in the area of scarce resources.

7.1.3 Sectoral mismatch

One of the shortcomings of development policy analysis in sub-Saharan African context is the limited attention given to understand and strengthen sectoral complementarities that are critical to the promotion of development in SSA. As a result, most of the policies and strategies have the tendency of promoting favoritism to one sector or putting emphasis on one sector's development at the expense of the other. There are three sectoral complementarities that are crucial for development in SSA. These are the nexus between the public-private sector, agriculture-industry sector, and the formal-informal sector.

7.1.3.1. Public and private sector

Looking back at the major groups of development strategies that are reviewed in Chapter 6, one can see that each group placed different emphasis on the public and private sector regarding their role in promoting economic growth and development. The BWIs promote that the economy would fare better without government intervention as an economic actor. In particular, the process of extensive intervention and participation in the economy through establishment of public enterprises and the extensive use of regulatory powers have been cited as some of the principal vehicles through which the government stifled the emergence of a dynamic private sector. And this was in fact one of the basic objectives behind the various SAP driven policy reforms that focused on deregulating the economy and minimizing the role of governments (UNECA 1996).

On the other hand, the regional development strategies were based on promoting active state engagement in economic activities through the establishment of public enterprises. According to this group, in view of the structural rigidities in most African countries and extremely weak private sectors and underdeveloped markets and technological backwardness, successful diversification is not likely to be realized without the active involvement of the state. UNECA (1996) notes that this is essential in the creation of the minimal critical mass and synergy, especially in the areas of human resources development, accelerated investment and absorptive capacity. Although the role of the public sector in Africa's development effort is crucial it cannot replace the private sector and the public sector involvement shouldn't undermine the development of the private sector, as it is the case in most African countries.

Until recently, the industrial development in sub-Saharan Africa was, to a large extent, dominated by the public sector involvement. In countries like Algeria, Ethiopia, Mozambique, United Republic of Tanzania and Zambia, virtually the entire industrial economy was in the hands of the public sector. In other countries such as Côte d'Ivoire, Egypt, Nigeria and Zaire, the public sector plays a dominant role. In only a few countries, such as Botswana, Gabon, Kenya, Mauritius and Zimbabwe, is the leadership role in industry with the private sector (UNECA 1989). Unfortunately, most public enterprises in Africa, as documented in a number of studies, are performing far from satisfactorily. Nonetheless, this should not lead to the generalization that governments are unsuited to run businesses and that the very ethos of the public enterprise makes it prone to economic inefficiency.

There are some records which show that a number of public enterprises in Asia and Latin America and also in the industrialized North have performed very well indeed, and some of them are emerging as world industrial leaders. Landes (1998,469) states that, "the French economy grew and changed under government direction and planning much more than in other European countries." Even in the case of Africa, the public sector industries in Algeria and Egypt have good records of technical efficiency and have led their countries towards a higher stage of industrialization. In Zimbabwe, the public sector corporations operate like business firms and all of them are profit making. According to UNECA (1989), 'the most remarkable case is that of Ethiopia, where, thanks to the efforts of indigenous managers, capacity utilization rose from an average of 30 percent to over 75 percent'. This was achieved through improved production planning and efficiency improvement measures.

In recent years, there has been a shift in emphasis, in terms of the role of the public sector in development activities in general and industrial development, in particular. According to Mkandawire (1998), the shift in emphasis is attributable not only to the dismal performance of African states during the current social and economic crises, but also to a number of ideological, paradigmatic and structural shifts in both the domestic and international spheres. First, on the ideological level there has been the dramatic ascendancy of neo-liberalism−partly as a result of the rise and political triumph of the neo-conservative movements. This has gone to the extent that even the aid discourse has embraced some of the anti-state perception of neo-liberalism. Second, at the structural level, the process of globalization has forced all governments to rethink and restructure the state-market relationships in their respective countries and to pay greater homage to "market forces".

On the other hand, the East Asian experience shows that, even in regimes dominated by private enterprise, government intervention can be very effective in spurring industrial growth and development. The success of government intervention in those economies illustrates the effectiveness of partnership between the public and private sector in circumstances where accelerating capital accumulation, industrialization, technological transformation, and diversification of exports and growth, are essential elements of a conscious and deliberate economic policy (UNECA 1996). To achieve these objectives, the governments of these countries shaped and guided the market in order to ensure that individual firms and entrepreneurs acted not only in their own immediate self-interest but also in harmony with the long-term interests of society and the economy at large.

Government intervention in East Asian economies were designed to counteract a number of factors that typically limit the capacity and willingness of individual firms to undertake long term investment and to modernize their method of production and organization. Policy intervention in East Asia took many forms. Some of the major ones are (World Bank 1993b):

- Targeted and subsidized credit to selected industries;
- Low deposit and ceilings on borrowing rates to increase profits and retained earnings;
- Protection of domestic industries;
- The establishment and support of government banks;
- Public investment in applied research, firm and industry-specific export targets;
- Development of export marketing institutions;
- Wide sharing of information between public and private sectors.

In the final analysis, experience from other parts of the developing world shows that the issue is not about considering either the public sector or the private sector as the principal development actor; it is rather an issue of how to strengthen their complementarities. In this context, developing and strengthening the complementarities between the public and private sector is of strategic importance to promote any kind of economic growth and especially sustainable industrial development in the sub-Saharan African context.

7.1.3.2 Agriculture and industry

Despite the agricultural sector being the mainstay of most economies in SSA, since the early years of independence and throughout the 1970s and the 1980s, industrial development has been the major pre-occupation of policy makers in SSA. The first generations of industrialization strategies in SSA were based on promoting 'import substitution' as the major driver of industrial development. This was briefly followed by the 'export-oriented' strategies before being overtaken by the strategies of self-sustained development through industrialization. The literature review revealed that the link between agriculture and industry has not been given its due consideration within the context of industrial development strategies. This neglect was particularly at the peak in the 1970s and the 1980s during which sub-Saharan African countries were channeling the lion's share of their national budget for industrial projects of a different scale, while the agricultural sector was suffering from a shortage of resources.

This has manifested itself in the continuous decline of agricultural production in SSA during the 1970s and the 1980s. Even after the declaration of the LPA that contains the achievement of food self-sufficiency as one of its goals, the African agricultural sector continued to face the biggest causality. The Lagos target of a 4 percent annual growth has been far from achieved. Average growth was only 1.7 percent during the first five years of the decade compared to an average of 3 percent population growth (UNECA 1989). African countries that were once self-sufficient in food, and even had exportable surpluses have become net importers of food with severe national deficits in food. In general, industrialization strategies in SSA were not based on the symbiotic relationship between industry and agriculture. On the contrary, they were seen as competing sectors.

Nevertheless, it was a grave fallacy to view agriculture and industry as competing sectors, one growing at the expense of the other (UN 1992). In reality, the fortunes of the two sectors are intimately interlinked; thus:

- The efficiency of agriculture depends greatly on industrial methods of storage, processing and preservation of crops;
- Agricultural outputs are critical inputs for industrial sectors such as textiles, food processing, edible oils etc.;
- A prosperous agricultural community generates surplus incomes and thus widens the effective demand for consumer and intermediate goods produced by industry;
- Exported agricultural surpluses bring in foreign exchange earnings, badly needed for import of components, spares and industrial raw materials.

In the 1990s, most countries in SSA have shown a shift of emphasis in terms of the priority given to the industry and agricultural sector. Most countries have given a higher priority to the agricultural sector with an objective of fulfilling the objective of being food self-sufficient and reducing poverty in the region. This trend is correlated to the shift of emphasis that happened in regional and international organizations that are promoting development in SSA. As a result, most of the regional structures and institutions that have been established in the seventies and the 1980s for the promotion of industrialization in SSA have been either scrapped or left with minimal attention. This shift of emphasis is an outcome of the pressure of liberalization that promotes the idea of leaving all industrial and business activities to the private sector.

Considering the important role of the industrial sector to fulfill the objective of achieving food self-sufficiency and poverty-reduction and the low level of development of the private sector in SSA, it will be beneficial to promote a balanced strategic emphasis that promotes due recognition for both sectors and their complementary.

7.1.3.3 Formal and informal sector

Most African countries have focused nearly all their attention on encouraging and subsidizing the formal sector in a variety of ways. The anticipated growth through the development of the large-scale industrialization process has failed to materialize. Despite the dynamism of the informal sector, it is neglected and poor. The challenge is how to expand the informal sector, which produces the numerous entrepreneurs in developing countries. The informal sector in developing countries represents about 50% or more of the full-time workers and produces 40% to 60% of the national income. The informal enterprises provide the bulk of urban employment and are second only to small-holder agriculture as a rural employer.

Entrepreneurs in the informal sector engage in a wide range of business: agriculture, manufacturing and repair, trade, and construction (Demeke and Amha 1997). Many operate in the open air, or are forced to 'squat' without full legal rights. The informal sector is making an invaluable contribution to the economic and social development of Africa. It accounts for over 20 percent of Africa's GDP, while providing 60 to 70 percent of employment (UN 1996). For the African countries, this sector is an important contributor to GDP as a source of jobs, income and social services; it also provides a breeding ground for human development. All of these factors combine to make the informal sector an important tool for poverty alleviation.

The informal sector uses labor and domestic raw materials more intensively than the formal sector. Their technology is simple but flexible. They innovate, particularly in their ability to recycle scrap materials. In Ethiopia, for example, artisans make kerosene lamps and charcoal cooking stoves from thin metal plates hammered from used oil drums (Demeke and Amha 1997). The informal sector thrives because of its responsiveness to market forces and because of its close links with grass roots institutions. Ease of entry and exit makes these small firms an outlet for the skills of entrepreneurs from all sections of the society. For women, the poor, and other disadvantaged groups, the informal sector is often the only such outlet.

It is generally believed that the informal financial sector in African countries is large, even though it is difficult to provide quantitative evidence to measure its actual size. There is a wide variety of arrangements in the informal financial sector, rooted in customs and traditions, some dating back centuries, but constantly evolving in response to changing economic and social conditions. The sector is characterized by a high degree of spontaneity and flexibility, with demand creating its own supply. One form of informal finance widely in use is the rotating savings and credit association (ROSCA). Members contribute a mutually acceptable amount of money to a fund that is then made available to them on a rotating basis. In Ghana, ROSCAs–or "Susus" as they are called–have evolved into larger scale credit and saving facilities. Informal credit in Ghana is four to five times larger than formal credit. In Ethiopia, a non-institutional form of group controlled pooled capital known as "Equb" brings savings and credit facilities down to the poorest segments of the population. In Cameroon, the informal financial sector (Tontines) is estimated to account for about 75 percent of rural financial assets and obligations. In Zimbabwe and Zambia 87 and 43 percent respectively of farmers' credit needs are met by informal sources (UNECA 1996).

According to a report by the UN (1996,19-22), informal finance offers many advantages for the following reasons. The informal or indigenous agents know their clients better than formal banks do, which reduces their information costs. Their administrative and staff overhead is lower; their interest rates are not regulated so they can adjust to market forces. But despite their popularity and potential, most forms of informal finance have their limitations too, especially in terms of economies of scope and scale, maturity transformation, spatial transfer of savings, predominance of cash transaction.

The informal sector, especially in urban areas, has had to substitute for much of the social solidarity once found liberally in traditional Africa. The informal sector serves, in addition, as a safety net for those retrenched or retired from formal sector employment and unemployed school leavers and migrants. Other forms of non-formal social security schemes provide support to their members in times of adversity. The "edir" in rural and, more importantly, urban Ethiopia provides financial assistance, extends support in household cores and otherwise share collectively in the afflictions and sorrows of bereaved families.

Any attempt at deepening and broadening financial mobilization must target the vast majority of the people, more so the rural milieu that has, for long, remained outside the network of formal institutions. For this purpose it would be necessary to strengthen, promote and modernize self-help, informal financial intermediaries.

As a way of extending and intensifying financial intermediation, policies should aim to encourage links between the formal and informal financial institutions. This will be to the advantage of both sets of institutions. For example, due to their wide regional outreach, cooperative societies acting as financial intermediaries may assist the banks to effectively extend their services to the rural population at low costs. In order to make maximum contribution to employment and provide other "spread effects", policies must be structured to accommodate the development and promotion of small- and medium-scale enterprises as central elements of a broader industrial development strategy. Integration with the formal sector benefits the entrepreneur and the national economy. Despite the paucity of data, the statistics that do exist and casual observations indicate that linkage with the formal sector will need to be strengthened in most of the African economies. Moreover, a preliminary survey of Africa's current development plans reveals that a more congenial enabling environment needs to be created to stimulate small-enterprise growth and integration of the informal sector into the mainstream of the national economy (UN 1996).

The informal sector has always existed in other regions of the world. It existed by a different name in the United States and Japan. In the United States, it was gradually and completely co-opted into the formal sector. In Japan, it was used as the hub of industrialization, with blacksmiths being the main agents. Countries in Asia such as the Republic of Korea, Singapore and Hong Kong developed strategies that brought about a smooth and efficient transformation of the informal to the formal sector (UN 1996). Africa is now presented with an opportunity to use the creative energies of the informal sector for socio-economic transformation. It is now essential to come up with policies and programs to promote indigenous entrepreneurship and industrialization that would stimulate the process of sustainable and self-reliant growth.

7.1.4 Global inertia

During the last few decades, the world has become an increasingly global community whereby decisions made and activities conducted in other parts of the world have a significant bearing on what is going to happen at the local level. The globalization trend is multifaceted with combinations of pros and cons. In general, one can say that global factors can have a second-degree effect in any development process at the national level. There are two factors that could be a source of global inertia with regards to promoting sustainable industrial development in SSA. These are the debt burden of SSA and the impact of trade liberalization as it is being promoted by the World Trade Organization (WTO).

7.1.4.1 The debt burden

Development indicators of SSA for the last two to three decades show that, one of the significant changes in terms of macroeconomic indicators in SSA is the substantial increase of foreign debt owed by African governments in the last few deacdes. As can be seen from Table 15, 33 sub-Saharan African countries belong to the category of highly indebted poor countries (HIPC). The debt burden of these countries had shown a significant increase during the 1980s. From 1975 to 1997, the debt burden of these countries has multiplied on average from 10 to 20 times. Similarly, the total debt stock has jumped from US$19.97 billion in 1975 to US$201.12 billion in 1997, which is more than twenty fold than it was in 1975. Given the negative effects of the debt burden on African economies and the need to releases resources, the issue of debt should be discussed more fundamentally from a political dimension and the perspective of Africa's economic development.

While the need to do something about debt appears to be universally accepted, what to do is still being debated. Different measures to reduce the debt burden over the short run have been advocated. Two of the major options suggested are debt reduction and, more radically, debt cancellation. Some analysts have argued that the realistic options for African debt situation is debt cancellation and conversion into grants of any remaining official bilateral and multilateral debt (UNCTAD 1998). Debt cancellation for African countries can be based on a number of grounds. The first is that, given the magnitude of the debt and the continent's growth prospects, particularly in the export sector, African countries cannot realistically pay the debt in the foreseeable future. Second, releasing resources in the form of debt cancellation, or the conversion of debt into grants, will afford the affected countries the opportunity to return to a growth path. No matter what approach is taken, the resolution of external debt problems is a touchy subject because of the underlying economic and political issues (UNECA 1999).

Critical to the evolution of the debt debates is the position of the Bretton Woods Institutions. The position of the IMF is that the debts are obligations that must be honored and that calls for their cancellation are therefore unrealistic and raise false expectations. Unconditional cancellation raises the risk that debt relief could be squandered on official corruption, increased military expenditure, or grandoise projects, with little benefit, if any, in terms of sustainable growth or poverty reduction. That position is, of course understandable from the perspective of development institutions to which debts must be paid in order for them to maintain some degree of viability and integrity.

The reality of the situation, however, is that a number of African countries are in a worse economic situation where payment seems impossible under any plausible, human development-centered economic growth.

Table 15: Total debt stocks of HIPCs in SSA (US$ billion)

Country	1975	1980	1985	1990	1991	1993	1995	1997
Angola	…	…	2.99	8.59	9.00	10.57	11.51	10.16
Benin	0.09	0.42	0.85	1.29	1.32	1.45	1.61	1.62
Burkina Faso	0.06	0.33	0.51	0.83	0.97	1.12	1.27	1.30
Burundi	0.02	0.17	0.46	0.91	0.96	1.06	1.16	1.07
Cameroon	0.44	2.59	3.17	6.68	6.90	7.46	9.35	9.29
Central African Rep.	0.08	0.19	0.34	0.70	0.79	0.88	0.95	0.89
Chad	0.14	0.28	0.22	0.52	0.63	0.77	0.90	1.03
Congo Deom. Republic	2.03	4.77	6.17	10.27	10.83	11.27	13.24	12.33
Congo Republic	0.36	1.53	3.05	4.95	4.83	5.08	6.00	5.07
Cote d'Ivoire	1.46	7.46	9.66	17.25	18.17	19.07	18.90	15.61
Equatorial Guinea	0.03	0.08	0.13	0.24	0.25	0.26	0.29	0.28
Ethiopia	0.34	0.82	5.21	8.63	9.12	9.70	10.31	10.08
Ghana	0.72	1.40	2.26	3.87	4.37	4.88	5.86	5.98
Guinea	0.77	1.13	1.47	2.48	2.62	2.85	3.24	3.52
Guinea-Bissau	0.01	0.14	0.32	0.69	0.75	0.79	0.90	0.92
Kenya	1.29	3.38	4.18	7.06	7.45	7.12	7.38	6.49
Liberia	0.18	0.69	1.24	1.85	1.95	1.96	2.15	2.01
Mdagascar	0.90	1.25	2.53	3.70	3.91	3.80	4.32	4.10
Malawi	0.27	0.83	1.02	1.56	1.66	1.83	2.24	2.21
Mali	0.36	0.73	1.46	2.47	2.60	2.90	2.96	2.95
Mauritania	0.19	0.84	1.45	2.10	2.19	2.14	2.35	2.45
Mozambique	…	…	2.87	4.65	4.72	5.19	5.73	5.99
Niger	0.11	0.86	1.19	1.73	1.49	1.54	1.59	1.58
Rwanda	0.02	0.19	0.37	0.71	0.81	0.91	1.03	1.11
Sao Tome & Principe	0.00	0.02	0.06	0.15	0.17	0.21	0.25	0.26
Senegal	0.35	1.47	2.57	3.73	3.57	3.80	3.84	3.67
Sierra Leone	0.21	0.47	0.71	1.15	1.21	1.40	1.18	1.15
Somalia	0.23	0.66	1.64	2.37	2.45	2.50	2.68	2.56
Sudan	1.60	5.18	8.96	14.76	15.23	15.84	17.60	16.33
Tanzania	2.39	5.32	9.11	6.45	6.57	6.81	7.45	7.18
Togo	0.12	1.05	0.94	1.27	1.34	1.28	1.46	1.34
Uganda	0.21	0.69	1.23	2.58	2.78	3.03	3.57	3.71
Zambia	1.68	3.26	4.58	7.27	7.34	6.79	6.86	6.76
sub-Saharan Africa	19.97	58.90	104.7	190.19	195.89	205.85	222.02	201.12

Source: Compiled from World Bank, Global development Finance, 1999

Other reasons given aginst debt cancellation include the "moral hazard" argument. In its crude version, the argument is that any scheme of forgiveness will lead debtor countries to pursue irresponsible policies and lead eventually to a new round of over-borrowing. A variant of this argument goes further to assert that if debts were reduced through any form of relief or forgiveness, debtor countries would be less concerned with pursuing the objective of domestic stability and the promotion of growth (UNECA 1999).

The most recent intiative –the HIPC initiative– of the Bretton Woods Institutions was borne out the recognition in the 1990s that a significant number of low-income countries had debt burdens that remained above sustainable levels over the medium term. Even strong policy reformers that made full use of current debt relief mechanisms were in trouble (UNECA 1999). The primary objective of the HIPC initiative is to provide –for countries with good tracj records of adjustment and reform– a robust exit from debt rescheduling and the achievement of debt sustainability. While some argued that it is too early to pass judgement on HIPC, doubts have been expressed about its ability to solve once and for all Africa's seemingly intractable debt problems. Basic concerns have been expressed with regard to eligibility for and the adequacy of debt reduction, the speed at which relief should be granted, the length of the completion period, the performance crietria and the technical basis of the debt sustainability analysis (UNCTAD 1998).

What African countries need is the release of more resources from debt servicing and payment. The large debt implies that vast amounts of resources are allocated to debt service, thereby reducing what is available for financing development. For most countries, it means that the inadequate resource are left for national development after servicing debt. The implication is that the debt has become so large, relative to export earnings and economic size of the countries. There is already abundant empirical evidence showing that Africa's external debt burden is having severe adverse impact on investment and renewed growth. It impedes public investment in physical and human infrastructure and deters private and foreign investment thereby creating a situation that discourages inflows of new external resources (UNECA 1997).

Some African countries have openly expressed their concern about the conditions of reform that are required by the global financing institutions to be included in the HIPC initiative. Prime Minister Meles Zenawi of Ethiopia said the following in his opening speech to the Joint Conference of African Ministers of Finance and Ministers of Economic Development and Planning convened under the theme 'The Challenges of Financing African Development' (Zenawi 1999,2).

> *"What I found most objectionable about HIPC and most of the other debt reduction initiatives is that they are being used as the whip to enforce unquestioning acceptance of the economic orthodoxy, the so called Washington consensus, that is being promoted by some international financial institutions…. The choice which we are left with under HIPC is thus to either abandon all independent and rational thinking in economic policy making or wallow in the quagmire of unsustainable debt. It is a choice between the devil and deep blue sea. To use the whip of the debt overhang to enforce this orthodoxy in debt-ridden countries, is in some ways tantamount to blackmail and is therefore both unviable and immoral."*

As an alternative, UNCTAD (1998) suggests that it is possible to establish key insolvency principles which, when applied within the existing international framework, would dictate an immediate write-off of all sub-Saharan Africa's debt as unpayable. It further advocates for an independent assessment of debt sustainability in the future, arguing that experience has demonstrated that the approaches to debt-reduction have fallen short of addressing the problem. This has perpetuated aid dependency and undermined the application of "sound policies" and commitment to and ownership of reform programs, among other problems.

Many potential benefits of debt reduction can be identified. First, stemming and reversing capital flight would be the single most-effective way of financing Africa's development. For Guyana, for example, debt forgiveness under HIPC, which is estimated to reduce indebtedness by 25 percent would reduce the proportion of Guyanese private wealth held abroad by 10.1 percent. Each dollar of public funds benefiting the country from debt reduction is augmented by $2.41 of repatriated funds. Second, debt reduction will go a long way towards reducing the high degree of uncertainty for both domestic and foreign investors. Third, many of the policy makers will be released from protracted and uncertain debt negotiations. Fourth, much needed resources will be released for Africa's development by the debt reduction or cancellation. Fifth, the removal of the elements of uncertainty inherent in the huge debt will stimulate private investment (UNECA, 1999). The debt issue needs to be resolved in light of these multiple benefits.

7.1.4.2 Globalization and liberalization

Globalization is perhaps one of the most important trends shaping the current environment for economic development. The dominant development model of our time is economic globalization, a system fueled by the belief that a single global economy with universal rules is inevitable. In this sense, globalization may be understood to be the creation of a market system in which national economies are integrated with each other through international or global markets. According to Rao (1997), integration, in this sense, is identified with the establishment of the 'Law of One Price', the equalization of prices of both goods and factors. The main modes (and therefore indicators) of this global economic integration are international trade, foreign direct investment and capital flows. Globalization is indicated by the fact that the rate of growth of each of these indicators has been faster than the growth of the overall world output (Ayreetey et al. 1998). As a result, corporations have emerged as the dominant governance institutions on the planet since the 1950s, with the largest among them reaching into virtually every country of the world and exceeding most governments in size and power (Korten, 1995). In the following decades, it is the corporate interest more than the human interest that has defined the policy agendas of states and international bodies, although this reality and its implications have gone largely unnoticed and unaddressed. This was what has been characterized as a 'disturbing trend' by Welford (1997) in the context of the current debate on sustainable development. Another implication of competition as the central value of neo-liberalism is that the public sector must be downsized because it does not and cannot obey the basic laws of competing for profits or for market share. According to Rao (1997), liberalization is anchored in the following five basic assumptions. First, politically, the unconstrained market regime is feasible and distributional problems can be resolved without 'distorting' the market. Second, the market can fully coordinate individual decisions (the state can only get in the way). Third, public investment is an inefficient substitute for private investment in the growth process and complementarities are negligible. Fourth, the unhindered import of technology can provide an adequate basis for developing competitiveness. Fifth, free movement of finance and enterprises across the national border will produce internal and external balance thereby benefiting the South.

Besides the theoretical underpinning of neo-liberal philosophy, the following are identified by Ayreetey et al. (1998) as the major factors that appear to be driving the process of globalization. First, rapid advances in communication and transportation technology have reduced the costs of moving goods, money, people and information. Second, globalization relates to the expanding geographical scope of business activities of private transnational corporations and financial institutions.

Third, it refers to the increased extent to which markets for goods, services and factors of production are effectively integrated across national borders. Fourth, it is concerned with the higher degree of uniformity in policy and institutional environments that set the rules of the game for economic actions and interactions on the part of private agents based in various countries. The interaction of these factors has undoubtedly led to an accentuated tendency of the world economy towards greater interaction and integration between economies.

In the past two decades, international flows of goods and especially of finance capital have increased sharply. The costs of transactions across national frontiers–the movement of money, knowledge and materials–have been greatly reduced by the information and communication revolution. Formal processes of market integration have been initiated in North America and are reaching their culmination in Western Europe. Rao (1997) states that the movement of goods, capital and enterprises is marked by great unevenness. On the whole, however, the balance of force seems to point in the direction of globalization in the descriptive sense of a process of increasing international resource and goods flows. The forces driving this process were evident both during the quarter century of industrial development following 1945 and in the subsequent quarter century of slowed growth, heightened instability and widespread changes in economic institutions and policies in both North and South.

Three views of 'Freer Trade"

For: "The rise in global trade facilitated by trade liberalization within the rules-based system has created more and better paid jobs in many countries".

Singapore Ministerial Declaration of WTO, adopted on 13 December 1996

Qualified: "In the few years the international economic environment has seen a surge of activity and new initiatives, especially in trade, capital flows and financial liberalization. Many changes are positive- but they are driven overwhelmingly by the economic interests of the rich and powerful countries. Much less attention is being given to the needs of the poorer and weaker countries. Their interests have become marginalized. Global inequalities have grown more extreme. Nothing short of major reconsideration of mechanisms to offset these tendencies to global inequality is needed."

Human Development Report 1998, United Nations Development Program

Against: "The Uruguay Round Agreements and the establishment of the WTO were proclaimed as a means of enhancing the creation of global wealth and prosperity and promoting the well-being of all people in members states. In realty, however, in the past five years the WTO has contributed to the concentration of wealth in the hands of the rich few; increasing poverty for the majority of the world's population; and unsustainable patterns of production and consumption.

Statement from Members of International Civil Society opposing a 'Millenium Round'

signed by 1,200 organizations from 87 countries by October 1999.

(Source: Panos Institute. Novmeber 1999. More Power to the World Trade Organization?

The most important tool in this effort has been the creation of international trade agreements whose tribunals and enforcement measures supersede the legal systems of nation states and supplant their judicial processes by setting up independent dispute resolution systems that exist outside the confines of their courts and their laws. The development of the General Agreement on Trade and Tariff (GATT) and the subsequent establishment of the World Trade Organization (WTO) represent a major turning point in the globalization process.

The WTO enforces a number of international trade agreements on goods, services, intellectual property rights, food safety, animal and plant health, financial services, food, agricultural policy, investment and technology. What makes the WTO so powerful is that it has both the legislative and judicial authority to challenge laws, policies and programs of countries that do not conform to WTO rules and overrule them if they are seen to be too "trade restrictive." As can be seen from Box 3, the impact of 'free trade' over the last few years has been portrayed differently by different groups.

In pursuit of expanding the horizon of free trade, an attempt was made by the Organization for Economic Cooperation and Development (OECD) recently, to develop a 'Multilateral Investment Treaty' that promotes free flow of investments throughout the world. This treaty was aimed at expanding the freedom of investment flows from one country to another and eliminating national and regional restriction on investments. This effort was faced with significant opposition from the international civil society and the developing world. As a result of this opposition, the OECD was forced to discontinue the negotiation process on Multilateral Agreement on Investment (MAI) in December 1998. Another major event that was expected to define the nature of globalization in the new millennium was the international WTO conference held in Seattle at the end of 1999. Some countries, including members of the European Union, have asked for a new round of comprehensive talks while others, including most of the developing countries, have objected to the resumption of a new round before addressing the limitations within the existing framework. The WTO conference faced major opposition from civic movements and it ended without reaching any agreement on the resumption of a new round of talks. What happened in Seattle should be taken as an important signal signifying the urgent need of reorienting global institutions such as WTO. In response to the crisis-inducing globalization of the past two decades, there has been a remarkable convergence of formal policy regimes in the South toward a neo-liberal order. Three salient factors explain this tendency (Rao 1997).

The first is the substantial influence that neo-liberal ideology assumed in the stabilization and structural adjustment programs that were administered by the BWIs. Second, neo-liberalism, of which state minimalism has been the kingpin, furnished an intellectual basis for these states to make a virtue out of necessity by providing cover for political projects of elite minorities to jettison social commitments. Third, the pursuit of liberalization in individual countries not only affected their internal economies but also altered the global environment facing each of them, an alteration that made the pursuit of autonomous policies increasingly precarious or, at least, increasingly unfashionable.

According to Mosley (1996), relations between the developed and the developing countries can, in principle, produce either "backwash effects", favoring the developed countries, or "spread effects", favoring the developing countries. There is increasing evidence of "backwash effects" amongst the (LDCs), which over the last 15 years have experienced a decline in real per capita income of 0.8 percent per annum (World Bank, 1994). The majority of countries in this group are concentrated in SSA. During the past few decades, the ability of any growth to reduce poverty in SSA has been held back by liberalization policies which tend to cheapen physical capital in terms of labor, and hence to minimize the employment-creating potential of economic growth (Mosley 1996). The bias imparted by these forms of globalization has been almost directly antithetical to the much advocated goal of poverty reduction. In this connection, Prime Minister Meles Zenawi of Ethiopia stated that 'if present conditions remain unaltered and the trend we see were to continue, then being more enmeshed within the globalized economy would only mean that by force of circumstances, Africa would be made to stay on the margins of the global economy' (Zenawi 1999).

7.2 The strategy framework

It is important for policy design that the behavior of the model and its empirical relevance is fully understood. Thus, the model should not be overly complex, although it must incorporate the essential ingredients for providing a general framework for affecting a "systems change". This research is based on identifying the fundamental factors that are key determinants in promoting sustainable development in SSA. By doing so, it overcomes the problems of 'detailed complexities' that arise from attempting to incorporate every development variable into a single model while at the same time it focuses on the most common factors influencing development strategies in sub-Saharan Africa. Focusing on the key determinants will also help countries to make the best use of the facilitating factors that might have wide variation from one country to another.

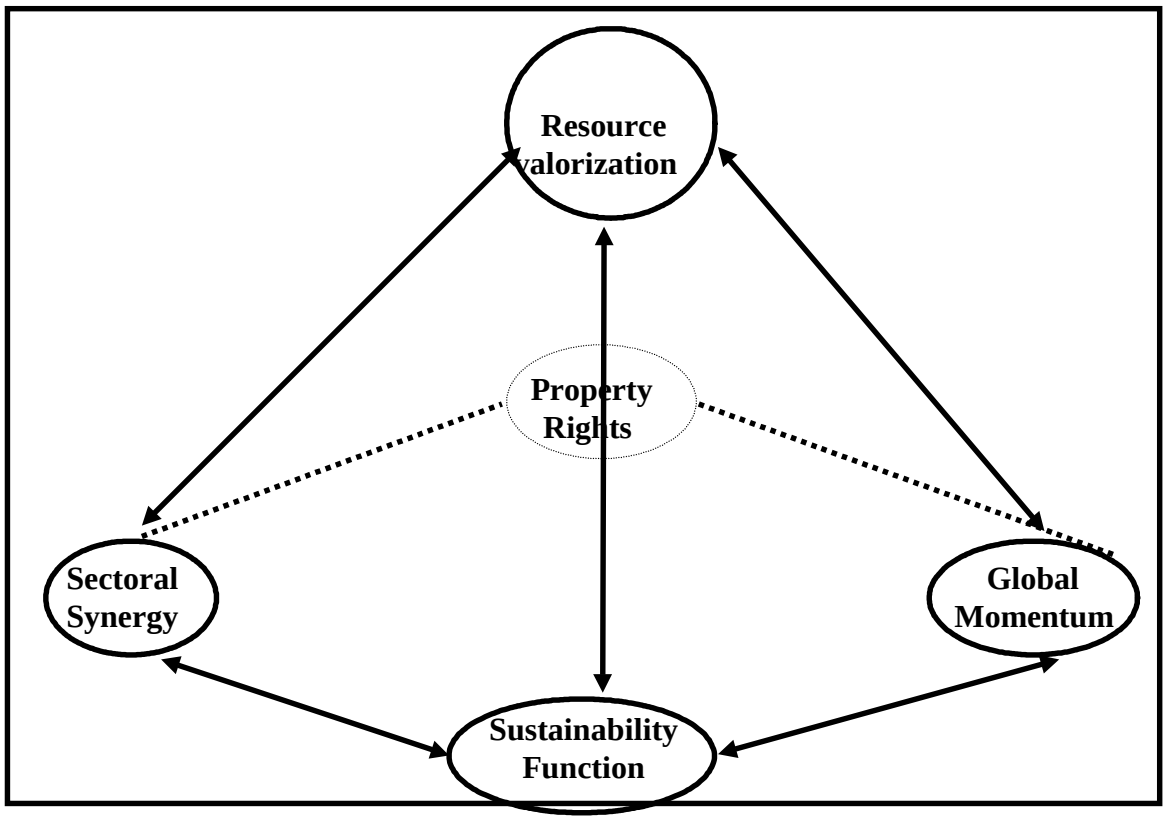


Figure 11: Proposed Strategic Framework for Sustainable Industrial Development in SSA

The proposed 'SID Strategic Framework for SSA' was developed based on the conceptual analysis and the review of the empirical evidence that has been done in the preceding chapters. The model has one core element with four sub-elements that interact with one another. The core element focuses on the resource system. The sub-elements cover property rights, sectoral synergy, global momentum and the sustainability function. Details of the core model and the sub-models are given in the following sections.

7.2.1 The Resource core model

The major drive of the resource core model is based on the assertion that maximum and efficient utilization of a country's resource is a fundamental prerequisite for sustainable development and a basis for attracting foreign resources. As presented in Chapter 7.1.2, the Resource challenge has four sub-components. While the whole process of resource valorization is influenced by the actions to be taken at the other levels of the macro-model, each component requires specific strategic measures focused on overcoming the limitations discussed in Chapter 7.1.2. The Resource model and the respective strategic measures are presented in Figure 12. The resource valorization model constitutes the core element of the strategy framework. The principal objective of this core model is refocusing development strategies in SSA towards valorization of national resources as a prerequisite for attracting foreign direct investment and as a basis for promoting sustainable development. The interactions between the different elements of the core model and the interactions between the core model and the sub-models of the framework will influence the resource valorization process.

The first component of the core model is the natural resources component. The major challenge under this component is to manage the natural resources of the region in such a way that they will provide the required ecological space for the development of the region, on a sustainable basis. This requires the reconciliation of population growth and development aspirations with the regenerative and assimilative capacity of the ecological resource. In this context, SSA needs to focus on achieving a demographic transition that is commensurate with the region's socio-economic and socio-ecological capabilities. There have been numerous natural resource conservation initiatives in SSA that have been implemented by international development agencies and national governments that have had very limited success. The major limitation of these projects is the lack of local communities' involvement and ownership of the project. On the other hand, there are a few cases of success stories that are based on the 'Local Resource Management' (LRM) approach that have been able to achieve an efficient resource management in SSA.

In line with the LRM approach the local forms of organization and management should be used to maintain and develop natural resources and effectively control the observance of desirable behavioral changes. In this context, sub-Saharan African countries need to adopt the LRM approach as the major strategic approach for natural resource management in the region. The sustainability of any resource management effort is eventually determined by the presence of an efficient property right regime that is responsive to societal needs.

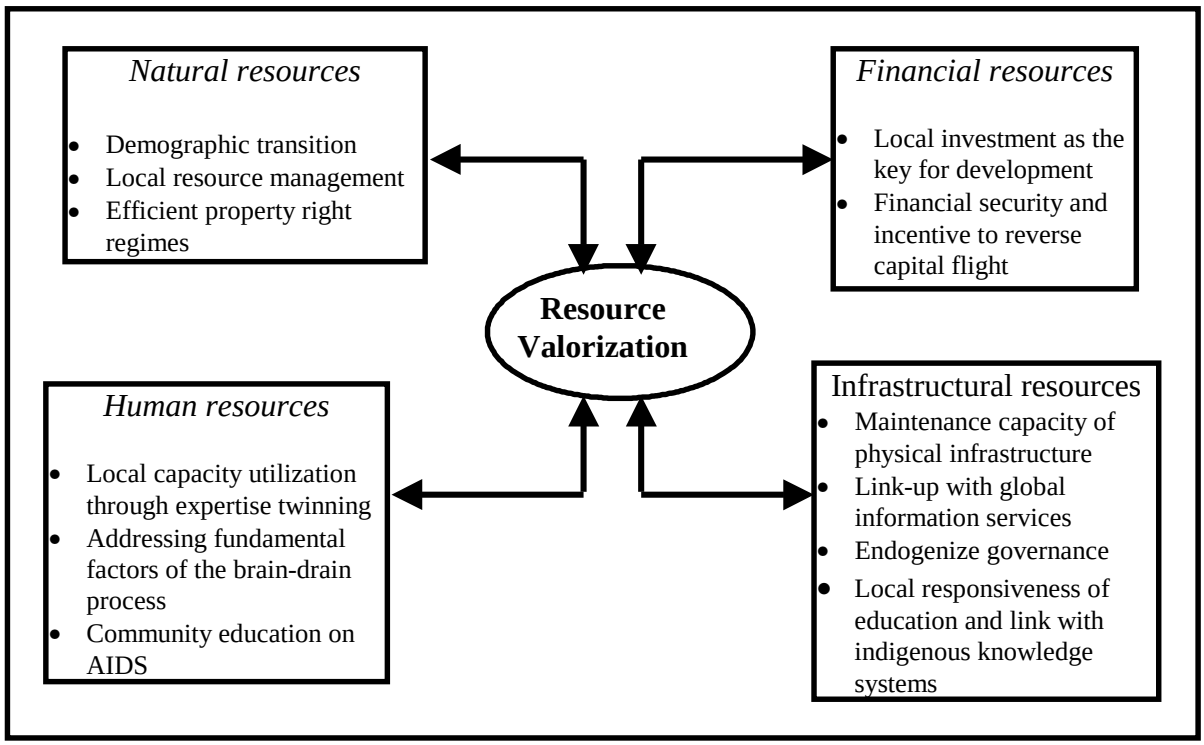


Figure 12: The Resource core model and its strategic elements

The second component of the core model is the human resources component. The principal objective of this component is reversing the outflow of highly skilled manpower from SSA. The primary focus, in this context, should be enhancing existing capacity utilization within the region rather than focusing on generating new skills which will continue to flow to other parts of the world. Shifting the emphasis to capacity utilization will enable countries to specifically identify the objective need for generation of new skills that are required for the development process. In other words, effective capacity utilization should be used as the basis for determining the need for new skill development.

The checking and/or reversal of the brain drain will require taking measures that address both the fundamental and facilitating factors of the process.

As can be seen from Table 16, the long-term success of such a measure is dependent on the ability to take rectifying measures that target both the fundamental and facilitating factors. Furthermore, national governments, multilateral and bilateral development agencies should overcome their 'bias'[11] against African experts and recognize the importance of local capacity utilization in development activities and encourage the leading participation of African experts in their development undertakings. While it is important to encourage the lead participation of African experts, it is equally important to recognize the need for expertise from other parts of the world. African countries and their experts have a lot to learn and gain from the wealth of knowledge that is generated from other parts of the world. In this context, the development of an appropriate twinning strategy[12] that facilitates local capacity utilization and effective transfer of knowledge and experience in both directions is essential in terms of promoting sustainable development.

Table 16: Measures to reverse the brain drain

Mismatch between educational curricula and national socio-economic realities;	Re-orienting the whole education and esearch program towards national priorities and agneda
Mismatch between training and job opportunity;	Reconciling training programs with national and sectoral needs through prudent human resource development planning;
Heavy reliance on foreign and international expertise and bias against local expertise;	Promotion of national expertise and capacity utilization;
Lack of conducive working conditions and research facilities;	Creating a conducive working environment and facility as a basis for national capacity building in science and technology;
Weak institutional incentive and recognition system;	Establishing an effective incentive and recognition system that is strictly based on performance and output

[11] This bias also prevails in a number of African countries where authorities have a 'blind faith' in Western expertise.
[12] Some development agencies have already started to apply this strategy.

The development of a human resource management strategy that enhances the utilization of existing human and institutional capacities and provides an appropriate incentive mechanism is crucial for reversing the brain drain. Minas (1993) identified two kinds of human resource management approaches: the strategic management approach and the tactical management approach. The most effective approach is the strategic management approach that focuses upon communication, participation, teamwork, appraisal, training, and organizational development strategies. In contrast, the tactical approach emphasizes administrative rules, procedures, authorities, and power dynamics and heavy reliance on past experience and short-term decisions. Since it rejects new developments and seeks to perpetuate the status quo, the tactical approach has limited effectiveness in an environment of dynamic internal and external changes. SSA needs to move away from tactical to strategic management of its human resource.

Another element of the human resource sub-model is containing the adverse effect of AIDS in the development effort in SSA. Countries in SSA have been hardest hit by the HIV/AIDS epidemic, and account for about 70 percent of all HIV/AIDS cases in the world. The disease usually attacks those between 15 and 49 years. These are adults in their reproductive years and who constitute the bulk of the economically active population. As a disease that attacks the most productive segment of the society, AIDS is having and is going to have a disastrous effect on the development effort. The key to the solution again lies in information; that is, making survival-relevant information about AIDS available to the society at large. In this context, sub-Saharan African countries need to undertake vigorous education and awareness programs that utilize the capacity of modern and traditional institutions and mobilize the active segment of the society. This should include the victims of the virus who have proved to be the most effective change agents in terms of promoting the change of attitude that enhances the prevention of AIDS transmission.

The third component of the core model is the financial resources component. As pointed out by Mkandawire (1998), the financial mobilization effort for development in SSA has been, to a large extent, focused on attracting foreign direct investment. The principal objective of this strategic component is to refocus the financial mobilization efforts towards local capital and reversing the capital flight that is draining financial resource from SSA. While the strategic measures that are proposed under the other component of the framework will positively influence the process of reversing the capital flight there are some specific measures that should be taken.

The key element of these measures is to ensure effective property security regimes in sub-Saharan African countries through an independent and efficient judicial system that upholds the rule of law. This goes hand in hand with a transparent system of administration that ensures public accountability. Other than these, governments should endeavor to create an incentive mechanism that would encourage nationals living abroad to repatriate their capital and invest in their own home country. These strategic measures are important not only for the reversal of capital flight per se but they also play a key role in attracting foreign direct investment which takes the state of domestic investment as the litmus paper for the state of economic stability and security.

The fourth component of the core model is the infrastructural resources component. The development of an adequate physical infrastructure is an essential prerequisite for economic development. This has been the focus of most governments and development agencies in the last few decades. What has been neglected was the need for developing a national capacity for maintenance of physical infrastructures. From a sustainable development perspective, sub-Saharan African countries and their development partners should give equal attention to building capacities for maintenance and efficient utilization of physical infrastructures as they are giving to the development of new ones. Furthermore, in view of the global transition to the knowledge-based economy, sub-Saharan African countries should make the maximum effort to utilize the evolving information and communication technologies and services in their development effort.

Modern institutions in African history are a recent phenomenon that started with the importation of Western institutional structures during the colonial era. While the diffusion of institutional structures may not be unique to Africa, the failure to adapt and/or assimilate these institutional structures with the African society seems to be a unique feature to Africa. As a result, modern institutions of governance in Africa have the tendency to alienate themselves from society. Successive post-colonial political systems in most of the African countries have strengthened this alienation by utilizing these institutions for the purpose of fulfilling their political objectives. The major source of this alienation is the disregard of indigenous/traditional forms of grass-roots governance systems that have been functioning for ages and the lack of effort to endogenize ‘Western institutions’ to the local context. Such institutional failures are making a significant contribution to the rise in number of civil conflicts and the weakening of community-based conflict resolution mechanisms in the region.

Even the much promoted 'good governance' which is currently being advocated as a solution for Africa's crisis does not give due consideration for indigenous governance as the basis for the genesis of African governance. While the increasing recognition of the role of civil society in African governance is a positive trend, the proliferation of Western styled non-governmental organizations (NGOs) has become the primary actor with peripheral attention given to indigenous and traditional organizations. Addressing these institutional crises is a critical element for promoting sustainable development in SSA. The key strategic element for overcoming the crises is endogenizing African institutions by building upon the positive element of an African institutional base, which is rich in grass-roots participation, and making them responsive to local needs and cultural context. This would require synthesizing the best elements from the traditional and western governance practices and create a governance system which provides broader participation by local community and be responsive to the changing global environment.

The African educational system is another major institution that requires fundamental reform. The key elements of this reform are promoting a shift of emphasis from largely theoretical to a practical, locally-responsive and application-oriented structure of education and reorienting the focus of research towards the possibility of transforming socially useful indigenous knowledge and practices into modern systems of knowledge. Such an approach would enable the African educational institutions to generate a new breed of professionals that are well equipped with the necessary global and local knowledge and enhance the capacity of African societies to identify, process, utilize and accumulate survival-useful information. The progress that has been made in the field of science and technology during the last few decades is fundamentally transforming the global economy from material-based to a knowledge-based economy. This transformation may make a significant contribution in promoting sustainable development by replacing the movement of physical objects with movements of information and by facilitating partial dematerialization of products and services. Nonetheless, there are disturbing trends which indicate that the developing world in general and sub-Saharan African countries, in particular, might be left on the margin of this transformation process. There are some recent initiatives that are aimed at preparing SSA to be part of this transformation process. This includes the 'African Virtual University' Project developed by the World Bank and the African Development Forum initiated by the UNECA. The major challenge in such a transformation process is to develop the ability to identify the survival-useful information from both local and global sources and to assimilate them in the development process. It has to be recognized that Africa has a significant indigenous and traditional knowledge base that could be useful in promoting sustainable development in the region.

The identification of this knowledge and its assimilation with the modern knowledge base will help Africa take its rightful place among the emerging knowledge-based economies. The strategic focus from the sustainability perspective should be on developing an appropriate knowledge framework that would integrate the best elements from the indigenous knowledge base and the western knowledge base to the benefit of the society.

7.2.2 Property rights regime sub-model

Property right regimes are a subset of a society's institutions that provide the organizational setting within which incentives are structured and human interactions are shaped. Hence, property rights regimes of any country basically define the relationship between society and nature and the relationships between the different segments of the society. As such it has both socio-economic and socio-ecological dimensions. With each of the major socio-economic transformation (agricultural, industrial) there has been a corresponding transformation in property structure that in turn determined the nature of the socio-ecological relationships. If the sustainability transformation is going to happen, it will definitely require a new form of property ownership structure whose principal elements are presented in the 'Property rights regime sub-model'.

There are two components that constitute the characteristic of any property rights regime (Hanna et al. 1995). The first one is property rights that are defined as the bundles of entitlements defining owners' rights and duties in the use of a particular resource. The second one is the property rules covering the rules and mechanisms under which those rights and duties are exercised. The major drive of this sub-model is that the nature of ownership and its protection constitute the fundamental element in determining the nature and pace of societal development. Accordingly, the 'Property Rights Regime sub-model' is composed of two components, namely, the ownership structure and the level of protection. From the perspective of promoting sustainable development, the key objective of the sub-model' is to provide property rights regime that promotes socio-economic and socio-ecological succession.

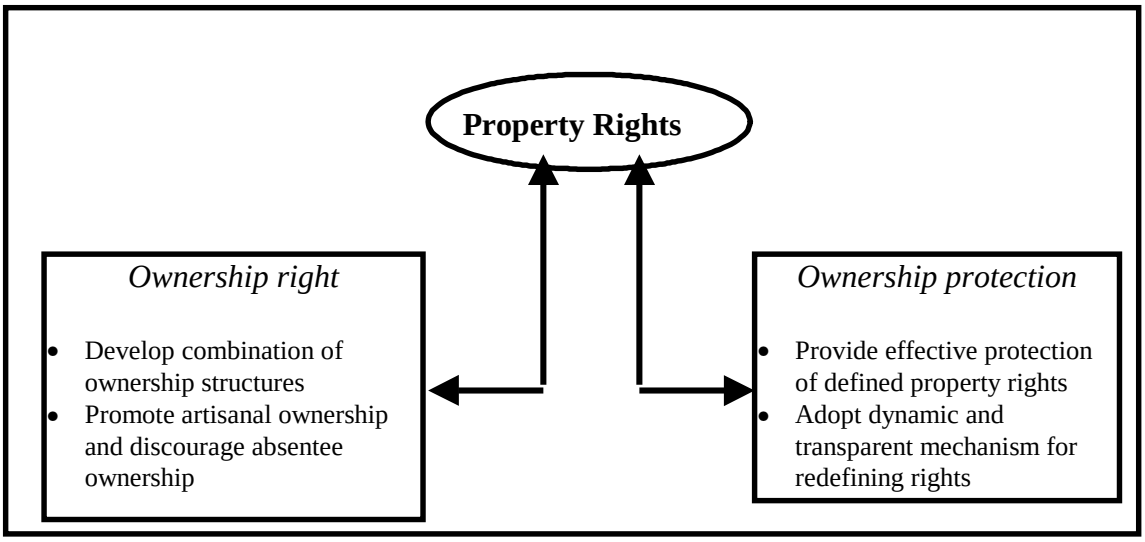


Figure 13: The Property Rights Regime Sub-Model and its Strategic Elements

Most of the literature on property rights is dominated with arguments and counter arguments claiming that the kind of ownership structure is a critical element in terms of environmental protection, private ownership structures being the most efficient ones. The numerous cases of efficiencies and inefficiencies on both sides (of private and community ownership) indicate that efficient environmental protection is not strictly related to the kind of ownership structure. This shows that there are cases where private ownership could be more efficient than community ownership and similarly there are cases where community ownership is far more efficient than private ownership. Hence, combinations of different structures of ownership will be the one that takes us to the optimum situation of sustainable resource use and management. Property right regimes may differ by the nature of ownership, the rights and duties of owners, the rules of use, and the locus of control. In this context, Hanna et al. (1995) developed the following taxonomy that presents four types of property rights regimes with their associated rights and duties from resource management perspectives.

Table 17: Types of Property Rights Regimes with owners, rights, and duties

Regime type	Owner	Owner rights	Owner duties
Private property	Individual	Socially acceptable uses; control of access	Avoidance of socially unacceptable uses
Common property	Collective	Exclusion of non owners	Maintenance, constrain rates of uses
State property	Citizens	Determine rules	Maintain social objectives
Open access (non-property)	None	Capture	None

(Source: Hanna et al. 1995,29. Property rights and environmental resources.)

Another key aspect of ownership structures that should be considered, besides economic and ecological efficiency, is the issue of equitability. One strategic approach that may be adopted by sub-Saharan African countries in terms of promoting equity and efficiency at the same time is to discourage absentee ownership in favor of artisanal ownership. This is particularly relevant to most sub-Saharan African countries where artisanal producers are considered to be 'illegal operators' in their own surroundings. Despite the enormous focus of the property rights' literature on ownership structures, most of the failures that arise from property rights regimes are associated with the lack of efficient protection mechanisms of the defined ownership structure rather than to the nature of the ownership structure. In this context, it can be said that the efficiency of a given property right regime is ultimately determined by the efficiency of the mechanism that is put in place to protect the defined property structure, whatever its nature. The efficiency of the protection mechanism is in turn determined by the responsiveness of the ownership structure to the broad socio-economic needs of the society. Thus, developing a property right regime composed of an ownership structure that responds to the socio-economic needs and an effective protection mechanism for the ownership structure is a strategic requirement for promoting sustainable development in SSA.

As stated earlier, ownership structures will evolve continuously with the evolving socio-economic and socio-ecological trends. This evidently presupposes frequent redefinition of ownership structures. Instituting a transparent and participatory mechanism of redefining property structures that involves grass-root communities in the decision-making process is an essential element to ensure the long-term viability of the system.

This is particularly important for SSA where there are numerous ethnic tensions that are directly linked to ownership and management of resources. In this context, developing a functional property right regime will have multiple benefits of providing political stability in the region, besides providing the basis for the promotion of the much desired socio-economic development on a sustainable basis.

7.2.3 The Sectoral synergy Sub-model

The promotion of sectoral synergy is identified as a fundamental factor to promote sustainable industrial development in SSA. While the promotion of sectoral synergy at all levels is essential, there are three sectoral synergies that are critical for SID in SSA. These are the synergies between the public and private sector, formal and informal sector, and the agriculture and industry sector. The principal objective of the 'Sectoral Synergy Sub-model' is to overcome the competitive trend between these sectors and to strengthen their complementarity.

The first strategic step to overcome these shortcomings is to recognize the complimentary role of these sectors and avoid policy favoritism and/or bias towards the one at the expense of the other. Thus, the promotion of strategic linkage between these sectors that is based on the recognition of the dynamic socio-economic contribution of each sector is a basic requirement for promoting sustainable industrial development in SSA. The policy favoritism that was directed towards the public sector development in the 1970s and 1980s has significantly undermined the development of the private sector in SSA. As a result, the private sector is still at its infancy stage. Since the beginning of the 1990s, an increasing number of African governments have recognized the critical role of the private sector in Africa's development. Nonetheless, concrete measures of overcoming the inertia from the earlier decades and enhancing the private sector's participation is still lagging behind in most countries. One strategic option is to utilize the privatization process (which has become a common practice in SSA) as a basis for promoting public-private sector partnership and enhancing the development of the local private sector. Furthermore, African countries should develop a special private sector support program that is managed with the participation of the private sector as key partner.

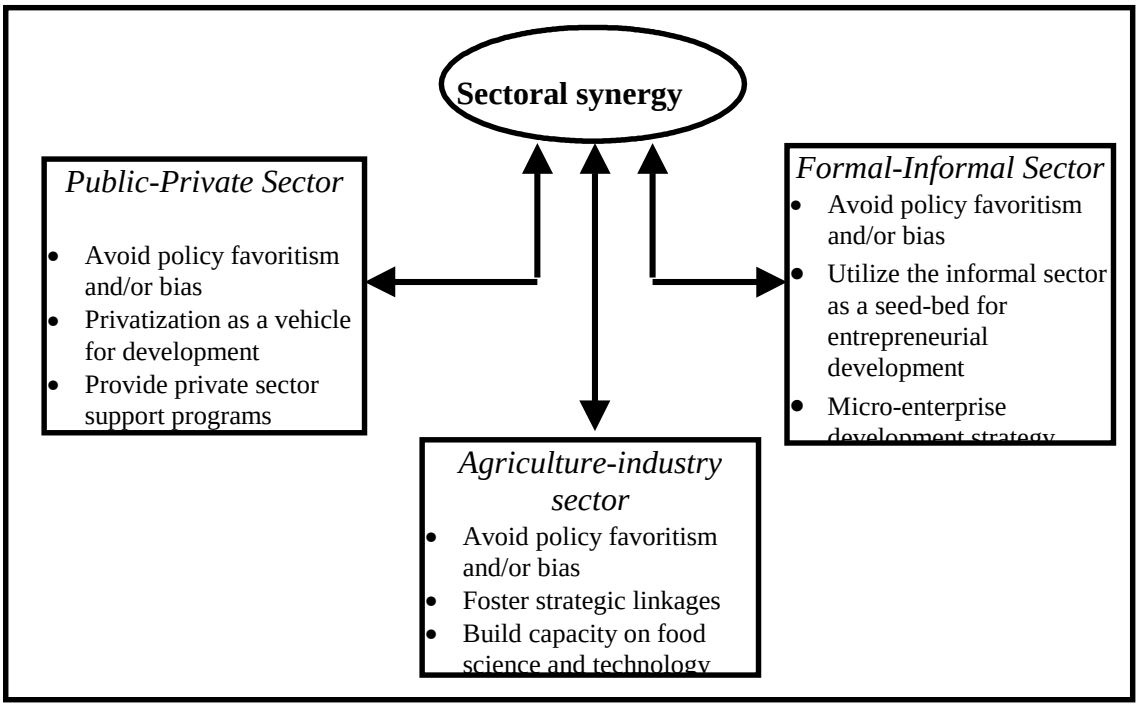


Figure 14: The Sectoral Synergy Sub-Model and its Strategic Elements

Agriculture is the mainstay of the economies of most sub-Saharan African countries. As such, it constitutes a significant share of the GDP, employment and export earnings of these countries. Apparently, any industrial development strategy under such a situation should be based on consolidating the forward and backward linkage of the industrial sector with the agricultural sector. In view of achieving food self-sufficiency as a regional priority, the focus of the strategic linkage between agriculture and industry in SSA should focus on promoting the development of appropriate food science and technologies that are responsive to the local nutrition culture and ecology. This has to be based on combining indigenous knowledge of food processing and preservation with modern technologies.

There is abundant literature that presents lack of entrepreneurial skills as the major hindrance for industrial development in SSA. A closer look at the informal sector shows that a reservoir of skill and creativity exists within the African societies. The challenge is to develop a proper mechanism for tapping into this resource and to use the informal sector as a seedbed for generating African entrepreneurs. There are numerous entrepreneurial development initiatives in SSA that had been launched in recent years as part of capacity building initiatives.

Most of these initiatives are based on replicating the prototype model of entrepreneurial development from Western or Asian countries. While experience from other regions may be useful to provide an insight, development agencies have to realize that entrepreneurial development is highly influenced by the socio-economic and cultural context. A micro-enterprise development strategy that is based on a full understanding of the informal sector operating in a given country provides a sound basis for developing sustainable enterprises that are responsive to the specific socio-economic and socio-ecological signals. Such a strategy may also provide the foundation for poverty alleviation through targeting the most vulnerable segments of the society including women.

7.2.4 The Global Momentum Sub-model

In today's world of globalization, no country's strategy can be free of influence from global factors. The effect of globalization on Africa's development has been significant in the past three decades. While there are a number of global factors that may have one or another kind of influence, there are two global factors that have been identified as the fundamental factors that need to be addressed if Africans wish to promote sustainable industrial development. These two factors are the debt burden and the liberalization impact. Addressing these two factors, which currently function as a source of global inertia to Africa's development effort, will provide an additional global momentum to facilitate sustainable industrial development in sub-Saharan Africa.

The debt burden of SSA has been the focus of numerous research initiatives during the last few years. A few mechanisms are in place to address the debt-burden issue. While the issue of debt is a common problem to the developing world, as was presented in Chapter 7.4.1, the situation is quite different and grave when it comes to SSA. Even if the self-centered and disoriented leadership of sub-Saharan African countries has contributed to the debt crises, the global financing institutions also have a significant share of responsibility for the crises. In the end, however, it is the billions that are struggling for survival who are bearing the brunt of the debt burden. Within the current global context, none of the highly indebted sub-Saharan African countries are in a position to come out of the debt quagmire on their own.

The principle of 'Common but differentiated responsibility' that has been coined with respect to the global environmental commons, seems to be quite appropriate for the resolution of the debt crisis. Such a measure should take into account the historical precedent of the debt situation in sub-Saharan Africa and the enormous developmental challenge that is faced by sub-Saharan African countries.

In this context, it is absolutely imperative for the global financial establishments and the developing world to take the lead responsibility to provide debt cancellation (or substantial reduction) to highly indebted countries in SSA. On the other hand, it is equally important for governments in SSA to utilize the financial capability that is going to be obtained from the debt relief to promote development in their own country. From a long-term development perspective that is based on enhancing self-dependency, a significant share of such funds should be utilized to put the fundamental prerequisites for development in place rather being spent on providing social services.

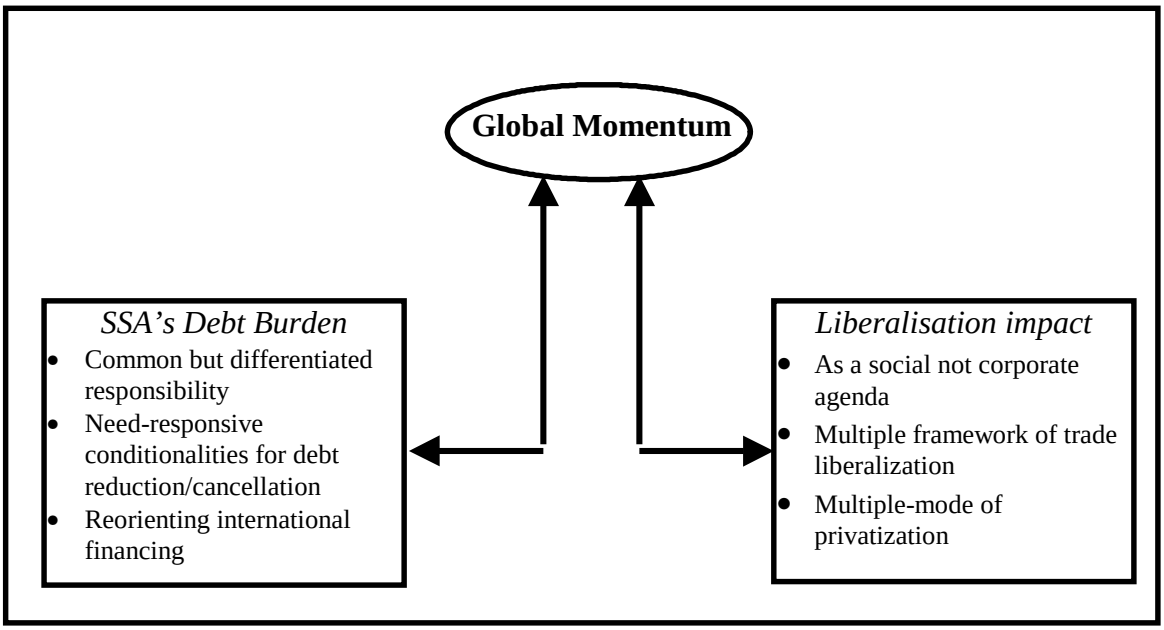


Figure 15: The Global Momentum Sub-Model and its Strategic Elements

The Highly Indebted Poor Countries (HIPC) Initiative is a mechanism that is developed by the IMF and the World Bank to address the 'debt sustainability problems' of poor countries. This initiative has a series of conditionalities that have to be fulfilled in order for a country to benefit from this initiative. The potential of using the debt resolution mechanisms as a catalyst for promoting changes in the developing world may be a desirable objective. Nevertheless, the current conditionalities that are promoted by the IMF and the World Bank have carry-over limitations, since they are basically an extension of SAP requirements.

If such conditionalities are desired to be development-oriented, they have to be primarily responsive to national and regional needs and operational realities. In this context, it is valuable to consider the points included in the 'African position on HIPC' that was recently endorsed by African stakeholders on the debt crisis.

While overcoming the debt-burden problem is a priority, it is equally important to reorient international financing in such a way that it promotes sustainable development. Recently, the Operations Evaluation Department of the World Bank organized an on-line conference. The theme of the conference was "Promoting Environmental Sustainability in Development." Inputs from different parts of the world have strongly indicated that, despite the enormous effort made by the World Bank, it has not been successful in promoting environmentally sustainable projects. In this context, reorienting international financing policies so that it promotes sustainable production and consumption will enable us to avoid 'ecological debts' going beyond the financial debts Thus, reorienting international financing should be taken as one strategic element of avoiding future debt crises of any nature.

The globalization process that is happening in the form of trade, investment, and capital flow liberalization is another global inertia factor that poses a significant challenge to development efforts in the developing world. While globalization as a socio-economic phenomenon may not be inherently damaging, the process of globalization, as it is happening today, places the developing world in a disadvantageous position. In the context of this research, the following three strategic principles should be adopted in order to avoid the adverse impact of globalization on the development efforts in SSA.

Primarily, the globalization process, as it is promoted today, is serving as a vehicle for promoting the interests of the corporate empire with the irrational assumption that 'what is good for business is good for the society'. The progress towards a more sustainable society will require the de-rationalization of the above assumption to 'what is good for the society is good for business'. The globalization process, that has been championed by the World Trade Organization (WTO) and other multilateral organizations, has become an exclusive club through which the corporate empire and a few industrialized countries dictate the terms and condition of globalization to the whole world. From a global sustainability perspective, the WTO must be transformed into an inclusive forum where the interest of all stakeholders is reflected and addressed. In this context, the developing world, including countries in SSA, need to solidify their position and ally themselves with the international civil society movement that is working to counter-balance corporate domination.

The release of the 'African Declaration on Seattle' that was endorsed by representatives of African Civil societies, marks the beginning of such a process. The declaration which is entitled 'No New Round - Turn Around' covers a number of points that reflects Africa's position on the globalization process. The international civil movement that challenged the WTO conference in Seattle echoed most of the points that were contained in the African declaration.

Secondly, the WTO and the developed world demand complete liberalization of trade in developing countries within the context of liberalization. The developed countries used different kinds of direct and indirect protective measures to develop their economy and they still have some of these protective measures in place. Having a leveled field of competition for all parties is a fundamental prerequisite for achieving a socially beneficial and economically efficient competition. In this context, attempting to impose a single global model of liberalization, with minor provisions covering the developing countries, reflects a fundamental mismatch with the global reality. From sustainability perspective, the liberalization process will require a multiple framework of liberalization that is aimed at leveling the ground for 'free competition' and narrowing the global economic disparities that prevails today. Such a process will lead to a 'free and fair competition' that benefits both the developed and the developing world.

Thirdly, privatization has been promoted as one of the major liberalization strategies. At the beginning of 1990, about a dozen countries in Africa undertook some form of privatization; by 1993 that number doubled and by the end of 1996 all but five countries divested some public enterprises (UNECA 1999). The key objective of privatization from a globalization perspective is the transfer of publicly owned enterprises to private holding and the restriction of the role of the government to the creation of enabling environment for free-competition. For some governments, the principal objective might be the generation of additional revenues for development activities. From a sustainability perspective, however, the privatization can be utilized as a mechanism for promoting social equity, enhancing the dynamic link between public and private sectors and facilitating the development of the domestic sector. Fulfillment of such an objective will require a multiple-mode of privatization that broadens the basis for local participation.

7.2.5 The Sustainability Sub-model

All of the previous sub-models were developed based on identifying the fundamental factors that determine the nature and pace of development in SSA. As such, their applicability may be limited to SSA even if the general framework and approach may provide an insight that could be useful for other parts of the world. The 'Sustainability sub-model' that is presented at the base of the strategy framework, however, is a model that may be applicable for all parts of the world. It provides a general principle that can be applied in the process of developing policies and strategies for sustainable development in any part of the world. In the context of this research, the Sustainability Sub-model has two major components. These are the macro-policy and the sectoral policy domains.

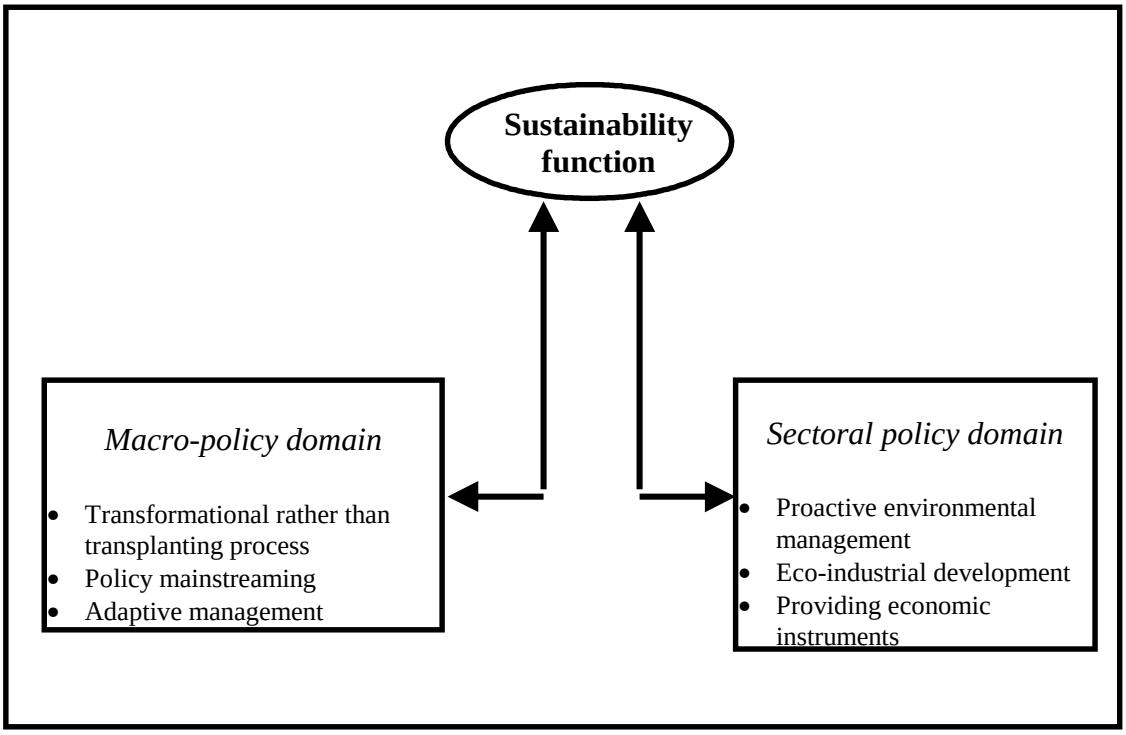


Figure 16: The Sustainability Sub-model and its Strategic Elements

The macro-policy domain is composed of three fundamental principles. These are placing emphasis on transformational rather than transplanting industrialization process, the policy mainstreaming principle and the adaptive management principles. One of the major shortcomings of industrial development strategies in SSA is their inability to consider the industrialization process as a societal transformation process in its broadest sense.

As a result, industrialization has been mainly promoted as unidirectional economic growth that could be achieved through the transfer (or rather the transplantation) of technologies and the infusion of foreign direct investment. This has led to a misplaced emphasis on unidirectional 'technology transfer' and attraction of foreign direct investment to SSA, which has never been successful. In this connection, it is of primary importance to promote industrialization as a transformational process that correlates with the socio-economic and socio-ecological context of African societies.

The principle of mainstreaming is based on the recognition of the following two factors. Primarily, one of the key features that emerges from policy analysis with respect to environmental issues or sustainability is the limitation of considering environmental issues as an 'add-on' element in development policies and strategies. As pointed out by Munasinghe (1996), 'up to now we have not seriously considered altering economy-wide policies merely to achieve environmental objectives but instead have chosen to rely on specific complementary measures to mitigate environmental harm'. Apparently, even if most of the countries in SSA have a number of environmental policies and regulations they have limited results due to the absence of the necessary enforcement mechanisms. This approach has not been successful in promoting environmental protection within SSA and it definitely fell far short of promoting sustainable development. In practice, the 'add-on' approach has limitations in terms of achieving effective environmental management even in the countries where there are highly organized enforcement mechanisms[13].

One can make a parallel analogy with the effectiveness of the end-of-pipe management and pollution prevention approaches. However effective it could be, the end-of-pipe management approach will not be sufficient to achieve sustainable development. The shift in emphasis to the more integrated approach of pollution prevention and cleaner production is based on the recognition of the limitations of the 'end-of-pipe' approaches at the micro level. Similarly, the 'add-on' approach with respect to environmental issues at the macro-level has made limited contributions to the promotion of sustainable development at the macro-level. Hence, there is a need for a shift with respect to the treatment of environmental considerations at the macro level. Empirical evidence shows that sustainable development cannot be achieved through 'add-on' environmental policy regimes. It requires the integration of ecological considerations in the very process of designing development strategies.

[13] United States, which is a country with the most comprehensive regulatory and enforcement mechanism in the world is usually cited as the number one polluter in the world.

The mainstreaming principle can be applied by instituting a mechanism of socio-ecological consistency in all major macroeconomic policies through a strategic impact assessment of policies and strategies.

One of the major factors that has contributed to the failure of development strategies in SSA is the 'static' perception of development strategies irrespective of their operational environments. This has been based on the wrong conclusion that what has worked for one country/region should work for another. This has led to a 'single model' dominance which goes to the extent of prescribing the details. As it was seen in the case of SSA, the inherent static nature of the models promoted have been acting as a source of inertia in terms of making the necessary changes even after the models have proven to fail repeatedly. Overcoming such a static approach is a key element in developing strategies for sustainable development. This can be achieved through the adoption of the adaptive management principles in the field of policy and strategy development.

The basic tenet of this principle is that a strategy should be primarily based on the local dynamics and should have a feedback mechanism that would enable it to evolve continuously in response to the changing internal and external environment. The adoptive process should cover the whole chain of the strategy development process instead of being limited to the lower end of the process. In a nutshell, it can be said that any development strategy is as good as its response mechanisms to the changing environment. No one can talk about a perfect strategy at any moment in time while we have a continuously and irreversibly evolving and changing environment. Thus, the primary focus in strategy development for sustainable development should not be on how perfect it can be but on how efficiently responsive it is.

The second dimension of the 'Sustainability Sub-model' is the sectoral policy domain that specifically refers to the development of the industrial sector. Besides rectifying the myopic perception of the industrialization process, sub-Saharan African countries need to incorporate socio-ecological considerations into their industrial development strategies. This can be achieved by the adoption of proactive environmental management and the eco-industrial development approach. Sub-Saharan African countries are placed in an advantageous position that would enable them to utilize the evolving concepts and tools that have been discussed in Chapter 5 as a basis for laying the foundation for sustainable production and consumption.

This, in a way, provides the possibility for developing countries to tunnel through the 'Environmental Kuznet's Curve'[14] (Munasinghe 1995) and achieve the desired level of industrial development without causing a significant adverse impact on the natural environment.

The proactive environmental management approach, as a constellation of concepts and tools that are aimed at improving the environmental performance of products, processes and services, can be adopted and implemented to any scale of industrial operation. The principal objective of this approach is to minimize and eliminate the adverse environmental impact of any industrial operation through integrated, preventive, and life cycle oriented approaches. Considering the current low levels of industrial efficiency and resource utilization, industries in SSA can benefit significantly by adopting the proactive environmental approach. The eco-industrial development (eco-restructuring) approach takes the environmental performance improvement one step further by focusing on a number of industries operating in a given region. This involves industrial planning at a regional level with an objective of fulfilling socio-economic and socio-ecological objectives on a sustainable basis. Eco-industrial development approaches are particularly effective in developing natural-resource-based industries. Since SSA has a significant potential to develop natural-resource based industries, adapting the eco-industrial development approach, as its principal industrial development strategy will enable Africa to develop its industrial sector on a sustainable basis.

In a global economic system where the market holds a prominent position as a source of signals (information), economic instruments have a vital role to play in promoting sustainable industrial development. This can be achieved by applying different kinds of economic incentives that encourage industries to take proactive measures to improve their resource efficiency and instituting economic disincentives that forces polluting industries to reduce their environmental impact through polluter pays principles. The design of such economic instruments should be guided by the objective of facilitating a desirable behavioral and operational change at the industry level rather than being driven by revenue generation for the government. In this context, sub-Saharan African countries should take the necessary steps to put the appropriate economic instruments in place together with the necessary technical and institutional support.

[14] The Environmental Kuznet Curve is the inverted 'U' shaped curve which indicates that pollution increases with increasing income up to a certain point, and then starts to decrease with rising income.

The development of the necessary institutional setups for the promotion of proactive environmental management and eco-industrial development is of strategic importance for Africa's industrialization on a sustainable basis. This will include:

- Developing the human capacity in the field of preventive environmental management;
- Creating institutions such as National Cleaner Production Centers that can serve as instruments for capacity building and as information clearinghouses;
- Considering eco-industrial development approaches as the basis for regional planning of industrial development;
- Introducing policies that provide economic incentives to those industries that are taking proactive steps and that impose economic disincentives for those who are lagging behind.

The strategic focus of the development challenges in SSA and the strategic measures that are proposed within the strategic framework can be summarized as follows.

Table 18: Summary of the strategic elements of the development challenges in SSA and the proposed measures

Sub-model	Strategic challenges	Strategic measures
Natural resources	· Mismatch between population and carrying capacity · Ineffective conservation measures · Lack of ownership security	· Promoting demographic transition · Promoting 'Local Resource Management' approach · Introducing efficient property right regimes
Human resources	· Bias against local expertise · Loss of highly skilled professionals due to the brain drain process · Loss of the productive segment of the population due to AIDS epidemic	· Improved local capacity utilization through expertise twinning · Shifting to strategic human resource management addressing the fundamentals · Community education on AIDS

Financial resources	· Policy overemphasis on foreign investment · Loss of local capital due to capital flight	· Promoting local investment as the key for development · Providing financial security and incentive to reverse and contain capital flight
Physical infrastructure	· Low coverage on strategic infrastructure · Weak management and maintenance capability	· Infrastructural development with emphasis on ITC · Develop efficient management and maintenance capabilities
Institutional infrastructure	· Alienation of the nation-state · Disoriented and dysfunctional education system	· Endogenizing governance through community empowerment · Make education responsive to local conditions and foster link with indigenous knowledge systems
Property right regimes	· Domination of mono-structure of ownership · Static and rigid property right regimes · Weak protection mechanisms	· Develop combinations of ownership structures · Install dynamic and transparent property redefining mechanisms · Provide effective protection mechanisms
Sectoral synergy	· Policy frameworks with sectoral bias · Weak link between complementary sectors · Lower capacity of the disadvantaged sectors	· Remove policy favoritism between complementary sectors · Foster strategic linkage between public and private, formal and informal, and agriculture and industry · Provides support programs to the disadvantaged sectors
Global momentum	· The debt-burden as the sole responsibility of the developing world · Rigid conditions for debt reduction/cancellation · Single model of trade liberalization and privatization · International financing promoting unsustainable production/consumption	· Uphold the principle of 'Common but Differentiated Responsibility' · Need-responsiveness conditions for debt cancellation/reduction · Multiple framework of trade liberalization/privatization · Reorienting international financing to avoid future financial and natural debt

Sustainability function	· Industrialization as a transplanting process · Environment as an 'add-on' policy issue · Rigidity and lack of mechanisms for continuous improvement of policies and strategies · Dominance of reactive environmental management attitudes and practices · Low level of utilizing economic instruments to promote environmental performance improvement	· Industrialization as transformational process · Mainstreaming socio-ecological factors in development policies and strategies · Following adaptive management principles in policies and strategies development · Promoting proactive environmental management and eco-industrial development · Enhanced utilization of economic instruments

To conclude, this research has been based on the conclusion that the path and pace of societal evolutionary succession is determined by the ability of that society to identify, process, utilize and accumulate survival-relevant information. Having such a capacity will enable society to have efficient feedback mechanisms that operate with minimal feedback lag. The relevance of the information is determined by the interaction between the entity and significance factors which reflect the 'process of becoming' the 'state of being', and the 'evolutionary space'[15] of the respective society. A mismatch between the entity factors and significance factors will lead to an increase in feedback lag. Such feedback lags are the major source of the developmental and environmental challenges of the twentieth century. In the case of sub-Saharan Africa, this situation is further aggravated by the continuous deterioration of the region's capacity to identify, process, utilize and accumulate survival-useful information. In this context, the key step to promote sustainable industrial development in SSA is to revive and develop such capacities in the region. The elements that are proposed in the strategic framework are aimed at enhancing such capacity revival for developing SSA on a sustainable basis.

[15] Evolutionary space represents the multiple possible evolutionary path of a given system.

7.3 Ethiopia as an illustrative case

Ethiopia is a landlocked country in the Horn of Africa. Its boundaries extend from latitude 3^0 N to 15^0 N and from longitude 33^0 E to 48^0 E, enclosing an area of 1,133,380 sq km. Ethiopia is a country of great geographical diversity endowed with a rich natural resource base (CSE 1998). Its location, near the equator, with extensive altitudinal range has rendered the country suitable for human settlement based on a range of crop production systems and pastoralism for thousands of years. According to a census conducted in May 1984, the total population was 39, 868,501. Based on these figures, the country's estimated total population was 58,506,000 in mid 1996 (Last 1999). Ethiopia's economy is mainly based on agricultural resources. Aside from agriculture, livestock and forestry, Ethiopia has undeveloped mineral resources. In the past five years foreign interest in gold and other precious metals, and oil and gas exploration has increased (EIU 1999).

7.3.1 The Ethiopian economy

The Ethiopian economy is highly dependent on agriculture, which accounts for around 50% of GDP. An estimated 85% of the population earn their livelihood directly or indirectly from agricultural production. Coffee export accounts for more than 65% of foreign exchange earnings, while hides and skins are the second main foreign-exchange source. Services account for more than one third of economic activity. The composition of service earnings has shifted only slowly in response to the recent economic liberalization, with limited growth in the building, transport and tourism sectors. Agricultural activity is uneven in geographical distribution having the main concentration in the highland region. A grain surplus is produced largely in the central and western regions, while the northern highlands are far more vulnerable to variations in rainfall. Coffee production is prominent in central and southern areas while pastoralism predominates in the east and southeast lowlands.

Industry accounts for some 10% of the economic activity. Manufacturing is overwhelmingly concentrated around Addis Ababa and Dire Dawa. The government is fostering attempts to boost the manufacture of consumer goods in regional centers such as Mekelle and Bahir Dar. According to UNIDO (1996), the economic and industrial evolution of Ethiopia has closely mirrored its domestic socio-political environment. A period of relative political stability combined with the pursuit of prudent macroeconomic policies in the mid-1950s to the late 1960s saw the economy expand impressively, the manufacturing base grew considerably, and the development of institutional capacity took root.

Yet development in 1974 ushered in a period of socialist economic transition and eventual economic regression. For much of the period between 1974 and 1991, Ethiopia had a socialist command economy. During this period, national planning was completely controlled by the government and decisions were implemented by force. In the 1960s, GDP increased at an average annual rate of 4.4%, while in the 1970s and the 1980s it rose by 1.9% and 1.6% respectively (Pickett 1999).

From 1974 to 1991, Ethiopia suffered continuously from civil war and like most of the sub-Saharan African countries in the 1970 and 1980s, Ethiopia faced increased economic problems. However, as Hansson (1995,5) stated, "even if the civil war demanded enormous resources and thus hampered the possibilities of economic growth and development, and even if international prices and interest rates have not always changed in favor of a country like Ethiopia, domestic policy measures played a central role in the negative process of development during this period." The policy reforms during this period were driven by the political motto entitled "Ethiopia Tikdem" literally meaning Ethiopia First. The main characteristics of the economic system is summarized by Hansson (1997) as follows:

- A highly centralized resource allocation;
- Resource allocation that was largely determined by administrative processes and orders, instead of by market forces and prices;
- Widespread state ownership in non-agriculture; state-owned land, mainly used and worked by private (individual) farmers;
- Lack of incentives for individuals;
- Lack of competition;
- Heavy trade- and exchange-rate controls. Overvalued exchange rate and a growing illegal trade and parallel markets for foreign exchange;

The political party that is currently in power is the Ethiopian Peoples Revolutionary Democratic Front (EPRDF). At the downfall of the military-led socialist government in May 1991, EPRDF formed a transitional government through a coalition with different political parties. Shortly after taking power, the transitional government announced its intention to dismantle the command economy and to return to the market most of the functions that it had lost. It also indicated that it would pursue policies that would deliver macro-economic stability. The resultant economic reform program was embodied in a series of policy framework papers that were supported by the IMF, the World Bank, the European Union and leading bilateral donors (Picket 1999).

In 1995, the Ethiopian Peoples Revolutionary Democratic Front (EPRDF) won a national election and formed a government that replaced the transitional government. Since EPRDF is the core political group of both the previous Transitional and the current Federal Government of Ethiopia, existing policies and strategies are essentially a continuation of the policies and strategies of the Transitional Government that ran the country from 1991 to 1995.

7.3.2 Current policy and strategy framework

The policy and strategy reforms in Ethiopia are based on the economic policy that was issued by the Transitional Government of Ethiopia in November 1991. According to a document produced by the Ministry of Planning and Economic Development (MOPED), the policy has the following six major objectives (MOPED 1993). The primary objective was stated as the replacement of the command economy by an economic system driven by market forces. The second major objective of the transitional economic policy is the enhancement of popular participation in economic activities and decision-making processes by ensuring the control over resources by regional authorities. The third policy element pinpoints the underlying factors for the progressive decline and collapse of the economy as being inherent in the structure of the economy. One of the factors is defined as the absence of firm links and interdependence among various sectors of the economy. The fourth issue is the strategic importance given to agriculture as a sector that needs to be placed on the right track, as a sector that is decisive to attain food self-sufficiency and as a starting point for structural transformation. The fifth point is ensuring a link between the various sectors of the economy, but particularly between agriculture and industry. The sixth element of the policy points to the need for expanding the frontiers of production, both in quantity and quality, to obtain foreign exchange.

Based on the economic policy, the Transitional Government issued an economic development strategy that is known as the 'Agricultural Development Led Industrialization (ADLI)'. MOPED (1993) states that ADLI has been chosen as a strategy not only to avert the failure from the import substitution strategy and the export-led industrialization strategy that have been witnessed in the past, but also it would :

- have, as its focus, the bulk of the population;
- constitute a basis for the task of structural transformation; and
- lay the foundation for self-sufficiency.

The document further states that the adoption of ADLI does not mean that an export-led industrialization strategy and an import substituting strategy are altogether useless or unnecessary. It states that the real issue is how to harmonize them and optimize their contribution to economic development and it claims that ADLI will accomplish this objective. The Agricultural Development Led Industrialization strategy is further segregated into sectoral strategies that include (MOPED 1993:18): agriculture, industry, mining, population growth, technological progress, economic and social infrastructure, etc. The following can be identified as the core elements of the industrial development strategy component of ADLI (MOPED 1993):

- Emphasis on the expansion of the domestic market rather than the export market;
- The promotion of labor-intensive technologies and utilization of domestic raw materials;
- Determination of the composition of industrial output based on the needs and income levels of the population;
- Government intervention to motivate the choice of labor-intensive technology that makes extensive use of domestic raw materials.

Although the strategy is named as 'Agricultural Development Led Industrialization' it is clear from the document that various aspects of industrialization are the key elements that influence the development of agriculture in the country.

In accordance with the economic policy, the Ethiopian government has maintained an exceedingly cautious fiscal policy and controlled monetary growth, while simultaneously engaging in 'substantial structural reforms including devolution of power to the regions' (Hansson 1998). Sudarshan Gooptu, a Senior Economist at the World Bank, said that 'the ongoing economic reform program in Ethiopia is, indeed, homegrown' (Gooptu 1998). The reform process has led to a number of encouraging results although there are some doubts on the sustainability of these results. In this connection, EIU (1999,23) concludes that "the economic reform process, in formal macroeconomic terms at least, has achieved a degree of stability that few involved in its planning would have dared to predict. However, its attainment of the underlying aims of improving basic social services, reducing poverty and laying the foundations for sustainable economic growth is far less certain." According to this report, the recorded GDP growth rates of 5-10% between 1994 and 1997 reflect favorable climate and harvests rather than the discernible impact of policy changes.

Nevertheless, assessed against the background of Ethiopia's war-battered economy in 1991, and the in-coming government's inexperience in economic management, different reports indicate that the economic reform program has been comparatively smooth and successful. Since 1992, the country has adopted what in practice was a fairly standard structural adjustment program (SAP). In 1992, a World Bank-led economic recovery and reconstruction program (ERRP) was launched, followed later that year by structural adjustment credits from the IMF. Until recently, cooperation and coordination between the donor community and the government, in general, have been smooth despite differences on the pace and scope of liberalization.

Over the past five years, Ethiopia has cautiously devalued the birr and moved towards a market-determined exchange rate by the use of periodic and partly managed foreign exchange auctions. According to EIU (1999: 35), "the reforms appear to have been remarkably successful; a major, yet gradual, devaluation of the birr has been achieved, with minimal inflationary consequences, and in the parallel market, the rate of the birr has gradually fallen, narrowing the premium for unofficial foreign-exchange transactions." As a result of the reforms, Ethiopia's official reserve position has strengthened considerably in the 1990s. Successive devaluation and liberalization measures appear to have had little impact on inflation, which averaged 2.3% a year between 1993 and 1997, down from 35.7% in 1991 (EIU 1999).

7.3.3 Framework of responses to the national challenges

The government has developed a number of sectoral strategies and programs taking the economic policy and the development strategy as their basis. The following policies, strategies and development initiatives are the most relevant ones in the context of this research and the strategy framework proposed for SSA.

7.3.3.1 Environmental policies and strategies

Ethiopia has abundant natural resources, but agricultural land in densely populated areas of the highlands has been deteriorating steadily in recent decades. Increasing and sometimes conflicting demands have led to a great proportion of the biological resources in the rural environment being used in unsustainable ways. This has resulted in further reductions in the country's ability to produce food and other biological resources demanded by the increasing human and animal populations (CSE 1998). Accelerated deforestation has led to severe soil erosion in regions where populations are entirely dependent on marginal, rain-fed agriculture.

This has spurred a series of environmental initiatives by the government, including a National Conservation Action Plan with measures for selective reforestation. An Environmental Protection Agency has also been created and steps are being taken towards establishing a biodiversity strategy.

The Conservation Strategy of Ethiopia (CSE) takes a holistic view of the natural, human- made and cultural resources, and their use and abuse and seeks to integrate, into a coherent framework covering existing and future plans, policies and investments related to environmental sustainability. The overall policy goal is 'to improve and enhance the health and quality of the life of all Ethiopians and to promote sustainable social and economic development through the sound management and use of natural, human-made and cultural resources and the environment as a whole' (CSE 1998:2-3).

The CSE has 11 sectoral and 11 cross-sectoral policies, each with its own objectives, guiding principles and strategies. An action plan and institutional framework for implementing activities that are in line with the aims and objectives of the CSE have also been detailed. The Environmental Policy of Ethiopia (EPE) was developed based on the Conservation Strategy of Ethiopia and is sought to guide all environment-related activities which are undertaken or must be undertaken by the Environmental Protection Authority and other sectors. Both CSE and EPE have addressed the issue of population and environment as one of the cross-sectoral issues. Specifically, "undertaking a comprehensive and country-wide assessment of the human carrying capacity of the natural resources and the environment to identify potential areas for voluntary settlement"(EPA 1997:18) is stated as one of the policies on population and environment. The other policy elements that are stated under Article 4.1 reflect the need for promoting a demographic transition that is commensurate with the carrying capacity of the natural resource base. The government has also issued a national population policy that facilitates the demographic transition required for the development process.

Both CSE and EPE emphasize the importance of community participation in conservation and environmental management programs. As a matter of fact, CSE is based on implementation modalities at the local level. Currently, most of the regional governments have developed regional conservation strategies (RCS) while a few are still going through such development. Furthermore, community participation and the environment are one of the cross-sectoral policy components of the environmental Policy of Ethiopia. Nevertheless, both CSE and EPE do not have an explicit reference to local resource management approaches that are based on indigenous and traditional conservation practices, as the principal mechanism of conservation activities at the local level.

The government has to realize that efficient conservation will require more than mere participation. They require ownership by the community that can be achieved through local resource management practices.

7.3.3.2 Investment promotion strategy

National investment strategies are one of the key elements of a mechanism for checking and reversing capital flight from developing countries like Ethiopia. In this context, the establishment of the Ethiopian Investment Authority (EIA) and the issuance of a series of investment proclamations since 1992 constitute the core element of the investment promotion strategy of Ethiopia. According to the EIA (1999a), since July 1992 a total of 4000 new and 398 expansion projects with a total planned investment capital of birr 36.57 billion have been approved and given investment permits. The ownership structure of the projects approved indicates that 96.5% (4,246 projects) are domestic while only 3.5% of the investments are foreign investment projects. Capital-wise, however, foreign investments constitute about 22.7%, indicating a relatively higher capital per project compared to the domestic ones.

The investment proclamation No. 7/1996 defines the framework of investment incentives that are provided by the government. The proclamation provides tax exemption for investments that are classified as pioneer investment activities, promoted investment activities, and expansion and upgrading investments. The period for tax exemption is from 1 to 5 years, depending on the category of investment and their regional location in the context of relatively developed and undeveloped region. The investment incentive system, furthermore, provides some additional incentives for Ethiopian nationals living abroad and foreign investors who are reinvesting their profits. Despite a further liberalization of the investment code in 1998, and campaigns to attract foreign investors from both OECD economies and the Arabian Peninsula since 1994, foreign direct investment in Ethiopia remains minimal. The total foreign investment flow from 1992 to 1998 was about US$1396 million out of which about 30% came from a single Ethio-Saudi investor from the Middle East (EIU 1999). Apart from interest in mining and hydrocarbons, investments in the agro-industrial and tourism sectors show good promise. An inconspicuous, but nevertheless significant, amount of “foreign” investment comes from expatriate Ethiopians who are beginning to re-invest at home (EIU 1999).

The EIA has made a significant effort to create an international awareness regarding the scope of the investment potential that exists in Ethiopia.

As a result of this effort, a comprehensive investment guide for Ethiopia, the preparation of which was sponsored by the United Nations Conference on Trade and Development (UNCTAD) and the International Chamber of Commerce (ICC), was officially launched in July 1999 in Geneva. It was noted that (EIA 1999b) Ethiopia was selected as one of the six countries to participate in this pilot program. Although the effort that has been made so far has registered modest results, the level of both domestic and foreign investment has not yet reached a satisfactory level. Two of the most frequently cited impediments for the advancement of private investment in Ethiopia are the issue of land-ownership and the lack of an efficient legislative service that ensures the protection of property and the rule of law. These are issues related to the institutional and property rights sub-models. Besides making efforts to overcome these impediments, efforts have to be made to create additional incentives to enhance domestic private investment in the manufacturing sector. One area that has to be considered is the improvement of the condition of land availability for manufacturing industries and facilitating the process of acquisition of land.

7.3.3.3 Human resource management strategy

Awarding scholarships for foreign higher education was identified as one of the major routes of brain drain in Ethiopia. Aredo and Zelalem (1998) conducted a case study covering four of the major government institutions that are providing scholarships for higher education. The institutions are Addis Ababa University (AAU), the Ministry of Economic Development and Cooperation (MEDAC), the Ethiopian Science and Technology Commission (ESTC), and the Disaster Prevention and Preparedness Commission (DPPC). The study indicated that the number of non-returnees, from among the staff sent abroad for further studies has steadily increased since the 1980s and shows no sign of abating. The study further indicates that the percentage of female non-returnees from the four organizations, which stood at 43% over the period considered, was higher than the percentage for male non-returnees which was about 34 percent.

Table 19: Profile of staff from case study institutions that did not return home

	AAU	MEDAC	ESTC	DPPC
Study period	81/82-94/95	80/81-96/97	86/87-95/96	92/93-95/96
Percentage of non-returnees	35	38	41	23
Fields with higher % of non-returnees	Medicine (43%)	_	Technology (56%)	Technology (53%)
Program of study with higher % of non-returnees	Ph.D. and specialization (42%)	MA (MSc) (50%)	Certificate Ph.D. (100%)	MA (MSc) (31%)
Major host countries	West Europe (42%)	West Europe (50%)	West Europe (94%)	West Europe (62%)
Major donors	Institutions (68%)	SIDA (33%)	NA	Governments (62%)

(Source: Aredo and Zelalem 1998:174)

As can be seen from Table 18, 43% of the medical doctors that were sent for specialization by AAU and 56% of the technologists who were sent by ESTC, did not return. In general, out of 1000 staff members sent abroad for specialization by AAU, 50 percent settled permanently in the countries to which they were sent. This situation continues to get worse year by year. The President of Addis Ababa University, in a speech delivered at the graduation ceremony of 1998/99, stated that the continuous flow of qualified and experienced professors and lecturers to other countries has become a matter of grave concern for the university to conduct its education and research activities. The problem is touching almost all-major institutions in the country and needs to be addressed immediately.

According to Minas (1998:204), 'human resources management in the Ethiopian civil service is based on a number of administrative rules and regulations that have served governments in the last four decades. As such, tactical management entangled with procedures that serve public authorities for short-term decisions. In this context, the government needs to promote a human resource management strategy that replaces the tactical management approach that is currently dominant with the strategic management approach, that lays the necessary foundation for developing a dynamic working environment for highly trained professionals. Such an approach should also promote a higher recognition and value to national expertise as compared to foreign expertise.

In this context, the government should promote, nationally available expertise for positions of international expertise and support the demand for competitive pay for Ethiopian nationals that are participating in development projects financed by international programs.

7.3.3.4 Infrastructural resource

The development of the physical infrastructure is given higher attention in the national development strategy (ADLI). The strategy contains specific elements of strategies covering road transport, air transport, power, telecommunications, rail transport, and water supply and sewerage. From the strategy document, it can be seen that the maintenance and improvement of existing facilities has been identified as one of the strategic measures to be taken with respect to road transport, telecommunications, air transport and rail transport services (MOPED 1993). Furthermore, in line with the economic policy of the country, the government has started to take steps for the partial liberalization of the power and telecommunication service industries.

Regarding the information and communication technology, so far, the National Telecommunication Agency is the sole Internet provider in the country and has limitations in terms of capacity. It is disclosed that the Internet service is one of the telecommunication services that is going to be partially liberalized and this is expected to address the limitations existing today. The Internet service is limited to Addis Ababa and its environs. However, a national project aimed at expanding the provision of Internet services to some of the regional states, is currently underway. Furthermore, it was disclosed that the World Space Foundation is currently in consultation with relevant government agencies in order to connect all schools in the country with the World Space foundation digital satellite system. Further liberalization of the ICT sector and the realization of the project with the World Space Foundation may provide the foundation for the transition towards a knowledge-based economy.

Education is one of the two sectors (the other being the health sector) that have a comprehensive sectoral strategy that was developed based on the country's economic policy and national development strategy. For hundreds of years in Ethiopian history, education has been associated with religious institutions and their teaching. Modern education in Ethiopia is as old as the creation of modern bureaucracy in Ethiopian history, which started to happen towards the end of the twentieth century (TGE 1994). At the beginning, it focused mainly in giving communication skills and the rudiments that were necessary to run the newly born modern bureaucracy. This had been the focus of education until it was disrupted by the second Italian invasion of Ethiopia in 1936.

After the defeat of the Italians in 1941, some efforts were made to give priority to education and a number of schools and institutions of higher learning were opened. Again, the main focus of this effort was to produce teachers and administrators for the state governmental machinery. Gradually, however, some technical and professional training centers were established to cater for the demands of the infantile modern economy.

The education strategy document produced by the Transitional Government of Ethiopia (TGE) questions the objectives and relevance of education in the last twenty years. It concludes that " though the curriculum was broadly based on international standards its usefulness to the objective situation in Ethiopia is contentious. It is generally agreed that the impact of modern education on the day to day life of the society at large has been negligible." (TGE 1994,1) The strategy document further indicates that at present, the educational system in Ethiopia is inundated with a number of problems and could be considered to be in a crisis. The crisis reflects itself in the fact that (TGE 1994):

- The few schools that are functioning are poorly equipped, overcrowded and badly managed;
- The curricula are irrelevant and with no clearly defined objectives;
- The teaching concentrates more on theoretical knowledge with little connection to day-to-day life;
- The approach lacks to be problem-solving orientation;
- Technical-vocational training institutions are very few and deficient in quality of their training;
- Higher education institutions are scanty and operating in overcrowded conditions and with minimal research capacity.

The principal objective of the education strategy is to produce citizens who are numerate and literate and that have (TGE 1994):

- the basic knowledge about themselves and their environment;
- the ability to recognize and solve individual as well as communal problems appropriately;
- the potential to be productive members of the community;
- the awareness to utilize their environment rationally;
- the attitude to interact with their fellow citizens in a civil and tolerant manner.

The strategy, furthermore, emphasizes the need for educational restructuring and curriculum review to fulfill the above stated objectives. It states that improvement of the quality of education begins with having an objective, goal-oriented and efficient structure. To this end, the new educational structure shall be comprised of the following four tiers. Basic education, covering kindergarten to grade 4; general education that covers general primary education (5–8), general secondary education (9–10) and preparatory secondary education of two years; higher education that includes college diploma, undergraduate and postgraduate education; and specialized education on a formal and non-formal basis. The curricula shall be revised accordingly to fit in with the educational objectives.

The government of Ethiopia has been implementing a series of structural changes based on the adopted policy and strategy. Most of the higher education institutions are in the process of reviewing their curricula. Some of the reforms that have been taken within the context of implementing the education policy and strategy at the primary and secondary level education have been faced with some resistance from students and teachers. This could be mainly related to the process of the reform rather than the content of the reform. Developing a broad base of participation in which all stakeholders in the educational system can make a direct contribution to the content and nature of the reform process, is essential in order to have an educational system that is responsive to societal needs. Furthermore, the educational restructuring and the curriculum review process should focus on transforming socially useful, indigenous knowledge and adopting the modern knowledge systems to local relevance.

Ethiopia's history as an organized and independent political entity dates from about 100 BC with a kingdom centered at Axum in the current northern regional state of Tigrai. In the fourth and sixth centuries, the Axumite Empire extended across the Red Sea, but its core lay in the northern Ethiopian highlands (Gilkes 1999). When the Axumite Empire collapsed in the eighth century, power shifted south to Lasta, and later to Shoa. In the 16th century, 50 years of conflict with the Muslim sultanate of Adal exhausted both. Subsequently Adal was reduced to the city of Harar and the Ethiopian rulers moved to Gondar in the north-west. In the late 18th century, as the monarchy weakened, the central government broke-down. During this period, the real power was in the hands of the provincial nobles. In 1855, Tewodros, a minor noble from Gondar managed to bring the country back under one monarchy, and this was later consolidated by Emperor Yohannes IV from Tigrai region.

Nevertheless, Ethiopia as it is known today, largely, emerged during the reign of Menelik of Shoa who succeeded Emperor Yohannes. Menelik of Shoa reunited and expanded the empire to the east, south and west of Shoa, which is the central highland of current Ethiopia. Despite the heavy-handed campaign that Menelik waged in areas where he faced resistance, he left most of the local governance systems intact. This was identified as one of the factors that contributed for his successful mobilization of the Ethiopian people to defeat the first Italian invasion in 1896 (Zawde 1994). Hail Selassie, who became emperor of Ethiopia in 1931, initiated the process of wrestling power from the nobility and local authorities and 'turning Ethiopia into a modern autocracy' (Gilkes 1999). Emperor Haile Selassie continued his policy of centralization after the second victory over the Italian invasion in 1941. Under Haile Selassie, 'Ethiopia remained essentially feudal, with a small Amhara-dominated modern sectors in the bureaucracy and in industry" (Gilkes 1999,453)

In 1974, the popular opposition to the imperial government reached its highest level. In September 1975, the last imperial kingdom was replaced with the military coordinating committee that was established as the provisional military administrative council (PMAC), also known as the Dergue. The PMAC began to see itself as the vanguard of the revolution and it opted for a socialist model of government. The Dergue that has emerged as a nationalist state evolved into a one-party socialist state that has further strengthened the centralization of power. This led to the intensification of the opposition movement led by EPRDF and the subsequent downfall of the government in May 1991.

The right to self-determination of nations and nationalities constitute the core principle of the current government led by the Ethiopian Peoples Revolutionary Democratic Front (EPRDF). Accordingly, the current Constitution of the country states that Ethiopia shall be a federal state under which the various states shall be delimited on the basis of the settlement patterns, identity, language and consent of the people concerned. The governance system that has been promoted by the EPRDF-led government represents a fundamental deviation from the governance practices that were promoted over the last one hundred years. The major challenge under such a circumstance is how to balance the devolution of power to regional states with the federal government functions including the protection of constitutional rights of individuals. This is particularly more challenging in a situation where most of the regional states are based on ethnic heterogeneity. According to Hansson (1995,156) "the majority of the regions consist of 5 and 13 nationalities. Only three consist of just one nationality and another two are largely one-nationality regions."

Under such circumstance, the ethnic-based devolution of power to the regions without effective Federal mechanism of civil protection may lead to infringement of individual and minority rights. Such a situation will have an adverse impact on the whole development process. Looking at the investment profile of the country, despite the provision of attractive incentives for investors in other regions, 40.3% of the total project approved and 52.2% of the total capital investment made so far is concentrated in Addis Ababa (EIA 1999). Some argue that there is a direct correlation between the investment bias and the level of individual and investment security in the regions.

On the other hand, one of the benefits of the ethnic-based federalism is that it provides the possibility of utilizing age-old traditional governance practices that have been suppressed during the 'centralization-era'. Here, it should be noted that sustainable development requires more than devolution of power to the regional states or the introduction of western democratic structures. It requires the empowerment of local communities down to the grass-roots level. The western democracy, as good as it is, has its own limitations in terms of empowering the people at the grass-roots level. Sustainable development, as a social transformation process, will require a new form of democracy that enhances people's participation in major decision-making process both at local and national level. In this context, the Federal Government of Ethiopia should take the necessary steps that promote the importance of community-based traditional governance practices. Combining the positive elements of these governance practices with the devolution of power and western democratic institutions will provide an effective basis for people's empowerment.

7.3.3.5 Property rights

There were numerous kinds of land tenure arrangements that existed in Ethiopia for many years until the end of the nineteenth century. Most of these arrangements were based upon local customary practices, historical backgrounds and the situation of land availability. As was noted by Aredo (1999,23), the long existence of such numerous forms of communal tenure arrangements "demonstrate peasant's capability to undertake institutional innovations in response to location-specific problems regarding access to land." The last Ethiopian monarchy, led by Emperor Haile Selasie, played a major role in redefining land tenure systems in the country. This role was manifested in different ways. First, the state was holding vast tracts of land throughout the country, and especially in the southern part of the country. As was noted by Rahmato (1994,20), "the vast holdings of the state were primarily used for political purpose: by grants of land the reigning monarchs sought to buy support and loyalty, or by threat of dispossession, to discourage opposition."

Second, as again pointed out by Rahmato (1984,21) "lands under private tenure were private not in the strictly capitalist but in the specifically Ethiopian sense of the term." Though rarely involved in practice, the sanctity of private property was not recognized in principle. In theory, all the land of the country belonged to the state (Aredo 1999).

Aredo (1999) argues that the Proclamation of March 1975 made the utilization of total land ownership for political control, universal and highly effective. By assuming uncontested control of land, the government was able "to exercise almost absolute power over the lives of the peasantry, including the power to recruit them into a vast army, resettle, villagize and tax them the way it liked" (Aredo,26). According to Rahmato (1994,1), "the 1975 and subsequent legislations which, taken together, constitute the government's land reform policy, contain contradictory and self defeating elements." According to Rahmato (1994), the three main outcomes of the enforcement of this proclamation were a) rural institutions were stripped of their decision-making power; b) policy implementation and management relied heavily on administrative and personal orders, rather than upon statutory law; and c) no effort was made to involve or consult peasants or their leadership on decisions affecting their lives or economy.

There are two important aspects that characterize the property rights regime with respect to land ownership in Ethiopia today. First, the issue of land ownership is now a constitutional issue in which the system of ownership is defined in the constitution of the country which came into force in December 1994. Secondly, the current government chose to retain state ownership of land, thereby, continuing the key provisions of the previous government on land reform. Rahmato (1995,ii) argues that both situations "will aggravate the rigidities of the land system, making timely changes in tenure and flexibility and efficiency in holdings more difficult, if not impossible." The constitution, which declares that land will continue to be owned by the state, has a provision that guarantees the usufructury[16] rights of land users. On the other hand, the constitutional declaration of the right to land for every Ethiopian who earns his living by farming necessitates the redistribution of land on a continuous basis. The land redistribution conducted in the Amhara Region reflects the element of contradiction that is present within the existing land tenure law in terms of protecting the usufructury right and the right to have land.

[16] Usufructury rights provide peasants use rights over their holding which includes the right to transfer them to others by rent or inheritance.

As noted by Hansson (1998,31) "considering the crucial importance of legal protection of land tenure rights for investments in land, the land redistribution in the Amhara region is problematic."

In general, the Government of Ethiopia needs to take the necessary measures to create a dynamic and flexible land ownership structure that is based on having a combination of private, state, and community ownership structure of land ownership. The declaration of land ownership as a constitutional issue has blocked the necessary condition for flexibility. However desirable it may sound politically, it will continue to act as a source of inertia for the whole development process and may even be detrimental to the political agenda of the ruling party. The definition of a dynamic ownership structure needs to be supported with the necessary legal protection regimes that include transparent institutional mechanisms for redefining property rights regimes on a continuous basis. The issue of having an efficient property rights regime is essential in terms of enhancing the effectiveness of the other strategic instruments and has to be given urgent consideration by the Ethiopian government.

7.3.3.6 Sectoral Synergy

The National Science and Technology Policy issued by the Ethiopian Science and Technology Commission (ESTC) in November 1994 contains a number of strategic provisions that imply the importance of promoting sectoral synergy. For instance, the "formulation and implementation of S & T plans, programs and projects to accelerate the country's socio-economic development; self-sufficiency in food production and satisfying the need for other basic necessities with due attention to environmental protection" is stated as first strategy element of the national policy (ESTC 1993,5). In addition, the national science and technology policy provides a framework to create favorable and supportive relations between science and technology education and the production activities. It also stresses the need to improve capability and methodology to identify the scientific content of traditional technologies.

The national science and technology policy identified the following as the priority sectors and programs: agriculture, natural resource development and environmental protection, water resources development, energy, industry, construction, transport and communications, mineral resources, health and population planning, education, new and emerging technologies. The policy further identifies a number of strategic elements under each sectoral program. Some of these strategic provisions promote different levels of synergies between some of the sectors.

For instance, “to encourage efforts to build and develop the capacity to produce essential inputs for the development of the agricultural sector” is stated as the first strategic element under the industry sector (ESTC 1993,12). Based on the national policy, ESTC has developed a number of sectoral policies including one for the industry sector. The national industry science and technology policy was issued in 1994 and it incorporates policies covering manufacturing, construction, transport and communication industries and handicrafts (ESTC 1994). The sectoral policy rightly emphasizes the importance of identification and improvement of endogenous technologies and the identification and promotion of environmentally sound technologies.

Both the national science and technology policy and the sectoral policies have some provisions that are cross-sectoral. These provisions can be utilized as a basis to foster sectoral synergies between some of the major strategic sectors. Such an effort can be more strengthened if the Ethiopian Science and Technology commission takes the necessary steps to establish centers that facilitate the implementation of the provisions that promote sectoral synergy. In this context, the establishment of institutes such as the Leather Technology Institute, that has been inaugurated recently, will have strategic importance in promoting efficient linkage between agriculture and industry sectors.

Regarding the public-private sector synergy, the government is making some steps in promoting public-private sector partnerships in some of the strategic sectors such as the power and telecommunication sector. Furthermore, the on-going transformation of state owned companies to share companies could be used as a basis for fostering the public-private sector partnership besides broadening the privatization base. The broadening of the privatization base should also give due consideration to the development and eventual transformation of the informal sector.

According to a recent survey done by the Central Statistics Authority (CSA), over 89% of the informal sector operators are concentrated in manufacturing, trade, hotel and restaurant activities while 85% of the small scale industries are engaged in the manufacturing of food, fabricated metal, furniture and wearing apparels. In 1997, the Government of Ethiopia issued a national MSE development and promotion strategy recognizing the role of the Micro and Small-scale Enterprises (MSEs) as an important vehicle to address the challenges of unemployment, economic growth and equity. The primary objective of the national strategy framework is to create an enabling environment for small and micro enterprises (MOTI 1997:5).

The strategy includes defining the elements of support frameworks for MSEs and the definition of institutional arrangements including the establishment of the Federal Micro and Small Enterprises Development Agency. The main objective of the Agency is to provide technical and institutional support for the development and promotion of MSEs in the country.

Another important legislation issued in connection with the informal sector development is Proclamation No. 40/1996 on 'Licensing and Supervision of Micro Financing Institutions'. Several micro financing schemes were established since 1991. Most of these micro financing schemes are associated with regional development associations and/or NGOs working in rural development projects. The need for legislation for micro financing schemes was necessitated, due to lack of provisions for such activities in existing monetary and banking laws. The proclamation empowers the national bank of Ethiopia to provide directives for the establishment and operation of a micro financing institution. Based on the power vested in it, the National Bank of Ethiopia has issued ten directives so far, covering different aspects of legalization, operation and supervision of micro financing institutions.

According to the information obtained from the National Bank of Ethiopia, so far, eleven micro financing institutions were issued license of operation, fulfilling all the requirements, while the application of six other micro financing institutions is under consideration. Most of the micro credit services that have been provided so far, are limited to supplying finance for purchasing of basic agricultural inputs and providing credit for petty trade activities. The establishment of the Federal Micro and Small enterprises Development Agency and the issuance of the proclamation on micro financing institutions provide a framework for the facilitation of formal-informal sector transformation. In order to lay down the basis for sustainable industrial development, however, there is a strong need to link the micro financing schemes with the technical support service that can be rendered by the Federal Micro and Small Enterprise Development Agency and other similar development agencies. Such services may include identification of projects for household and micro processing and provision of technical back-up support for the realization of the projects.

7.3.3.7 Global inertia

The government of Ethiopia has been undertaking a series of liberalization measures since 1991. Even if the liberalization measures follow the prescription given under the standard structural adjustment programs, they have been tailored in response to the country's economic policy objectives and the local institutional challenges.

The cautious approach followed by the government and the level of economic stabilization achieved seems to be a good indicator regarding the importance of correlating the adjustment programs with the pace of structural transformation. According to GebreAb (1998,8), "between 1991/92 and 1996/97 GDP grew at an average rate of 7 percent annually, the average rate of inflation stood at 3.6 percent and public savings increased from –0.9 percent of GDP to 5.6 percent."

The privatization process is one of the core elements of the economic liberalization and its results have been a source of diverse opinion. The Ethiopian Privatization Agency (EPA) was established in February 1994 by Proclamation No. 87/1994 with the mandate of managing the privatization process in Ethiopia. Azmite (1999,1) noted that, "unlike in the case of other developing countries who often retain the services of foreign experts in the formulation and subsequent execution of the program, in Ethiopia the privatization program was launched as a pilot exercise to enhance in-house knowledge and experience and by duly considering the socio-economic reality of the country."

Based on the above principle, the first phase of the privatization process was focused on smaller industrial and trade enterprises. According to Azmite (1999) this was done for the following two reasons. Primarily, to relinquish small retail activities to the private sector as soon as possible and secondly to reduce the cost of errors that may be committed owing to lack of experience. The privatization process proceeded accordingly and by the mid 1996/97 fiscal year, a total of about 21 industrial enterprises, 14 hotels and 108 retail enterprises were privatized. By May 1999, a total of 138 small businesses and 37 industrial enterprises have been transformed to private ownership (Azmite 1999). It was further noted that, there are plans to privatize a total of 120 public enterprises over the coming three years. As a result of this cautious approach, the privatization process in Ethiopia has been generally cited to be slow by external evaluators (EIU 1999).

The privatization process has moved to the second phase, based on the experience obtained from the first phase. The issuance of Proclamation No. 146/1998, with a view to remove a number of bottlenecks to the privatization process, constitutes the core element of the second phase. The following are the objectives of the privatization program (FDRE 1998):

- To generate revenue required for financing development activities undertaken by the government;
- To change the role and participation of the government in the economy to enable it to exert more effort on activities requiring its attention;

- To promote the Country's economic development through encouraging the expansion of the private sector.

The proclamation empowers the Agency to undertake studies to adopt detailed procedures enabling the use of various appropriate modalities of privatization. The proclamation further provides a provision for converting an enterprise into a share company in the course of preparation for privatization, when it is necessary. Looking at the actual results of privatization so far, according to the list of state-owned enterprises privatized up to May 1999, all but one enterprise was transferred fully to private ownership (EPA 1999:10-11). The only exception is the Legedembi Gold Mine where the government retained two percent of the total share. Azmite (1999,4) noted that "a financial scheme was proposed and approved by the government, to encourage the participation of entrepreneurs that have managerial capability, who hitherto, were not able to take part, owing to financial limitations." This includes different modalities of deferred payment and facilitation of bank loans with a minimum down payment of ten percent.

While the mechanisms that were put in place are encouraging, the agency needs to do more on broadening the base of the privatization process and utilizing the privatization process as an instrument of strengthening the domestic private sector. The President of the Addis Ababa Chamber of Commerce (EPA 1999) indicated that many local business people would like to participate in the privatization process if the necessary mechanisms for local business participation are created. EPA should be prepared to utilize this interest and use the privatization process for the development of a vibrant domestic industrial sector. This would require taking the promotion of the development of the private sector as the primary objective in contrast to the other two policy objectives of the privatization process. Such prioritization may also address the problem of inflated asset value, which has been cited as one of the impediments for the local participation. Because, such problems are, in most cases, associated with having revenue generation as the primary objective of privatization.

As a result of the liberalization process, Ethiopia has been receiving increased financial assistance in terms of loans and grants from different financing institutions. As a result, the external debt rose by 4% to 10.1 billion between 1993 and 1997 (EIU 1999). The vast majority of the World Bank recorded debt is long-term, officially guaranteed debt, owed chiefly to bilateral creditors. Ethiopia's debt service was capped following an initial round of debt rescheduling in late 1992, bringing total debt service down to $109 million in that year.

A further round of debt reduction was announced following a meeting of the Paris Club in January 1997. Ethiopia is one of the countries that are included under HIPC initiative.

Looking at the most recent keynote speeches delivered by the Prime Minister, the Ethiopian government seems to be determined to put public resistance against rigid prescription and conditionalities imposed by the World Bank and IMF. This resistance is, presumably, based on the comfortable success it has achieved in its economic liberalization that has been performed in its own terms (EIU 1999). The structural adjustment program that has been implemented in Ethiopia leans more towards the African Alternative Framework for SAP (AAF-SAP) since it attempts to tailor adjustment programs with the requisite for structural transformation. Such an experience is a useful experience for other sub-Saharan African countries and needs to be encouraged by the World Bank and IMF. Such an experience will also be useful to transform the HIPC initiative into a development instrument since it enables the development of effective conditionalities for the HIPC process.

7.3.3.8 Sustainability function

Both the Conservation Strategy of Ethiopia (CSE) and the Environmental Policy of Ethiopia (EPE) contain policy elements that imply the importance of mainstreaming socio-ecological aspects in development programs. More specifically, there are two cross-sectoral policy components with a mainstreaming effect in the Environmental Policy of Ethiopia. Article 4.6 of EPE covers different aspects of the importance of incorporating environmental costs and benefits in the development planning process. Under this article, the initiation of a pilot project on the application of environmental accounting in Ethiopia was identified as one of the policy directions. Furthermore, Article 4.6.e states (EPA 1997,21) "to explicitly consider in 5-, 10-, 50- and 100-year time perspectives the economic costs and benefits to the environment in the planning of all major development programs, projects and activities."

Article 4.9 of EPE covers the policy direction on Environmental Impact Assessment (EIA). The article contains eleven sub-articles covering different aspects of EIA and the conditions under which EIA must be performed. Article 4.9.g (EPA 1997,23) provides a provision "to create a bylaw on EIA process which requires appropriate environmental impact statements and environmental audits for private and state development projects. The preparation of the guideline on EIA has been underway at the Environmental Protection Authority and is about to be implemented soon.

Besides the articles on environmental economics and EIA, there are other cross-sectoral policies on education, research, and information systems that can contribute to the mainstreaming effort in the policy domain. While the policy recognition given to the integration of socio-ecological factors is encouraging, most of these provisions are still limited to the projects development level. Thus, there is a need to expand the scope of the mainstreaming effort to macro development policies through strategic impact assessment. In this connection, the implementation of the project on national environmental accounting may provide the basis for facilitating the mainstreaming effort at the macro-level.

The sectoral policies of EPE, contain policy directions that may ensure the promotion of sustainable industrial development in the country. More specifically, Article 3.8 of EPE, provides policy directions for the control of hazardous materials and pollution from industrial waste. This sectoral policy emphasizes the importance of pollution prevention and minimization as the primary approach for pollution control. To this effect, Article 3.8.a states (EPA 1997,15), “to adhere to the precautionary principle of minimizing and where possible preventing discharges of substances and to disallow the discharge when they are likely to be hazardous.” Article 3.8.m, more specifically (EPA 1997,16) states “to promote waste minimization processes including the efficient recycling of materials wherever possible.” In addition to the policy direction stipulated under Article 3.8, the sectoral policies on minerals resources, on energy resources, and on the atmospheric pollution and climate change, have policy provisions that promote preventive environmental management.

Based on the policy directives and provisions, the Ethiopian government has taken some practical steps in terms of developing a national capacity for sustainable industrial development. The principal effort is capacity building in the field of cleaner production. A national capacity building program on cleaner production was initiated in 1996 by one of the professional societies, the Chemical Society of Ethiopia (CSE). This project was implemented between 1996-98 in partnership with the Ethiopian Private Industries Association and the relevant government agencies including the Environmental Protection Authority. Based on the outcome of this project, a proposal for the establishment of the Ethiopian Cleaner Production Center (ECPC) has been approved by the government. The center will be hosted by the Ethiopian Science and Technology Commission and will be part of the international cleaner production centers program, jointly coordinated by the United Nations Industrial Development Organization (UNIDO) and United Nations Environmental Program (UNEP).

Besides the establishment of ECPC, a national project on ecologically sustainable industrial development (ESID) is in the process of being finalized by the Environmental Protection Authority in collaboration with the Netherlands' government. The ESID project is more focused on capacity building in policy formulation and institutional enforcement while the ECPC project is more focused on building technical capacity of industries to implement pollution prevention and waste minimization projects. In view of influencing the long-term sustainability of industrial development in the country, it will be advisable to consider an eco-industrial development strategy as the major strategy component of the ESID project. In addition to the above projects, different departments of Addis Ababa University are taking the necessary steps to introduce environmental courses in their education programs. These activities together with the issuance of the guideline for EIA will provide a strong basis for the promotion of sustainable industrial development in the country.

In this section, the proposed strategy framework for sustainable industrial development in SSA was used as a benchmark to analyze the state of development strategies in Ethiopia. Based on the overview done on current policy and strategy elements, the current state of the Ethiopian development strategy with respect to the proposed strategy framework for sustainable industrial development in SSA is summarized in Table 20.

Table 20: Status of development strategies in Ethiopia compared with the proposed strategy framework for sub-Saharan Africa

The model	Strategy element	Ethiopian situation	Rating
Natural resources	Ecological space	Framework in place/weak supporting mechanisms	+/-
	Demographic transition	Framework in place with necessary mechanisms	+
	Local resource management	Emphasis on participation but no explicit emphasis on indigenous practices	+/-
Financial resources	Security of property	Framework in place but weak implementation	+/-
	Incentive provision	Partially in place	+/-
Human resources	Strategic management	Weak	-
	Capacity utilization	Partial progress	+/-
Infrastructural resource	Physical infrastructure	Framework in place/needs more emphasis on developing maintenance capacity	+/-
	Educational institutions	Structure in place/content refocus required	+/-
	Governance institution	Devolution in process/weak endogenization	+/-
Property rights	Structure of ownership	Mono structure	-
	Protection of ownership	Structural conflict	-
Sectoral synergy	Public-private synergy	Framework in place/using share companies as the base	+/-
	Agriculture-industry synergy	More incentive and support framework required	+/-
	Formal-informal synergy	Framework in place/coupling financial schemes with technical support required	+/-
Global inertia	Debt burden	Appropriate strategy	+
	Liberalization	Appropriate mechanism	+
Sustainability function	Macro domain	Framework in place, applying EIA to macro-policies	+/-
	Sectoral domain	Both policy and operational mechanisms in place	+

The illustrative case done on Ethiopia indicates that most of the strategic elements that are proposed under the strategy framework for SSA have been covered at different levels of strategy development and implementation. Nevertheless, as is always the case in frameworks of detailed complexities, there is a lack of distinction between the fundamental and facilitating factors. As a result, factors that require prior attention are overshadowed by a long-list of policy and strategy issues that have to be addressed. Such an approach leads to an inefficient distribution of national resources and efforts with minimum contribution to the overall development process.

As can be seen from Table 20, the state of development strategies in Ethiopia can be categorized into the following three groups:

- Facilitators (+): these are strategy elements that are defined in such a way that they will facilitate sustainable industrial development;
- Semi-facilitators (+/-): these are strategy elements that fulfill the basic framework requirement but lack some elements to be facilitators of sustainable industrial development;
- Detractors (-): these are strategy elements that have not been addressed in the proper context and hence act as detractors of the progress towards sustainable industrial development.

Out of the 19 strategic elements that have been considered, four strategic elements are identified as facilitators, while twelve of the strategic elements have been rated as semi-facilitators. The remaining three have been classified as detractors. Although each of the strategic elements has been considered independently, it is the optimal interaction between the different elements of the model that leads to sustainable industrial development. In this context, having a single detractor with respect to one of the strategic elements will have a significant negative effect on the effectiveness of the whole strategic framework. This has been seen in the Ethiopian case also where, for instance, the limitation in the property right regime is influencing the effectiveness of the investment strategy. In this context, the pace of promoting sustainable industrial development in Ethiopia will be dependent on the government's ability to minimize the number of strategic elements that are acting as detractors and increase the number of strategic elements that are acting as facilitators.

Conclusions and Recommendations

The continuous proliferation of unsustainable production and consumption practices through the implementation of disoriented development strategies will be the major source of systemic dysfunction in the 21st century in SSA. That is why reorientation of the development strategies through mainstreaming of socio-ecological considerations has to be taken as the principal task to promote sustainable development. Despite numerous national and international efforts that have been made to promote sustainable development, progress registered so far is still far from ensuring the containment and reversal of the state of environmental decline. The task of promoting sustainable development has become more difficult due to the prevailing confusion around the concept of sustainable development. At a global level, this has led to the deepening division of the sustainable development agenda into the 'green' and 'brown' agenda with varying emphasis on ecological and social issues respectively.

During the last ten years, numerous efforts have been made to define sustainability and sustainable development within the disciplinary and interdisciplinary context. The disciplinary attempt led to a solutions framework with limited scope of application while the interdisciplinary attempt led to an era of 'detailed complexity' where a long list of symptomatic solutions overshadowed the root causes. This thesis argues that sustainability and sustainable development can be better understood through a systems-evolutionary approach on a transdisciplinary basis. The definition of sustainable development on the basis of the interaction between the entity and significance factors of a societal system provides a contextual definition of the concept. This implies that the specific path of sustainable development as a process may vary from one society to another society as a function of the respective entity and significance factors. Sub-Saharan Africa is the least developed region in the world which is locked-in a vicious circle of underdevelopment, poverty, and environmental degradation. In the words of a participant to one of the seminars organized under this research, "Africa is in an intensive care unit (ICU) and needs vital treatment." Taking Africa out of the ICU would require a proper diagnosis. This thesis concludes that the (under)development crisis in SSA is related to the methodologies employed in policy and strategy development. Neither, the reductionist prescription on the basis of 'one-fits-all' model, nor the multiple interventionist prescriptions that led to detailed complexity will provide a sound basis for the ICU treatment. It requires a systems dynamics approach that enhances the region's capacity to understand the distinction and interaction between the fundamental and facilitating factors and identify the appropriate nodes of intervention.

One of the theoretical conclusions made in this research is that the path and progress towards sustainable development by a given society is dependent on its ability to identify, process, utilize and transfer the survival-relevant information for its societal function. Without questioning their good intent, most of the development strategies that have been promoted in SSA so far have not helped in developing this capacity. Hence, reorienting development strategies with an objective of enhancing societal capacities in SR information management is a fundamental prerequisite for promoting sustainable industrial development in SSA.

In light of the alarming rate of resource depletion in the region, resource valorization is proposed as the core element of the proposed strategy. This includes the valorization of natural, human, financial, and physical and institutional infrastructure. This has to be supplemented with the development of responsive property rights regimes, the promotion of sectoral synergy between the principal sectors, the creation of a mechanism that transforms factors of global inertia into global momentum, and the introduction of systems that ensure the sustainability of the development process.

The strategy framework is proposed to serve as a generic strategy and needs to be adapted to the local specifics of each country. As was demonstrated through the illustrative case on Ethiopia, the framework can be used as a benchmark to evaluate existing national development strategies. On the basis of the benchmarking results, national governments should give priority to act on the strategy elements that are acting as detractors to the development process. The following are the key principles that have been utilized in the development of the framework and that need to be maintained in the process of adapting and utilizing the proposed strategy framework.

- Understand the entity factors as factors that provide the boundary conditions for the development process and the significance factors as factors that determine the pace of the development process.
- Evaluate the distinction and the dynamic interaction between the fundamental and the facilitating factors and focus on the fundamental factors.
- Emphasize the importance of identifying and utilizing the positive elements of endogenous capacities and indigenous knowledge as essential repositories of survival-relevant information.

- Recognize that mainstreaming socio-ecological considerations in development strategies, with its multiple benefits, provides the basis for sustainability.
- Focus on factors that influence the efficiency of the adaptive mechanism of the strategy framework. A strategy is as good as its adaptive mechanisms.

The promotion of global sustainability in general and sustainable industrial development in SSA, in particular, requires a fundamental reorientation in national, regional and international structures. The core element of this reorientation is overhauling institutional structures that are generating survival-harmful information and enhancing institutional capacities that generate survival-useful information. In the context of the proposed strategy framework, the following are two of the areas where there is a significant capacity-gap that may not be filled by individual countries in SSA.

1. The development of the appropriate skill and knowledge base will enhance the process of creating the necessary capacity for sustainable industrial development in SSA. This can be achieved by reorienting existing education and training programs and utilizing existing and evolving training media. In this context, it is recommended to develop a program on 'Education for Sustainable Industrial Development in Africa'. This program should mainly focus on creating the capacity required to implement the strategy elements proposed under the sustainability function sub-model.
2. The nexus between trade, environment and development will hold a key position in determining the role of the global institutional structures as a source of inertia or momentum to the development process in Africa. Developing regional capacity to analyze this nexus from an African perspective and make their representation and input visible in the global forum is essential in utilizing globalization as a source of momentum. In this context, it is proposed to establish a regional program on 'Global Trade, Environment and Development, and Africa'.

Follow-up actions to be taken in these two areas will influence the pace of measures that have to be taken by national governments with respect to the other component of the proposed strategy framework. In this context, national governments and regional organizations should take the necessary steps to fill the gaps in these two areas through international cooperation. Similarly, partners in the developed world should assist SSA to develop their capacity and be an active partner in mapping out the path towards global sustainability. In the final analysis, the progress towards sustainability is a global path and it needs global partnership through shared responsibilities.

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Appendix: Profile of sub-Saharan Africa (SSA)

Sub-Saharan Africa, which is also known as Africa South of the Sahara, is composed of all African countries with the exception of six countries in Northern Africa. The African countries that are not included in the so-called sub-Saharan Africa are Algeria, Egypt, Libya, Morocco, Tunisia and Western Sahara. Despite the geographic and cultural diversities each country have, countries in sub-Saharan Africa are believed to share a number of common features in terms of their socio-economic fundamentals and institutional arrangements. This has provided the basis for undertaking researches with a regional focus on sub-Saharan Africa in general. The region is further subdivided into four sub-regions. These are known as Central, Eastern, Southern and Western Africa sub-regions. The following is a profile of sub-Saharan African countries covering their area, population, population growth rate and per capita GDP.

Table 21: Profile of Sub-Saharan Africa

Country	Sub-region	Area (sq. km)	Population*	Population growth rate* (%)	GDP per capita** (USD)
Burundi	Central Africa	27,830	5,735,937	3.54	740
Cameroon	"	475,440	15,456,092	2.79	2,000
Central African Republic	"	622,980	3,444,951	2.04	1,640
Chad	"	1,284,000	7,557,436	2.65	1,000
Republic of the Congo	"	342,000	2,716,814	2.16	1,500
Democratic Republic of the Congo	"	2,345,410	50,481,305	2.96	710
Equatorial Guinea	"	28,050	465,746	2.55	***1,500
Gabon	"	267,670	1,225,853	1.48	6,400
Rwanda	"	26,340	8,154,933	2.43	690
Sao Tome and Principe	"	1,000	154,878	3.14	1,100
Comores	East Africa	2,170	562,723	3.11	***700
Djibouti	"	22,000	447,439	1.51	1200
Eritrea	"	121,320	3,984,723	3.88	660
Ethiopia	"	1,127,127	59,680,383	2.16	560
Kenya	"	582,650	28,808,658	1.59	1550

Madagascar	"	587,040	14,873,387	2.80	730
Seychelles	"	455	79,164	0.65	7,000
Somalia	"	637,660	7,140,643	4.13	600
Sudan	East Africa	2,505,810	34,475,690	2,71	930
Tanzania	"	945,090	31,270,820	2.14	730
Uganda	"	236,040	22,804,973	2.83	1,020
Angola	Southern Africa	1,246,700	11,177,537	2.84	1,000
Botswana	"	630,370	1,464,167	1.05	3,600
Lesotho	"	30,350	2,128,950	1.80	2,400
Mauritius	"	1,860	1,182,212	1.18	10,000
Mozambique	"	801,590	19,124,335	2.54	900
Namibia	"	825,418	1,648,270	1.57	4,100
South Africa	"	1,219,912	43,426,386	1.32	6,800
Swaziland	"	17,360	985,335	1.91	4,200
Zambia	"	752,610	9,663,535	2.12	880
Zimbabwe	"	390,580	11,163,160	1.02	2,400
Benin	West Africa	112,620	6,305,567	3.30	1,300
Burkina Faso	"	274,200	11,575,898	2.70	1,000
Cape Verde	"	4,030	405,748	1.44	1,450
Cote d'Ivoire	"	322,460	15,818,068	2.35	1,680
Gambia	"	11,300	1,336,320	3.35	1,000
Ghana	"	238,540	18,887,626	2.05	1,800
Guinea	"	245,860	7,538,953	0.82	1,180
Guinea-Bissau	"	36,120	1,234,555	2.31	1,000
Liberia	"	111,370	2,923,725	4.92	1,000
Mali	"	1,240,000	1,429,124	3.01	790
Mauritania	"	1,030,700	2,581,738	2.99	1,890
Niger	"	1,267,000	9,962,242	2.95	970
Nigeria	"	923,770	113,828,587	2.92	960
Senegal	"	196,190	10,051,930	3.32	1,600
Sierra Leone	"	71,740	5,296,651	4.34	530
Togo	"	56,790	5,081,413	3.51	1,670
	Total	**24,247,522**	**615,744,577**		

* 1999 estimation ** 1998 estimation, purchasing power parity *** 1997 estimation
(Source: Compiled from 'The World Fact Book 1999' from the web site at

http://www.odci.gov/cia/publications/factbook/)

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Strategy Framework for Sustainable Industrial Development in sub-Saharan Africa

Over the last few years, the concepts of sustainability and sustainable development have increasingly become key elements of policy and strategic planning exercises of communities, businesses, governments and international organizations. Despite the global consensus on the desirability of sustainability and sustainable development, there are a wide variety of definitions and interpretations of these concepts. At the practical level, this has led to a considerable confusion including the disturbing division of the sustainable development agenda into the 'green' and 'brown' agenda. This has intensified the effort of developing a concrete body of theory for sustainable development. The scientific community has been responding to this challenge in different ways.

This dissertation argues that the core element of the challenge to the scientific community is to overcome the 'scope limitations' of the disciplinary approach and the 'detailed complexity' caused by the interdisciplinary approaches. It further demonstrates that this can be done through the combined application of transdisciplinary theories such as general systems theory, general evolutionary theory and information theory. With regards to national policies and strategies, the dissertation argues that sustainable development requires more than 'add-on' environmental policies. This implies the need to mainstream socio-ecological factors in to development strategies. Furthermore, it argues that industrial development should be promoted as 'transformational' rather than a 'transplanting' process. This will require reorienting the existing knowledge system in sub-Saharan Africa and combining the positive elements of indigenous knowledge base with the modern sciences and technologies.

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