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Report on the Review of African Sustainable Industrial Development

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Acronyms

AGOA	African Growth and Opportunities Act
AGOA	African Growth and Opportunities Act
BOD	Biochemical Oxygen Demand
CIP	Competitive Industrial Performance
DANCED	Danish Cooperation for Environment and Development
EMPR	Environmental Management Programme Report
ESI	Environmental Sustainability Index
ESI	Environmental Sustainability Index
FAO	Food and Agriculture Organization of the United Nations
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GEF	Global Environment Facility
GNP	Gross National Product
ILO	International Labour Organization
IOM	International Organization for Migration
ISO	International Organization for Standardization
IUCN	World Conservation Union
IVA	Industrial Value Added
JPOI	Johannesburg Plan of Implementation
LCA	Life-Cycle Assessment
LDC	Least Developed Countries
MDG	Millennium Development Goal
MoU	Minutes of Understanding
MVA	Manufacturing Value Added
NCPC	National Clean Production Center
PGM	Platinum Platinum-group metals
PRSPs	Poverty Reduction Strategy Papers
SADC	Southern African Development Community
SARDC	Southern African Research and Documentation Center
SME	Small And Medium Enterprise
SOEs	State-Owned Enterprises
SPS	Sanitary and Phyto-Sanitary Measures
TBT	Technical Barriers to Trade
TCB	Technical Capacity Building
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Program
UNECA	United Nations Economic Commission for Africa
UNEP	United Nations Environment Program
UNIDO	United Nations Industrial Development Organization
WAIPA	World Association of Investment Promotion Agencies
WHO	World Health Organization
WRI	World Resources Institute
WTO	World Trade Organization

Executive Summary

Industrial growth is an indisputable pre-requisite of sustainable development. Most development forums looking at economic transformation, environmental sustainability and poverty reduction in Africa have endorsed this – with a general consensus for the need for rapid industrialization in Africa. Nevertheless, it is also recognized that industrial growth might have detrimental effects on the environment and use up exhaustible natural resource. Agenda 21 and the Johannesburg Plan of Implementation (JPOI) suggests that improvement of production systems through technologies and processes that utilize natural resource more efficiently, and at the same time produce less waste, must be the centerpiece of any industrialization strategy.

Poverty eradication and sustainable natural resource management are strongly related, as unsustainable production practices are often linked with limited livelihood choices of the poor and the effort of backward economies to be competitive in an increasingly globalized world. Furthermore, there is fairly strong evidence of industry's contribution to poverty reduction, especially in predominantly rural economies as efforts to promote rural development can be more effective if rural incomes can be raised through small scale manufacturing activities such as agro-processing with strong linkages to agricultural production.

Despite the importance of industry in the context of sustainable development in Africa, the continent lags behind other developing regions in industrial performance. Africa's share of world manufacturing output also declined from 0.9% to a still lower figure of 0.8% over the two decades spanning 1980 - 2001. Within Africa, the distribution of manufacturing activity is highly skewed with just one country, South Africa, accounting for 27.3% of total MVA in sub-Saharan Africa and registering significant growth over the past two decades. Thus for most countries of Africa there has been a loss in their share of global manufacturing output.

Almost all industry related indices show weak performances. The contribution of manufacturing output to total national income is generally low, with the share of manufacturing value added (MVA) in GDP in 2004 ranging from a high of about 20% in Mauritius to as low as 0.5% in Djibouti and an average of only about 9%. Primary products still dominates exports from most African countries although, generally, manufacturing exports from Africa have seen significant growth from 1990 to 2004 with a few countries (Kenya, Cameroon, Egypt, Madagascar, Morocco, Seychelles, Zambia and Mauritius) standing out as exceptional performers in this regard. . However, this is not universal across the continent. In fact, the volume of manufactured exports from several countries has actually declined. More importantly, high technology exports (which characterize rapidly industrializing countries) account for only about four percent of manufactured exports from Africa as compared with 32% in East Asia and a developing country average of 23%. Industry's contribution to employment, even in South Africa, where the industrial sector is more advanced, is negligible at 3.5%, in South Africa and less than 0.5% in most countries

It is, however, to be noted that while in general growth in industry has been slow, positive performance in a few countries and an increase interest in foreign direct investment in African industry indicates a potential for industrial take-off. The challenge is to ensure that

environmental best practices are incorporated at these early stages of industrialization whenever manufacturing investments are being considered.

African countries fare poorly in relation to their ability to ensure environmental sustainability. A wide range of interventions and an appropriate incentive framework need to be put in place at the heart of which is the ability to change trajectories- including the societal and institutional capacity to fix problems and improve results over time. In a comparison of countries offered by UNIDO as per the Environmental Sustainability Index (ESI) that incorporates 76 data sets tracking natural resource endowments, past and present pollution levels, environmental management efforts, and the capacity of society to improve its environmental performance into 21 indicators of environmental sustainability", virtually no country in Africa scores above 60 out of a possible score of 100 with Sudan the lowest, ranking country, scoring 35.9.

Because of Africa's low level of industrialization, industry currently does not pose a serious environmental burden. Rather, the chief source of environmental degradation is deforestation caused by over-dependence of African livelihoods on agriculture fueled by population growth. This is reflected in an overgrowing need for cultivable and grazing lands, extensive system of production, and exploitation of mineral resources and hydrocarbons. To the extent that there has been structural change in African economies, the main shift has been towards a more prominent position of industry, which, over time, will result in an increase in the environmental burden unlike in the developed world where the dominant shift is from industry to services and a decrease in pollution intensity. Also, while the overall level of industrial pollution is still low, the environmental impact intensity vis-à-vis the level of industrialization is among the highest in the world.

Industrial development carriers with it several threats to the environment that require explicit attention if sustainable development is to be achieved. The main concerns relate to (i) air emissions, (ii) discharge of effluents, (iii) use of non-renewable material and energy resources as well as of toxic and eco-toxic substances, (iv) hazardous and non-hazardous waste, (v) design of inefficient, toxic and non-recyclable products and, (vi) pressures on bio-diversity. Key actions identified by the JPOI to address these issues are:

- Introduction of cleaner production technology and improving access to environmentally sustainable technologies on the global market,
- Increasing efficiency in recourse use,
- Legislated regulatory instruments to encourage sustainable practice,
- Mobilizing financial and technical resources,
- Promoting environmentally sustainable trade policies/practices, and
- Adjustment of relevant domestic policies.

Despite some achievements with respects to the above, African countries face many challenges related to inadequate local awareness of environmental issues, a weak policy environment, limited access to the latest technologies, a predominantly unskilled labor force whereas sustainable industrialization tends to require higher levels of skill, etc. Added to this, African countries are late comers to industry and, as such, face additional challenges including challenges that emanate from the pattern of economic transformation and an increasingly

competitive environment that does not allow the opportunity for learning. Much of Africa has also failed to take advantage of the opportunities provided by globalization such as greater trade liberalization, easier transfer of capital, technology and labor as well as greater attention to environmental issues in world trade. Rather there have been capital flight and net out flows in skilled labor. Weakness in governance and political instability also remain major constraints to sustainable development and industrialization in a number of African countries.

The first step towards environmentally sustainable industrialization is to gain a stronger position in industry - to improve productivity and investment levels. Any strategy aiming to revive environmentally sustainable industrial growth in Africa must focus on structural issues, prominent amongst which are relating to domestic capability building and strengthening of domestic factor markets and supply of public goods. But this is not enough. Sustainability will require not only a focus on accelerating industrialization, but also initiating a shift from current production processes to less highly polluting, resource wasting industries, and production processes. It requires investment in rapidly evolving, environmentally friendly technologies that save on inputs and are more efficient in energy use is based on renewable resources and that generates less waste along the life cycle of a product. Promoting improved awareness of environmental issues and cleaner production processes, facilitation access to the necessary technologies and putting in place an appropriate incentive structure is necessary – the latter being required because sustainable industrialization will require investments outlays which may not be justified by cost reductions alone and since environmental protection is essentially an externality. Also, skills development takes on added importance in the context of sustainability given that environmentally sustainable technologies tend to require higher skill levels. Finally, given the double challenges of promoting industrialization as late starters and the need to change current production practices, industrial organization must be improved with greater emphasis on attracting FDI and with a view to information sharing and establishment of support networks.

1 Introduction

There is general agreement that industrial growth is vital to economic development in African countries with a potential to contribute significantly to poverty reduction. African economies tend to be narrowly focused on agricultural production and mineral extraction, generating limited incomes for a largely rural population. The promotion of micro, small and medium-sized enterprises to further process the primary products generated from these sectors would provide alternative livelihoods for rural communities, and generate employment opportunities as well as stimulate growth in the agriculture and services sectors.[1] As such, industrial growth is an indispensable pre-requisite of sustainable development. This has been endorsed by most development forums focusing on development in Africa. For example, the New Economic Partnership for African Development (NEPAD) endorsed by African Heads of States and Governments at the turn of the new millennium states that African countries must diversify their economies away from their dependence on primary production and a narrow export base. It furthermore emphasizes that the logical starting point for doing so is to "harness Africa's natural resource base and increase value added in *inter alia* agro-processing and that diversification should be based on strong inter-sectoral linkages".[2]

Even though there is a general consensus on the need for rapid industrialization in Africa, industrial growth can have detrimental effects on the environment and exhaust non-renewable natural resources if undertaken in an unsustainable manner. Therefore, although rapid industrialization and structural transformation towards a greater share of industry in African economies remains a component of sustainable development, it is important that measures be in place to ensure that such industrialization occurs with minimum impact on the natural resource base so that the ability of future generations to meet their livelihood needs is not sacrificed.

Agenda 21 and the Johannesburg Plan of Implementation (JPOI) suggest that improvement of production systems through technologies and processes that utilize natural resources more efficiently and at the same time produce less wastes must be at the center of any industrialization strategy. To achieve this; i.e., to bring industrialization efforts in line with sustainable development, the following principles need to be applied:

- Understanding the implications of specific industrial processes on the environment within a life-cycle approach, with focus on re-use and re-cycling of products;
- Introducing requirements for environmental impact assessments and environmental accountability;
- Promoting practices that minimize the pollution and waste generated by manufacturing processes -- including assessment and use of cleaner production technologies and methods;

[1] This has been recognized in the Johannesburg Plan of Implementation of Agenda 21 that calls for the promotion of micro, small and medium enterprises particularly in agro-processing as a means of creating better livelihoods for rural populations in Africa.

[2] UNIDO, Industrial Development Report, 2004

- Promoting production processes that are more efficient in their use of resources (especially non-renewable resources), and energy (especially that from non-renewable sources);
- Raising awareness of the relevant stakeholders (entrepreneurs, industry support institutions, government, CSOs, higher institutions of learning) about the benefits (conservation of the environment, market access, possible reduction in costs) and possibilities regarding sustainable approaches in manufacturing.
- Introducing incentives, (subsidies, tax rebates, the publicizing of new technologies,) and regulatory instruments to encourage companies to make production processes and products more sustainable.

This report will review the trends in industrialization within Africa and the consequent issues related to sustainable industrial development vis-à-vis the principles of the JPOI and of Agenda 21 listed above. It will identify critical challenges and constraints to bringing industrialization efforts in Africa in line with the principles of sustainable development and draw lessons from current experience to provide recommendations for future action.

2 Trends in African Industrial Development

2.1 OVERVIEW

Africa lags behind other developing regions in almost all its industry related indices. World Bank data provided in Table 1 indicate that with a few exceptions (Botswana, Cape Verde, Madagascar, Namibia, Seychelles, Swaziland, South Africa and Tunisia) industrial output per capita as measured by the dollar value of manufacturing value added (MVA) per population has been stagnant over the pas three decades or has even declined. Further analysis by UNIDO of trends in industrial output suggests that MVA in Africa has grown at a rate exceeding the world average (although falling well short of the phenomenal growth rates achieved in East and South Asia).[3] However, in per capita terms, growth in Africa's MVA remains below the global average

The contribution of manufacturing output to total national income remains low, with the share of MVA in GDP in 2004 ranging from a high of about 20 % in Mauritius to as low as 0.5% in Djibouti and an average of only about 9% (50 countries excluding Libya, Sierra Leone, and Somali are reported on in Table 1). Countries with significant manufacturing sectors (i.e. exceeding $250 per capita per year) are few. Out of the 50 countries reported on in Table 1, only Mauritius, Seychelles, South Africa, and Tunisia have a significant manufacturing sector. Clearly, structural change in African economies has been limited, with most economies still dominated by the agricultural or mining sectors. Yet, the analysis of structural change in highly performing economies suggests that poverty elasticities of industrial development are larger than those of agriculture. The experience of such economies confirms that rapid growth in agricultural productivity is a precondition for economic take-off and sustained poverty reduction, but it also suggests that this is not enough. Agricultural growth, especially at the initial stages of development, is not an end in itself but should also serve as a vehicle for facilitating industrialization.

[3] UNIDO, Industrial Development Report 2004

Table 1: Manufacturing value added at constant factor cost (at 2000 prices) and as % of GDP (1980 to 2004)

Country	MVA in mill US$	MVA per capita						Manufacturing as share of GDP (%)					
	2004	1880-1984	1985 – 1989	1990 – 1994	1995 – 1999	2000 – 2004	(1993-2003)*	1880-1984	1985-1989	1990-1994	1995-1999	2000-2004
Algeria	4,648	341	349	387	404	577	-3	11	13	11	9	7
Angola	406	n/a	49	44	50	114	4	0.00	9	5	4	4
Benin	251	9	12	16	19	31	4	8	8	8	9	9
Botswana	278	12	22	38	45	73	3	6	5	5	5	4
Burkina Faso	n/a	15	16	19	24	n/a	2	15	15	14	12	12
Burundi	n/a	n/a	n/a	n/a	n/a	n/a	n/a	8	10	13	9	0.0
Cameroon	1,310	64	66	59	74	146	-2	10	13	13	10	9
Cape Verde	59	n/a	4	3	5	8	2	0.00	6	9	10	7
Central African Republic	n/a	8	9	7	8	n/a	n/a	7	9	10	9	2
Chad	n/a	n/a	n/a	n/a	n/a	n/a	4	5	11	11	11	11
Comoros	9	2	2	2	2	3	-1	3	4	5	4	4
Congo, Dem. Rep.	204	48	75	69	44	53	n/a	13	10	6	6	5
Congo, Rep.	175	15	16	16	17	38	-1	6	8	8	7	5
Cote d'Ivoire	1,168	67	64	65	99	121	0.4	14	18	18	16	14
Djibouti	n/a	n/a	n/a	6	5	n/a	n/a	0.00	1	5	2	1
Egypt, Arab Rep.	n/a	n/a	n/a	655	831	n/a	n/a	13	15	16	17	4
Equatorial Guinea	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0	0	4	5	1
Eritrea	84	n/a	n/a	n/a	8	9	4	0	0	4	9	10
Ethiopia	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6	8	5	0	0
Gabon	n/a	n/a	n/a	n/a	n/a	n/a	-3	5	8	6	5	5
Gambia, The	24	2	3	3	4	6	-1	6	6	6	5	5
Ghana	n/a	72	49	53	43	n/a	1	6	10	9	9	9
Guinea	132	n/a	n/a	20	23	41	1	0.00	2	4	4	4
Guinea-Bissau	34	n/a	n/a	6	3	3	14	0.00	7	5	10	10
Kenya	1,247	61	81	103	124	131	2	11	10	10	9	11
Lesotho	164	4	5	7	8	11	5	9	12	13	15	17
Liberia	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6	2	0	0	5
Libya	n/a	n/a	n/a	n/a	n/a	n/a	n/a	3	3	0	0	0
Madagascar	476	n/a	34	37	39	47	3					
Malawi	182	11	11	12	16	22	-3	13	14	16	13	10

Table 1: Manufacturing value added at constant factor cost (at 2000 prices) and as % of GDP (1980 to 2004)

Country	MVA in mill US$	MVA per capita						Manufacturing as share of GDP (%)					
	2004	1880-1984	1985 – 1989	1990 – 1994	1995 – 1999	2000 – 2004	(1993-2003)*	1880-1984	1985-1989	1990-1994	1995-1999	2000-2004
Mali	104	10	11	14	22	37	-5	6	8	8	5	3
Mauritania	78	n/a	8	9	9	12	-3	0.00	11	10	9	8
Mauritius	1,000	18	21	30	38	60	3	14	20	20	21	20
Morocco	6,951	178	216	265	308	461	1	18	18	18	18	17
Mozambique	726	n/a	n/a	n/a	27	56	n/a	0	0	8	10	14
Namibia	415	18	21	23	31	47	0.3	11	11	12	10	10
Niger	n/a	n/a	15	15	17	n/a	0.3	5	7	6	6	5
Nigeria	n/a	136	164	305	323	n/a	1	9	7	5	5	3
Rwanda	258	24	33	20	18	26	2	15	12	15	11	11
Sao Tome and Principe	n/a	n/a	n/a	0	0	n/a	-5	0.00	6	6	5	3
Senegal	697	26	27	30	37	60	2	11	13	13	13	13
Seychelles	111	3	4	5	6	8	6	9	9	11	14	18
Sierra Leone	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6	2	5	6	0
Somalia	n/a	n/a	n/a	n/a	n/a	n/a	n/a	5	5	1	0	0
South Africa	24,993	862	943	946	1,153	1,706	0.1	23	21	20	18	18
Sudan	n/a	83	151	n/a	230	n/a	n/a	7	5	0	5	8
Swaziland	370	2	3	6	7	19	-2	17	24	28	28	24
Tanzania	830	n/a	n/a	63	81	132	2	6	6	8	7	7
Togo	148	9	8	8	11	18	3	7	8	10	8	9
Tunisia	4,361	143	141	134	164	272	4	13	16	17	18	18
Uganda	631	n/a	22	34	51	82	8	5	6	6	8	9
Zambia	410	11	9	11	27	44	-5	19	27	27	11	8
Zimbabwe	737	41	47	48	71	79	-7	20	20	22	16	13

* Average annual percentage growth rate in MVA per capita from 1980 to 2004
Source: The World Bank, World Development Indicators, 2004

Africa's share of world manufacturing output declined slightly from 0.9% to 0.8% over the two decades spanning 1980-2001 (Table 2). Within Africa, the distribution of manufacturing activity is highly skewed with just one country, South Africa, accounting for 27.3% of total MVA in Sub-Saharan Africa and registering significant growth over the past two decades. Thus for most countries there has been a loss in their share of global manufacturing output. The 1990's were a decade of rapid globalization during which there was a shift of production from industrialized to developing country locations. As a result, developing countries as a whole increased their share of global MVA from 16.9 to 24%. Nevertheless, African countries actually lost their share in all branches except textiles and apparel, leather and footwear, and basic metals.

Table 2: Distribution of World MVA at current market price, by region

Region	1980	1990	2001
World	100	100	100
Developing countries	*13.7*	*14.4*	*23.7*
Africa	0.9	0.9	0.8
Of which South Africa	4.1	6.1	16.0
Latin and Central America	7.1	5.6	5.7
West Asia & Europe	1.6	1.8	1.2
Countries in Central Eastern Europe	19.3	8.9	2.7
Developed Countries	*67.0*	*76.7*	*73.6*
North America	22.1	23.3	30.1
Western Europe	32.1	34.0	26.2
Others	*12.8*	*19.4*	*17.3*
China	3.9	2.6	7.2
Least Developed	N.A	0.3	1.0

Source: Development and Globalization, Facts and Figures, UNCTAD, 2004

The structural shift towards a greater role for industry in African economies is limited by narrow local markets and a lack of appropriate marketing channels. As for the international markets, tariffs and other barriers hinder value addition of goods and perpetuate Africa's condition as exporter of unprocessed raw materials. Neither is information technology properly explored to build new markets.

Manufactured exports from Africa have seen significant growth from 1990 to 2004 as shown in Diagram 1, which depicts trend in volume of manufactured exports of 22 countries as per World Bank data reported in Table 3. Countries such as Kenya, Cameroon, Egypt, Madagascar, Morocco, Seychelles, Zambia and (although not included in Table 3 but discussed in Box 1) Mauritius have seen quite significant growth in their manufactured exports with an increasing share of manufactured goods out of total exports. However, this is not universal across the continent. In fact, the volume of manufactured exports from several countries has actually declined and, compared to other developing regions the share of manufactured goods in total exports is still relatively low. Primary products still dominate exports from most African countries. The average ratio of primary exports to manufactured exports was 2:1 in 2001.[4] Only in Madagascar, Mauritius, Senegal, South Africa and Tunisia did the value of manufactured

[4] UNIDO, Industrial Development Report, 2004

exports exceed the value of primary exports and only South Africa has a significant proportion of high-technology manufactured exports. A particularly striking feature of industrialization in economically well-performing counties is that the share of manufactured exports from total exports increased significantly faster than the share of MVA in GDP. By contrast, in Africa, industry is geared primarily towards import substitution for the domestic market rather than for export even the benefits that could be derived from import substitutive industrialization have been reduced by companies' continued heavy dependence on imports for inputs and intermediate goods and their poor utilization of capacity due to foreign currency shortages and devaluation.

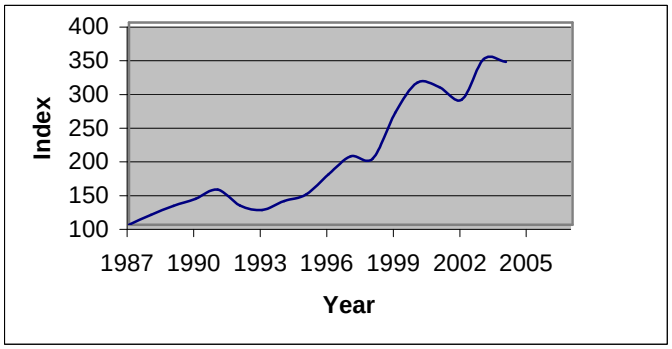


Diagram 1: Volume Index of Manufactured Exports from Africa (1987 = 100)
Source: World Bank database

High technology exports account for only four percent of manufactured exports from Africa as compared with 32% in East Asia and a developing country average of 23%. Africa's ability to move up market into the export of manufactures, and specifically of medium - to - high technology manufactures will depend on the development of the necessary skills and technology accumulating process, which is currently at early stages of development. Africa's industries thus continue to be dominated by low levels of technology, skills and capacity utilization with a seemingly limited scope for adoption of computer-assisted manufacturing and knowledge-intensive production systems and thus tend to be non-competitive on the world market.

Box 1. Mauritius export promotion, a rare example

Once a poor, sugar dependent nation, Mauritius now has a diversified economy in which manufacturing and tourism play a growing role. This was enabled through the introduction of an effective system of tax incentives to manufacturing businesses, as part of which export-processing zones and duty-free industrial areas were developed. Mauritius' policy included to protecting existing import-substitution industries while at the same time permitting exporting firms to take advantage of duty free imports. Additionally, the authorities strategically encouraged investments in service industries such as finance and information and telecommunication technologies. This was not all. Realizing that the labor force was ill equipped for the transition from a mono-crop economy, the government increased spending on skills development and infrastructure. In addition, the government of Mauritius has also succeeded in restraining corruption and other bad practices by its public officials.

Taking Mauritius as a case study in its Economic Report on Africa 2003, the UN Economic Commission for Africa concluded that the success of Mauritius has much to do with how development strategies are formulated. The policies are "well thought out to address the needs of the economy," and are not simply formulated in reaction to crises.

Table 3: Manufactured exports (1990 to 2004) in million US$, as % of total exports and volume index

Country	Value of manufactured exports						Volume Index		
	value at 2000 prices			% of total exports			(1987 = 100)		
	1990 – 1994	1995 – 1999	2000 - 2004	1990-1994	1995-1999	2000-2004	1990 - 1994	1995–1999	2000–2004
Algeria	n/a	n/a	n/a	1	0.3	0.7	331	117	n/a
Angola	81	94	85	2	2	1	81	91	84
Botswana	60	257	43	4	13	2	115	120	75
Burundi	6	2	1	8	3.811	1	43	15	2
Cameroon	235	263	382	14	19	18	141	158	230
CAR	n/a	n/a	n/a	n/a	n/a	n/a	119	140	125
Chad	n/a	n/a	n/a	0.4	n/a	n/a	151	n/a	n/a
Congo, Rep.	27	21	21	2	1	1	85	51	51
Cote d'Ivoire	1,008	1,207	1,421	37	29	30	123	15.5	164
Djibouti	n/a	23	n/a	n/a	67	51	n/a	130	n/a
Egypt, A. R.	1,253	1,524	n/a	34	33	48	86	104	276
Eritrea	n/a	21	6	17	34	22	n/a	n/a	n/a
Ethiopia	46	49	65	23	12	14	n/a	n/a	n/a
Ghana	71	120	121	n/a	n/a	n/a	n/a	n/a	n/a
Guinea	86	89	107	n/a	n/a	n/a	n/a	n/a	1
Kenya	n/a	n/a	n/a	n/a	n/a	n/a	134	219	261
Lesotho	n/a	n/a	51	n/a	3	15	n/a	n/a	127
Madagascar	136	297	410	45	64	63	210	457	632
Malawi	30	61	79	n/a	n/a	n/a	88	110	109
Morocco	2,354	2,621	3,022	13	5	2	191	273	312
Mozambique	15	10	13	21.	21	24	n/a	n/a	n/a
Namibia	220	210	257	n/a	n/a	n/a	87	98	111
Niger	n/a	n/a	n/a	1	1	1	n/a	n/a	n/a
Nigeria	47	52	n/a	5	16	43	n/a	n/a	n/a
Rwanda	1	1	1	n/a	n/a	n/a	71	56	128
Sao Tome and P.	n/a	n/a	n/a	23	26	24	n/a	n/a	n/a
Senegal	158	163	191	25	54	65	101	104	126
Seychelles	15	51	117	n/a	n/a	n/a	394	1,373	3,165
South Africa	11,544	18,611	25,939	0.4	n/a	3	105	110	110
Swaziland	27.96	86.33	17.	16	13	7	204	131	28
Tanzania	n/a	n/a	n/a	35	21	25	n/a	162	n/a
Tunisia	n/a	n/a	n/a	n/a	n/a	n/a	113	125	n/a
Zambia	70	153	n/a	361	35	26	165	363	388
Zimbabwe	635	753	n/a	n/a	n/a	n/a	113	134	58

Source: The World Bank, World Development Indicators, 2004

Industry's contribution to employment, even in South Africa where the industrial sector is more advanced, is negligible: South Africa at 3.5%, Tunisia -- 3.3%, Mauritius -- 1.8%, Zimbabwe --1.5%, Botswana -- 1.5%, Algeria --1.0%, Kenya -- 0.7%, Zambia -- 0.6%, Ghana 0.4% and lower. Within this limited employment picture, the most highly employing sub-sectors are food, textiles, clothing and beverage production. Mining is also a contributor, especially in the SADC countries, where there are about 2.5 million people employed in formal mining

activities and 1.5 million in the small scale sector. Tanzania and Zimbabwe account for 550,000 and 350,000 miners respectively; mainly involved is small-scale mining. It is estimated that overall there are about 3.5 million small scale and traditional miners in Africa. The sector could be providing livelihoods for up to 2 million people and has the capacity to contribute more that 3 billion US$ to GDP (ILO, 1999).

2.2 STRUCTURE OF INDUSTRY

The main demand stimulus to industrial growth in Africa appears to emanate from population growth (a ten percent increase in per capita income led only to a 10.6% rise in MVA, while population growth of ten percent is associated with an 18.4% increase in MVA, while at the same time, industrialization has to a large extent been geared to import substitution for the domestic market than for export).[5] Accordingly, industries producing basic necessities- textiles, apparel, food and beverages (and some printing and furniture or wood processing) are the ones in which most African countries seem to show signs of dynamism. Yet, in addition to export orientation, another feature of industry in fast-growing countries is rapid growth in the metal working and automotive industries, fuelled by high levels of engineering, R&D and capital intensity.

Table 4: Ranking of manufacturing sub-sectors by country, 2001

Country	Rank		
	1	2	3
Algeria	iron and steel	food	Textiles
Botswana	textile	food	Na
Cameroon	rubber	food	Wood
Congo, Rep.	food	beverage	Wood
Egypt, Arab Rep.	textile	food	non-metallic minerals
Ethiopia	textile	food	Beverages
Gambia	food	printing	Beverages
Ghana	wood	textiles	Food
Kenya	food	textiles	transport equipment
Liberia	beverage	food	other chemicals
Libya	clothing	na	Na
Mauritius	clothing	food	Textiles
Morocco	food	food	Textiles
Niger	furniture	na	Na
Nigeria	food	textiles	Printing
Senegal	food	textiles	industrial chemicals
Sierra Leone	food	beverage	Printing
Somalia	food	textiles	Paper
South Africa	food	clothing	fabricated metal
Tanzania	food	textiles	industrial chemicals
Tunisia	clothing	food	Textiles
Zambia	food	textiles	fabricated metal
Zimbabwe	food	textiles	clothing

Source: African Development Review, 2001

[5] UNIDO, Industrial Development Report 2004

The larger economies; e.g., South. Africa and Egypt, have some presence in the automobiles and metals sub-sectors. Industry in the smaller economies, however, is comprised largely of medium, small and micro enterprises (dominated numerically by small scale and informal activities) that manufacture simple consumer goods including foods, beverages, soap and detergents, textiles and tobacco. Most of these operate obsolete technology, leading to growing cases of industrial pollution around a few fast growing urban centers, and to difficulties in market penetration and competitiveness. Large-scale industries are concentrated in the extractive sector (oil, gas and minerals), but their linkages with the other sectors of the local economies are minimal.

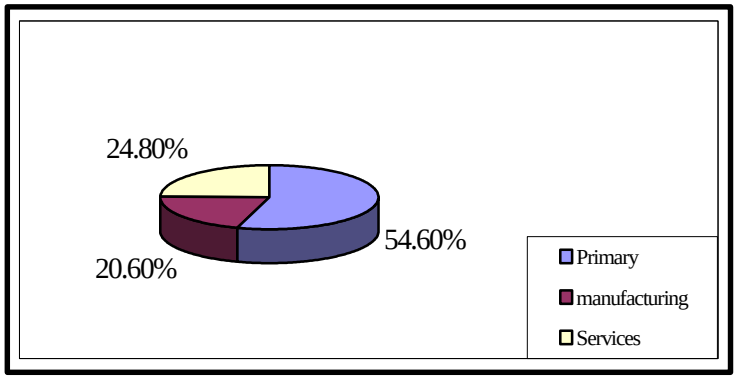
Mineral exploration and production are significant parts of the economies of African countries and remain key factors for future economic growth. The region is richly endowed with mineral reserves and ranks first or second in terms of concentration of world mineral reserves of bauxite, chromites, cobalt, diamonds, gold, manganese, phosphate rock, titanium, vanadium, vermiculite and zirconium. The sub-sector, particularly in oil and gas, has also attracted significant foreign investments. Nevertheless, widespread civil wars, internal ethnic or political conflicts and refugee displacements continue to destabilize a number of African countries and constrain new investment in mineral exploration and development in many areas. Countries directly affected include Algeria, Angola, Congo Liberia Rwanda, Sierra Leone, among others.[6]

The upstream oil industry in Africa in 2004 produced 8.4 million barrels per day. Five countries dominate Africa's upstream oil production; together they account for 85% of the continent's oil production and are, in decreasing order of output, Nigeria, Libya, Algeria, Egypt and Angola. The downstream oil industry comprises 44 refineries in 25 countries with a total distillation capacity of 3.3 million barrels per day, 3.6 percent of the world total. The major refining centers, in decreasing order of refining capacity, are Egypt, Algeria, South Africa, Nigeria, Libya and Morocco.

The plastics industry in Africa has been experiencing a boom in recent times - demand for plastic products has been growing at an average of 15-20% every year. The growing demand for plastic goods and machinery has been spurred by economic reforms and sustained economic development in many African countries. African countries have been producing ever increasing quantities of a wide range of plastic goods like plastic molded furniture, plastics house ware items, woven sacks, bags, ropes, plastic shoes, PVC pipes/fittings/electrical fittings, PET Performs, plumbing and drainage systems, plastic building materials, toothbrushes and a variety of other plastic household products.
African countries where plastic manufacturer industries are growing fast are Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Congo, Cote d'lvoire, E. Guinea, Egypt, Ethiopia, Gabon, Ghana, Guinea, Guinea Bissau, Kenya, Lesotho, Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome & Principe, Senegal, Seychelles, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Togo, Tunisia, Uganda, Zaire, Zambia, Zimbabwe.

[6] UNIDO, Industrial Development Report, 2004

Diagram 2: Distribution of FDI inflows



2.3 INVESTMENT PROMOTION AND FOREIGN DIRECT INVESTMENT

Private sector capital formation in Africa has averaged about 11.5% of GDP over the last 20 years. One of the most striking realities about Africa's failure to industrialize in the last few decades is that it has been a net exporter of capital. For example, around 70 percent of Nigeria's private wealth is believed to be held outside of Nigeria[7]. In low and middle-income Africa, domestic savings fall well short of the levels needed to finance the take off of industry in any major way. But even in cases where domestic savings levels are adequate, intermediation systems fail to translate the savings into profitable investment. In part, this reflects structural weaknesses in banking systems, the underdevelopment of capital markets or the extent to which investable surpluses are held in the public sector as in oil exporting countries. Since the 1990's, however, the share of foreign direct investment (FDI) has grown; although the flows are unevenly distributed, dominated by South Africa and with only about 20% of FDI actually being directed to manufacturing (see Table 5).

Table 5: Foreign Direct Investment to African Countries (1980 to 2004)
At net current prices in US$ and as share of GDP (%)

Country	net foreign direct invest (million US$)					FDI as share of GDP, (%)				
	1880–1984	1985 - 1989	1990 - 1994	1995 – 1999	2000 - 2004	1880-1984	1985-1989	1990-1994	1995-1999	2000-2004
Algeria	-45	-67	-18	298	980	-0.1	-0.1	-0.04	0.6	2
Angola	n/a	192	249	896.2	1,399	n/a	3	4	14	13
Benin	1.0	1	7	22.4	60.6	0.1	0.1	0.4	1	2
Botswana	61.3	64	-52	65.1	55.6	5.6	4	-1	1	1
Burkina Faso	1	0.3	11	9.5	n/a	0.1	0.1	0.5	0.4	0.4
Burundi	1	1.0	1	0.3	2.4	0.1	0.1	0.1	0.1	0.4
Cameroon	89	322	73.9	-1.0	370.6	1.2	3	0.4	-0.1	4
Cape Verde	n/a	n/a	1.2	28.0	30.9	n/a	0.2	0.3	5	5
Central A.R	6	4	-6.5	4.0	n/a	0.8	0.3	-0.6	0.4	0.4
Chad	2	23	17.7	33.3	549.3	0.2	2	1	2	24
Comoros	n/a	3	0.19	0.5	0.82	n/a	2	0.1	0.2	0.3
Congo, D. R.	115	9	2.7	-29.2	-37.8	0.9	0.1	0.1	-1	-0.7
Congo, Rep.	39.5	17.5	93	166	366.2	2.0	1	5	7	11
Cote d'Ivoire	44.6	53.1	6.2	325.3	182.6	0.5	2	0.1	3	2
Egypt, A. R.	331	171.0	913.6	738.4	1933.5	1.4	0.5	2	1	2
Equatorial Guinea	n/a	1	21	187.7	149.73[b]	n/a	1	17	56	4
Eritrea	n/a	n/a	n/a	38	15	n/a	n/a	N/a	5	2

[7] UNIDO, Industrial Development Report, 2004

Table 5: Foreign Direct Investment to African Countries (1980 to 2004)
At net current prices in US$ and as share of GDP (%)

Country	net foreign direct invest (million US$)					FDI as share of GDP, (%)				
	1880–1984	1985 - 1989	1990 - 1994	1995 – 1999	2000 - 2004	1880-1984	1985-1989	1990-1994	1995-1999	2000-2004
Ethiopia	n/a	n/a	n/a	41	24	n/a	n/a	N/a	1	0.4
Gabon	62	219	-74	-50	-36	1.7	6	-1.6	-1	-1
Gambia, The	n/a	5	8	9	16	n/a	2	3	2	4
Ghana	11	7	58	56	95[b]	0.2	0.2	1	1	1
Guinea	n/a	24.9[c]	26	34	-7	n/a	1	1	1	-0.3
Kenya	21	27	11	34	70	0.3	0.3	0.1	0.3	1
Lesotho	4	25	38	90	73	0.9	5	5	10	8
Liberia	40[d]	1.9	5.7	n/a	6	2.6	0.15[a]	N/a	1	1
Libya	-532	-33	n/a	n/a	n/a	-1.6	-0.2	N/a	n/a	N/a
Madagascar	n/a	3	16	22	46	n/a	0.1	1	1	1
Malawi	3	0.1	n/a	25	36	0.2	n/a	N/a	1	2
Mali	20	1	n/a	23	93	1.4	0.04	0.1	1	3
Mauritania	n/a	3	6	1	5	n/a	0.3	1	0.1	11
Mauritius	1	15	8	19	70	0.1	1	0.4	1	2
Morocco	n/a	n/a	n/a	572	1002	n/a	n/a	N/a	2	3
Mozambique	n/a	3	25	155	293	n/a	0.1	1	4	7
Namibia	n/a	n/a	83	97	201	n/a	n/a	3	3	6
Niger	12	-5.3	-2	0.3	19	0.5	-0.2	-0.1	0.1	1
Nigeria	82	857	615	1134	2816	0.3	4	2	3	5
Rwanda	16	19	5	3	5	1.2	1	0.2	0.2	0.3
Sao Tome & Principe	n/a	1	2	24	6	n/a	3	4	5	10
Senegal	54	-25	-14	75	60	2.1	-1	-0.1	2	1
Seychelles	5	11	7	36	27	3.4	4	2	6	4
Sierra Leone	-2	1	9	-0.4	20	-0.1	0.1	1	0.03	3
South Africa	-160	-134	608	-262	255	-0.2	-0.2	-1	-0.2	3
Sudan	n/a	1	0	168	814	n/a	0.02	0	2	5
Swaziland	7	35	37	55	35	1.2	6	4	4	3
Tanzania	n/a	n/a	30	215	308	n/a	N/a	1	3	3
Togo	12	13	9	12.4	n/a	1.1	1	1	1	n/a
Tunisia	287	128	365	389	649	3.4	1	3	2	3
Uganda	0.1	22	3	105	176	0.03	1	0.1	2	3
Zambia	8	n/a	9	156	167	0.2	n/a	0.3	5	4
Zimbabwe	-29	-5	14	15	11[b]	-0.4	-0.1	0.2	2	0.1

Source: The World Bank, World Development Indicators, 2004
a Average (1985 - 1987)
b " (2000 - 2003)
c " (1986 - 1989)
d " (1982 – 1984)

Growth in FDI to Africa can be attributed to economic reforms initiated in many countries aimed at increasing the role of the private sector. For example Egypt and Ghana have initiated successful programs for privatizing state-owned enterprises. Egypt's privatization program was identified as one of the keystones in its economic reform process in the early 1990s, when the

country was trying to fit into a rapidly changing world environment. Partly, the privatization process was mandated upon Egypt with IMF assistance in 1991, when one of the conditions under which the loans were provided was a requirement to privatize. Yet, more importantly, poorly performing state-owned enterprises (SOEs) were a drag on the economy, accounting for roughly 40 percent of GDP during the 1980s. The SOEs required substantial financial resources to keep them afloat, yet the government could no longer provide the resources. In Ghana, there are significant investments by Malaysian investors in joint ventures with Ghanaian entrepreneurs in areas as diverse as banking, communications, palm oil and real estate.

Additionally, most African countries have taken steps to restore and maintain macroeconomic stability through the devaluation of overvalued national currencies, the maintenance of fiscal discipline and the deregulation of interest rates. As part of a general trend towards the a more liberal system,[8] African countries have improved their regulatory frameworks for FDI, making investment policy far more open, permitting profit repatriation and providing tax and other incentives to attract investment. In the 1990s new African countries concluded provisions for double taxation so that foreign investors do not have to pay taxes twice on the same transaction. Progress has also been made in other areas that are important for the FDI climate, such as trade liberalization, the strengthening of the rule of law, and improvements in legal and other institutions as well as in telecommunications and transport infrastructure.

Improvements in the regulatory framework have been buttressed in many countries by the conclusion of, or accession to, international agreements dealing with the protection of FDI, such as the Convention on the Settlement of Investment Disputes between States and Nationals of Other States. Most African countries (50) have concluded bilateral investment treaties with other countries, which aim at protecting and promoting FDI and which clarify the terms under which FDI can take place between partner countries. The treaties contribute to the creation of a more secure environment for foreign investors in the continent. Such improvements have put many African countries at par with most other developing countries. However, realizing that, because of the negative image of Africa as a whole, it may not be sufficient to improve the investment climate and have economic determinants in place to catch investors' attention many African countries have

Box 2. Morocco: sustained increase in FDI inflows

During the 1990's, broad macroeconomic reforms have created a favorable investment climate in Morocco. This coupled with a successful privatization program and liberalization of the FDI regime has made the country more attractive to foreign investors. As a result, FDI inflows to Morocco increased from an annual average of $572.4 million in 1995-1999 to an average of $1.00 billion in 2000-2004 (Table 5); in 1997, they amounted to $1.1 billion. Morocco has established itself as one of the largest recipients of FDI in Africa and it is at the forefront of changing the investor image of Africa.

According to the national investment authority, the success is due to the following factors: (i) improvements in the macroeconomic framework, (ii) the establishment of a sound institutional and legal framework for FDI (including the liberalization and simplification of administrative procedures), (iii) the provision of incentives, (iv) the modernization of the stock exchange and reforms of the banking sector, (v) the privatization program and (vi) the establishment of export processing zones – to list a few.

[8] A survey of thirty two least developed countries in Africa carried out by UNCTAD in 1997 found that twenty six had a liberal or relatively liberal regime for the repatriation of dividends and capital, UNCTAD, 1997b

established investment promotion agencies to change this image as well as to facilitate investment. Since 1995, investment promotion agencies from 25 African countries have joined the World Association of Investment Promotion Agencies (WAIPA) in order to benefit from an exchange of information on best practices in investment promotion.

The increasing interest of FDI in African industry and recent encouraging performance by countries such as Morocco [Box 2] and Angola suggest a potential for industrial growth in Africa.

2.4 SUMMARY

From the above discussion, it can be inferred that, in most African countries, the manufacturing sector is still insignificant. Africa in general and Sub-Saharan the manufacturing sector is still insignificant. Africa in general and Sub-Saharan Africa in particular is the world's least industrialized continental region. There are no newly industrializing countries and no industrial cities on the scale of Shanghai, Hong Kong, Sao Paulo or Mexico City. UNIDO's Competitive Industrial Performance (CIP) index ranks 93 core countries. Of these, thirty-four are African countries, most of which are concentrated in the lower echelons of the rankings, underlying the region's relative industrial backwardness (Table 6). Yet there is a strong positive association between the CIP index and GDP per capita underlying industry's contribution to growth.

Table 6: Africa: Ranking by CIP index values, 2000

Rank	Country	CIP Index (X100)	Rank	Country	CIP Index (X100)
1	South Africa	299	18	Gambia	120
2	Mauritius	240	19	Burkina Faso	118
3	Swaziland	221	20	Cameroon	111
4	Zimbabwe	213	21	Namibia	108
5	Senegal	199	22	Tanzania	106
6	Lesotho	191	3	Malawi	105
7	Cape Verde	187	24	Gabon	101
8	Côte d'Ivoire	171	25	Niger	100
9	Nigeria	153	26	Benin	93
10	Sudan	150	27	Rwanda	75
11	Ghana	139	28	Guinea	71
12	Zambia	139	29	Botswana	58
13	Seychelles	137	30	Ethiopia	50
14	Kenya	134	31	Burundi	47
15	Togo	127	32	Central Africa Republic	43
16	Madagascar	123	33	Comoros	41
17	Uganda	123	34	Mali	40

Source: UNIDO, 2004

3 Industrial Development and Poverty Reduction

Poverty eradication and sustainable natural resource management are strongly linked. Poverty reduction can in turn be promoted through industrial growth by value addition and creation of employment opportunities – well performing industry is also associated with poverty reduction as per evidence shown in Table 6 above from a sample of over 50 developing countries examined by UNIDO on the basis of data for 1999 and 2000 – an increase of 0.01 in the CIP index being associated with a rise of between $250 and $300 (in 1990 prices) in GDP per capita.

The analysis of structural change in highly performing economies, which includes countries like China, India, and Indonesia provides a useful indication of the necessary level of industrial growth to halve income poverty by 2015 in Africa. The indirect poverty elasticities of sectoral development can be estimated using the sectoral elasticities of output drawn from the experience of high performing countries and the poverty elasticities of growth for Africa (Table 7). Whenever industrial value added (IVA) increases by one percentage point, poverty headcounts fall by between 0.22% in land-locked countries and 0.37% in coastal ones. Significantly, the poverty elasticities of industrial development are larger than those of agriculture to GDP growth, which vary between 0.16 and 0.28. Above all, these estimates suggest that in order to cut income poverty by half in Africa, the growth rates required for industrial value added are 9% and 6% per annum in land-locked and natural resource rich economies, respectively.

Table 7: African countries: Poverty Elasticities of Growth

Type of Country	Poverty Elasticity to			
	GDP	Agriculture	Industry	Services
Coastal	0.60	0.28	0.37	0.45
Natural resource-rich	0.40	0.22	0.30	0.36
Land-locked	0.30	0.16	0.22	0.26

Source: UNIDO calculations

Africa's performance in terms of poverty reduction over the past two and a half decades is not encouraging having generally shown an increase, rising more rapidly in those countries where income inequality has also been increasing. Benin, Cape Verde, Equatorial Guinea, Malawi and Uganda have reduced poverty and the MDG goal of halving poverty by 2016 appears attainable. Mozambique, Mauritania, South Africa and Botswana also face attainable growth-rate requirements. The poorest African countries do, however, pose a big challenge. They have been making the slowest progress towards the income poverty goal – when they have not actually been slipping away from it. In may African countries the MDG growth requirements greatly exceed the best they have achieved in the recent past. If their growth rates do not improve, MDG fulfillment dates would have to be reset as follows: 2066 for the landlocked countries, 2055 for the resource – abundant coastal national, and 2057 for the coastal ones"[9]. These same countries have been performing poorly in terms of industrial development.

[9] UNIDO, Industrial Development Report, 2004

The policy implications for poverty reduction are crucial. Most Poverty Reduction Strategy Papers (PRSPs) make agriculture and rural development the priority because three quarters of the world's poor live in rural areas and depend on agriculture for their livelihood. The experience of high performing countries confirms that rapid growth in agricultural productivity is a precondition for economic take off and sustained poverty reduction. But the experience of these countries also supports the view that agricultural growth, especially at the initial stages of development, is not an end in itself but a vehicle for facilitating industrialization.

Efforts to promote rural development and alleviate poverty can be more effective if rural incomes can be raised through small scale manufacturing activities, for example in agro-processing. Therefore, the contribution of agriculture development to poverty reduction in Africa should take the form both of raising rural incomes directly while facilitating movement of surplus labour out of agriculture into more productive, higher paid, industrial and service activities.

4 The Issue of Environmental Sustainability in Africa

Environmental sustainability is a multi-dimensional concept including guarding against natural resource depletion (of non-renewable resources such as minerals and petroleum and resources that require time to regenerate such as forests, soil and water), minimizing pollution and maintaining the health of ecosystems. The challenges to environmental sustainability occur both from development, with increasingly intensive use of natural resources and energy and greater waste production, as well as from underdevelopment and poverty, which is often accompanied by extensive and inefficient use of natural resources and limited capacity for investment in natural resource conservation and rehabilitation, pollution control and ecosystem protection.

Accordingly, to ensure sustainability, a wide range of interventions and an appropriate incentive framework need to be put in place – from pollution control to promotion of effective natural resource management in all economic activities to the development of the related institutional capacity. It requires attention to the past, the present and the future. Current pollution flows and resource use clearly are important determinants of sustainability but not necessarily the only consideration. Underlying natural resource endowments and past pollution as well as resource consumption will define the starting point for any environment strategy in a particular society. At the heart of environmental sustainability is the ability to change trajectories- including the societal and institutional capacity to fix problems and improve results over time. As stated in the Environmental Sustainable Index Report, 2005, "sustainability is a characteristic of dynamic systems that maintain themselves over time, it is not a fixed end-point that can be defined. Environmental sustainability refers to the long-term maintenance of valued environmental resources in an evolving human context"[10]

[10] UNIDO, Industrial Development Report, 2004

Table 8: Environmental Sustainability Index Scores and Global Rankings

Country	ESI Score	Non – OECD Rank	Country	ESI Score	Non – OECD Rank
Gabon	61.7	5	Algeria	46.0	70
Namibia	56.7	19	Burkina Faso	45.7	71
Botswana	55.9	21	Nigeria	45.4	72
Congo	53.8	24	Kenya	43.3	74
Mali	53.7	25	Niger	45.0	76
Ghana	52.8	31	Chad	45.0	77
Cameroon	52.5	32	Morocco	44.8	78
Tunisia	51.8	36	Rwanda	44.8	79
Uganda	51.3	38	Mozambique	44.8	80
Senegal	51.1	40	Togo	44.5	84
Zambia	51.1	41	Dem. Rep. Congo	44.1	85
Tanzania	50.3	44	Egypt	44.0	87
Madagascar	50.2	45	Sierra Leone	43.4	92
Gambia	50.0	50	Liberia	43.4	93
Malawi	49.3	52	Angola	42.9	94
Guinea-Bissau	48.6	54	Mauritania	42.6	95
Guinea	48.1	58	Libya	42.3	97
Benin	47.5	63	Zimbabwe	41.2	99
Côte d'Ivoire	47.3	66	Burundi	40.0	101
South Africa	46.2	68	Ethiopia	37.9	106
			Sudan	35.9	111

Source: Environmental Sustainable Index Report, 2005

African countries fare poorly in relation to their ability to ensure environmental sustainability. Table 8 provides a comparison among countries as per the Environmental Sustainability Index (ESI). The ESI benchmarks the ability of nations to protect the environment over the next several decades. It integrates 76 data sets tracking natural resource endowments, past and present pollution levels, environmental management efforts, and the capacity of society to improve its environmental performance into 21 indicators of environmental sustainability"[11]. These indicators permit comparison across a range of issues that fall into the following five broad categories:

- Environmental systems
- Reducing environmental stresses
- Reducing human vulnerability to environmental stresses
- Societal and Institutional Capacity to respond to environmental challenges
- Global stewardship

The ESI score quantifies the likelihood that a country will be able to preserve valuable environmental resources effectively over the period of several decades. A high score indicates a better ability to ensure environmental sustainability – the highest score being Finland 75.1, second 73.4 Norway, and lowest 29.2 North Korea. Research has shown that countries that pay

[11] Yale Center for Environmental Law and Policy, Environmental Sustainability Index, 2005

attention to environmental policy and regulate effectively are more likely to produce successful environmental outcomes although, at the country level, sustainability is also strongly affected by natural resource endowments, past development paths, current and future pressures, and capacities to deal with them. Most countries do well on some issues and much less well on others. Virtually no country scores very high or very low on all 21 indicators. Thus, every country has something to learn from benchmarking its environmental performance against relevant peer countries. As shown in Table 8, with the exception of Gabon, all countries in Africa rank below 60 out of a possible score of 100 with Sudan the lowest, ranking country, scoring 35.9.

About 23% of the variance in the ESI is accounted for by per capita GDP, which suggests that richer countries can and do invest more in pollution control and other environmental amenities. It is also becoming more evident that governance is a critical factor underpinning environmental progress. Several studies both in Africa and within the rest of the world have shown a high correlation between civil and political liberties in a country (fair elections, free speech, active NGOs, vibrant legislatures) and the focus given within such countries to environmental challenges. [12]

The environmental problems that most directly affect Africa can be classified as follows:

- Loss of tropical forests and other habitats critical for biological diversity;
- Unsustainable agricultural practices;
- Dependence on fire wood as the main source of household energy;
- Contamination of rivers and other sources of water through human actions;
- Unsustainable exploitation of non-renewable minerals; and,
- Growing urban and industrial pollution as industry expands – exacerbated by the crowding in urban centers, of which industrial pollution is a growing part as industry expands.

The chief source of environmental degradation is deforestation caused by the over-dependence of African livelihoods on agriculture which is reflected in an ever growing need for cultivable and grazing lands and fuelled by population growth, and species loss, destruction of fauna, climatic change, changes in water table levels and stream flow, and soil erosion. Exploitation of minerals and hydrocarbons, also important in many African economies, creates additional and significant environmental impacts with pollutants such as sulfur dioxide and other acid gas emissions, acid mine drainage water and heavy metal contamination.

The development of industry, though sluggish, is providing alternative sources of livelihoods. Industrial growth will therefore reduce those pressures on the environment associated with poverty. However, industry itself is associated with more intensive use of natural resources and energy and with the generation of waste and pollution, and these will have their own impacts on the environment. Thus, structural change in African economies where the desired shift is towards a more prominent position for industry (with a declining share of agriculture in total economic activity although not necessarily a decline in the agricultural production) may actually results in an increase in the environmental burden of a country. There will certainly be a shift in

[12] Ibid

the make-up of that environmental burden. The challenge is to ensure that income growth generated from a developing industrial sector is associated with the application of environmentally sustainable production processes throughout the economy of a country.

Because industry is underdeveloped, its environmental impacts are not currently as serious a problem as in the rest of the world. However, as discussed in Section 2, the potential for growth is there and the challenge is to ensure that cleaner production techniques and other environmentally best practices are incorporated at these early stages of industrialization whenever manufacturing investments are being considered. Also, as will be discussed later, even though the aggregate volume of industrial pollution is small in Africa relative to the overall size of the industry, pollution intensity is among the highest in the world; a reason being the structure of industry that is dominated by basic necessities and mineral extraction and on small scale enterprises that apply out dated technologies. Whereas, rapid industrial growth is highly desirable in order to diversify the economy, create jobs, and add value to primary products and raw material being produced – and thereby reduce Africa's high levels of poverty, it is important that the necessary legal and institutional arrangements be in place to enable this growth to take place in a sustainable manner, keeping mind that environmental commitment can be a highly efficient tool for enhancing profitability and competitiveness.

5 Environmentally Sustainable Industrial Development in Africa: Current Status

Industrial development carries with it several threats to the environment that require explicit attention if sustainable development is it to be achieved. The main concerns relate to (i) air emissions, (ii) discharge of effluents, (iii) use of non-renewable material and energy resources, and (iv) pressures on bio-diversity. The following sections provide an overview of the current status in Africa regarding each of these concerns. It will also consider the state of awareness of environmental issues and management capacity among all relevant stakeholders in African industrial development

5.1 AIR EMISSIONS

Table 9 shows that manufacturing's contribution to air pollution is relatively low with the exception of heavy metal emissions. However, industry does use more commercially supplied energy than any other sector. Thus, indirectly it perpetuates emissions that cause greenhouse effect, acid rain and ozone depletion such as NO_2, SO_2 and CO_2. Given that air pollution is mostly caused through commercial energy supply, the type of energy used in Africa's industries and its effective use becomes a major issue for air emissions (more on this later in section 4.3).

Table 9: Contribution of Manufacturing and Energy Supply to Total Air Pollution in Africa (%)

Type of pollutant	Commercial energy supply	Traditional energy supply	Manufacturing
Particulates	35	10	15
Lead	41	Negligible	59
Cadmium	13	5	70
Mercury	20	1	77
Non-methane hydrocarbons	35	5	20
Sulfur dioxide	85	0.5	13
Nitrogen dioxide	30	2	1
Carbon dioxide	75	3	7
Methane	18	5	12
Nitrous oxide	12	8	Negligible

Source: World Energy Assessment, Energy and the Challenge of Sustainability, UNDP, 2000

Africa's emissions of greenhouse gases are at a relatively level, estimated at only 7 percent of all global emissions. Africa as a whole presently emits only 3.5% of the world's total carbon dioxide emissions and one country, South Africa, contributes 44% of the region's CO_2 emissions[13] suggesting negligible emissions in the other African countries. Nevertheless, it must be borne in mind that emission of green house gases from African industry will eventually become a concern unless measures are taken to reduce CO_2 emissions in industry and to shift towards renewable energy sources with further industrialization. Diagram 4 shows that African CO_2 intensity grew slightly, from 0.27 to 0.29 Mt per capita between 1980 and 2002, whereas in most parts of the world such emissions are being reduced.

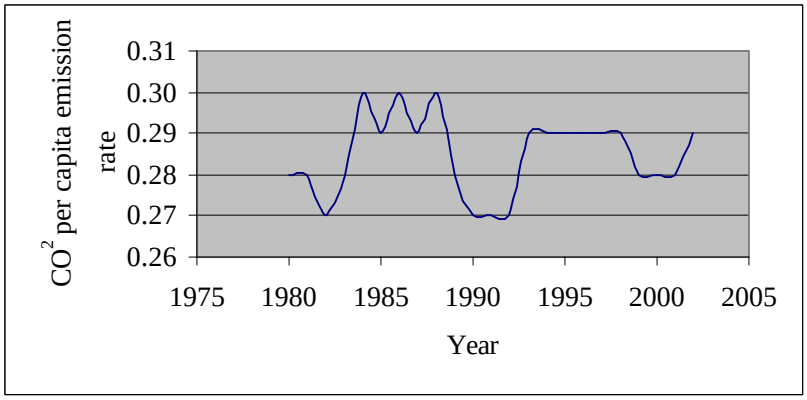


Diagram 4: CO^2 per capita emission rate in Metric tone - 1980 to 2002
Source: Carbon dioxide Information Analyses Centre Oak Ridge National Laboratory, 2005

Table 10 shows carbon dioxide emission by the manufacturing sector in African countries. It is indicated that South Africa and Egypt and released the most carbon dioxide. This reflects their status as the most industrialized countries or largest energy producers in Africa. Also, they derive much of their energy from high carbon–intensity coal. This dependence on coal-based thermal power and a growing industrial sector suggest a potential greenhouse pollution problem unless measures are taken to provide incentives for alternative energy sources for these countries such as hydropower, wind, geothermal and solar. On the other hand, despite having a population almost two times larger than South Africa's, Ethiopia emitted less than one 100th of the carbon

[13] UNEP, Sustainable Consumption and Production Activities in Africa, Regional Status Report, 2002 - 2004

dioxide. This is due both to the absence of industrial development in Ethiopia and minimum utilization of thermal energy as Ethiopia covers 90% of its energy demand by generating energy using hydroelectric power.

Togo, Angola, Zambia and Congo Democratic Republic use much of the energy generated in the country for manufacturing and construction purposes. Thus the percentage of CO_2 emissions from the manufacturing and construction sectors is higher as a share of the total carbon dioxide emission in these countries than in the others.

Table 10: Carbon Dioxide Emissions in Africa, 2001

Country	Total CO^2 Emissions (million MT tons)	CO^2 emission from Industry* % of total
Algeria	70.6	9.7
Egypt	117.9	30.9
Libya	38.7	12.5
Morocco	31.9	16.5
Tunisia	18.2	23.2
Angola	2.8	41.6
Benin	1.6	10.3
Cameroon	2.9	7.5
Congo	0.8	15.4
Congo Demo Rep.	1.8	35.4
Côte d'Ivoire	5.1	9.4
Eritrea	0.7	5.9
Ethiopia	3.3	27.6
Gabon	1.6	23.5
Ghana	6.2	11.5
Kenya	8.1	16.7
Mauritania	1.3	15.1
Mozambique	2.3	8.8
Niger	56.1	11.0
Rwanda	3.7	20.7
Somalia	N.A	17.8
South Africa	341.3	15.3
Sudan	6.6	15.9
Tanzania	2.8	49.5
Togo	0.9	N.A
Uganda	N.A	40.2
Zambia	1.9	15.4
Zimbabwe	12.5	N.A

*Manufacturing and construction
Source: International Energy Agency (IEA), 2005

5.2 DISCHARGE OF EFFLUENTS

It has been indicated in section 2 of this report that the textile industry is one of the largest sub-sectors within African industry. Due to a number of factors, most notably the lack of access to external technological resources, pollution from the textile sector is considerably worse in Africa

than elsewhere, on a per unit basis, as many operations do not practice any sort of waste treatment at all. The textile sector accounts for approximately 11 percent of industrial organic water pollution in all of Africa. However, the problem is not limited to the textile industry. Most industries discharge their effluents untreated into water bodies and onto open land. Most industries discharge effluents untreated in water bodies and open land. For example, over 90% of industries in Ethiopia discharge untreated effluents. Similarly, 35% of all factories in Maputo, Mozambique are chemical industries whose effluents are discharged untreated into the Motola River, ending up in the Indian Ocean. Thirty-four percent of wastewater in urban areas in Zimbabwe emanates from local industries"14. Table 11 shows distribution of organic pollutant effluent across industrial sectors in Africa. The highest pollution source is the food and beverage industries followed by the paper and pulp industry. Although biological oxygen demand (BOD), suspended solids (SS), toxic chemicals and bio-accumulative metals are the major industrial pollutants to be considered to analysis the impact of effluents from industries, due to lack of data, this could not be discussed further in this paper.

It has also been indicated in Section 2 that industry in Africa tends to be comprised of small and medium sized enterprises (SME's). Production in small plants, compared to large ones in the same sector tends to be more polluting as such enterprises are less compliant with environmental regulations.

The mining sector also contributes to water pollution. Acid mining drainage represents the most widespread and pervasive mining-related agent of impact. This is particularly true if mineralized targets for mining consist of sulfide ore bodies or are contaminated with sulfides, especially iron sulfide. Many South African, Zambian and Zimbabwean mineral deposits are susceptible to acid mine drainage. Residual toxic metals from mining processes enter the external environment, where they have the potential to cause various types of damage to the biophysical environment. The more problematic metals are cadmium, chromium, copper, mercury, vanadium, zinc and, to a lesser extent, iron and manganese.

[14] UNEP, Sustainable Consumption and Production Activities in Africa, Regional Status Report, 2002 - 2004

Table 11: Distribution of Organic Pollutant Effluent across Industrial Sectors by country in Africa,

Country	Emissions of organic water pollutants				Industry shares of emissions of organic water pollutants % of total							
	kilograms per day		kilograms per day per worker									
	1990	2001[a]	1990	2001[a]	Primary metals 2001[a]	Paper and pulp 2001[a]	Chemicals 2001[a]	Food and beverages 2001[a]	Stones, ceramics, glasses 2001[a]	Textiles 2001[a]	Wood 2001[a]	Others 2001[a]
Algeria	106,977	45,645	0.3	0.2	23.4	2.0	5.9	59.5	0.7	8.0	1.0	..
Angola	4,544	1,472	0.2	0.2	7.6	3.0	9.1	65.9	0.3	6.0	4.0	4.0
Benin	..	..	..	..	..	..	..	..	..	..	..	..
Botswana	4,509	3,543	0.2	0.3	1.7	6.7	5.4	77.9	0.2	10.0	3.0	2.5
Burkina Faso	..	2,598	..	0.2	3.5	1.1	5.4	73.8	0.1	4.0	10.0	2.2
Burundi	1,570	..	0.2	..	..	..	..	..	..	..	..	..
Cameroon	13,989	10,714	0.3	0.2	3.1	6.3	28.3	52.7	0.0	4.0	6.0	..
Central African Republic	998	670	0.2	0.2	0.0	..	4.0	62.0	0.0	14.0	20.0	..
Chad	..	..	..	..	..	..	..	..	..	..	..	..
Congo, Dem. Rep.	..	..	..	..	..	..	..	..	..	..	..	..
Congo, Rep.	..	..	..	..	..	..	..	..	..	..	..	..
Côte d'Ivoire	..	12,401	..	0.2	..	5.5	7.1	71.9	0.0	9.0	6.0	..
Egypt, Arab Rep.	211,531	203,633	0.2	0.2	11.8	7.9	8.0	49.8	0.3	19.0	0.0	3.3
Eritrea	..	..	..	..	..	..	..	..	..	..	..	..
Ethiopia	18,593	20,849	0.2	0.2	1.8	10.4	4.6	61.2	0.3	20.0	1.0	0.7
Gabon	2,018	1,886	0.3	0.3	0.0	6.0	4.9	79.7	0.1	1.0	7.0	1.3
Gambia, The	..	832	..	0.3	..	..	..	..	..	..	..	..
Ghana	..	14,449	..	0.2	9.8	16.9	10.5	39.5	0.2	9.0	12.0	2.2
Guinea	..	..	..	..	..	..	..	..	..	..	..	..
Guinea-Bissau	..	..	..	..	..	..	..	..	..	..	..	..
Kenya	42,588	53,029	0.2	0.3	4.1	11.9	5.7	70.0	0.1	8.0	2.0	2.3
Lesotho	2,958	3,123	0.2	0.2	1.2	4.0	0.7	39.7	0.1	51.0	1.0	2.2
Liberia	..	..	..	..	..	..	..	..	..	..	..	..
Libya	..	..	..	..	..	..	..	..	..	..	..	..
Madagascar	..	..	..	..	..	..	..	..	..	..	..	..
Malawi	10,024	11,805	0.3	0.3	0.0	16.0	3.7	70.0	0.0	8.0	2.0	0.2
Mali	..	..	..	..	..	..	..	..	..	..	..	..
Mauritania	..	..	..	..	..	..	..	..	..	..	..	..
Mauritius	17,813	17,700	0.2	0.2	0.9	6.6	2.6	32.8	0.1	55.0	1.0	1.1
Morocco	41,710	88,779	0.1	0.2	0.7	7.0	6.4	54.4	0.4	27.0	1.0	3.2

Table 11: Distribution of Organic Pollutant Effluent across Industrial Sectors by country in Africa,

Country	Emissions of organic water pollutants				Industry shares of emissions of organic water pollutants % of total							
	kilograms per day		kilograms per day per worker									
	1990	2001[a]	1990	2001[a]	Primary metals 2001[a]	Paper and pulp 2001[a]	Chemicals 2001[a]	Food and beverages 2001[a]	Stones, ceramics, glasses 2001[a]	Textiles 2001[a]	Wood 2001[a]	Others 2001[a]
Mozambique	20,414	10,230	0.3	0.3	1.1	7.1	2.7	81.2	0.1	6.0	1.0	0.8
Namibia	..	7,350	..	0.3	0.0	5.0	1.6	90.4	0.1	1.0	1.0	0.9
New Zealand	50,243	46,099	0.2	0.2	3.2	21.7	5.2	57.3	0.1	5.0	4.0	3.5
Niger	..	..	..	..	..	..	..	..	..	..	..	..
Nigeria	52,350	82,477	0.2	0.2	1.4	15.4	11.3	40.2	0.1	23.0	5.0	3.7
Papua New Guinea	..	..	..	..	..	..	..	..	..	..	..	..
Rwanda	..	..	..	..	..	..	..	..	..	..	..	..
Senegal	10,309	6,643	0.3	0.4	0.0	6.6	4.2	87.0	0.1	2.0	0.0	1.0
Sierra Leone	..	4,170	..	0.3	..	9.6	3.0	82.3	0.1	2.0	2.0	..
Somalia	..	..	..	..	..	..	..	..	..	..	..	..
South Africa	261,618	181,284	0.2	0.2	9.8	19.5	7.9	46.4	0.0	5.0	5.0	6.4
Sudan	..	..	..	..	..	..	..	..	..	..	..	..
Swaziland	6,586	2,009	0.3	0.2	..	79.8	0.3	..	0.2	17.0	2.0	..
Tanzania	31,125	35,155	0.2	0.3	1.5	9.4	2.7	69.3	0.1	14.0	2.0	0.9
Togo	..	..	..	..	..	..	..	..	..	..	..	..
Tunisia	..	49,337	..	0.1	3.0	5.3	7.0	33.7	0.4	44.0	2.0	4.6
Uganda	..	..	..	..	..	..	..	..	..	..	..	..
Zambia	15,880	11,433	0.2	0.2	3.4	10.8	7.3	63.6	0.0	9.0	3.0	2.8
Zimbabwe	37,149	26,810	0.2	0.2	5.2	10.2	7.9	54.2	0.0	16.0	3.0	3.5

Source: The World Bank Group, World Development Indicators, 2005
Note: Industry shares may not sum to 100 percent because data may be from different years.
a. Data refer to any year from 1993 to 2001.

5.3 USE OF ENERGY AND OTHER NON-RENEWABLE RESOURCES

Energy is the driver of industrial development. Although energy prices in Africa are high, there is inefficiency in energy generation, distribution and use; e.g., it is estimated that Africa takes on a 30% energy loss during distribution. Thus there is a significant potential for energy savings with an associated equally significant reduction in costs through increased energy efficiency along the whole life cycle of the energy sector: generation, transmission, distribution and use. In addition to efficiency, the type of energy used is also important for the promotion of sustainable industrialization. To a large extent, energy used in African industry is biomass based on non-renewable resources and associated with negative environmental and social impacts. Of Africa's 53 countries, only Egypt, South Africa, Ethiopia, Malawi, Zambia, Zimbabwe, Lesotho, Sudan and Tanzania generate and use significant hydroelectric power. South Africa is the only African nation to use nuclear power. Overall, the use of solar power is insignificant throughout the continent.

The mining sub-sector is of course an extractive industry based on the extraction of non-renewable resources. In the 1960s and 1970s, many African countries adopted policies to make the mining sector the engine for growth and rapid industrialization. In many countries the mineral sector still remains the driver of the national economy, even though, over the past few decades there has been general stagnation and even decline of the mining industry due to *inter alia* the lack of managerial and technical expertise, inability to access finance, and depression of mineral prices as well as little innovation in the technologies applied to mineral extraction.

A more detailed discussion of use of energy and non-renewable resources can be found in report on "Energy for Sustainable Development" prepared by Economic Commission for Africa, 2005.

5.4 PRESSURE ON BIODIVERSITY

Africa's biodiversity and natural wealth are key to contributing to the economic development of the continent. It includes five globally significant biodiversity hotspots (Cape Floristic Province, the Eastern Arc Mountains and Coastal Forests of Tanzania and Kenya; Madagascar and the Indian Ocean Islands, the Succulent Karoo, and the Guinean Forests of Western Africa. Africa has a large and diverse heritage of flora and fauna, including major domesticated crops. The continent is home to more than 50,000 known plant species, 1,000 mammal species, and 1,500 bird species. Eastern Africa has the highest numbers of endemic species of mammals (55%), birds (63%), reptiles (49%) and amphibians (40%). Madagascar is the most endemic-rich country in Africa and one of the six most significant concentrations of plants in the world is the Cape Floral Kingdom. 70% of the wild species in North Africa are known to be of potential value as sources of traditional food, medicine and pharmaceuticals and half of these have more than one potential use.

Savannahs, the richest grasslands in the world, are the most extensive ecosystem in Africa. They support many indigenous plants and animals as well as the world's largest concentration of large mammals. African wetlands also have a rich biological diversity, with many endemic and rare plant species as well as wildlife such as migratory birds. Wetlands are found in most African

countries. Throughout centuries, African societies have depended on the rich biodiversity of the continent for survival. They have developed strategies to protect and conserve this natural heritage for the benefit of their own and future generations. In some cultures, rich areas of biodiversity, including forests were often designated as sacred or protected areas.

Although most of the African countries have ratified the biodiversity-related conventions, the large and diverse biological heritage of the continent is at risk in all regions of Africa. Some species have already been reported as extinct and many others are under threat of extinction. Recent estimates show that a total of 124 animal species have become extinct from the wild and 924 animal species are critically endangered or vulnerable. Twelve plant species are extinct and 869 are critically endangered. Despite being among the most biologically productive ecosystems in Africa, wetlands are being lost as they are regarded in most of the cases as wastelands and potential areas for agriculture. The introduction of exotic species over the past century has also contributed to biodiversity loss. Armed conflicts have also led to significant ecological damage and biodiversity losses.

Since the 1970s, escalating and unsustainable pressures from fast-growing populations and cities as well as expanding agricultural and industrial activities have increasingly threatened the environment and key natural resources in most African countries. Moreover, environmental pollution is an increasingly major threat to biodiversity in many African countries. Pesticide residues have reduced the populations of several bird species and other organisms. As the region continues to industrialize the adverse impact of pollution on biodiversity is most likely to increase unless cleaner production processes and technologies are promoted. Climate change is the latest emerging threat to biodiversity in Africa. It has already been identified as an emerging cause to the loss of habitat to many species and in particular amphibian populations

Most of the African countries have submitted their national report to the Conference of the Parties to the UN Convention on Biological Diversity and are preparing, finalizing and implementing their biodiversity strategies and action plans called for by Article 6(a) of the Convention. The objective of this Action Plan will aim at improving Africa's implementation of the objectives of the Convention including the relevant decisions of the Conference of the Parties with a particular emphasis on sustainable use and the fair and equitable sharing of benefits. To this end, the ecosystem approach will be promoted. A special attention will be devoted to implement throughout Africa the Bonn guidelines on access to genetic resources and fair and equitable sharing of the benefits arising out of their utilization.

African countries have played a leading role in the negotiation of the Cartagena Protocol on Biosafety. Many African countries have signed the Protocol and are now engaged in the process of ratification. On the issue of biosafety, this Action Plan will aim at increasing efforts to prepare and implement national biosafety frameworks by African countries. It will also entail the development and implementation of activities to build African human and institutional capacities in accordance with the decisions of the Intergovernmental Committee of the Cartagena Protocol chaired by an African official.

6 Promoting Sustainable Industrialization in Africa: Challenges & Achievements

It has been indicated in the introduction to this report that the JPOI is based on six principles ranging from increased awareness of environment issues to introduction of improved technologies to greater research of environmental impacts through the life cycle of a production process. Many international forums, in suggesting action to promote patterns of industrial development that simultaneously satisfy environmental sustainability and industrial development in Africa, have emphasized the promotion and preferential transfer of environmentally sustainable technologies with special emphasis on cleaner production programs. This section therefore focuses on programs that seek to realize these principles.

6.1 INTRODUCTION OF MORE SUSTAINABLE INDUSTRIAL MANAGEMENT PRACTICES

It is commonly assumed that the most effective way for enterprises to adopt more sustainable patterns of production is by introducing environmentally sustainable technologies. However, this is not necessarily the case. Often, the cause of enterprises' unsustainable production practices is their management structures and practices, which do not give enough priority to ensuring high levels of efficiency in the use of natural resources (raw materials, water and energy), to protecting worker health and safety and to minimizing environmental impacts. As defined by UNEP, cleaner production is the continuous application of an integrated preventive environmental strategy to processes, products, and services, to increase overall efficiency and reduce risks to humans and the environment. Cleaner production can be applied to the processes used in any industry, to products themselves and to various services provided in society. In particular:

- For production processes, cleaner production means any one or more of the following: conserving raw materials, water and energy; eliminating toxic and dangerous raw materials; and reducing the quantity and toxicity of all emissions and wastes at source during the production process.
- For products, cleaner production means reducing the environmental, health and safety impacts of products over their entire life cycles, from raw materials extraction, through manufacturing and use, to the 'ultimate' disposal of the product.
- For services, cleaner production implies incorporating preventive environmental concerns into designing and delivering services.

UNIDO and UNEP supported by UNDP or bilateral donors are the agencies most actively promoting cleaner production in Africa. Since 1994, UNIDO has helped establish 27 National Clean Production Centers (NCPCs) globally, out of which 10 are in Africa. NCPCs have been established in Egypt, Ethiopia, Kenya, Morocco, Mozambique, South Africa, Tanzania, Tunisia, Uganda, and Zimbabwe. Additional centers are in the process of being set up and many countries, including countries in Africa, have requested to have NCPCs established.

Over the years, several countries in Africa have initiated or implemented other projects and programs related to cleaner production. Demonstration projects have been launched to convince

industrial leaders of the economic and environmental benefits of cleaner production – with a reasonable level of success. However, most of these programs, being donor-funded, have been short-lived. Their sustainability is yet to be demonstrated and local ownership needs to be clearly shown by the implementing countries. It must be borne in mind that any successful cleaner production initiative must be led by local people with local knowledge, which calls for building a basic capacity level in the region. In general, businesses in Africa have reacted slowly to adopting cleaner production approaches and, indeed, to adapting to the preventive approach. In addition to limited local capacity, the constraints for adopting cleaner production are attitudinal (misunderstanding of the cleaner production concept leading to indifference and resistance to change), and systemic as well as organizational, technical, economic and policy-related.

Despite these constraints, some key achievements from the adoption of cleaner production can be observed in Africa. For example in Tunisia, a battery manufacturer employing 200 people identified 19 actions, of which the first 7 changes alone offered potential savings of nearly US$750,000 in the first year, with no capital investment required.

The adoption of cleaner production practices is only one way that enterprises can upgrade their management practices to drive them towards greater resource efficiency and greater protection of their workers and the natural environment. The adoption of environmental management systems, the best known of which is ISO 14000, can also assist enterprises in this direction. The adoption of related management system standards, covering such topics as health and safety management (e.g., OHSAS 18000) or social responsibility (e.g., SA 8000 or ISO 26000 which is currently being developed), also go in the same direction. Even the adoption of management systems that do not focus on sustainability but rather quality can promote resource efficiency as a by-product. The best example of such a standard is ISO 9000. By focusing on product quality, these systems can help enterprises reduce wastage during their production processes. The adoption of other management system standards, for instance the new standard on Hazard Analysis Critical Control Point mechanisms (ISO 22000 for the food industry), can also improve resource efficiency for the same reasons.

Metrology, standards, testing and quality institutions provide complementary support to the introduction of such standards by allowing for proper control of product, health and environmental quality, and by providing the means for certification against the standards. Such institutions also encourage the development of new products through R&D and promote best practices. Projects to strengthen such institutions in Ethiopia, Uganda, Nigeria and Burundi among others are underway. Promotion of linkages between R&D institutions and industry (e.g., the Leather and Leather Product Training Institute in Ethiopia) have also helped the testing, promotion and skills development related to cleaner and more productive production.

More general systems for improving productivity in general, such as the 5S approach, can have a side-benefit better resource efficiency and better protection of the workforce. It is for this reason, for instance, that the Asia Productivity Organization introduced the concept of Green Productivity, in which traditional tools and approaches for increasing productivity are used to reduce waste and pollution generation and improve worker safety.

6.2 INTRODUCTION OF ENVIRONMENTALLY SOUND TECHNOLOGIES

As per UNIDO's definition, environmentally sound technologies are defined as " technologies that are less polluting, use resources in a more sustainable manner, and handle residual wastes in a more acceptable manner than the technologies they replace"[15] They are often divided into three categories: (i) treatment technologies, (ii) recycling technologies, and (iii) cleaner technologies. Treatment technologies, traditionally called end-of-pipe technologies, are used at the end of the production process to collect pollutants and then destroy, neutralize or fix them. Although an "easy fix", in the sense that their adoption does not require entrepreneurs to analyze in any depth why they are generating wastes and pollutants, they have significant drawbacks. In the first place, they are a sunk cost and add no value to the products. Entrepreneurs cannot hope to get any return on their investment in treatment technologies. More critically, most treatment technologies generate further residues themselves, some of which may be more harmful than the original waste product, and many of which will require further treatment technologies if they are to be handled correctly.

Recycling technologies are a more sustainable solution to treatment technologies. Although, like treatment technologies, they do not prevent wastes and pollutants from being generated, nevertheless by allowing enterprises to reuse the wastes as a secondary raw material, they do reduce more effectively the environmental impacts of a production process and they can give entrepreneurs a return on their investment. Like treatment technologies, they almost always generate further residues that will require treatment or release into the environment. On the other hand, cleaner technologies are manufacturing processes that reduce the generation of pollutants or waste and the consumption production inputs (raw materials, water and energy). They simultaneously reduce the levels of input consumption and reduce the need for treatment technologies and thus often reduce the overall costs of production. Moreover, the use of cleaner technologies can reduce or even eliminate the need to trade off environmental protection against economic growth, occupational safety against productivity, and consumer safety against competition in international markets. Setting goals across a range of sustainability issues leads to 'win-win' situations that benefit everyone.

Most of the environmentally sustainable technologies applied in Africa (to the extent that such technologies are applied) fall in the first and second categories. However, treatment in particular is not a long-term solution to the environmental problems associated with industrial expansion. Natural systems have a limited assimilative capacity to dilute wastes. In areas where there is a heavy concentration of industry this capacity is easily exceeded. The level of treatment is often limited, especially in a context of weak environmental laws and/or weak enforcement of environmental laws, because entrepreneurs will accept to allocate only so much of production cost for the treatment of wastes (which is essentially an overhead expenditure) in order to remain competitive. As for recycling, while it is better than treatment, it often suffers from limited or unpredictable markets for its products, which creates risks to those who adopt it. The cleaner technology approach, on the other hand, is a better means of avoiding and/or minimizing environmental problems by reducing pollutant and waste generation at the source while at the same time reducing production costs and often resulting in better quality products.

[15] UNIDO, Industrial Development Report, 2004

Many demonstration projects have been launched to convince industrial leaders to introduce cleaner technologies. The leather industry has particularly benefited from such support. In 1995, UNIDO established the Eastern and Southern Africa Leather Industries Association (ESLIA), located in Nairobi, Kenya, which was designed to channel assistance and to coordinate all activities, including the promotion of cleaner technologies and practices in the leather industry. A sharply focused regional project financed by the Government of Switzerland was also launched in 1997 and was aimed primarily at reducing the amounts of major tannery pollutants such as chromium salts, sulfides and nitrogen compounds. It undertook the introduction of five cleaner technologies at 11 tanneries in Ethiopia, Kenya, Malawi, Namibia, the Sudan, Uganda, Zambia, and Zimbabwe with significant success in pollution reduction. Other sectors where demonstrations of cleaner technologies have been performed include textiles and metal finishing. Despite many convincing results, application of the technologies is yet to take off in any significant way.

In most African countries the process of technology and capability acquisition in general has been highly deficient. Contractual agreements for establishing industries rarely include a commitment to long-term support of the enterprise beyond facilitating acquisition of hardware. The point is usually lost that technological learning is not a by-product of hardware purchases but a strategic objective to be pursued in industrialization efforts. In general, the organizational structure, management and information systems of industrial firms in Africa are underdeveloped making it difficult to expand into and/or adopt new production processes, added to which there is the perceived management risk associated with any significant investment outlay. The problem is more acute for the adoption of environmentally sustainable technologies, particularly cleaner production technologies, as environmental management functions are the least developed of any firm's operations and there is limited relevant staff experience.

The introduction of cleaner technologies is being attempted in the context of a policy environment that lacks leadership for environmental affairs, that puts insufficient emphasis on cleaner production issues in environmental, technology, trade and industrial development strategies, and that lacks an effective framework for control and enforcement of environmental protection. It is also introduced in the context of industries that lack effective organization without a critical mass of companies and institutions willing to cooperate, network and share knowledge and information, where industrial associations are weak, and where there are little if any hives of research and development, innovation, diversification and technology diffusion – all of which complement the introduction of new technologies into an industry, as is necessary for the promotion of cleaner technologies in Africa. Related to this, government capacity to render extension services including those related to testing, metrology, certification and accreditation industrial development and SME creation is limited.

Cleaner technologies, because they are newer and therefore more sophisticated, tend to require high levels of skilled labor, and investment in skills development is necessarily a prerequisite for sustainable economic growth. Most African countries suffer from low levels of investment in human capital. Technical education is of course provided. Nevertheless, technical education tends to be under-financed and course content is not rigorous from a sustainability perspective. The analytical tools of prevention, such as cleaner production, energy efficiency, waste

minimization and life cycle thinking, are often not included at all levels of technical education, the tendency being to regard such training as a specialization or as an optional add-on. If sustainable development technologies are to be introduced into African industries and effectively applied, however, "cleaner-production education must be considered as part of life-long skills development programs and should not be confined to formal education"[16].

Additional constraints include:

- In the case of treatment technologies, the need for high investment outlays for what is generally considered an overhead cost;
- Lack of appropriate funding mechanisms as such technologies are not fully valued by credit providers in their evaluation procedures for lending, equity participation, etc;
- A perception that investments in cleaner technologies present a high financial risk due to their innovative nature;
- Because cleaner technologies are new technologies, investments in them may not be applied in the most cost effective manner;
- Absence of a sound operational basis (with well established production practices, maintenance schemes etc.);
- Cleaner technologies are often more complex than those they replace;
- There is a need to undertake comprehensive assessments to identify the most appropriate cleaner technology opportunities, the skills for which are often lacking;
- Inadequate access to reliable technical information tailored to the specific and variable needs of African industrial firms and their assimilative capacities.

6.3 MANAGING NON-RENEWABLE RESOURCE USE

The above discussion has made no distinctions between renewable and non-renewable resources. Yet, the reduction in the use of non-renewable resources, either by being more efficient in the use of them or by switching to renewable resources, is also a key aspect of sustainable development. Much of the energy used in Africa's formal sector comes from non-renewable resources. In general, the transportation, transmission and distribution infrastructure for energy in Africa is undeveloped and the policy, regulatory and institutional framework is inadequate, resulting in inefficient and unsustainable utilization and wastage of energy. Programs have been introduced, mostly with external support, to promote the rational the use of energy and the adoption of renewable energy technologies. Examples are programs for industrial energy efficiency and renewable energy development in Ghana; advisory services for industrial energy management in Nigeria; and industrial energy efficiency and renewable energy development in Ethiopia.

Industry accounts for a major share of commercial energy consumption in the region (31 percent in Cote d'Ivoire, 79 percent in Togo, 55 percent in Zaire). This is dominated by industry's consumption of electricity, which approaches and sometimes exceeds 50 percent of total electricity consumption. Although a few countries are net oil exporters (e.g., Nigeria, Cameroon, Zaire), most African countries are very dependent on imported petroleum for meeting the energy

[16] UNEP, The African 10 year Framework Program on Sustainable Consumption and Production, 2005

needs of their formal sectors, and they face serious problems in obtaining foreign exchange to finance their energy imports.

In light of the region's economic problems (including the shortage of investment capital) and the limited resource base of many countries (which restricts their energy supply options), increasing the efficiency of current supply and utilization should be the top priority of any strategy to address the region's energy problems. Energy sector rehabilitation to increase the efficiency and reliability of energy supplies and promote efficient energy use is the least-cost solution and offers the greatest short-term relief. For most countries, the cheapest and quickest way to alleviate the foreign exchange burden of energy imports, reduce the capital constraints of building new production capacity, and extend domestic energy supplies is to increase the efficiency of energy use. In addition, by producing more output with the same energy cost input (i.e., reducing energy costs), energy efficiency promotes economic efficiency and improves the productivity and competitiveness of energy-consuming enterprises.

It is believed that energy use in the modern sector in African countries is extremely inefficient, offering large, untapped energy conservation potential. Experience in African countries has shown that technically proven, cost-effective energy conservation and efficiency measures can save at least 10 to 30 percent of energy consumption. For example, according to World Bank estimates, energy efficiency in the industrial sector in Ghana is low and could be increased by at least 15 percent through housekeeping measures alone. In Niger, the consumption of electricity in industrial buildings has increased rapidly in recent years and is inefficient due to dilapidated equipment and poor operating practices. The World Bank estimates that 40 percent of electricity consumption for air conditioning could be saved through more efficient equipment and practices. These conclusions are supported by the results of UNIDO’s NCPCS, which have found in all the countries they operate, large potential for reducing energy consumption.

Despite the large energy conservation potential and the clear economic benefits of energy conservation, there are numerous technical, financial, institutional, and policy barriers to achieving widespread energy efficiency improvements in Africa. These constraints include:

- Lack of data: There is a serious lack of detailed and reliable data on energy use in industry, transport, and buildings. These data are needed to identify and estimate sectoral and sub-sectoral energy conservation potential. Studies and energy audits are needed to identify conservation potential and specific measures in individual plants and enterprises.
- Lack of awareness: Among policymakers and energy users there is a lack of awareness of energy conservation benefits, potential, practices, and technologies.
- Lack of skilled manpower: Across all countries there is a serious lack of personnel with adequate technical, financial, economic, managerial, and energy planning skills to identify and implement specific energy conservation measures and design and implement energy conservation policies and programs. In some cases, manpower problems are the main constraint to efficient energy planning and management.
- Lack of adequate institutional frameworks: Most countries do not have agencies responsible for formulating, coordinating, implementing, and monitoring energy conservation policies and programs.

- Lack of financing: There is a shortage of capital (especially foreign exchange) available to finance energy conservation programs and individual projects.
- Inefficient pricing policies: In many countries, electricity tariffs and prices for petroleum products are subsidized and do not reflect real economic costs.

With regard to the mining sector, whereas many African countries remain dependent on mineral resources, mining have attributes that make it difficult to manage and pose daunting challenges of sustainability including, of course, the issue of depletion of non-renewable mineral resources. The policy challenges regarding the use of the wealth generated by mineral resources to promote growth and development and sustain it long after the minerals have been depleted need to be accorded the attention they deserve by the concerned African countries

6.4 LEGISLATED REGULATORY INSTRUMENTS TO ENCOURAGE SUSTAINABLE PRACTICES

There are a number of laws and overarching policies regulations and guidelines that are aimed at sustainable development and sound environmental management. In Ethiopia, Kenya and Morocco UNIDO has supported an ecologically sustainable industrial development program. These instruments; e.g., in Ethiopia seem to put emphasis on pollution control; however, the legislation tends to be consistent also with requirements for preventing environmental impacts and more rational use of resources. Nevertheless, cleaner production is not specifically legislated in African countries today.

Nations throughout Africa are starting to give force and structure to environmental policies, enshrining them in constitutions, laws, and regulations. Most African countries are in the process of drafting or implementing framework environmental laws. As shown in Table 12, 41 countries out of 54, which is 76% of the African countries, have completed their national environmental action plan respectively, while Central African Republic and Zimbabwe have begun to develop them. These national environmental action plans rely on implementing legislation or regulations to provide the detailed requirements and standards. It is therefore essential that the framework national environmental action plan provide a comprehensive administrative structure capable of overseeing the development, implementation, and enforcement of the environmental legal regime. Additionally, the framework law provides the basic authority for enabling provisions in all environmental matters – from air and water pollution to access to genetic resources to community-based natural resource management. Thus, the success of an environmental legal system depends in large part on the completeness of the substantive and administrative provisions contained in the framework environmental laws.

Table 12: Status of National Environmental Action Plan in African Countries

Country	Status of National Environmental Action Plan	Country	Status of National Environmental Action Plan
Algeria	No data	Libya	No data
Angola	No data	Madagascar	Completed
Benin	Completed	Malawi	Completed
Botswana	Completed	Mali	Completed
Burkina Faso	Completed	Mauritania	Completed
Burundi	Completed	Mauritius	Completed
Cameroon	Completed	Morocco	No data
Cape Verde	Completed	Mozambique	Completed
Central African Republic	Being prepared	Namibia	Completed
Chad	No data	Niger	Completed
Comoros	Completed	Nigeria	Completed
Congo, Dem. Rep.	Completed	Rwanda	Completed
Congo, Rep.	Completed	Sao Tome And Principe	Completed
Cote d'Ivoire	Completed	Senegal	Completed
Djibouti	No data	Seychelles	Completed
Egypt, Arab Rep.	Completed	Sierra Leone	Completed
Equatorial Guinea	Completed	Somalia	No data
Eritrea	Completed	South Africa	Completed
Ethiopia	Completed	Sudan	No data
Gabon	Completed	Swaziland	Completed
Gambia, The	Completed	Tanzania	Completed
Ghana	Completed	Togo	Completed
Guinea	Completed	Tunisia	Completed
Guinea Bissau	Completed	Uganda	Completed
Kenya	Completed	Zambia	Completed
Lesotho	Completed	Zimbabwe	Being prepared
Liberia	No data		

Source: ADB, Gender, Poverty and Environmental Indicators on African Countries, 2003 - 2004

6.5 MOBILIZING RESOURCES (FINANCIAL AND TECHNICAL) TO SUPPORT SUSTAINABLE INDUSTRIAL DEVELOPMENT IN AFRICAN COUNTRIES

Various international agencies have provided support to African countries to help them mobilize resources for sustainable industrial development. Chief among these is UNIDO. Since 1998, UNIDO has been using the concept of integrated programs as a means of strengthening its response to sustainable industrial development needs and focusing its assistance at the country level. This exercise has confirmed that the priority sectors for industrial development are agro-based, such as leather and leather products and the textile, garment and food industries. These sub-sectors are characterized by an abundance of raw materials coupled with adequate skill levels, and have the potential for rapidly improving productivity (United Nations, 2001).

In 1999 and 2000, Governments confirmed that their comparative advantages lay in diversifying their economies by processing agricultural products, primarily textiles/garments, leather/leather

products and food. This is the core of the UNIDO strategy in each country, emphasizing the need to improve quality standards, identify new market channels and increase product range (United Nations, 2001).

A total of 13 programs were ongoing in sub-Saharan Africa in 2000 (in Burkina Faso, Côte d'Ivoire, Eritrea, Ethiopia, Ghana, Guinea, Mali, Mozambique, Nigeria, Rwanda, Senegal, Uganda and the United Republic of Tanzania) and 5 in northern Africa (Algeria, Egypt, Morocco, the Sudan and Tunisia). Their common goal is to improve the competitiveness of selected industries and, wherever possible, identify new market opportunities, thus opening the door to the global economy. Four new programs, for Eritrea, Madagascar, Mali and Nigeria, were approved in 2000 (United Nations, 2001).

As part of the integrated services for the African leather industry which it has developed over the years (for Ethiopia, Kenya, Malawi, Namibia, the Sudan, Uganda, the United Republic of Tanzania, Zambia and Zimbabwe), UNIDO has been tackling critical environmental problems by assisting companies in installing or upgrading effluent treatment plants and providing operator training at the Nairobi Leather Development Center (United Nations, 2001).

In the context of its decentralization policy and in order to strengthen its field representation, UNIDO opened the Regional Industrial Development Center in Lagos. Apart from its crucial role in implementing the UNIDO country framework for Nigeria, the Center will provide technical support to countries in West and Central Africa. It will serve as a technical support facility for program formulation, as a resource center for short-term advisory services for the public and private sectors and as a regional center of excellence for industrial development issues, including sustainable development. It will serve also as a technical support facility for the active involvement of UNIDO in Montreal Protocol and GEF projects (United Nations, 2001).

Rural industry has been supported by focusing on improving technologies through the introduction of modern shop-floor management systems, with an emphasis on minimizing waste and improving hygienic conditions in plants. In addition, to ensure sustainability appropriate technical staffs have been trained. This approach was coupled with quality control systems, which in the case of fisheries in Guinea successfully enabled European Union fish export standards to be met. This meant improving the technical capabilities of the standardization and certification structures through training and the introduction of international standards. In some countries, such as Burkina Faso and Mali, hybrid-drying techniques for preserving fruit and vegetables were introduced with a view to reducing post-harvest losses. All integrated programs utilize a version of this approach, adapting it to the needs and conditions of each country as appropriate (United Nations, 2001).

UNIDO activities in the development of small- and medium-scale enterprises are carried out for the three main economic levels, which are policy formulation and implementation; institutional capacity building; and improving entrepreneurial skills at the enterprise level. Activities in Burkina Faso, Côte d'Ivoire, Ethiopia, Ghana, Guinea, Senegal, Uganda and the United Republic of Tanzania address the gender imbalance by including assistance to women entrepreneurs involved in food processing whereby both their technical and their business skills are enhanced. Similar activities for the textile and garment sector have been carried out in Kenya and the United Republic of Tanzania. Support for improving the quality of traditional textiles has been provided to artisans in Burkina Faso, Guinea and Senegal under approved integrated programs (United Nations, 2001).

At the enterprise level, the objective is to ensure that adequate business advisory services are made available in accordance with entrepreneurs' needs. In addition, women entrepreneurs are encouraged to participate in integrated programs concentrating on improving their small businesses by developing new products and improving product quality and range (United Nations, 2001). To achieve this, particular attention is paid to the quality of the services provided by support institutions, both public and private and, where necessary, the required tools and methods are provided through training programs. In some cases, new institutions are required. Although it is still too early to comment on the impact, there have been marked improvements in the quality and range of traditional textiles, women's food-processing activities, fish exports to the European Union and, in general, awareness with regard to quality (United Nations, 2001). As in the context of industry, all integrated programs in the area of rural development and food security, utilize a version of this approach, adapting it to the needs and conditions of each country as appropriate (United Nations, 2001).

UNIDO activities in the area of environmental protection build on the fact that industry is the affirmed major polluter and that a targeted multidisciplinary approach is necessary to ensure the required mitigation. Although African industries do not generate significant atmospheric pollution compared to their counterparts in the North, efforts are needed to introduce environmental best practices at these early stages of industrialization (United Nations, 2001).

Integrated programs in Africa have concentrated on the key areas where environmental impacts are most visible, specifically, urban waste disposal and cleaner production. Significant progress has been made in creating awareness at the policy level of the need to tailor environmental legislation to the country's level of industrialization and the size and structure of the existing industrial processing units (United Nations, 2001).

6.6 CREATING A FAVORABLE GLOBAL MARKET

Changes in consumption patterns in the developed world present an opportunity for exports of environmentally and socially preferred goods. Products from African countries that currently have environmentally based advantages in industrialized countries' markets include organically grown food, reusable and recyclable materials, biomass fuels, natural fibres and sustainably harvested forest products. Product environmental statements and eco-labels based on life-cycle considerations will become far more prevalent in the developed world.

In Zimbabwe, most cash-crop cotton is grown under near-organic conditions and is hand picked, resulting in lower environmental impact and higher quality relative to a machine-harvested crop. In South Africa, trials on growing organic cotton and integrated pest management are being undertaken and a DANCED-funded cleaner-production demonstration project is investigating the market for organic cotton products in Europe: developing auditable supply-chain certification from the cotton producer to the end product is a major challenge, and the close proximity of grower, ginner, spinner, weaver, finisher, designer and garment manufacturer is a major advantage for the local manufacturing industry in that regard.

Internationally, South Africa had one of the highest proportions of forests certified by the Forest Stewardship Council. This presents a potential competitive advantage for downstream industrial processors.

The use of environmental life-cycle assessment (LCA) is becoming more prevalent in developed countries. African countries must become involved in LCA of their primary and manufactured products. Because of the lack of local capacity, LCAs of primary resources from Africa are being made without the input or knowledge of local people. Ignorance of the results could result in their products being replaced by substitutes and in missed opportunities to improve their manufacturing processes.

6.7 PROMOTING ENVIRONMENTALLY SUSTAINABLE TRADE POLICIES/PRACTICES

UNIDO is a key player as provider of technical assistance and capacity building for African countries in the field of trade, in particular with regards to assistance for overcoming supply-side constraints –fostering development of productive capacities-- and by increasing the ability of producers in African countries to conform with growing standards, technical regulations and conformity assessment requirements reducing negative impact of Technical Barriers to Trade (TBT) and Sanitary and Phyto-Sanitary Measures (SPS)

UNIDO's mission is to contribute to the achievement of a considerable increase in the share, volume and MVA and exports of African countries with a special focus on Least Developed Countries (LDCs). The *UNIDO Trade Capacity Building Initiative* addresses more specifically the relation between trade, sustainable development and poverty alleviation. Consequently, UNIDO services aim to build human and institutional capacity to facilitate the participation of African countries in the multilateral trading system.

The Trade Capacity Building strategy adopted by UNIDO to facilitate trade, foster export capacity and increase access to markets consists of three-pronged coordinated and integrated actions, the 3C Approach:

- *Compete*: Remove supply side constraints and increase the competitiveness of the industrial sector;
- *Conform*: Enable products to conform with market requirements (standards, technical regulations and conformity assessment procedures) and overcome barriers to trade;

- *Connect*: Enable producers to be connected with the market and foster integration in the multilateral trading system.

In removing supply side constraints, the focus is on the manufacture of products with high-export potential, especially in *agribusiness*, and the provision of assistance related to enterprise upgrading, innovation, technology acquisition, increasing capacity to meet international standards, technical requirements and environmental regulations. Through the introduction of supporting legislation, policies and institutional reform, UNIDO supports the creation of an enabling environment for foreign direct investment.

In ensuring conformity and international recognition of local certificates and laboratory analysis and tests, UNIDO focus is on upgrading standards, metrology, testing and quality infrastructure and services. It also supports African countries to overcome barriers to trade and to participate in international standards setting. Furthermore, UNIDO assists the establishment of accreditation/certification systems, national measurement institutions to ensure harmonization with international metrology systems, and of market surveillance institutions.

In ensuring connectivity with markets, export promotion support is provided in co-operation with there specialized organizations. Specifically, UNIDO assists in value chain integration and in strengthening those institutions that bear directly on developing countries' export performance, such as small business export consortia and export-oriented clusters and networking. UNIDO signed in Cancun in 2003 a minutes of understanding (MoU) with the World Trade Organization (WTO) outlining a joint program based on UNIDO TCB approach.

Trade Capacity Building Projects that can be strictly classified as Trade-related based on WTO/OECD criteria is shown in Table 13.

From 2001 to 2005 UNIDO implemented 85 QSM projects5, 80 national/regional and 5 global projects. LDC benefited from 25 projects. With regards to LDCs, in the last 5 years UNIDO has being implementing QSM projects for $14 million and the end of 2005 three new LDC projects in QSM amounting to some $8 million are being approved. As a whole, QSM projects recorded a significant growth in volume and reached an amount of almost 20 millions US$ in 2005.

Table 13: Trade Capacity Building Projects in Africa

Region / Country	Years	Budget in US$
Africa Regional UEMOA	2000 - 2004	11,152,733
Africa Regional ECOWAS 2)	2004	16,000,000
Algeria	2000, 2003, 2004	2,467,367
Egypt	2003	1,038,947
Ghana 1)	2004	40,000
Kenya 1)	2003	77,000
Lybia 1)	2004	31,000
Malawi	2001	85,000

Table 13: Trade Capacity Building Projects in Africa		
Region / Country	**Years**	**Budget in US$**
Mauritania 1)	2004	48,250
Mozambique	2002	201,196
Nigeria	2003, 2004	264,696
Senegal	2000, 2003	1,132,750
Tunisia	2000, 2004	4,325,520
U.R. of Tanzania 1)	2004	30,000
Uganda 1)	2000	43,400
Total		20,937,859

6.8 ADJUSTMENT OF RELEVANT DOMESTIC POLICIES: A CASE STUDY

Ethiopia began to formulate its conservation strategy in 1989 with assistance from IUCN and completed it in 2001. The end of military rule brought about liberalization of prices and markets, the removal of subsidies, reductions in trade tariffs and current account stability. Public policy promoted symbiosis between agriculture and industry (agricultural-development-led industrialization) and strengthened the growth of the domestic market and the utilization of domestically available raw materials (with labour-intensive technologies). The 1998 programme of privatization of Government enterprises aimed to generate revenue for financing Government development activities; to reduce Government's role in the economy, freeing it to concentrate on other activities; and to promote economic development through expansion of the private sector. An export strategy was developed with a view to creating markets for the agricultural sector, generating foreign exchange and promoting international competitiveness. A science and technology policy was instituted to build up the country's science and technology capability and enhance its contribution to the national economy. There are special programmes to support industry and energy production.

An environmental policy was adopted in 1997 which provides policy elements that ensure industrial sustainability in Ethiopian whereby technology must be appropriate and affordable, the full environmental and social costs must be calculated, hazardous wastes and pollution from industry are controlled on the "polluter pays" principle, and environmental impact assessments are recommended.

Although policy promotes environmental impact assessments, there is no legislation mandating them and little capacity to undertake them. Similar observations can be made regarding the lack of legislative and other back-up for other policies: the policy of phasing out dependency on traditional biomass fuels by promoting electricity has failed because subsidies to the power generation industry were eliminated (Malifu, 2001).

6.9 AWARENESS OF ENVIRONMENTAL ISSUES

Information and awareness raising have been identified in the JPOI as key inputs to sustainable development. Education to demonstrate that actions affect the environment, and community

empowerment to link decision making on environmental issues with those most affected by such decisions is essential if adequate action is to be taken towards sustainable development. Once awareness is raised, the necessary values, attitudes and behavior can change and skills can be developed.

Environmental education is essential if the environment is to be protected and sustainably used. This involves not only basic environmental awareness, but also the development of a cadre of skilled and highly motivated young environmental managers in the region. Conserve Africa will promote. Develop and implement activities that aim to educate, sensitize and inform the public, the African organisations, businesses, markets and interested parties about the environmental problems, priorities and challenges that face the continent.

Public awareness and concern for the environment is becoming an increasingly important factor among decision makers in Africa as they seek to expand the development of their economies. Increased environmental awareness among Africans and a desire for ecotourism dollars could be important motivators for environmental action. A significant amount of international attention also has been focused on the environmental problems, which Africa now faces, and is directly responsible for a large number of policy and awareness initiatives. For example, there are well over a hundred non-governmental organizations (NGO's) active in the preservation of the region's environment.

However, the institutional, economic, and legal capacities of most governments in the region remain ill equipped and under funded in dealing with environmental problems. Significant challenges to the region include increasing the framework for environmental assessment in African countries, especially those that require sectoral and regional approaches. Sectors such as agriculture, industrialization and urban management require significant attention as they have a close relationship to the environment and natural resource base of African countries.

7 African Countries as Late Industrializing Economies: Additional Challenges for Sustainable Development

Although sustainable industrialization, and indeed industrialization more generally, has been slow across the whole continent, the issue of sustainable industrialization cannot be considered fully by looking only at the regional level. Rather, the continent can be categorized into at least three groups of countries distinguished by their opportunities. The largest, with nearly 40% of the region’s population includes the land-locked without significant natural resource endowments. This situation is wholly unique to Africa and the countries, Ethiopia, Zambia, Rwanda, Burundi, Mali, Chad, Malawi, Swaziland, Central African Republic, Uganda, Burkina Faso, are among the poorest in the world. The model for such countries that has worked in other regions is for them to export regionally tradable goods to their neighbors. The advantage is that they face lower transportation costs and limited environmental restrictions, which allows for greater competitiveness. The risk for sustainable development is that environmental issues are often compromised and the constraints, often critically binding, are that trade depends upon dynamism in the neighboring economies. Given that industrial development and growth in general has been sluggish in most of Africa, the opportunities for intra regional trade has been

limited and it is expected that GDP growth in these countries has therefore been constrained, with the consequent constraints that relatively low income growth (below potential) imposes on the adoption of environmentally sustainable technologies.

The second category of countries includes those with well endowed natural resources. As the Nigerian case testifies (wastage of oil wealth), success in this category of countries depends primarily upon improving governance and the existence of a strong effective state. In contrast, the third group of countries; i.e., coastal economies, must focus on becoming globally competitive in manufactures. They are, however, constrained by being late comers to the industrialization arena that has now become a highly competitive activity, with China as the dominant low-income supplier. African countries are hampered by lack of accumulated capital (human in terms of skilled labor, financial and business know-how), established access/familiarity with world markets, and poor institutional support and infrastructural services. Yet, Africa's coastal economies have some advantages: better location than Asia and lower wage rates. The interplay of these advantages and constraints has resulted in a pattern of industrial development that has some very negative implications for sustainable development, where comparative advantage and competitiveness is based on location, cheap labor and the ability to exploit natural resources often to the exclusion of sustainability considerations. Taking this into consideration, industrialization policy must therefore emphasize a growth path (and put in place an appropriate incentives structure) that is able to take advantage of new technological developments so that sustainable practices are maintained. The challenges do remain daunting.

7.1 CHALLENGES EMANATING FROM THE PATTERN OF ECONOMIC TRANSFORMATION

The pattern of economic transformation in developed countries has been a shift from agriculture to manufacturing, whose share of both output and employment increases rapidly. Declining farm sector employment is offset by technological advances that raise productivity in agriculture, while the demand for services grows in the transaction-intensive manufacturing sector. As manufacturing productivity grows, a second phase of structural change is observed with declining employment in manufacturing and surplus labor moving into an expanding services sector where labor productivity grows more slowly than in manufactures. Economic transformation in African countries is at an early stage where agriculture is still dominant and industry is only just emerging as a sector of any significance.

African countries are late industrializing countries and, as such, typically apply processes that are not based on the latest technologies (and cleaner production technologies tend to be among the latest developments) since as late starters they have limited R&D capacity and tend to exploit the technology and equipment developed by earlier actors.[17] Structural change is also more towards manufacturing than towards services where there is less environmental impact. Structural change is achieved faster where developing countries participate in skill-intensive, high-tech production networks than where their contribution is confined to outsourced labor-intensive, low-tech or natural resource based activities. Africa, however, has limited capacity for research and development, innovation, diversification and technology diffusion. It has limited ability to

[17] UNEP, Africa - Regional Industrial Review, 2001

tap into global production networks, such as participating in off-shoring and outsourcing arrangements.

7.2 THE ISSUE OF GLOBALIZATION

With increasing globalization of today's world, no country can be free from influence of global factors although the effects differ markedly between countries. The drivers for globalization's major advances are the economic developments in the highly industrialized nations: only a few countries in the developing world play any substantial role in the global economy. Many developing countries, especially in Africa, contribute passively and mainly on the basis of their natural resource and labor endowments. Much of Africa has failed to take advantage of the opportunities provided by globalization such as greater trade liberalization, easier transfer of capital, technology and labor as well as greater attention to environmental issues in world trade. Rather there have been capital flight and net outflows in skilled labor.

Box 3: Statistics on Africa's Brain Drain

- Since 1990, Africa has been losing 20,000 professionals annually.
- Over 300,000 professionals reside outside Africa.
- Ethiopia lost 75% of its skilled workforce between 1980 and 1991.
- It costs US$40,000 to train a doctor in Kenya; US$15,000 for a university student.
- 35% of total ODA to Africa is spent on expatriate professionals.

Source: International Organization for Migration (IOM)

- **Capital flight:** Relative to other regions, Africa invests less of its own capital at home than other developing areas. Despite a lower level of wealth per worker than any other region, Africa's wealth owners have relocated 37 per cent of their wealth outside the continent. As per UNEP data, between 1982 and 1991, capital flight from severely indebted, low income countries in Africa was about $22 billion, equivalent to about half the external resources required for development.[18]

- **Outflow of skilled labor:** Data on brain drain in Africa is scarce and inconsistent; however, statistics show a continent losing the very people it needs most for economic, social, scientific, and technological progress. The Economic Commission for Africa ECA estimates that between 1960 and 1989, some 127,000 highly qualified African professionals left the continent. According to the International Organization for Migration (IOM), Africa has been losing 20,000 professionals each year since 1990. This trend has sparked claims that the continent is dying a slow death from brain drain, and belated recognition by the United Nations that "emigration of African professionals to the West is one of the greatest obstacles to Africa's development [Box 3]." Brain drain in Africa has financial, institutional, and societal costs. African countries get little return from their investment in higher education, since too many graduates leave or fail to return home at the end of their studies. In light of a dwindling professional sector, African institutions are increasingly dependent on foreign expertise. To fill the human resource gap created by brain drain, Africa employs up to 150,000 expatriate professionals at a cost of US$4 billion a year.

[18] UNEP, Africa - Regional Industrial Review, 2001

- **Technology transfer:** Africa's industries continue to be dominated by low levels of technology, skills and capacity utilization, with a limited scope for the adoption of computer-assisted manufacturing and knowledge-intensive production systems. This, coupled with heavy dependence on primary commodity exports (accounting for around 80% of total export earnings), reflects the low level of human resource development and limited scientific and technological capability that are major constraints to industrial expansion.

- **Environmental and quality certification for world trade:** Trade liberalization and globalization in the world economy has intensified international competitiveness in the production of goods and services. The WTO 's rules for governing international trade brought into sharp focus the increasing importance of international standards and conformity assessment procedures in removing technical barriers. Most African countries are signatories of the WTO Agreements and are parties to the Agreement on Technical Barriers to Trade (TBT). Many have also accepted the Code of Good Practice for the preparation, adoption and application of standards. That is to say that establishing national standards and their harmonization with international standards are now necessary conditions for the development of the economy of any country and its trade with foreign countries. However, many African countries, at varying stages of development, are lacking adequate standards infrastructure. Most of them have not had many years of systematic integrated standardization measures in place. Now the international trading environment calls for equal treatment and a move towards removal of former concessional trading arrangements for products such as sugar, rum and bananas, which are foreign exchange earnings. In addition, the use of international standards as a basis for international trade, including those which govern trading policies such as the tying of trade to environmental protection, plays a crucial role for gaining access to markets.

  Being ill-equipped to face such a challenge, African countries need continued technical assistance in the critical areas of standards infrastructure and metrology. The fact of underdevelopment is expected to be taken into account, as there is a growing concern among enemies of globalization that technical requirements are increasing and posing new barriers to market entry, even as tariff-related barriers are falling around the world.

  Consequently, the special and differential treatment requested for smaller economies should be expanded and should not be seen as an excuse for backing out from the "state of the art" in standards activities, but as a demand for African countries to be exempted in the short term from the implementation of requirements. Also requested is flexibility in the bilateral arrangements, including the needed assistance for a fair-trading partners for a win-win result.

In the relation to promoting sustainable development in a global context, the inability of African countries to take advantage of the opportunities from globalization is most evidenced in the

limited capacity of African countries to attract skilled labor, import and adopt environmentally sustainable technologies or where cleaner production processes are practiced to have these certified as such and thereby gain access to a growing environmentally conscious segment of the world market. Globalization places a high premium on scientific and technological capacity to innovate and adapt and to increase productivity and competitiveness. Yet doubts continue to be expressed about the relevance of African resource and institutional capacity for innovation and R&D, which is at the heart of the global economy. The recommended ratio of 60:40 of students in science and technology to arts and humanities, respectively in African Schools and Universities is rarely achieved at all levels in any African country.[19] "The technical capacity of countries can be assessed by the number of research and development scientists and engineers. The global median is 663 per million inhabitants"[20].

7.3 GOVERNANCE AND POLITICAL STABILITY

Weaknesses in governance remain a major constraint to sustainable development and industrialization in a number of African countries. Strengthening the capacity to govern and develop long-term policies as well as empowering the population to allow creative potential to flourish and adequate private engagement in development initiatives is one of Africa's major challenges and remains a basic pre-condition for industrial take-off and the introduction of strategic measures or incentive structure to promote sustainability in economic endeavors whether in industry or other sectors. Poor governance leading to armed conflicts, loss of human lives and environmental devastating has kept many African countries at early stages of industrialization reinforcing their position as late comers to the industrial scene. There is clear evidence from experiences of such countries as Uganda, Mozambique and Zimbabwe that political instability can be severely damaging to industrial growth.

8 Towards a More Enabling Environment for Sustainable Industrialization in Africa

Development in general, and industrial development in particular on the African continent, however, is unsustainable because of population issues, unplanned and haphazard urbanization, poverty, and the lagging technology and R&D development in the continent. Unsustainable development has resulted in chaotic circumstances in the socio-cultural, political economic and environmental systems. For some African countries that are well endowed with natural resources, the extraction, transportation, transformation or conversion, distribution, allocation and utilization of the natural resources have exacerbated the decline in the environmental, economic and social order.

The previous discussions suggest that the major challenges for promoting sustainable industrial development in Africa include *inter alia* such factors as the lack of adequate policies to regulate industrial development from the environmental point of view, weak industrial organization that does not allow Africa to take advantage of global developments regarding environmentally sustainable production processes, a weak incentive structure to support sustainable

[19] Ibid

[20] UNIDO, Industrial Development Report, 2004

industrialization, low levels of human development; and, lack of appropriate institutions to support sustainable industrialization or, where they exists, a weak capacity. Increased investment in industrial development and the resulting increases in employment and wealth and an increased propensity to invest in cleaner production technologies must be the starting point to environmental improvement and sustainability. Clearly a multi-dimensional approach is necessary but a suggested point of departure is the concept of sustainable investment, whereby investors obtain an acceptable and long-term return on financial capital without systematically degrading natural capital resources while at the same time building the social capital associated with investments.

The following are example of indicators of sustainable industrial development:

1. Economic elements of sustainable industrial – Developing Financial Capital
   - Improvement in macro economic indices – income per capita, employment, savings and investment, foreign exchange reserves – and thereby the capacity to invest in and import environmentally sustainable technologies
   - Ensuring competitiveness in the global market
   - Developing skilled workforce
   - Maximizing natural resource productivity and rational use of energy

2. Environmental elements of sustainable industrial development – Promoting Natural Capital
   - Promoting energy and water efficiency
   - Maintaining biodiversity
   - Addressing climate change
   - Maintaining air and water quality by minimizing waste and pollution
   - Preventing or remedying land contamination
   - Promoting use of renewable resources

3. Social elements of sustainable industrial development – Promoting Social Capital
   - Poverty alleviation
   - Provision of education and training
   - Addressing historical inequalities
   - Protecting consumer rights and interests
   - Empowering local communities
   - Ensuring health and safety in the workplace

9 The way forward

This paper has argued that with a few notable exceptions, Africa's industry has been stagnant or even in decline over the past two decades. Industrial productivity, moreover, is low and the gap in productivity between African industrial firms and those of the rest of the world has steadily widened. Nevertheless, there is potential for growth as can be seen from the example of the few successful countries. However, the challenges are many and the environment competitive. African countries, as late comers to the scene are further encumbered by limited capital

(human/skill base and financial), infrastructure and support institutions. To gain a foothold therefore, they have often adopted unsustainable practices in their industrial endeavors.

The first step towards sustainable industrialization is therefore to gain a stronger position in industry – to improve productivity and investment levels. Clearly, any strategy to revive industrial growth in Africa must focus on structural issues, prominent amongst which are relating to domestic capability building and the strengthening of domestic factor markets and the supply of public goods. To succeed, it must be highly context-specific – sensitive to local conditions, needs, and resources, -- and integrated across factor markets and institutions.

Exposing firms to international competition and increasing domestic competition as well as improving access to new technologies and (with more longer term maturity) investment in human capital should improve efficiency and thus productivity levels within Africa's industry. This, however, must be supported by necessary public goods (particularly investments in infrastructure), support institutions (for trade facilitation, credit, access to technology, establishment of standards, certification, etc.), and an incentive structure that is conducive to industrial growth. These should be strategic taking into consideration the promotion of industries that have a high growth potential, that have strong linkages within national economies, that can absorb an increasing amount of labor from the rural sectors and also that promote the adoption of environmentally sustainable practices. Trade liberalization may curtail the development of weak and up-coming industries and should allow for this as well as for to adjustment to a new and more competitive environment. In this respect, a useful strategy towards enhanced integration of African industries into world markets would be to do so first on a regional basis. For example, the East African Common Market (EACM) has the capacity to pool three similarly sized economies into a market of about 80 million people.

To encourage greater investment, particularly private investment and FDI (necessary because of the access it provides to skills, technology, patents and expert markets), a host of constraints ranging from high investor risk (or the perception of such risk) to high taxes and tariffs on investment goods to corruption, to macro-economic instability and over-valued exchange rates need to be addressed. As the industrialization process for late comers tends to be more capital and skill-intensive, there is a necessity of strengthening the financial and social infrastructure so that savings can be mobilized more effectively than at present, where government itself invests heavily in infrastructure and skills development. Capital-market development should also be accorded serious attention.

But this is not enough. Sustainability will require not only a focus on accelerating industrialization, but also initiating a shift from current production processes to less highly polluting, resource-wasting industries and production processes. It requires investment in rapidly evolving technology that saves on inputs and is more efficient in energy use, that is based on renewable resources and that generates less waste along the life cycle of a product. Promoting improved awareness of environmental issues and cleaner production processes, facilitation access to the necessary technologies and putting in place an appropriate incentive structure is necessary. The latter is especially important since sustainable industrialization will require investments outlays which may not be justified by cost reductions alone and since environmental protection is essentially an externality. Also, skills development takes on added

importance in the context of sustainability since environmentally sustainable technologies tend to require higher skill levels. Finally, given the double challenges of promoting industrialization as late starters and the need to change current production practices, industrial organization must be improved with greater emphasis on attracting FDI and with a view to information sharing and establishment of support networks.

In addition, government developmental policies must be consciously crafted to address environmental sustainability and industrialization in Africa and implemented with the continuous commitment and with appropriate resource allocation. Some elements of supportive policy would be:

- Compatibility in sectoral development programs such that activities in any one sector do not have adverse environmental impacts, which would make it difficult to achieve the desired sustainable management of resources in any other sector now and in the future. For this to be successful it must involve the interaction of relevant disciplines in the planning and policy formulation stages, and in all stages of research and development activities at local, national, regional, and global levels.
- Adoption of an environmental perspective and management of natural resources in development programs.
- Development of alternative energy systems; i.e., the shift from highly carbon–intensity coal as the main energy source as its use will lead to intensive air emissions and greenhouse pollution.
- Provision of regulatory measures and creation of enforcement capacity for protecting the environment and reduction of degradation due to solid waste and waste water effluent from industries.
- Integration of environmental impact assessments with urban planning and management, so that, with the high growth in urbanization in Africa, environmental impacts are monitored and managed continuously and within a context of holistic development.