REPORT ON THE ETHIOPIAN ECONOMY

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DEVELOPMENT, PROSPECTS AND CHALLENGES OF THE ENERGY SECTOR IN ETHIOPIA

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(EEA)

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Foreword

Contributing to the economic development of the country, encouraging and supporting the teaching of economics in educational institutions, promoting and strengthening research in economics, creating discussion forums on economic issues, and informing regularly the public at large (policy makers, civil society, academia, international organizations, etc.) on the state of the economy are some of the core objectives of the Ethiopian Economics Association (EEA). This publication, “Report on the Ethiopian Economy”, is the one of the key instruments for fulfilling these objectives. EEA believes that producing an independent professional report on the Ethiopian economy in a continuous, systematic and constructive way would contribute to the success of the ongoing social and economic programs in the country.

The ‘Report on the Ethiopian Economy’ usually addresses most of the economic sectors including agriculture, manufacturing, public finance, monetary sector, external trade and social infrastructure – education and health. However, not all these sectors are often adequately covered due to lack of extensive and consistent data for producing reliable and rigorous analyses. Data permit, future reports will try to address all socio-economic activities in the country.

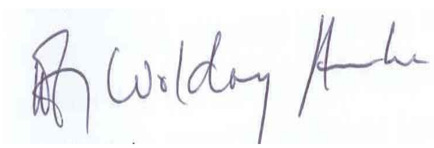
This year’s Report is the seventh in the series. Similar to the previous publications, the Report has two parts: performance evaluation and analytical assessment of key issues and challenges facing the economy in part one and analysis of a thematic issue in the second.

In part one, the report provides an update of the performance of the social and economic development in Ethiopian during the fiscal year under review. It looks at the macro-economic issues from broader perspectives by taking the standard performance indicators, comparing the year with the preceding year and noting the recent trends in those indicators. The update on the agricultural sector performance also introduced the status and some aspects of rural non-farm employment and income diversification. The later is a new and important input from the point of view of emerging concerns about rural employment and income generation given the rising population pressure and effects on access to productive resources like cultivable land. In the first part the report also provides a detailed analysis of the manufacturing industries' performance, structure and investment activities. The state of condition and tendency of Ethiopia's foreign trade is also adequately covered. An overview of the health sector performance both at national and regional states levels is provided which looks into the recent public investments in health service provision and outcomes.

Past reports have considered a number of thematic issues which were selected on the basis of their relevance and priority for national development. Similarly, the thematic focus of this year's Report takes up the entry point to one of the critical determinants of development – the energy sector. Energy is one of the major inputs and facilitator of socio-economic development. It helps in improving productivity and performance efficiency of production of goods and services. Access to modern energy is also one aspect of civilization and modernization of the standard of living. Ethiopia is known to have a large and untapped potential energy resources including hydropower, geothermal, wind and solar energy. Compared to the potential, however, the current level of energy production is minimal; and the country is among the lowest per capita modern energy consuming society. Currently the largest share of household energy source in Ethiopia comes from biomass. This has got serious implications for environment and sustainable natural resources use and development. Following the recent pace of the socio-economic development, a growing demand for energy for household, industrial and service sectors use in Ethiopia is a real phenomenon. This fact has won an appreciation by the government which has recently undertaken significant energy sector planning and investments to meet the ever increasing demands. Given the expected and mounting challenges of global climate change and its effects, green and renewable energy development policy and strategy needs great attention. The report has extensively dealt with and covered issues including: the role of energy in the national economy; the energy resource basis and current state of utilization; current energy sector policy, strategy and management; energy demand, supply, access, consumption, as well as future demand projections; energy sector investments and the potential role of public-private partnership in energy development (production and distribution) taking other countries' experiences.

EEA very much hopes that, as past reports, this specific Report would be useful to all categories of readers, particularly to policy makers in various economic activities who have key roles to play in guiding the economy.

Finally, I would like to express my appreciation to all those people whose contribution has made this Report possible.



Wolday Amha
President
Ethiopian Economics Association

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Many have contributed to the completion of this Report. EEA would like to thank all of them for their constructive inputs. The Director of the Ethiopian Economic Policy Research Institute, Assefa Admassie, supervised the design and write-up of the report. In part I of the Report, the chapter on 'Macro-Economic Development' is prepared by Kassahun Abera, Tewodros Mekonnen, Emerta Asaminew, and Getcahew Ahmed. Samuel Gebreselassie wrote the chapters on the 'Performance of the Ethiopian Agriculture' and 'Livelihood Diversification in Rural Ethiopia'. The chapters on the 'Changes in the Performance, Structure and Investment of Manufacturing Industries' and 'The Changing Trade Structure of Ethiopia' are written by Kibre Moges and Amin Abdella. Finally, Degnet Abebaw wrote the chapter on 'The Health Sector Performance in Ethiopia'.

Part II of the Report, which deals with the Development, Prospects and Challenges of the Energy, is written by Berhanu Adenew, Mengistu Tefera and Mekonnen kassa. Berhanu Adenew and Assefa Admassie also did the editorial work of the report.

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Table of Contents

List of Tables, Figures and Boxes

A. List of Tables

B. List of Figures

C. List of Boxes

List of Abbreviations

AFREPREN	African Energy Policy Research Network
EEPCO	Ethiopian Electric Power Corporation
EPE	Ethiopian Petroleum Enterprise
EREDPC	Ethiopian Rural Energy Development and Promotion Center
EWEA	European Wind Energy Association
FDRE	Federal Democratic Republic of Ethiopia
ICS	Inter Connected System
IPP	Independent Power Producer
Km	Kilometers
KWh	kilowatt hours
LPG	Liquid Petroleum Gas
M^2	square meters
M^3	cubic meters
MEDaC	Ministry of Economic Development and Co-operation
MME	Ministry of Mines and Energy
MoARD	Ministry of Agriculture and Rural Development
MW	Megawatts
MWh	Megawatt hours
NBE	National Bank of Ethiopia
PV	Photovoltaic
RETs	Renewable Energy Technologies
SCS	Self Contained System
SWERA	Solar and Wind Energy Resources Assessment
tCO_2e	Tons of carbon dioxide Equivalent
UEAP	Universal Electricity Access Program
USD	United States Dollars
WBISPP	Woody Biomass Inventory and Strategic Planning Project
WCED	World Commission on Environment and Development

PART I

REVIEW OF ECONOMIC PERFORMANCE

Introduction to Part One

Part I of this Report focuses on the performance of the Ethiopian Economy during 2007/08. The main aim of Part I is to highlight developments in the main aggregates of the economy during the year in review. This will cover the overall performance of the macro-economy and the various sub-sectors that include agriculture, industry and the service sector.

While the first Chapter of Part I will examine the various indicators of macro-economic performance ranging from nominal to real aggregates of the economy, the remaining chapters will deal with the various aspects of agriculture, industry, trade and inflation during the year under review. After a review of the economic developments during the period in Part I, Part II, the Development, Prospects and Challenges of the Energy Sector in Ethiopia (the thematic issue of this year's Annual Report) investigates the status and developments of the energy sector in detail.

Chapter 1

Macro-economy

1.1 Introduction

This Chapter deals with the performance of the Ethiopian macro-economy during fiscal years 2006/07 - 2007/08. Developments of the overall and sectoral growths, the external sector, the monetary and banking sector, the finance stance of the government and the inflation rates are the main focus of this Chapter, among others. If there is any structural change the economy has undergone during the last four decades, it will be analyzed in this Chapter. To capture the overview of the macro-economy, therefore, the Chapter is outlined as follows.

Section 1.2 reviews the growth performance of the overall economy, sectoral performances, the contribution of major sectors to the performance of the gross domestic product, and the structural change each sector has undergone. The major sectors included in the analysis are Agriculture, Industry and Services. The performance of the sub-sectors within the major sector are also reviewed with some level of aggregation. Among the major points that this sub-section highlights are: first, Ethiopian economy continued its fourth consecutive year of rapid growth keeping a steady growth of 11.8%; second, the dominance of the agricultural sector continued with small shift towards the service sector in the recent years while the industrial sector stagnated at less than 13%; third, the growth rate in agriculture has declined over the past 5 years while the industrial sector maintains a steady growth. The Service sector, on the other hand, showed a significant surge; and finally while the non-agricultural per capita income has increased to 11 percent, the agricultural per capita growth has declined to 4 percent.

Section 1.3 reviews the flow of investment and the rate of domestic saving during the reporting period. In addition to its size at a national level, the regional distribution, the origin, and the sectoral distribution of investment is also summarized in this sub-section. Furthermore, the expected contributions of the newly approved investment to both permanent and temporary employment generation opportunities (for each type of investment approved) are also discussed in this section.

Section 1.4 examines the performance of the exports, imports, the overall balance of payments and the exchange rate developments. To gauge the structural change the foreign trade has undergone, the share of exports and imports and their composition have been reviewed during the last five years. The direction of external trade is also analyzed in this section.

The performance of the financial intermediaries and the developments of the monetary aggregates are the main focus of Section 1.5. Inter alia, the stock of money supply and the structure of interest rates will be examined. Further, the role of the financial institutions in both mobilizing deposits and allocating credits is examined in some detail in this section.

Section 1.6 discuses the fiscal stance of the government in terms of revenues, expenditures and the net balance of the federal government. The various sources of revenues and their trends, the relative share of expenditure and their implication, and the relative contributions of various sources of financing are the main focus of this section.

Section 1.7 reviews the feature of the price movements or inflation at the country and regions during the last five years. The strange co-movements between prices and agricultural output continued in this fiscal year. Different hypotheses from various sources are coming out to justify the current dramatic increase of prices. The increase in prices showed a staggering 25% increase in 2007/08. This poses problems for the poor especially the urban poor as food prices shoot up. Thus, this section analyses the movement of prices of food and non-food items in the recent years.

Finally, Section 1.8 summarizes by briefly reviewing the major salient features of the Ethiopian macro-economy.

1.2 Economic growth performance

According to the National Accounts data produced by the Ministry of Finance and Economic Development (MoFED) the Ethiopian economy experienced a real GDP growth rate of 11.8 percent in 2007/08. Over the past 5 years the real GDP grew by 11.7, 12.6, 11.6, 11.5 and 11.8, respectively. This impressive growth is attributed to a significant double digit growth especially in the service sector averaging 13 percent in the last 5 years. The growth in the agricultural sector has continuously declined from a peak of 16 percent in 2003/04 to 7.5 percent in 2007/08. The industrial sector has maintained a steady 10 percent growth over the years under consideration. The favorable weather condition has played a significant role in the growth of the economy as the economy still depends heavily on rain. As a result of these successive growth rates attention has now shifted to sustaining growth over a longer period of time.

Table 1.1: Sectoral growth performance

	1960/61 - 73/74	1974-75 -90/91	1991/92 - 96/97	1997/98 - 07/08	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08
Agriculture and allied activities	2.1	0.6	4.5	4.7	-10.5	16.9	13.5	10.9	9.4	7.5
Industry	7	3.6	8.7	7.1	6.5	11.6	9.4	10.2	10.2	10.4
Distributive Services	7.8	2.5	8.9	7.2	5.5	6.4	14.7	14.2	16.0	15.2
Other Services	6.9	4.7	8.1	8.9	6.5	6.1	10.9	12.5	12.5	18.9
GDP	3.7	2	6.3	6.2	-2.1	11.7	12.6	11.6	11.5	11.8
Per capita GDP	1.4	0.5	3.4	5.3	-4.8	8.7	9.6	8.6	8.2	8.3

Source: Ministry of Finance and Economic Development

During the years under review, distributive services have recorded impressive growth rates of 16 percent and 15 percent in 2006/07 and 2007/08, respectively, followed by other services with 12.5 and 18.9 percent annual growth.

Taking an approximate population growth of around 2.7 percent per annum the rapid growth in real GDP also translates to a significant growth in per capita income reaching 8.3 percent in 2007/08 following the 8.7 percent average annual growth in the past four years. Agricultural per capita has declined from 14 percent in 2003/04 to 4 percent in 2007/08 while the non-agricultural per capita increased from 3 percent in 2003/04 to 11 percent in 2007/08.

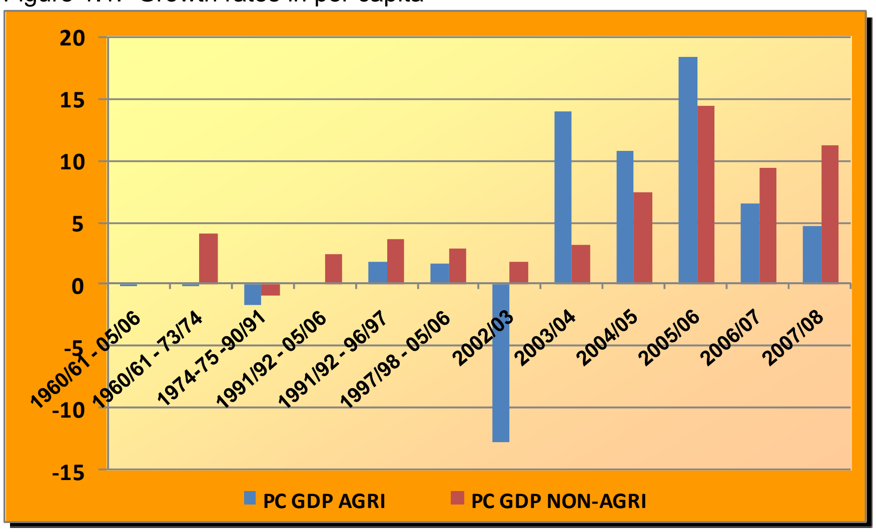
Table 1.2: Total and sectoral per capita income growth rate (%)

	GDP	Per capita GDP	PC GDP AGRI	PC GDP NON-AGRI
1960/61 - 05/06	2.7	0.2	-0.1	0
1960/61 - 73/74	3.7	1.4	-0.1	4.1
1974-75 -90/91	2	0.5	-1.7	-0.9
1991/92 - 05/06	4.8	1.9	0	2.4
1991/92 - 96/97	6.3	3.4	1.8	3.7
1997/98 - 05/06	6.2	2.9	1.7	2.9
2002/03	-2.1	-4.8	-12.8	1.8
2003/04	11.7	8.7	14	3.2
2004/05	12.6	9.6	10.7	7.4
2005/06	11.6	8.6	18.3	14.4
2006/07	11.5	8.2	6.5	9.4
2007/08	11.8	8.3	4.6	11.1

Source: Ministry of Finance and Economic Development, Central Statistical Authority, and Staff compilation.

Despite this amazing growth trend, the structure of the economy has not changed very much, agriculture still dominating the other sectors. The share of the agricultural sector during 2006/07 and 2007/08 reached 46.3 and 44.6 percent, respectively, whereas, the share of the service sector has been relatively increasing.

Figure 1.1: Growth rates in per capita

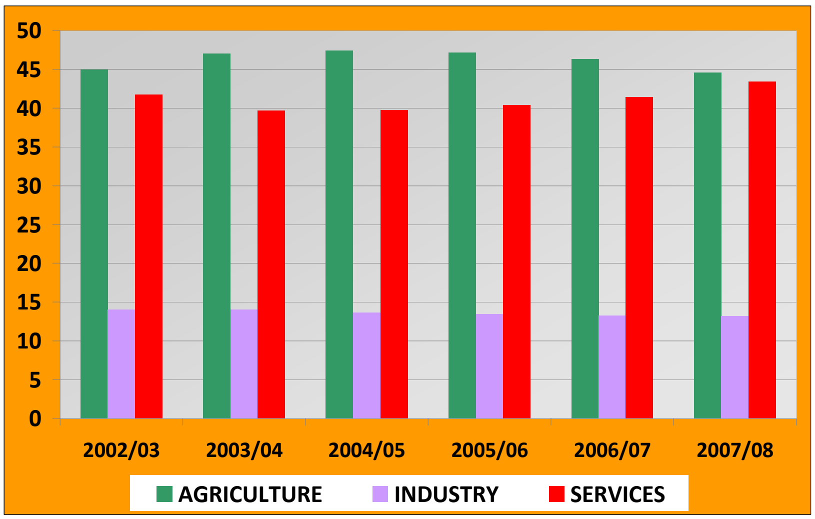


Source: Ministry of Finance and Economic Development

More recently the share of the service sector including both distributive and other services has increased substantially. Growth in Trade, Hotels, Financial intermediation and education services are the major components that contributed to the growth of the service sector.

The share of the industrial sector, however, has remained stagnant in the past years. Although the country's development plan shows a direction from agriculture to industry and services, no significant change is observed with respect to increasing the share of industry. Figure 1.2 shows the share of the major sectors out of the total real GDP.

Figure 1.2: Share of major sectors in total real GDP



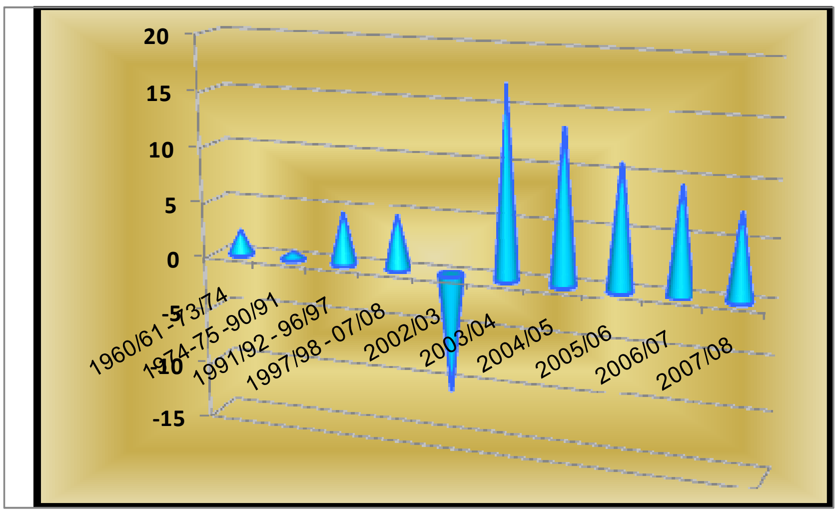
Source: Ministry of Finance and Economic Development

1.2.1 The agricultural sector

It has been said time and again that agriculture is the backbone of the Ethiopian economy not just because it constitutes almost half of the GDP but also because more than 85 percent of the population still depend on it for their livelihood. As a result the government has given more attention to the development of agriculture. The key challenge here is how to increase the productivity of smallholder farmers so that they would increasingly benefit from the small plot of land, and surplus labor could increasingly move to the industrial sector. However, the attempt to increase productivity has not yielded the expected outcome.

During the two years under review, the growth rate of the agricultural sector has declined from 9.4 in 2006/07 to 7.5 percent in 2007/08. Because of this decline in growth rate, agriculture lost its dominant share in the total output without significantly contributing to the growth of the industrial sector i.e. no significantly observable transformation towards industrial sector. This is partly because of the fact that the agricultural sector is dominated by the smallholder and is still employing the traditional methods of production. The sector primarily depends on rain for good harvest.

Figure 1.3: Growth rates in the value added of agricultural sector



Source: Ministry of Finance and Economic Development

The excessive dependence on rain needs to be avoided as much as possible. Recognizing this challenge massive investment on irrigation schemes is planned by the government in the current development strategy PASDEP. In addition, the increased distribution of fertilizers (with its own merits and demerits), selected seeds, expert advice and the massive investment in the training of extension workers shows the focus the government is giving to the sector. While these efforts are indeed useful interventions, the government should also give due considerations to improve the linkages between the industrial and agricultural sectors so that there will be growth linkages between the sectors.

1.2.2 The industrial sector

As described above the growth in the industrial sector has been steady at around 10%. Its share in the economy has, however, slightly declined by 1.6 percentage point in 2007/08 compared to its 2003/04 level.

Table 1.3: Growth performance in the industrial sub-sectors

Sub-Sectors	Share in Sector	Share in GDP	Growth					
	2000/01-2007/08	2000/01-2007/08	2001/02-2007/08	2003/04	2004/05	2005/06	2006/07	2007/08
Industry		12.4	9.6	11.6	9.4	10.2	10.2	10.4
Mining & Quarrying	3.5	0.4	5.9	2	4.1	7.2	6	6.8
Large & Medium Scale Industries	26.7	3.3	7.6	7.7	11.6	13.7	9.5	8.3
Small Scale Industries & Handcrafts	13.8	1.7	5.4	4.5	15	4.9	6	4.7
Electricity & Water	17	2.1	9.6	6.6	7.9	8.8	13.6	15.9
Construction	38.9	4.8	13	19.5	7.5	10.5	10.9	11.3

Source: Ministry of Finance and Economic Development, Central Statistical Authority, and Staff compilation.

The Industrial sector has maintained a steady 10 percent growth since 2005/06. The growth has been largely dominated by the growth in Electricity and Water and Construction sectors in 2007/08. Large and medium scale industries follow with 8.3 percent growth, while small scale and handicrafts grew by a slight 4.7 percent. The fact that the growth in the industrial sector is attributed to construction and infrastructure shows that there is a weak linkage between the agricultural and the industrial sectors. Linkage between the agricultural and industrial sectors would be created in the large, medium and small scale industries. In addition to this, the construction sector takes up the biggest share in the total industrial output (38 percent) followed by large and medium scale industries (26.7 percent) strengthening the point discussed above.

1.2.3 The service sector

The service sector is a more diverse sector composed of different components ranging from Trade and Hotels to Transport and communications, banking and non-market services. Overall the service sector has grown at a much faster rate than both agriculture and industry. During 2006/07 and 2007/08 the service sector grew by 14.3 percent and 17 percent, respectively. This has led to the increase of the share of services in the total GDP from 39 percent in 2003/04 to 43 percent in 2007/08. This impressive growth in the service sector could mainly be attributed to the growth of three major components; namely Trade and Hotels, Financial Intermediation and real estate and Education. These components grew by more than 15 percent during 2006/07 and 2007/08.

Table 1.4: Service sector growth performance

Sub-Sectors	Share in Sector 1997/98-2007/08	Share in GDP 1997/98-2007/08	Growth					
			2001/02-07/08	2003/04	2004/05	2005/06	2006/07	2007/08
Services	**100.0**	**39.2**	**10.4**	**6.3**	**12.8**	**13.3**	**14.3**	**17.0**
Distributive Services	**50.5**	**19.8**	**10.9**	**6.4**	**14.7**	**14.2**	**16.0**	**15.2**
Trade, Hotels, & Restaurant	36.9	14.5	11.1	5.2	12.8	17.9	18.6	15.6
Transport & Communication	13.6	5.3	10.5	9.5	19.2	5.7	9.3	13.9
Other Services	**49.5**	**19.4**	**10.0**	**6.1**	**10.9**	**12.4**	**12.5**	**18.9**
Financial Intermediation and Real Estate	23.5	9.2	12.9	6.8	10.2	17.2	15.2	18.9
Public Administration & Defense	11.8	4.6	4.5	0.2	11.6	6.4	2.8	24.8
Education	6.6	2.6	12.8	11.5	12.6	8.6	21.2	16.4
Health	2.4	0.9	9.7	15.9	16.9	9.8	8.6	20.9
Domestic & Other Services	5.2	2.0	6.8	4.4	7.4	8.8	8.6	10.5

Source: Ministry of Finance and Economic Development

Distributive services and other services take almost equal shares in total services. Trade, Hotels and Restaurants, transport and communications are classified under distributive services. Trade, Hotels and Restaurants have grown in double digits since 2004/05 for 4 consecutive years peaking at 2006/07 with 18.6 percent growth. Transport and Communications on the other hand saw two good years of growth in 2004/05 and 2007/08 with 19.2 percent and 13.9 percent growth, respectively. The growth in distributive services depends on the growth of the agricultural and industrial sectors and the other services and hence is a reflection of the growth in these sectors.

Financial intermediation and real estate services took a larger share taking up 23 percent of total services. During 2006/07 and 2007/08 this component grew by 15.2 percent and 18.9 percent, respectively. Another sector that has shown a significant growth in the past two years is the education sector. Because of the massive investment by the government on education services the sector grew by 21.2 percent and 16.4 percent in 2006/07 and 2007/08, respectively. The growth in public administration and health has jumped to 24.8 percent and 20.9 percent, respectively in 2007/08 from 2.8 percent and 8.6 percent in 2006/07.

1.3 Saving and investment

In this section, developments in domestic savings and investment are discussed. Developments in gross domestic savings and gross fixed capital formation, investment-saving gap and its financing as well as the structure of investment projects, their capital outlays and contribution to employment creation are the major points that will be discussed in this section.

1.3.1 Saving

Low saving has been a dominant feature of the Ethiopian economy. The share of gross domestic savings from GDP was, on average, 7.5 percent for the last thirteen years, which has even declined to 4.9 percent during the last five years. On the other hand, gross fixed capital formation as a share of GDP was 21.5 percent over the last five years, higher than the thirteen years' average of 20.4 percent. As a result, the resource gap has been increasing averaging 12.8 per cent over the last thirteen years and 16.6 percent over the last five years which was financed by external sources. The share of gross capital formation financed by the external sector was 83.3 per cent for the last five years.

Even after the central bank increased the minimum interest rate for bank deposits from 3 to 4 percent in mid 2008, saving during the review period was much lower than the previous year. Gross domestic savings as a share of GDP was only 3.4 percent in 2007/08 showing a declining trend when compared to the previous fiscal years rate which was 6.8 percent. The lower share of saving is reflected by the higher share of private consumption which increased from 83 per cent in 2006/07 to 87 per cent in 2007/08 (See Table 1.5).

Investment declined to 21.2 per cent in 2007/08 from 24.8 per cent in 2006/07. As a result, the resource gap showed a declining trend in 2007/08 when compared to the previous fiscal year. The share of gross fixed capital formation financed from foreign sources was also lower (69.3 per cent) in 2007/08 again declining from 76.6 percent which was recorded in 2006/07.

Table 1.5: Gross Domestic Savings (GDS), Gross Fixed Capital Formation (GFCF), and the Resource Gap (as a share of GDP)

Year	GDS	GFCF	Resource Gap	Share of GFCF Financed from Foreign Sources	Consumption			Debt Service Ratio	Gross External Debt
					Total	Gov.	Private		
1995/96	8.7	16.6	-7.9	54.8	91.8	8.1	83.7	35.0	51.2
1996/97	11.2	18.4	-7.2	19.7	89.5	8.3	81.2	49.8	45.9
1997/98	13.3	19.6	-6.3	41.7	87.6	10.2	77.4	15.0	50.3
1998/99	8.3	19.6	-11.3	38.4	92.2	16.0	76.2	18.2	53.7
1999/00	9.8	19.2	-9.3	36.4	90.8	18.5	72.3	25.2	67.0
2000/01	10.9	19.5	-8.6	61.9	89.9	15.2	74.7	22.2	68.0
2001/02	6.9	22.4	-15.6	77.0	93.7	16.4	77.3	15.4	79.6
2002/03	3.9	21.6	-17.7	82.5	96.4	19.1	77.4	14	79.4
2003/04	6.0	21.4	-15.4	80.3	94.6	14.7	79.9	12.3	71.8
2004/05	2.8	20.5	-17.7	85.8	97.4	13.8	83.7	9.8	48.8
2005/06	5.7	19.8	-14.1	104.6	94.8	12.4	82.5	9.9	46.6
2006/07	6.8	24.8	-18.0	76.6	93.7	10.4	83.3	1.2	11.8
2007/08	3.4	21.2	-17.8	69.3	96.8	9.8	87.0	2.5	12.3
Average (1995/96-2007/08)	7.5	20.4	-12.8	63.8	93.0	13.3	79.7	17.7	52.8
Average (2003/04-2007/08)	4.9	21.5	16.6	83.3	95.5	12.2	83.3	7.1	38.3

Source: Ethiopian Investment Agency

1.3.2 Investment

The Ethiopian Investment Agency licensed 9,202 investment projects in 2007/08 with total capital outlay of Birr 174.4 billion, which was 44 per cent higher than the 2006/07 fiscal year. These investment ventures created 605, 703 permanent employment which was more than 100 percent increase from the previous fiscal year. Of the total investment, 7539 (close to 82 per cent) projects are owned by domestic investors while 1,661 (18 per cent) projects were owned by foreign investors.

Table 1.6: Number, investment capital and employment creation of total approved investment projects during 2007/08

Sectors	No. of Projects	Capital (in millions of Birr)	Permanents Employment
Agriculture, hunting and forestry	2,208	39,555	251,878
Construction	595	3,249	15,677
Education	333	1,577	12,431
Electricity, gas, steam and water supply	4	2,487	168
Fishing	2	4	60
Health and social work	178	1,538	6,916
Hotels and restaurants	1,385	17,912	41,063
Manufacturing	2,023	65,194	188,339
Mining and quarrying	37	512	968
Other community, social and personal service activities	141	416	2,760
Public administration and defense; compulsory social sec.	1	8	25
Real estate, renting and business activities	1,775	40,483	77,997
Transport, Storage and Communication	188	495	2,398
Wholesale, retail trade & repair service	332	996	5,023
Grand Total	**9,202**	**174,426**	**605,703**

Source: Ethiopian Investment Agency

While contribution of these investment projects in terms of capital outlays and job creation differ across sectors, agriculture, manufacturing and real estate activities are among the top recipients during the period under review. In 2007/08 fiscal year, the manufacturing sector receives more than 37 per cent of the total capital outlays followed by real estate business activities (23.2 per cent) and agriculture (22.7 per cent). On the other hand, agriculture has been the main sector for creating employment (42 per cent of total jobs created) followed by the manufacturing sector (31 per cent) and real estate and related business activities (13 per cent).

Similarly, the flow of domestic private and public investments (constituting about 46 per cent of the total capital outlays and more than 45 percent of the employment created) was accounted by the agricultural, manufacturing and real estate business activities.

Table 1.7: Number, investment capital and employment creation of approved domestic private and public investment projects during 2007/08

Sectors	No. of Projects	Capital (in millions of birr)	Permanent Employment
Agriculture, hunting and forestry	1,857	13,902	85,525
Construction	529	2,466	12,170
Education	297	1,145	11,352
Electricity, gas, steam and water supply	3	2,485	158
Health and social work	151	894	5,868
Manufacturing	1,498	23,647	82,346
Mining and quarrying	27	333	763
Real estate, renting and business activities	1,371	25,934	28,381
Transport, storage and communication	146	386	1,799
Wholesale, retail trade & repair service	316	785	4,777
Other Businesses	1,346	8,037	37,198
Grand Total	**7,541**	**80,015**	**270,337**

Source: Ethiopian Investment Agency

As noted above, domestic investment projects dominate in terms of the number of approved projects. However, foreign-owned investment projects contribute more in terms of capital outlays (54 per cent) and in employment creation (55 per cent) in the economy (see Table 1.8). This was a little bit different from the previous fiscal year. Foreign-owned investment projects contributed 62 percent of the total capital outlays whereas investment projects owned by domestic investors contributed about 66 per cent of the jobs created in 2006/07.

Table 1.8: Status of investment projects during 2007/08

Type of investment	Pre-Implementation and Implementation			Operation		
	Number	Capital (in millions of birr)	Permanent Employment	Number	Capital (millions of birr)	Permanent Employment
Domestic	7,496	78,862	267,083	40	380	1,910
Foreign	1,512	92,888	330,331	149	1,523	5,035
Public	5	773	1,344			
Total	**9,013**	**172,523**	**598,758**	**189**	**1,903**	**6,945**

Source: Ethiopian Investment Agency

The fact that the Investment Agency licensed investors during the reporting period doesn’t mean that these investment projects immediately start operation. They often need some time before they become operational. During the period under review, only 189 investment projects with Birr 1.9 billion capital outlays started operation and contributed to the creation of employment for 6, 945 people (See Table 1.8). During the period under review, of the investment projects that went operational, 79 percent have been foreign-owned while the rest were owned by nationals.

1.4 The external sector

In this section of the report, the overall balance of payments, export, import, current account, capital account, and the exchange rate developments in 2007/08 are discussed.

1.4.1 The overall balance of payments

The overall balance of payments deteriorated from a surplus of Birr 480 million (0.5% of GDP) during the previous fiscal year to a deficit of Birr -2.7 billion (-1.1% of GDP) during the reporting period. The deterioration of the current account balance from Birr 6.8 billion (-4.7 % of GDP) in 2006/07 to a deficit of Birr 13.6 billion (-5.7% of GDP) during the reporting year accounts for most of the observed surge in the overall balance of payments deficit in 2007/08. The non-monetary capital (capital account balance), on the other hand, showed a surplus of Birr 8.8 billion (3.9% of GDP) during the reporting year increasing from Birr 6.7 billion (4.3 % of GDP) in the previous fiscal year.

The country's foreign exchange reserve was also heavily depleted from USD 1.3 billion in 2006/07 to USD 952 million in 2007/08. In other words, the available foreign exchange reserve was enough to finance less than 1.5 months of imports of goods and non factor services which dropped from about 2 months in 2006/07.

Table 1.9: Balance of payments[1] (in millions of Birr)

Indicator	2005/06	2006/07	2007/08		(% change)
	(C)	(B)	(A)	(A/C)	(A/B)
Export	8,683 (7.1)	10,422 (6.5)	13,550 (5.9)	56 (-16.9)	30 (-9.2)
Coffee	3,075 (2.5)	3,731 (2.3)	4,849 (2.1)	58 (-16.0)	30 (-8.7
Imports	38,052 (31.2)	45,081 (28.2)	58,505 (25.6)	46.7 (-16.8)	30 (-3.5)
Fuel	7,469 (6.1)	7,696 (4.8)	14,986 (6.5)	101 (6.6)	95 (35.4)
Trade Balance	-29.368 (-24.1)	-34,659 (-21.7)	-44,955 (-19.6)	53 (-18.4)	29.7 (-9.5)
Net Services	1,209 (1.1)	2,024 (1.1)	1,477 (0.6)	22 (-45.5)	-27 (-45.5)
Net Private Transfers	10,646 (8.7)	15,202 (9.3)	22,131 (9.6)	108 (10.3)	46 (3.2)
Current Account Balance (Excl. Public Transfer)	**-19,331** **(-15.8)**	**-17,433** **(-11.3)**	**-25,801** **(-11.2)**	**33** **(-29.1)**	**48** **(-0.9)**
Net Public Transfers	6,562 (6.2)	10,547 (6.6)	12,133 (5.2)	85 (-16.1)	13 (-21.2)
Current Account Balance (Inc. Public Transfer)	-12,769 (-9.6)	-6,886 (-4.7)	-13,668 (-5.9)	7.0 (-38.5)	98.5 (25.5)
Non Monetary Capital (Net)	**2,314** **(4.5)**	**6,683** **(4.3)**	**8,836** **(3.9)**	**282** **(-13.3)**	**32** **(-9.3)**
Overall Balance	**-2,123** **(-1.5)**	**481** **(0.5)**	**-2,709** **(-1.1)**	**28** **(-26.7)**	**-663** **(-320)**

Source: National Bank of Ethiopia

1.4.2 The export sector

The export earnings of the country increased from a low level of Birr 4.1 billion in 2002/03 to Birr 13.6 billion in 2007/08. Values of all major export items registered continuing increase in the last six years. As a result, total export earnings surged by 57% and 30.5% compared to 2005/06 and

[1] Statistics in parenthesis are percentage of GDP

2006/07, respectively. The increase in the global commodity price emanated from the overheated global economy before the crisis might account for much of the rise in value of export items. The value of all major export items except for fruits and vegetable as well as gold surged during 2007/08. The traditional export items such as coffee, oilseeds, pulses and hides& skins registered 40%, 23%, 115% and 16% respective growth compared to 2006/07. Among these traditional export items pulses have shown exceptionally high growth during the recent years.

The total export growth of 30.5% registered during 2007/08 could be accounted for 11.1% by coffee, 11.3% by pulses and 6.5% by flower exports. Flower export is outperforming the traditional export items in terms of both growth and share. It rose from Birr 651 million in 2006/08 to more than 1 billion in 2007/08.

Table 1.10: Value of major exports (in millions of Birr)

Commodity	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	Percentage change	
				(A)	(B)	(C)	(C/A)	(C/B)
Coffee	1,418	1,927	2,900	3,076	3,742	4,897	59.2	30.9
Oilseeds	396	713	1,081	1,835	1,655	2,037	11	23.1
Hides & Skins	448	376	585	651	789	918	41	16.3
Pulses	171	195	306	321	620	1,334	315.6	115.2
Meat Products	21	67	126	161	136	194	20.5	42.6
Fruits & Vegetables	82	110	139	115	142	118	2.6	-16.9
Flower	0	20	68	189	561	1,038	449	85
Chat	498	759	867	773	817	1,001	29.5	22.5
Bee's Wax	4	8	10	13	16	17	30.8	6.3
Gold	361	420	514	562	864	735	30.8	-14.9
Others	743	582	734	988	1,116	1,354	15.2	21.1
Total	4,142	5,177	7,330	8,684	10,458	13,643	57.1	30.5

Source: National Bank of Ethiopia

The observed increase in the values of export earnings could be attributed to exchange rate depreciation, price increase or volume increase. As Table 1.11 shows the volume of major export items dropped in 2007/08 relative to the previous fiscal year indicating that the gain in export earnings was not due to the volume increase but rather was due to price increase (both commodity price and exchange rate). This entails that there is structural problem in the sector that demands serious policy attention in terms of product and markets diversification. For instance, the volume of exports of coffee dropped (by 2.8%) from 176 million kg in 2006/07 to 171 million kg in 2007/08. Similarly, the volume of oilseeds, hides & skins, fruits and vegetables, live animals and chat dropped by 35%, 25%, 2.4%, 9% and 4.3%, respectively vis-à-vis that of the previous fiscal year. So, when the price of a commodity drops for some reason as we have seen in the recent periods, the export earnings from these items would be affected seriously. The unit price of major export items has increased in the last three years. This is due to the global commodity price hike before its fall down recently.

Table 1.11: Volume of major exports (in millions of Kg)

Commodity	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	Percentage change	
				(A)	(B)	(C)	(C/A)	(C/B)
Coffee	126	156	161	148	176	171	15.5	-2.8
Oilseeds	83	106	171	266	235	152	-42.9	-35.3
Hides & Skins	11	9	16	15	16	12	-20.0	-25.0
Pulses	66	73	122	110	159	233	111.8	46.5
Meat Products	2	4	7	8	6	6	-25.0	0.0
Fruits & Vegetables	25	37	38	35	41	40	14.3	-2.4
Flower	0	0	0	6	14	22	266.7	57.1
Live Animals	1	3	21	33	44	40	21.2	-9.1
Chat	6	14	14	18	23	22	22.2	-4.3

Source: National Bank OF Ethiopia

During 2007/08, the unit prices of coffee, oilseeds, hides skins and pulses rose relative to that of the fiscal year 2006/07 by 38%, 86%, 50% and 50%, respectively. The income and price elasticity of demand for export commodities is very low as evidenced by a number of empirical studies. Further, the demand for these export items deteriorates when there is economic slowdown in the rest of the world more than proportionally as we have witnessed in the recent periods. This sends strong message to policy makers to diversify the export sector both horizontally, vertically and spatially. Flower comes out to be one of the principal export items in the recent years.

Table 1.12: Unit prices of major export items (birr/kg)

Commodity	**2002/03**	**2003/04**	**2004/05**	**2005/06**	**2006/07**	**2007/08**	**Percentage change**	
				(A)	**(B)**	**(C)**	**(C/A)**	**(C/B)**
Coffee	11	12	18	21	21	29	38	38
Oilseeds	5	7	6	7	7	13	86	86
Hides & Skins	42	40	37	42	50	75	79	50
Pulses	3	3	3	3	4	6	100	50
Meat Products	12	17	17	20	23	30	50	30
Flower				30	41	46	53	12
Chat	82	55	63	42	36	45		25
Gold	72	94	86	113	155	196	74	27

Source: National Bank OF Ethiopia

Although the share of coffee was falling in the last ten years continuously, during the last two years it remained at about 36%. Coffee price was increasing in the last two years from 21 Birr per k.g in 2006/07 to 29 Birr per kg during the reporting period. Decreasing the dependency of the export sector on coffee is also good development but should not be replaced by another commodity. On the other hand, the combined share of oilseeds and pulses rose from 14% in 2002/03 to 25% in 2007/08 showing that the traditional export items still constitute a significant part of export earning in Ethiopia. The export sector should also be diversified into products which add value and create forward and backward linkage to other sector. The flower export outweighed chat export for the first time during this period–although marginally (see Table 1.13)

Germany, Saudi Arabia and the United States of America were the major destinations of Ethiopian exports during 2007/08 with the respective share of 10.3%, 7.3% and 6.7%. More specifically, Germany imported 30% of Ethiopian coffee and 10% of the flower export. Saudi Arabia imported 15% of coffee, 15% of live animals, 7% of oilseeds and 6% of pulses. The United States of America has imported 8%, 4% and 18% of coffee, flower and oilseeds, respectively. Japan, the Netherlands, Italy and China bought 6.3%, 6.2%, 4.9%, and 4.3 % of the total export during 2007/08, respectively. Netherlands and Djibouti are the main importers of flower and chat, respectively.

Table 1.13: The structure of the export sector

Commodity	**2002/03**	**2003/04**	**2004/05**	**2005/06**	**2006/07**	**2007/08**
Coffee	34.2	37.2	39.6	35.4	35.8	35.9
Oilseeds	9.6	13.8	14.7	21.1	15.8	14.9
Hides & Skins	10.8	7.3	8.0	7.5	7.5	6.7
Pulses	4.1	3.8	4.2	3.7	5.9	9.8
Meat Products	0.5	1.3	1.7	1.9	1.3	1.4
Fruits & Vegetables	2.0	2.1	1.9	1.3	1.4	0.9
Flower	0.0	0.0	0.0	0.0	5.4	7.6
Chat	12.0	14.7	11.8	8.9	7.8	7.3
Bee's Wax	0.1	0.2	0.1	0.1	0.2	0.1
Gold	8.7	8.1	7.0	6.5	8.3	5.4
Others	17.9	11.6	10.9	13.6	10.7	9.9
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: National Bank of Ethiopia

The share of imports by the Sudan, the Netherlands, United Arab Emirates and USA increased in the last 8 years. However, the share of exports to Djibouti, Italy and Japan showed declining trend during the same years. Japan banned coffee import due to sanitation related problems. The share of Germany, China, and Saudi Arabia has shown constant rise over time showing that Ethiopian exporters established stable markets in these countries. From the above facts one can see that most of the destinations of Ethiopia's exports are developed countries whose economy was affected seriously by the current economic and financial crisis. Export to other developing countries and Africa is marginal.

Table 1.14: Export by destination (% share)

Country	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08
Djibouti	16.0	7.0	7.0	7.4	4.9	5.7	4.2	3.6
Sudan	0.2	0.0	1.9	1.6	2.0	2.5	4.4	3.7
U.A.R	0.5	0.5	1.6	1.5	3.1	2.9	2.6	3.8
Germany	10.3	11.3	8.5	11.1	14.6	10.1	11.8	10.3
Italy	8.3	10.1	4.4	5.4	5.2	5.5	6.3	4.9
Netherlands	1.2	1.4	3.4	15.5	3.5	3.9	4.8	6.2
U.S.A.	3.2	4.3	8.2	5.2	5.3	4.8	5.0	6.7
China, P. Rep.	0.4	2.4	0.5	1.8	5.0	13.4	5.0	4.3
Japan	9.8	7.6	4.5	10.7	7.6	7.8	6.1	6.3
Saudi Arabia	7.6	5.9	4.4	6.6	6.0	6.1	6.2	7.3
Rest of the World	42.4	49.3	55.5	33.3	42.8	37.3	43.7	42.8

Source: National Bank of Ethiopia and staff computations

1.4.3 The import sector

The merchandise imports showed persistent and accelerated growth during the last six years from Birr 16 billion in 2002/03 to Birr 58.5 billion in 2007/08.

Relative to the previous year (2006/07) it grew by more than 30% in 2007/08. On average, it grew by 33% per year during the last five years. Given the limited sources of foreign exchange reserve the country has, it seems that it is difficult to sustain financing the import bill.

It is important to see the import composition, to check whether import will have growth enhancing or prohibiting impact. If the country imports technology such as capital goods, raw materials, fertilizers, intermediate inputs, chemicals, etc., it may have a significant implication for sustainable growth. On the hand, imports of consumer goods like expensive and luxurious cars may have little impact on the economic growth. In addition, imports of consumer goods such as cereals and food items to stabilize the inflation problem the country faces in the recent years would have a significant implication.

Table 1.15: Values of imports by enduse (in millions of Birr)

Year	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	Percentage Change	
				(A)	(B)	(C)	(C/A)	(C/B)
Raw Materials	187	224	425	670	1311	2385	256	82
Semi-Finished Goods	2357	3751	5751	7132	6746	11682	64	73
Fuel	2468	2677	5786	5652	7688	10434	85	36
Capital Goods	4715	7556	10377	12614	16453	16416	30	0
Consumer Goods	5615	7720	8532	11128	11590	14037	26	21
Miscellaneous	587	371	565	855	1338	3551	315	165
Total Imports	15,930	22,298	31,435	38,052	45,126	58,505	54	30

Source: National Bank of Ethiopia

Intermediate imports (raw materials, capital goods and semi-finished goods) which are important inputs to agricultural and industrial sectors increased by 24% compared to the last fiscal year 2006/07 and by 49% relative to 2005/06. Intermediate inputs grew by more than 37.5% during the last five years, on average. Capital goods took the lion's share of both intermediate imports (54%) and of total imports (28%) in 2007/08. Semi- finished goods and raw materials took second and third places in the intermediate imports showing 38% and 8% share during the year under review. During the last six years the share of capital goods showed a decreasing trend while the share of chemicals and fertilizers showed an increasing trend which is in line with the expansion of agricultural extension packages.

The country paid Birr 14 billion for consumer goods such as cars, TV, radio sets, food items, cereals, medical and pharmaceuticals, textiles, etc., during 2007/08. Import payments for consumer goods grew by 21% relative to the 2006/07 level and by 26% compared to 2005/06. It also grew by 25%, on average, during the last five years. The share of consumer goods dropped sharply from 35% in 2002/03 to 24% in 2007/08. The shift of import composition from consumer goods to capital goods is a welcome development in the efforts to use the limited foreign exchange the country has efficiently and effectively on goods which imbedded growth.

Table 1.16: Share of major imports

Year	**2002/03**	**2003/04**	**2004/05**	**2005/06**	**2006/07**	**2007/08**
Raw Materials	1	1	1	2	3	4
Semi-Finished Goods	15	17	18	19	15	20
Fuel	15	12	18	15	17	18
Capital Goods	30	34	33	33	36	28
Consumer Goods	35	35	27	29	26	24
Miscellaneous	4	2	2	2	3	6
Total Imports	100	100	100	100	100	100

Source: National Bank of Ethiopia

The value of fuel escalated persistently due to both price and volume increases during the last six years. Fuel price registered the historic high level of more than 140 dollar per barrel in July 2008. As a result, the country paid Birr 10.4 billion during 2007/08 which was 36% and 85% higher relative to fiscal years 2006/07 and 2005/06, respectively.

The share of fuel out of the total import bill ranges between 12%-18% during the last six years. The highest share was recorded during 2007/08 perhaps because the fuel price jumped very high during that year. This entails that the country paid more than 76% of the foreign exchange it gets from merchandize exports for fuel imports in 2007/08. Ethiopia purchases a significant part of its imports from China, Saudi Arabia and United Arab Emirates with respective shares of 15.6%, 13.6% and 9.8% of in 2007/08.

Table 1.17: Imports by origin (% share)

Country	**2000/01**	**2001/02**	**2002/03**	**2003/04**	**2004/05**	**2005/06**	**2006/07**	**2007/08**
Sudan	0.0	0.1	0.0	0.4	1.4	0.4	1.0	2.1
U.A.R	1.1	0.9	6.9	9.5	6.1	6.7	5.2	9.8
Germany	4.9	5.3	4.3	3.8	3.3	3.9	3.7	3.3
Italy	7.7	8.9	6.9	10.7	4.2	5.8	7.7	5.2
Russia	1.0	0.4	1.4	1.0	1.2	0.8	1.0	1.5
U.S.A.	5.1	9.6	6.0	8.6	10.6	8.4	3.8	4.4
China, P. Rep.	7.1	8.4	9.3	10.3	11.5	13.2	16.6	15.6
Japan	5.0	3.5	6.5	4.5	3.3	3.4	6.2	4.9
Saudi Arabia	4.0	13.6	8.2	8.4	17.0	14.9	15.1	13.2
Rest of the World	51.4	36.9	37.3	31.5	32.9	33.9	32.8	36.3

Source: National Bank of Ethiopia

The share of imports from the Sudan, United Arab Emirates and China increased in the recent years. On the contrary, the share of Germany, Italy and USA decreased over time. The main source of fuel imports are Saudi Arabia, United Arab Emirates and the Sudan. Based on the recent information, 70%, 25% and 5% of the fuel has been imported from these countries, respectively. Similarly, Ethiopia imports most of grain from Bulgaria, Romania and Italy. Japan is the major source of imports of motor vehicles.

Since October 2001, the official exchange rate of Ethiopia has been determined by the inter-bank foreign exchange market at which commercial banks and the National Bank participate every day. The nominal exchange rate depreciated by 5.1% to reach Birr 9.2441 per USD in 2007/08 fiscal year. This is the highest annual depreciation rate since the inter-bank market started. The gap between the official and the parallel market rate also widened to 3.4% in 2007/08. This premium exceeds the national bank target of 2% by 1.4 percentage points.

The total amount of foreign exchange traded in the inter-bank market dropped from USD 190 million in 2006/07 to USD 114 million in 2007/08. Out of this amount, 16% or USD 19 million was traded among commercial banks. Compared to USD 59 million traded among the commercial banks during the last fiscal year (2006/07) it dropped by nearly 69%. This entails that the national bank played the big role in terms of supplying the foreign exchange. This is because commercial banks have foreign exchange shortage relative to the demand for foreign exchange in the market. As a result, commercial banks start rationing the foreign exchange which in turn created inefficiency in the market.

For the last five years inflation was increasing in Ethiopia but the nominal exchange rate was relatively stable (See Table 1.18). However, in the recent years, the real exchange rate of Ethiopia appreciated by more than 38% in the last five years. This imposes serious problem on the competitiveness of the export sector.

The National bank of Ethiopia devalued the Birr twice nearly by 10% since January 2009. These are the highest devaluation since October 1992 when it was devalued by 85% from 2.07 to 5 Birr per USD. The advantage of exchange rate devaluation is mainly to solve the balance of payments problem through (i) improving the competitiveness of the exports sector in the international market (ii) encouraging remittance inflow in the country and (iii) discouraging the imports of goods and services by making them expensive in the domestic market. However, the workings of these measures will depend on export supply and import demand elasticities (the marshal learner's condition). A number of empirical studies show both export supplies and import demand are price inelastic in Ethiopia- due mainly to the structure of the export and import (the marshal learner's condition are not satisfied)

Table 1.18: Trends in nominal and real exchange rates

Period	Nominal exchange rate		Real effective exchange rate	Amount traded in millions of US$	
	Official	Parallel			
	Average weighted rate	Average rate		Total	o/w among CBs
2001/02	8.5425	8.6850	93.1	104	30
2002/03	8.5809	8.7091	99.0	40	13
2003/04	8.6197	8.6751	98.5	228	96
2004/05	8.6518	8.7110	94.0	139	22
2005/06	8.6810	9.0258	102.9	134	10
2006/07	8.7943	8.9570	120.8	190	59
2007/08	9.2441	9.5569	136.5	114	18

Source: National Bank of Ethiopia

Furthermore, if devaluation is not accompanied with other policy instruments like monetary and fiscal policies, it may exacerbate the inflation inertia the country is already in for the last five years. The supply response of the export sector which is not responsive to price incentives due to the structure of the export sector is another issue that makes devaluation less effective. In addition, given that most of the imports are essential goods like fertilizer, medical instruments, fuel, chemicals, capital goods, the balance of payment problem may not be solved by devaluation as expected. Frequent Birr devaluation as witnessed in the recent years may also be viewed by foreign investors as a sign of weakness of the economy. Thus, the balance of payment problem might be exacerbated instead of cured by the devaluation. Hence, to benefit out of devaluation, other policy packages need to be undertaken; the export sector needs to be diversified and frequent devaluation should be avoided.

1.5 Developments in monetary aggregates

This section of the report reviews developments in monetary and financial aggregates during the fiscal years 2006/07 and 2007/08. The main aspects of the monetary sector examined include the stock of money supply and demand aggregates, the interest rate, and the overall activities of the banking sector. Thus, in this part of the report, the overall intermediation activities of the banking sector both in absolute terms and relative to their historical status will be briefly discussed.

The money supply, expressed in terms of the broad money (M2) aggregate increased year-on-year basis by 22.2% and 20.3% during 2006/07 and 2007/08, respectively, over the stocks in 2005/06 and 2006/07, respectively. Accordingly, the stock of money supply reached Birr 56.7 billion at the end of 2006/7 and Birr 68.2 billion as at June 30, 2008. While the expansion of both domestic credit to the economy and net foreign assets accounted for the surge in money supply during 2006/07, the 29.4% increase in the domestic credit was in charge of the surge during 2007/08. The revival of net foreign assets during 2006/07 vis-à-vis the previous fiscal year could partially be attributed to the improved flow of foreign transfers during the year, albeit declined in 2007/08.

The National Bank of Ethiopia seems to continue having a mild expansionary monetary policy for the last few years through the year under review. For instance, in the three consecutive years (2004/05-2006/07), the stock of broad money supply grew on average by 19.1% showing an 8.1 percentage point acceleration vis-à-vis the average growths of 11.0% registered during three years through 2001/02-2003/04. The three years average growth continued to increase evenly all the way through 2007/08 reaching 19.3%.

The major components of broad money supply (i.e. domestic credit) showed positive change in 2006/07 and 2007/08 relative to their corresponding preceding years (see Table 1.19). On the other hand net foreign assets increase in 2006/07, bending back during 2007/08. More specifically, domestic credit grew by 25.4% and 29.4%, while net foreign assets surged by 9.9% in 2006/07 falling by 12.0% in the period ended June 2008. When we see the year-on-year dynamics of the components of money supply, domestic credit accelerated by 3.1 percentage points in 2006/07 over the growth rate in the previous year and by 4.0 percentage points during 2007/08 over that of 2006/07.

Meanwhile, net foreign assets accelerated by 22.8% in 2006/07, despite its year-on-year dynamics of -21.9% at the end of the 2007/08 fiscal year. Of the two components of domestic credit (credit to the government and credit to other sectors[2]), credit to other sectors showed a significant growth of 31.3% and 48.9% in 2006/07 and 2007/08, respectively compared to 19.8% and 9.2% credit to the government during the corresponding periods. Credit to other sectors was greater after 2006/07 than that of the government for the first time since the last ten years. During 2006/07 fiscal year, the share of credit to government sectors fell to 49.0% and further to 41.4% in 2007/08 from 51.3% at the end of 2005/06 the other sectors taking the balance (51.0% and 58.6%) during the recent two years.

[2] Other sectors are composed of State Enterprises, Cooperatives, Private Enterprises & Agencies and Banks

Table 1.19: Determinants of money supply (in billions of Birr)

	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08
Domestic Credit(Net)	26.3	27.6	27.5	28.8	31.1	40.3	49.3	61.8	80.0
Claims on Government (net)	14.8	15.2	16.0	17.2	19.2	21.8	25.3	30.3	33.1
Claims on Other Sectors	11.5	12.4	11.5	11.6	11.9	18.6	24.0	31.5	46.9
Net Foreign Assets	4.8	4.8	7.8	11.0	13.0	13.9	12.1	13.3	11.7
Other Items	-9.9	-7.8	-8.0	-9.3	-9.1	-14.0	-15.0	-18.4	-23.5
Broad Money Supply	21.1	24.6	27.3	30.5	33.6	40.2	46.4	56.7	68.2
Annual Percentage Change									
Domestic Credit(Net)	30.7	5.1	-0.4	4.7	8.0	29.6	22.3	25.4	29.4
Claims on Government(net)	54.2	2.9	5.3	7.5	11.6	13.5	16.1	19.8	9.2
Claims on Other Sectors	9.4	7.9	-7.3	0.9	2.6	56.3	29.0	31.3	48.9
Net Foreign Assets	-21.6	0.6	62.5	41.0	18.2	6.9	-12.9	9.9	-12.0
Broad Money Supply	9.0	16.3	11.0	11.7	10.2	19.6	15.4	22.2	20.3

Source: National Bank of Ethiopia

In general, developments in the monetary aggregates show that the non-government sectors are recently beginning to emerge as important beneficiaries of the banking sector. This can probably be taken as a sign that non-government sectors are becoming crucial elements of the national economy and are filling the output. The continued expansion in strategic economic activities (as witnessed in the construction sector and the expansion of the trade sector both international and domestic) seems to support this conjecture. Yet, the 'other sectors' include both public and private actors, and thus the above assertion should be taken with caution. The country should make sure that resources are fairly directed to the private sector for the realization of a private sector centered economy. Besides, the country should make sure that every penny spent on public parastatals is used effectively.

Looking at the liability side, narrow money supply continuously grew through the years 2006/07 and 2007/08 by 24.4% and 19.4% vis-à-vis their immediate past years and reached Birr 35.4 billion at the end of 2007/08 fiscal year. In particular, currency outside banks, which is the most liquid component of narrow money, continued its growth persistently even during the years under consideration. Demand deposits have also increased and grew significantly by 28.4% from 2005/06 to 2006/07 and by 11.2% from 2006/07 to 2007/08.

Table 1.20: Components of broad money (in millions of Birr)

Particulars	Year End June				Annual Percentage Change			
	2004/05	2005/06	2006/07	2007/08	2004/05	2005/06	2006/07	2007/08
Narrow Money Supply	21,290	23,812	29,618	35,350	18	11.8	24.4	19.4
Currency outside banks	10,021	11,423	13,708	17,654	27.8	14	20.0	28.8
Demand Deposits(net)	11,268	12,389	15,909	17,696	10.6	9.9	28.4	11.2
Quasi-Money Supply	18,922	22,566	27,034	32,832	21.4	19.3	19.8	21.4
Savings Deposit	17,311	20,486	23,715	29,478	20.5	18.3	15.8	24.3
Time Deposit	1,612	2,080	3,319	3,354	32.1	29.1	59.6	1.1
Broad Money Supply	40,212	46,377	56,652	68,182	19.6	15.3	22.2	20.4

Source: National Bank of Ethiopia

On the other hand, the share of narrow money supply to broad money declined marginally from 52.9% in 2004/05 to 51.8% in 2007/08 with no clear trend. It increased marginally to 52.9% in 2006/07 as compared to its share of 51.3% on year-on-year basis to decline later to 51.8% in 2007/08. Meanwhile, the dynamics of quasi money supply accelerated by 0.5 and 1.6 percentage points in 2006/07 and 2007/08, respectively, to 19.8% and 21.4% and reached Birr 32.8 billion at the end of 2007/08 fiscal year.

Time deposits grew significantly by 59.6% in the earlier year under review while saving deposits rose moderately by 24.3% in latter year in review. However, in absolute terms saving deposit constituted the lion's share (72.3% and 99.4%) of the increase in quasi money supply during the two respective years. In terms of contribution to total quasi money supply balance observed at the end of the years in review, saving deposit is by far the largest (87.7% in 2006/07 and 89.8% in 2007/08).

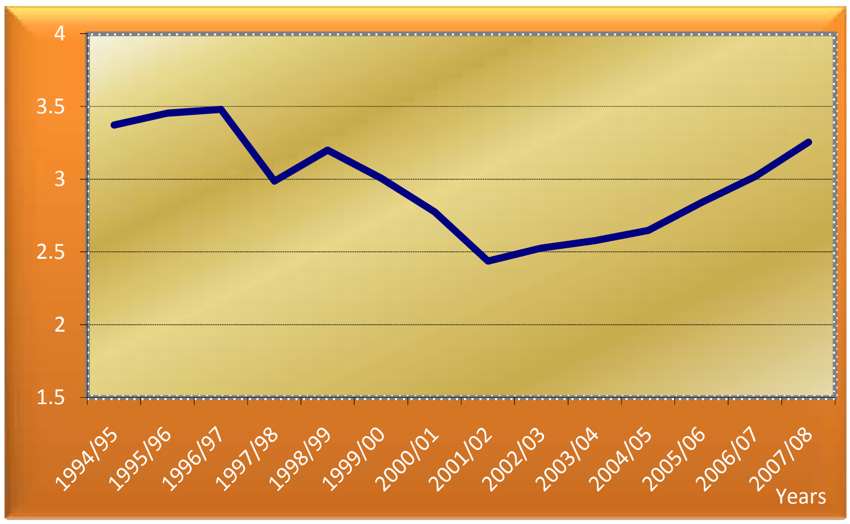
Table 1.21: Monetary aggregates and ratios (in millions of Birr)

Particulars	Year Ended June 30			Percentage Change		
	2005/06	2006/07	2007/08	2005/06	2006/07	2007/08
Reserve requirements(CB'S)	2,121	2,592	9,113	16.0	22.2	251.5
Actual Reserve(CB'S)	8,452	11,734	15,233	-34.0	38.8	29.8
Excess Reserve(CB'S)	6,331	9,141	6,120	-42.0	44.4	-33.1
Reserve Money	21,182	27,314	35,551	-12.0	28.9	30.2
Current in circulation	12,560	15,175	20,216	15.0	20.8	33.2
Bank Deposited	8,622	12,138	15,335	-34.0	40.8	26.3
Money multiplier (Ratio)						
Narrow Money to Reserve Money	1.1	1.1	1.0	22.2	-1.4	-8.3
Broad Money to reserve money	2.2	2.1	1.9	29.4	-5.7	-7.5
Other Monetary Ratio (%)						
Currency to narrow Money	52.7	51.2	57.2	2.4	-2.8	11.6
Currency to Broad money	27.1	26.8	29.7	-0.8	-1.2	10.7
Narrow Money to Broad Money	51.3	52.3	51.8	-2.9	1.9	-0.8
Quasi Money to Broad Money	48.7	47.7	48.2	3.3	-2.0	0.9
$M_{2/GDP}$ ratio (%)	35.2	33.1	30.7	-6.7	-5.8	-7.3
Velocity of money (GDP/M_2)	2.8	3.0	3.3	7.2	7.8	7.9

Source*:* National Bank of Ethiopia

In spite of the increase in loans to the private and government sectors by the banking system, the excess reserve of the commercial banks rose by 44.4% to Birr 9.1 billion in the 2006/07 fiscal year from Birr 6.3 billion a year earlier. However, the excess reserve showed a decline (33.1%) in 2007/08 and reached Birr 6.1 billion. The National Bank of Ethiopia declared a rise in the reserve requirement ratio from 5% to 10% in July 2007 and then from 10% to 15% in March 2008. The Bank raised the reserve requirement ratio to combat the expansion of domestic credit which was perceived to be a catalyst for the pervasive inflation rate the country faced. As a result, the actual reserve of commercial banks which is comprised of excess reserve and required reserves showed a 38.8% increase in 2006/07 and a 29.8% in 2007/08 (Table 1.21).

Figure 1.4: The income velocity of money



Source: National Bank of Ethiopia

As depicted in Figure 1.4, income velocity of money[3] shows a continuous rising trend since 2001/02 and reached 3.3 in 2007/08 from 2.8 in 2005/06 and 3.0 in 2006/07. This suggests that although the domestic credit to the economy had been continuously increasing for the last few years, the monetization rate of the economy which is measured by the inverse of the income velocity of money had been dropping during the period from 2001/02. On the other hand, a monetary ratio of narrow money to reserve money for the year 2006/07 showed no change against the previous year while it had

[3] The number of times a unit of currency is used for transaction purposes during a given period, usually a year.

slightly declined in 2007/08. The ratio of broad money to reserve money decreased continuously but marginally from 2.2 to 2.1 and then to 1.9 between 2005/06 and 2007/08 (Table 1.21).

With regard to developments in the interest rate, no significant changes were observed. This was true even in the face of high inflation that has been witnessed since 2004/05 fiscal year and which reached 17.1 percent during 2006/07 and 25.4 percent during 2007/08 fiscal years. There has not been any significant and effective policy change to counteract the impact of the high inflation on the real price of capital. As a result, in the face of double digit inflation, the real interest rate remained deep in the negative territory. As can be seen from Table 1.22, similar to the previous four years, in the year 2006/07 saving deposit rates remained between 3-3.15%, while the inflation rate was double digit. There is a slight improvement in the saving deposit rate during the 2007/08 fiscal year and the rate ranged between 4-4.15%. Despite this slight increment, the saving rate in real terms ranged between -21.4 and -21.25 during the latest fiscal year under examination.

On the other hand, interest rates on time deposits have shown slight movements through the periods shown in Table 1.22 and increased from 3.71% in 2005/06 to 4.08% in 2006/07, and then to 5.16% in 2007/08. Meanwhile, in 2006/07, the minimum, maximum and average lending interest rates had remained at 7%, 14% % and 10.5%, respectively, which were stagnant from 2004/05 onwards. Nonetheless, these values showed a one percentage point increase in 2007/08.

Given the high inflation rate (well in two digits level) recorded in the recent few years, the real average saving and lending rates continued to be negative. Other things being equal, these negative interest rates tend to discourage savings, reduce confidence on the Birr as a store of value, and put upward pressure on commodity prices in the longer time horizon as people seek other alternatives of same. While it can be observed that there has been a slight change in the interest rate structure of the country, given the movements of credit, inflation and overall economic aggregates, the interest rate does not seem to be adequately playing its conventional role in the Ethiopian economy.

Table 1.22: Interest rate structure

Description	**1999/00**	**2000/01**	**2001/02**	**2002/03**	**2003/04**	**2004/05**	**2005/06**	**2006/07**	**2007/08**
Deposit Rates									
Saving Deposit (Average)	*6.00*	*6.00*	*6.00*	*3.00*	*3.00*	*3.00*	*3.00*	*3.08*	*4.08*
Minimum	6.00	6.00	6.00	3.00	3.00	3.00	3.00	3.00	4.00
Maximum	6.00	6.00	6.00	3.15	3.15	3.15	3.15	3.15	4.15
Time Deposits									
Up to 1 year	6.27	6.28	6.36	3.30	3.35	3.40	3.47	3.64	4.67
1-2 years	6.36	6.54	6.67	3.51	3.62	3.64	3.71	4.11	5.23
Over 2 years	6.43	6.69	6.8	3.57	3.82	3.84	3.94	4.49	5.59
Average	*6.35*	*6.50*	*6.61*	*3.46*	*3.60*	*3.63*	*3.71*	*4.08*	*5.16*
Lending Rates									
Minimum	10.50	10.50	10.50	7.50	7.5	7.00	7.00	7.00	8.00
Maximum	13.00	13.50	15.00	14.00	14.00	14.00	14.00	14.00	15.00
Average	*11.80*	*12.00*	*12.80*	*10.80*	*10.80*	*10.50*	*10.50*	*10.50*	*11.50*

Source: National Bank of Ethiopia

The financial sector of the country constitutes mainly the central bank, commercial banks, insurance institutions and micro-finance institutions. As of 2007/08, the sector was composed of one central bank, 11 commercial banks, 10 insurance companies and 26 micro-finance institutions (MFIs) (due to the liquidation of one MFI). In terms of ownership, three of the commercial banks were publicly owned while the remaining banks were privately owned. Out of the 9 insurance companies only one was owned by the public sector. Commercial banks operating in Ethiopia have expanded their outreach over the last two years under investigation. The number of bank branches has increased by more than 15 percent over the two years and reached 562 bank branches at the close of June 2008 from 241 two years earlier. With regard to their distribution, close to 2/3 of the branches are operating in the regions with still big concentration in the economic and political capital with just 3.6 percent of the total population.

On the other hand, the total capital of the banking sector reached Birr 10.0 billion in 2007/08 from 5.4 billion at the end of 2005/06 showing an 84.4% growth over the two years period. Banks, capital grew by close to 13 % during 2007/08. The share of public banks was 65% of total banks' capital in 2004/05. It has increased to 70% and then declined to 66% over the succeeding periods. The decline in the share of public banks during the latter period is owing to the fast growth in capital of private banks during the year.

Table 1.23: Capital and branch networks of the banking system

Banks	2005/06	Branch Networks (In numbers)							Capital (In billions of birr)	
		2006/07			2007/08					
	Total	Addis A	Regions	Total	Addis A	Regions	Total	2005/06	2006/07	2007/08
Public Banks	236	62	193	255	62	202	264	3.5	6.2	6.6
Private banks	185	123	109	232	151	147	298	1.9	2.6	3.4
Total	**421**	**185**	**302**	**487**	**213**	**349**	**562**	**5.4**	**8.8**	**10.0**

Source*:* National Bank of Ethiopia

When it comes to developments in the banking activities[4], during the year ended June 2008, Birr 27.3 billion fresh loan was disbursed to the various sectors of the economy (excluding the government). This was 75% higher

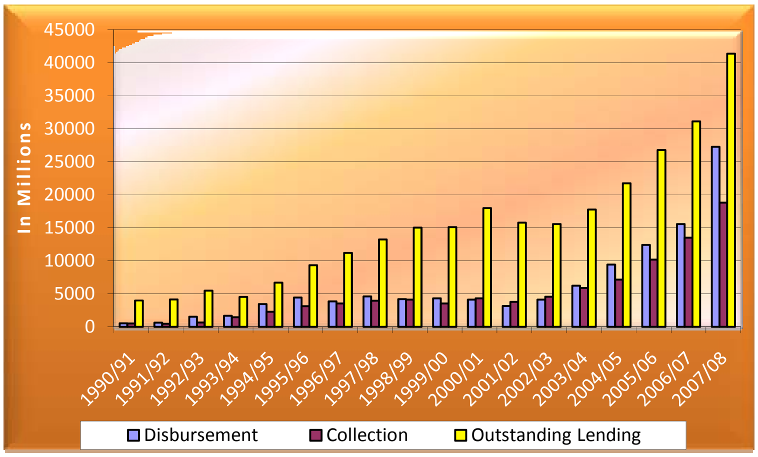
[4] See Figure 1.7 to see how loan disbursement, collection and outstanding credit of the banking system are behaving since 1990/91.

than the amount disbursed last fiscal year despite the continually increasing reserve requirement. Loan to the public sector and cooperatives increased significantly over the year ended June 2007 (loan to public enterprises increased by 453.2%, while loans to the cooperatives more than doubled). While the share of the private sector dropped from 77.7% to 61.2% in 2007/08, the share of the public enterprises and the cooperatives rose with a significant increase coming from the public enterprises (by 13 percentage points from 6.0% to 18.9%). The Commercial Bank of Ethiopia continued as the predominant bank in the country by contributing about 52.9% of the total fresh loans disbursed in 2007/08.

In 2006/07 international trade received the lion's share (28.1%) followed by domestic trade and agriculture with respective shares of 19.2% and 16.8%. During the fiscal year 2007/08, international trade was the main beneficiary of the new loans disbursed with a huge surge in its share to 33.8%. Agriculture (19.7%), domestic trade (18.4%) and industry (10.0%) enjoyed a double digit share.

On the collection side, during 2007/08, the total amount collected by the 11 commercial banks from the economy amounted to Birr 18.8 billion showing a 39.3% increase over that of 2006/07 which itself surged by 32.5% as compared to what was collected at the end of June 2006. The increase in collection during the two periods was mainly contributed by the surge in collection from the private sector and public enterprises. The share of collection from the private sector (which was close to 70%) is by far larger than that collected from the other sectors. As usual, and as can be expected the Commercial Bank of Ethiopia took the lion's share (collecting Birr 8.5 billion or 45.3%). Collection was dominated by collection from the international trade which contributes closer to 30% in both fiscal years. While domestic trade was the second largest contributor (18.7%) followed by agriculture (16.7%) during 2006/07, agriculture (23.6%) comes next to international trade and followed by domestic trade (18.2%) during 2007/08.

Figure 1.5: Development in banking activities



The outstanding credit of the banking sector as at June 30, 2008 stood at Birr 41.3 billion experiencing a 32.9% surge over the stock as at June 30, 2007. The June 30, 2007 balance had itself increased by 16.3% over the balance a year earlier. The peculiar development on the claims of the banking sector on the clients in the economy is that the claim on the public sector increased significantly by 167.6% in 2007/08. The major share is taken by the private sector with 82.3% in 2006/07 but declining to 70.8% in 2007/08. As may partly be derived from the observed trend on the share of various sectors from the total fresh loan disbursed, international trade is the largest debtor sector hosting 20.9% during 2006/07 and 29.5% in 2007/08, followed by industry, agriculture and domestic trade, respectively.

Table 1.24: Disbursement, collection and outstanding loans of the banking system (in millions of Birr)

Particulars	Disbursement			Collection			Outstanding Lending*		
	2005/06	2006/07	2007/08	2005/06	2006/07	2007/08	2005/06	2006/07	2007/08
Clients	***12402***	***15559***	***27255***	***10178***	***13489***	***18789***	***26751***	***31103***	***41340***
Public Enterprises	307	936	5175	917	1232	686	3017	3263	8733
Cooperatives	1965	2533	5390	1631	2559	5025	1849	2025	3161
Private Sector	10129	12090	16690	7550	9639	12996	21610	25589	29270
Interbank Lending	0	0	0	80	58	82	275	226	177
Sectors	***12402***	***15559***	***27255***	***10178***	***13489***	***18789***	***26751***	***31103***	***41340***
Agriculture	2189	2621	5372	1409	2255	4443	3418	4218	5481
Industry	1302	1525	2739	1153	1443	1587	6320	6997	7897
Domestic Trade	2458	2986	5012	1839	2519	3425	3346	3821	5219
International Trade	3542	4377	9210	3516	4032	5685	5325	6500	12205
Export	1658	2234	3116	1657	1795	2527	1581	2335	2974
Import	1884	2143	6094	1859	2237	3159	3744	4166	9231
Hotels and Tourism	92	165	244	105	131	202	317	676	723
Transport and Communication	1007	1432	1338	510	843	1076	1578	2370	2780
Housing and Construction	1167	1675	2017	727	976	1432	3207	3791	4865
Mines, Power and Water Resources	0	13	59	0	0	0	31	41	4
Others	503	585	998	736	1116	733	2842	2316	1820
Personal	141	180	266	104	113	121	93	147	169
Interbank Lending	0	0	0	80	61	86	275	226	177

Source: National Bank of Ethiopia Excluding lending to Central Government in the form of T-bills and government bonds.

1.6 Public finance

The general government revenue including external grants increased from low level of Birr 13.6 billion in 2002/03 to Birr 39.7 billion in 2007/08. Improved tax collection performance accounted for the observed surge in nominal revenue in the reviewed year. Non-tax and external grants components also increased but their combined share to total revenue was still less than 40%.

Tax revenue which constitutes more than 60% of domestic revenue grew by more than 37% relative to the previous year to reach Birr 23.8 billion in 2007/08. Indirect taxes which include sales and excise taxes, VAT and customs duties encompass the major source of domestic revenue in Ethiopia. Its share rose from 63% in 2002/03 to 71% in 2007/08. On the other hand, the share of direct taxes decreased from 37% in 2002/03 to 29% in 2007/08. Customs duties have the lion's share in the indirect taxes constituting nearly 70% in 2007/08. Although tax reform policies have been put in place in the recent years, the share of domestic indirect taxes -VAT and Sales tax dropped to 30% in 2007/08 from 33% in the previous year.

Non- tax revenue took 15% of total revenue & grants during the last two fiscal years, 2006/07 and 2007/08. Government investment has accounted for 61% of non-tax revenue in 2007/08. Sales of goods and services, charges and fees and privatization proceeds took the balance of 39%. The share of government investment increased persistently in the last six years from a low level of 38% in 2002/03 to more than 60% in the most recent two years. Similarly revenue from external grant increased during the last five years except in 2005/06 which dropped by 18% for many countries halt direct advance to the government.

Table 1.25: General government revenue (million Birr)

Particulars	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08
Tax Revenue	8,243	10,520	12,398	14,159	17,354	23,801
Direct Tax	3,010	3,132	3,930	5,102	5,168	7,015
Indirect Taxes	5,233	7,388	8,468	9,698	12,186	16,785
Non-Tax Revenue	2,907	2,666	3,194	5,371	4,444	5,993
Total Revenue	11,150	13,186	15,592	19,530	21,797	29,794
External Grants	2,446	4,001	4,565	3,732	7,583	9,911
Total Revenue & Grants	13,596	17,187	20,157	23,262	29,381	39,705
Growth rates						
Tax Revenue	4	27.6	17.9	14.2	22.6	37.2
Direct Tax	-3.6	4.1	25.5	29.8	1.3	35.7
Indirect Taxes	8.9	41.2	14.6	14.5	25.7	37.7
Non-Tax Revenue	14	-8.3	19.8	68.2	-17.3	34.9
Total Revenue	6.4	18.3	18.2	25.3	11.6	36.7
External Grants	0.9	63.6	14.1	-18.3	103.2	30.7
Total Revenue & Grants	5.4	26.4	17.3	15.4	26.3	35.1

Source: Ministry of Finance and Economic Development

Although the federal government revenue performance seems promising in nominal terms, it continuously decreases in terms of GDP from a high level of 19.8% in 2003/04 to 16.2% in 2007/08. Tax, non-tax and grant revenue dropped from 10.1%, 2.6% and 4.4% of GDP in 2006/07 to 9.7%, 2.4% and 4% in 2007/08, respectively. This shows that the federal government revenue collection performance is not growing in line with the domestic economic activities. This is mainly because, though agriculture contributes more than 45% to GDP, it played very marginal role to government revenue. If the revenue collection performance of the federal government is not growing with the economic activities (GDP), the government would depend on either foreign or domestic sources. Given the inflation pressure, depending on domestic borrowing such as borrowing from the central bank (direct advance) may exacerbate the inflation problem.

Table 1.26: The federal government revenue (as percent of GDP)

Components	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08
Tax Revenue	11.9	11.2	12.1	11.6	10.8	10.1	9.7
Direct Tax	4.7	4.1	3.6	3.7	3.9	3	2.9
Indirect Taxes	7.2	7.1	8.5	8	7.4	7.1	6.8
Non-Tax Revenue	3.8	4	3.1	3	4.1	2.6	2.4
Total Revenue	15.7	15.2	15.2	14.6	14.8	12.7	12.1
External Grants	3.6	3.3	4.6	4.3	2.8	4.4	4.0
Total Revenue & Grants	19.4	18.5	19.8	18.9	17.7	17.1	16.2
Annual Growth Rates							
Tax Revenue	8.9	-5.8	8.1	-4.1	-7.6	-6.1	-4
Direct Tax	16.6	-12.6	-11.8	2.1	5	-22.4	-5
Indirect Taxes	4.4	-1.3	19.6	-6.7	-7.4	-3.7	-3.6
Non-Tax Revenue	-16.9	3.3	-22.3	-2.5	36	-36.6	-5.6
Total Revenue	1.3	-3.6	0.2	-3.8	1.3	-14.5	-4.4
External Grants	-5.7	-8.6	38.6	-7.1	-33.9	55.7	-8.6
Total Revenue & Grants	-0.1	-4.5	7.1	-4.5	-6.7	-3.2	-5.4

Source: Ministry of Finance and Economic Development

Looking at the expenditures side, a total of Birr 46.9 billion was spent during 2007/08, which was 32% higher than that of the 2006/07 and 10.2% lower than the 2007/08 budget. Capital and recurrent expenditures registered Birr 24.1 and 22.8 billion respectively. Both capital and recurrent expenditure rose by more than 30% relative to 2006/07.

Table 1.27: The federal government expenditure (million Birr)

Year	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08
Capital expenditure	6130.3	5817.1	8136.0	11343.4	14041.8	18398.0	24121.0
Economic development	3329.9	3341.6	4810.7	7655.5	10425.6	11367.0	15682.2
Social development	994.5	1330.9	2258.3	3290.5	3099.3	5997.6	7472.7
Recurrent expenditure	9545.0	10461.0	11262.0	12515	14648	17165	22794
General Services	4630	4678	5048	5816	6522	7073	9128
Economic services	1048.0	1328.0	1356.0	1523.0	2009.0	2200.8	3110.8
Social Services	2801	3183	3253	3839	4996	6198	8662
Total expenditure	15675.3	16278.1	19398.0	23858.1	28689.6	35563.0	46915.0
Growth %	8.8	3.8	19.2	23.0	20.3	24.0	31.9

Source: Ministry of Finance and Economic Development and Staff Computation

Economic development absorbed a significant proportion of the capital expenditure rising from 67.4% in 2006/07 to 73.5% in 2007/08. Economic development comprises road, agriculture, natural resources, urban development, mines and energy and tourism. Road construction took the biggest share (45.7%) of the share for economic developments followed by agriculture (22%), natural resources (12%), urban development and housing (11.5%). The budget allotted for road and agriculture for the fiscal year 2007/08 was respectively 38.7% and 23.7%. Thus, while the road sector took 7 percentage points higher than the capital budget it was initially allotted, other sectors have utilized less than what they have been allocated in the budget.

The share of social development from the total capital expenditure, on the other hand, dropped to 22.5% during the reviewed year from 27% a year earlier. Education and health sectors took 62.5% and 34.4% of the social sector expenditure, respectively. Compared to the previous fiscal year, the share of education decreased from 70.9% to 62.5% but the share of health increased from 27% to 35.5%. The share of general services from capital expenditure continuously declined from 15.3% in 2003/04 to 4% during the reviewed year. Increasing the share of expenditure to pro-poor sectors is good development to reduce poverty.

Regarding the recurrent expenditure, the share of general services continued to decline in the last five years from 43.9% in 2003/04 to 40% in 2007/08. Defense expenditure was the largest component of general services owing to 42% of the general services followed by security (20%) in 2007/08. Consistent with the capital expenditure, the share of social service rose by more than 10 percentage points in the last five years. In 2007/08, education and health took 76% and 17% of social services, respectively. Similarly, the share of economic services increased although slightly during the last five years from 11.3% in 2003/04 to 13.5% in 2007/08

Although the federal government revenue and grants rose by 35% during 2007/08, it falls short of federal government expenditure which grew by about 32% during the same period. As a result, the federal finance registered a deficit of Birr 7.2 billion (3.8% of GDP). If we exclude the grant revenue, the deficit increases to Birr 17 billion (7.5% of GDP). However, if we compare the deficit with the previous year, it improved by 16.6% excluding grants and 24.4% including grants. The government finances its budget deficit of Birr 7.2 billion (including grants) from domestic borrowing (Birr 6.4 billion) and Birr 2.4 billion from external borrowing. The balance Birr 1.6 billion was an outflow of funds for unspecified reasons. The share of bank financing out of the domestic sources declined from 69% in 2006/07 to 61% in 2007/08. More than 60% of the budget was financed from the banking system- the significant part of it being direct advance (money printing). Thus, given the inflation pressure that prevailed in the country, this may exacerbate the problem further.

Table 1.28: The federal government budget deficit and its financing

Particulars	2006/07		2007/08		% change	
	A	B	C	D	D/C	D/B
Overall Surplus/Deficit	**Budget**	**Actual**	**Budget**	**Actual**		
(Including Grants)	-7.3	-6.2	-8.6	-7.2	-16.2	16.6
(% of GDP)	-4.6	-3.9	-3.8	-3.2	-16.2	-18.6
(Excluding Grants)	-16.2	-13.8	-19.2	-17.1	-10.6	24.4
(% of GDP)	-10.1	-8.6	-8.4	-7.5	-10.6	-13.2
Total Financing	7.3	6.2	8.6	7.2	-16.2	16.6
Net External Borrowings	3.3	1.9	3.5	2.4	-30.8	25.2
Gross Borrowing	2.5	1.8	2.9	1.8	-37.3	2
Amortization Paid	1	0.9	0.4	0.4	-3.3	-56.3
HIPC Relief	1.8	1.1	1	1	-0.4	-6.5
Net Domestic Borrowings	4	6.2	4.5	6.4	43	2.5
Banking system	4.0	4.3	4.5	3.9	-13.3	-8.9
Non-bank sources	0.0	2.0	0.0	2.5	-	26.9
Privatization	0.0	0.0	0.7	1.0	51.0	-
Other and residual	0.0	-1.9	0.0	-2.6	-	34.3

Source: Ministry of Finance and Economic Development and Staff Computation

1.7 Price developments

Developments in prices of goods and services have been a much puzzling issue in the past few years, partly because of its unprecedented sharp increase since 2004/05 in spite of the significant growth in output both agricultural and non-agricultural. During 2006/07 and 2007/08 the average annual inflation rate reached 17.1 percent and 25.4 percent, respectively. Different views came out in an attempt to explain the puzzle. Money supply, structural change, farmer behavior, and the like were some of the explanations given by different stakeholders. As can be seen from Table 1.29 agricultural output has grown although at a decreasing rate. On the other hand, money supply has grown significantly from 16 percent in 2004/05 to 20.4 percent in 2007/08 peaking in 2006/07 at 22.2 percent. The non-food inflation has also increased significantly but not as high as food inflation.

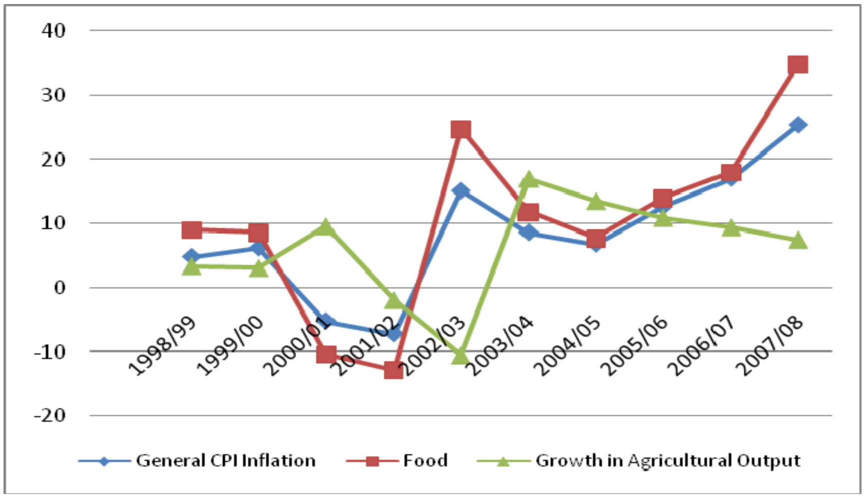
Table 1.29: Trends in prices and some related variables

Year	General CPI Inflation	Food	Non-Food	GDP Deflator	Growth in Agricultural Output	Growth in Broad Money (M2)
1998/99	4.8	9.0	-1.3	0.9	3.4	4.4
1999/00	6.2	8.6	2.4	1.0	3.1	14.4
2000/01	-5.2	-10.4	1.9	0.9	9.6	42.8
2001/02	-7.2	-12.9	0.9	0.9	-1.9	-13.9
2002/03	15.1	24.8	0.5	1.0	-10.5	11.5
2003/04	8.6	11.8	2.8	1.1	17.0	13.8
2004/05	6.8	7.7	5.2	1.2	13.5	16.0
2005/06	12.6	14.0	8.1	1.1	10.9	15.3
2006/07	17.1	18.0	14.9	1.5	9.4	22.2
2007/08	25.4	34.9	12.6	2.0	7.5	20.4

Source: Central Statistics Agency

More attention was given to food price inflation since it constitutes 57 percent of the total household expenditure. Food price inflation shot up by 18 percent and 35 percent in 2006/07 and 2007/08, respectively. This surge in food prices has impacted upon the poor especially the urban poor. A lot of measures have been taken by the government to control inflation. Some of the measures taken include increasing the reserve requirements of commercial banks to reduce the money supply as well as large volumes of wheat import to be distributed to the urban poor at a reduced price. The major components of food items whose prices grew very high include spices (141 percent), Oils and Fats (47 percent), cereals (38 percent), vegetables (37 percent).

Figure 1.6: Inflation and agricultural output



Source: Central Statistics Agency

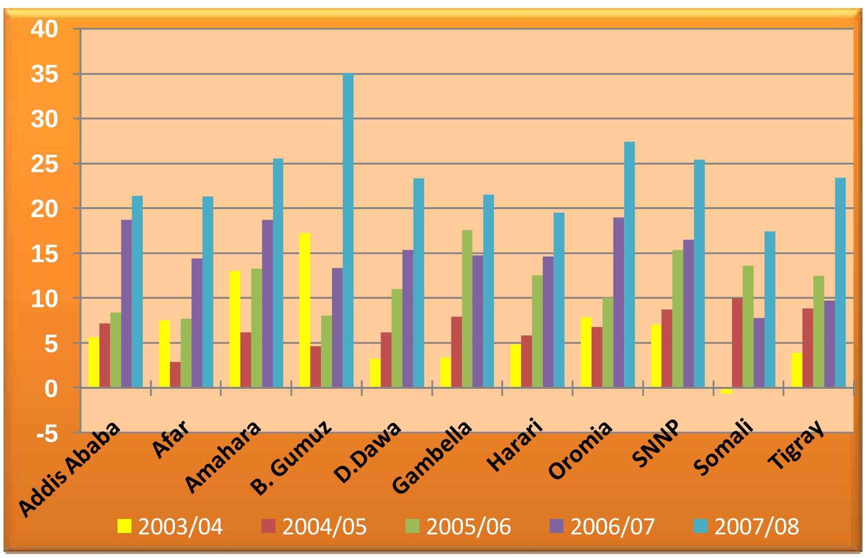
Similar to the national case, regional inflation rates have also been sharply increasing in the past few years especially during 2006/07 and 2007/08. This is expected given that prices are transmitted to regional centers from Addis Ababa. Annual Average inflation rate was the highest in Benishangul Gumuz region recording 35 percent in 2007/08 followed by Oromiya (27 percent) and Amhara (25 percent). Somali region and Harari recorded the lowest inflation rate recording, 7.4 percent and 19 percent during 2007/08, respectively.

Table 1.30: Annual average inflation rates in the regions

	2003/04	2004/05	2005/06	2006/07	2007/08
Addis Ababa	5.6	7.2	8.4	18.7	21.4
Afar	7.5	2.9	7.7	14.4	21.3
Amhara	13.0	6.2	13.3	18.7	25.5
B. Gumuz	17.2	4.6	8.0	13.4	35.1
Dire Dawa	3.2	6.2	11.0	15.4	23.3
Gambella	3.4	8.0	17.6	14.8	21.6
Harari	4.9	5.9	12.5	14.6	19.5
Oromiya	7.9	6.8	10.1	18.9	27.4
SNNP	7.1	8.7	15.3	16.5	25.4
Somali	-0.6	10.0	13.6	7.8	17.4
Tigray	3.9	8.9	12.5	9.7	23.4

Source: Central Statistics Agency

Figure 1.7: Annual average inflation rates in the regions



Source: Central Statistics Agency

1.8 Summary and conclusions

This section highlights the main points discussed in the various sub-sections, the salient features of the aggregate economy noted and the policy-related issues pointed. In addition to this it highlights the main macro-economic developments during the year.

The Ethiopian economy continued its 4th consecutive year of rapid growth keeping a steady growth of about 11.8 percent. The growth rate of the agricultural has declined over the past 5 years while the industrial sector maintains a steady growth. The Service sector, on the other hand, showed a significant surge. Accordingly, the share of the service sector in the GDP has increased coming close to the agricultural sector while the relative share of the agricultural and industrial sector in the economy has slightly fallen during the period. Therefore, the structure of the economy remains the same with agriculture still dominating followed by the service sector. Owing to the rapid growth in real GDP, per capita income has increased by an average of 8 percent. In the period under review the agricultural per capita growth has declined to 4 percent while that of the non-agricultural per capita has increased to 11 percent.

Domestic and foreign investments inflow increased during the reporting period. However, these investments are concentrated only in few sectors- the major ones being agriculture, manufacturing and real-estate activities. Moreover, of the total investment projects licensed during the fiscal year, only 189 (2 percent) of them started operation with capital outlays of less than 1.9 billion (1 percent).

The overall balance of payments of the country deteriorated during the reviewed year both in absolute magnitude and as a percent of GDP. The foreign exchange reserve available at the end of the reviewed year was able to cover less than 1.5 months of imports of goods and services. Although the capital account as a percent of GDP showed a 4.3% surplus, it could not offset the 5.7% deficit of the current account. The export earnings grew in absolute magnitude by 35% but dropped by more than 9% as percent of GDP. The import payments as percent of GDP, on the other hand, decreased only by 3.5%. As a result, the trade account deficit continued to widen.

Transfer accounts (both private and official) registered surplus and increasing trend in the last three years. Hadn't these accounts offset the ever widening trade account deficit, the current account balance of Ethiopia would have deteriorated further. On the other hand, though the trade account showed a massive deficit and the country's foreign exchange reserve depleted continuously, the nominal exchange rate remained relatively stable after it was devalued by more than 85% in 1992. Domestic inflation and the global economic slowdown appreciated the real exchange rate by more than 38% during the last five years. As a result, the competitiveness of the export sector was hit very hard to the extent that exporters showed reluctance to sale in the international market.

With regards to the monetary sector, the two previous years were marked by monetary expansion which was largely contributed by expansion in domestic credit. Meanwhile, the non-government sector is increasingly becoming the beneficiary of banking services which is an input in making the private sector the driving force behind Ethiopia's renascence. The last two years were also marked by relatively active changes in interest rate; nonetheless, the rate is much lower in the negative margin owing to the persistently high inflation rate the country has experienced in the recent few years.

Looking at the fiscal stance of the government, the revenue and grants increased by more than 35% vis-à-vis the previous fiscal year. However, since the expenditure also rose by almost the same percent, the government finance showed a deficit of Birr 7.2 billion during the reviewed year. The significant part of the deficit (more than 60%) was financed by borrowing from the banking sector which has direct impact on the inflation inertia the country faced. Tax revenue, representing more than 60% of the total revenue during 2007/08, remained to be the main source of revenue in Ethiopia. Similarly, import tax constituted more than 70% of indirect tax showing the country highly depends on foreign trade tax. Regarding the expenditure development, one interesting feature is, the share of capital expenditure has excelled that of the current expenditure since 2006/07. Economic development took more than 70% of the capital expenditure and its share is increasing as the share of social development showed slight decline. With respect to the recurrent budget, the share of general services declined slightly but the share of social and economic services rose in the recent years. From the general services, defense and security accounted for more than 60% in 2007/08.

Finally, the Ethiopian economy saw an unprecedented surge in general prices during 2006/07 and 2007/08 fiscal years. Although different hypotheses have been forwarded to explain the dramatic increase in prices, it seems that the past trend, where any increase in prices is accompanied by poor harvests and low GDP growth, has changed. The increase in prices is dominated by food prices that showed a 17 percent and 25 percent increase during 2006/07 and 2007/08, respectively. This poses problems for the poor especially the urban poor as food prices rose sharply. Regional Inflation also grew, Benishangul Gumuz recording the highest inflation in 2007/08, followed by Oromiya and Amhara Regions.

Chapter 2

Performance of the Agricultural Sector

This chapter attempts to examine the performance of the agricultural sector for the most recent years for which data is available and compares it with the preceding few years and also highlights the progress on agricultural productivity. The chapter begins with an assessment of the performance of the crop sub sector, followed by an assessment of the supply and use of modern inputs and agricultural credit in the smallholder farming system.

2.1 Agricultural land use

Data from the Central Statistical Agency (2007/08, Vol. IV) indicates that about 16 million hectares of land were utilized for various agricultural purposes (in 2008). This land was operated by more than 13 million agricultural households and about 14 million holders[1]. In terms of land use, about 79% was allocated for crop production (72% for temporary and about 7% for permanent crops). The remaining was allocated for fallow land (about 7%), grazing land (about 10%) and the balance has been occupied by wood lands and other uses (see Table 2.1).

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[1] According to CSA a holder is a person who exercises management control over the operation of the agricultural holding and makes the major decision regarding the utilization of the available resources. He/she has primary technical and economic responsibility for the holding. He/she may operate the holding directly as an owner or a manager. Under conditions of traditional agricultural holding the holder may be regarded as the person, who with or without the help of others, operates land and/or raises livestock in his/her own right, i.e. the person who decides on which, where, when, and how to grow crops or raise livestock or both and has the right to determine the utilization of the products. On the other hand, a household is considered an agricultural household when at least one member of the household is engaged in growing crops and/or raising livestock in private or in combination with others.

The average holding sizes per household and holder were recorded to be 1.18 and 1.15 hectares, respectively. On the other hand, the average cropland area was found to be 0.96 hectares per household and 0.93 hectare per holder.

Table 2.1: Agricultural land use in 2007/08

Land Use Total Area Average areas per farm holder	**Ha**	**%**	**(Ha.)**
Crop area*	12,382,438	78.9	0.93
Temporary crop area	11,343,121	72.3	0.87
Permanent crop area	1,039,314	6.6	0.14
Fallow land	1,165,337	7.4	0.09
Grazing land	1,529,603	9.8	0.12
Wood land	187,394	0.0	0.01
Other land use	422,172	2.7	0.03
Total	15,686,940		

Source: Computed from CSA (2008b): Agricultural Sample Survey. Report on Land Utilization, Volume IV.

*The numbers of households growing both types of crops are not mutually exclusive.

As indicated by the small farm sizes cultivated by millions of small farmers who use limited purchased inputs, agriculture in Ethiopia is largely subsistence. Though the average farm size was a little above one hectare, over 55% of the agricultural holders cultivated farms less than one hectare (see Table 2.2).

About 26 percent of the farmers cultivated farms larger than one hectare but less than two hectares but managed on average 32% of existing farm lands. Another 15% of the farmers cultivated farms that vary between 2 and 5 hectares. Those who cultivated farms exceeding 5 hectares are about 1 percent of the farming community and about 8% in terms of total farm lands cultivated by this group.

Table 2.2: Land use among different farmers

Holding Size (Ha.)	Total land Ha	Total land %	Average size per holder Ha	Number of holders No	% of holders
Under 0.10	42,925	0.3	0.05	937,608	6.68
0.10 – 0.50	1,055,501	6.7	0.30	3,547,226	25.96
0.51 – 1.00	2,485,586	15.8	0.73	3,390,130	24.81
1.01 – 2.00	5,042,257	32.1	1.42	3,550,625	25.99
2.01 – 5.00	5,885,076	37.5	2.85	2,063,882	15.11
5.01- 10.00	1,030,663	6.6	6.30	163,696	1.19
Over 10.00	144,931	1.0	14.06	10,311	0.00
Total	15,686,939	100.0	1.15	13,663,478	100.00

Source: Computed based on CSA (2008b). Agricultural Sample Survey. Report on Land Utilization. Volume IV.

2.1.1 The crop sub-sector

2.1.1.1 Cereal crops

The analysis on the crop sub sector covers the three major crops – cereals, pulses and oil crops. Unless mentioned otherwise, all figures used in this report come from the Central statistical Authority (CSA) which has official mandate to provide comprehensive statistical data on agriculture through the organisation and implementation of sample surveys.

Food crops are grown during two seasons; the minor season, *belg* (harvested from March up to and including August) and the major season, *meher* (harvested from April up to and including February) (FAO/WFP, 2009). As in the previous reports, data used in this report reflects the performance of the smallholder sector and for meher season, which contributes over 90% to the annual crop production.

The performance of the main cereal staples that include wheat, barley, teff, maize and sorghum was once again remarkable. In the reporting period, close to 145 million quintals of cereal crops have been harvested from 8.8 million hectares of farm lands. In terms of production, the 2008/09 production exceeds the preceding year's performance by 5.7%; while it exceeds the achievements of the 2003/04 production year by 70% and represents the fifth consecutive bumper harvest. Official sources indicate that over the past five years, production has increased on average by 14% every year.

Both area expansion and improved land productivity have contributed to this outstanding improvement in production of staple food crops. Official sources indicate that farmlands under cereal crops was expanded by 25% over the past five years, while yield grew by 28% during the same period (see Table 2.3). Though there are some disparities among the different crops, this progress, unlike the experience of other countries[2] which witnessed such kind of increased production, is generally not crop specific. The most outperforming crop is teff as its yield grew by over 45% in 2008/09 when compared to the 2003/04 (i.e. five years ago). Similarly, during the same period yield of barley and sorghum improved by 33% and 28%, respectively. Wheat and maize showed a 19% improvement and other crops which include finger millets, oats and rice grew by 38%.

Improvements in yield have surpassed area expansion in all crops except wheat, maize, and other crops that include finger millets, oats and rice. CSA data indicates that land cultivated by teff increased by 25% over the past five years, while its yield grew by 45% over the same period. Likewise, barley yield and land increased by 33% and 6% respectively. In the case of sorghum and other crops (that include finger millet, oats and rice), both land and yield grew almost proportionally. As shown in Table 2.3, land under sorghum production grew by 26% while its yield grew by 28% over the past five years.

[2] This refers to Asian countries which experienced the green revolution in the 1960s and 70s.

Contrary to the pattern seen in other cereal crops, area expansion accounts more to the improvement in the production of wheat and maize. Area under wheat and maize expanded by 32% and 29%, respectively, over the past five years; while their yield grew only by 19% in both cases.

Table 2.3: Performance of cereal crops in 2008/09 vis-à-vis the previous years

Crop	Area planted ('000 ha) In 2008/09	Change in area planted compared to		Production ('000 quintals)	Change in production compared to		Yield (Qt/ha)	Change in yield compared to	
		past year (%)	2003/04 (%)		Past year (%)	2003/04 (%)		past year (%)	2003/04 (%)
Teff	2,481	-3.3	24.7	30,280	0.1	80.5	12.2	4.5	45.2
Barely	978	-0.7	6.3	15,194	12.2	40.7	15.5	12.6	32.5
Wheat	1,454	2.0	32.3	25,376	9.6	57.2	17.5	7.7	19.1
Maize	1,768	0.0	29.3	39,325	4.9	54.6	22.2	4.7	19.4
Sorghum	1,615	5.3	25.8	28,044	5.5	60.9	17.4	0.6	27.9
Other cereals*	474	4.4	39.4	6,745	17.4	96.2	14.2	11.8	37.9
All cereals	8,770	0.5	25.3	144,964	5.7	70.0	16.5	5.1	27.9

Source: CSA (2009a) and CSA (2004a) (for Area, production and yield). The rest are computed from these government data. *Other cereals include finger millet, oats and rice.

2.1.1.2 Non-cereal crops

Official data indicates that about 1.6 million hectares of land was cultivated for various pulse crops in 2008/09 crop year, which exceeds the area cultivated in the preceding year and five years earlier (2003/04) by 4% and 44%, respectively. In terms of production, the country harvested about 19.6 million quintals of pulses in 2008/09 which indicates that the country has almost doubled (90%) its pulse production within five years. In the past year alone, pulse production grew by 10%. All this growth in production indicates a parallel growth in land productivity and in area expansion. Average yield of pulses grew by 32% and 8% over the past five and one years, respectively.

Table 2.4: Performance of non-cereal crops in 2008/09 vis-à-vis the previous years

Crop	Area planted ('000 ha) in 2008/09	Change in area planted compared to		Production ('000 quintals)	Change in production compared to		Yield (Qt/ha)	Change in yield compared to	
		Past year (%)	2003/04 (%)		past year (%)	2003/04 (%)		past year (%)	2003/04 (%)
Pulses	1,585	4.4	44.2	19,646	10.2	89.4	12.4	8.1	31.5
Oilseeds	855	20.9	49.7	6,557	6.3	109.6	7.7	-17.8	40.0
Vegetables	162	36.1	97.6	5,989	26.9	54.4	37.0	-6.6	-21.0
Root crops	146	-26.7	-9.2	12,136	-20.7	-24.4	83.1	0.0	-17.9
Fruit crops	48	-22.6	9.1	3,513	-24.0	40.7	73.2	0.0	30.4
Other/cash crops									
- chat	138	-25.4	23.2	1,149	-16.1	23.1	8.3	0.0	0.0
- coffee	391	-4.0	68.5	2,602	-4.9	101.2	6.7	0.0	23.4
- hops	24	-4.0	14.3	303		21.7	12.4	-3.2	3.4
- sugarcane	16	-24.0	14.3	5,594	-28.5	560.5	358.6	-1.2	--
Enset	278	--	--	5,566	--	--	20.0		--

Source: CSA (2009a) and CSA (2004a) (for Area, production and yield). The rest are computed from these government data. Note: computation of yield for a category of different crops is not advisable normally. The purpose of computing is only to see the progress over years. This also remains if the proportion of the respective crops in a given crop category (e.g. pulses or oilseeds) assumes to remain relatively unchanged (or change is insignificant).

On the other hand, oil crops which were cultivated on a little over 855,000 hectares of land in 2008/09 grew by 21% over the past year and 50% over the past five years. The production of oil crops doubled over the past five years and reached 6.6 million quintals in 2008/09 (see Table 2.4). Though yield declined by about 18% in the preceding year to 7.7 quintals/ha in the reporting period (2008/09 crop year), this level of yield is still very high (exceeds by 40%) when compared to the 2003/04 level.

Other non-grain crops cultivated by smallholders include vegetables, root crops, fruit crops, *Enset* and other cash crops (chat, coffee, hops, and sugar cane). CSA data indicate that about 1,203 thousand hectare were of land cultivated or occupied by these crops in 2008/09. In terms of cultivated land, coffee, *Enset* and vegetables are three most important non-grain crops with a percentage share of 33% (391 thousand hectares of land), 23% (or 278 thousand hectares of land) and 13% (or 162 thousand hectares of land), respectively followed by non-enset root crops with 146 thousand hectares and T'chat with 138 thousand hectares.

Though area cultivated by these crops has been increasing over the past five years, the trend seems to cease for the past year. With the exception of vegetables, area cultivated or covered by almost all of these crops which predominantly are cash crops has declined during the reporting period. Area decline was highest in root crops (decline by 27%), T'chat (by 25%), sugar cane (by 24%) and fruit crops (by 23%). Following the trend but at much low amount, area planted by coffee and hops declined in 2008/09 by 4% each.

The decline in areas is surprising because of first, the very high magnitude of decline (in a single year) especially for root crops, T'chat, fruits and sugar cane which were planted in 2008/09 on 20% less land when compared to the preceding year; second, because of the consistency or uniformity of the decline across a range of largely non-grain crops; and third and related to this, because the decline is also on permanent crops like coffee and plants that generate very high revenue to farmers, like T'chat. There is a need for a thorough examination of whether this reported decline in the area cultivated by these important crops is indeed true; and if it is true, it is important to assess whether this decline is desirable. But if it is found to be inconsistent with the plan, then it would be important to take appropriate measures (e.g. incentives for growers of these crops) to reverse the situation.

2.2 The use of modern inputs and technologies

Changes in technologies like improved seeds and fertilizers are the major source of productivity growth, though changes in factor ratio will also have impact on productivity. Technological change can increase the productivity of both factors (land or labour), though in practice it will of necessity be biased in one direction, changing the ratio between returns at the margin to one factor or the other. Adoption of high-value crops, or of inputs such as fertilizer, for example, is usually seen as labour augmenting; hence, may increase the marginal return to labour relative to capital and land inputs. In line with this, the quantity of fertilizers and improved seeds used and the area they are applied to and the use of pesticides and irrigation by smallholders over the reporting period is discussed both for cereal and non-cereal crops

2.2.1 The use of fertilizers

Ethiopia totally depends on imports to meet its annual fertilizer demand which has been steadily increasing over the past decade. The foreign exchange needed for fertilizer importation is financed through loans, donor assistance (grants) and Government treasury. According to FAO/WFP (2009) report chemical fertilizer use during the *meher* 2008/09 season, as indicated by cash and credit sales, increased by around 4 percent to 404 000 tons from a supply of 487 000 tons, leaving 83 000 tons to be carried over at Zonal distribution points until next year, despite significant increases in base prices of DAP (di-ammonium phosphate) to approximately ETB 820-900/quintal (USD 860/ton) and to approximately ETB 520-610/quintal (USD 570/ton) for urea.

The pattern and the amounts of fertilizer distributed to the various regions during *meher* 2008 were as follows: Oromiya received 42.3 percent compared to 47 percent in 2007 while Amhara received 36.8 percent compared to 32 percent in 2007. Similarly, SNNPR received 9.8 percent compared to 7.4 percent in 2007, whereas, Tigray received 3.5 percent compared to 3.8 percent in 2007. The remaining 7.6 percent (10.3 percent in 2007) was sold to farmers in other regions (FAO/WFP, 2009).

Despite the increase in sales, the use of DAP fertilizer declined in 2008/09. Against the trend over the past years, the use of DAP fertilizer declined by 9 percent in 2008/09 when compared to the 2007/08 (see Table 2.5). Similarly, the area on which DAP fertilizer was applied and the number of users of DAP fertilizer declined by about 6% and 5%, respectively. The trend over the past five years is, however, different. DAP use has been increasing by 62% since 2003/04, while farm land fertilized by DAP and number of farmers who applied DAP fertilizer increased by 42% and 47%, respectively.

Table 2.5: Utilization of modern farm inputs in 2008/09 and progress over the years

Input	Amount used in quintal (2008/09)	Applied area in hectare (2008/09)	Change in amount used compared to		Change in applied area compared to		Change in number of users compared to	
			Past year (%)	2003/04 (%)	Past year (%)	2003/04 (%)	Past year (%)	2003/04 (%)
Fertilize								
- DAP	1,313,060	1,606,803	-9.1	62	-6.1	42	-5.2	47
- Urea	253,618	274,600	5.2	50	6.6	43	11.4	60
Improved seeds:								
- All crops	219,512	465,809	17.2	30	7.8	142	8.2	187
- Teff	7,005	16,610	-12.8	61	-5.6	37	-12.4	-7
- Maize	86,882	349,217	0.3	33	1.4	27	4.7	19
- Wheat	99,655	56,030	31.4	55	34.7	23	35.3	30
Pesticides	NA	1,884,009	NA	NA	-0.1	111	0.0	97
Irrigation	NA	164,370	NA	NA	-8.6	36	-9.1	49
Participation in extension package	NA	1,496,063	NA	NA	8.2	40	9.7	41

Source: Computed based on CSA (2009b), CSA (2008c) and CSA (2004c).

Similar to DAP, the use of Urea fertilizer increased by 5% over the past year and by half (50%) over the past five years. There is a corresponding improvement in land cultivated using Urea fertilizer which increased by 43%. Similarly the number of farmers who applied Urea has increased by 60% in 2008/09 when compared with the past five years.

Despite this impressive progress, the improvement in fertilizer application rate is very modest. Fertilizer application rate among fertilizer users is on average 82 kg of DAP and 92 kg of Urea per hectare of cultivated land in 2008/09 crop year. Though there is a slight improvement over the past five years, the application rate in 2008/09 has declined by about 5% when compared to the 2007/08 rate. However, over the past five years there was a modest improvement. CSA data indicate that the average farmer has increased his DAP application rate by 14% to 82 kg/ha (of fertilized land) over the past five years.

Household level analysis also depicts a similar picture. Fertilizer consumption at farm household level has declined by about 5% over the past year, though it has increased by 10% when compared to the level five years ago. The average farmer used about 47 kilogram of DAP fertilizer in 2008/09 crop year (Table 2.6).

Though about one for every five farmers uses DAP fertilizer, the number of users of Urea (nitrogen source) is far lower than that - only 6 to 7%. The number of users of Urea fertilizer has also declined over time, though the application rate rose by about 6% over the past five years. Application rate varies from 92 kilograms per hectare of fertilized farmland to 30 kilograms per farm household.

Table 2.6: Intensity of modern farm inputs utilization in 2008/09

	Intensity of use in 2008/09 in Kg/ha (of applied area)	Achievement when compared to		Intensity of use in 2008/09 in Kg/household (user household)	Achievement when compared to	
		Past year (%)	2003/04 (%)		Past year	2003/04
Fertilizer						
- DAP						
- All crops	81.7	95.8	114.1	47.1	94.8	110.6
- Teff	77.5	112.2	120.5	43.2	142.1	156.0
- Maize	83.3	90.7	106.4	20.1	94.8	99.5
- Wheat	89.2	94.8	120.9	38.4	100.0	118.5
- Urea						
- All crops	92.4	98.8	105.5	30.2	94.7	94.7
Improved seeds						
- All crops	47.1	108.8	121.7	14.5	108.2	131.8
- Teff	42.2	92.5	117.9	16.6	99.4	172.9
- Maize	24.9	99.2	105.1	8.4	96.6	112.0
- Wheat	177.8	97.5	427.4	51.6	96.6	119.4

Source: Computed based on CSA (2009b, CSA (2008c) and CSA (2004c).

2.2.2 The use of improved seeds

Though improved seeds are critically important technology required for higher yield and productivity, the majority of farmers use local seeds. FAO/WFP (2009) report shows that in the 2008 *meher* season, at least 95 percent of all seeds used were local seeds carried over from the previous harvest either by the farmers themselves, following the traditional on-farm selection process whereby the farmer identifies next year's seed stock while it is still maturing in the field and gives it special protection, or by buying from preferred seed stock kept by other farmers in the same locality.

The CSA (2009c) report also indicates that of the 9.2 million quintals of seed farmers used in 2008/09 crop year, only 0.22 million quintals (or 2.2%) were improved/certified seeds. Similarly, of the 12.47 million hectares of land cultivated by various crops, only 0.47 million hectares (or 3.7%) were planted by improved seeds. Of the 21 951 tons of certified seeds used by farmers, 8,682 tons (40%) are maize, 9,966 tons (45%) are wheat, 950 tons (4%) are barely and 701 tons (3%) are teff seeds (CSA, 2009c).

Despite this low use of improved/fertilized seeds, there is some improvement over the past year. Total use of improved/certified seeds in 2008/09 crop year, for instance, increased by 32,233 tons (or 17%) when compared to the use in the preceding year. Overall, the use of improved seeds remains very low and is expected to be among the major constraints that retarded further growth of agricultural production and productivity in Ethiopia.

2.2.3 Irrigation and participation in extension packages

Of the 11.4 million hectares of land cultivated by various crops in 2008/09, only 164,370 hectares of land (1.4%) were irrigated[3] (CSA, 2009c). Though some progress has been made over the past fiver years[4], the progress is modest especially in view of the potential the country has. This indicates that the quality and quantity of the variable annual rains is still the major factor that determines the annual harvest.

Official data also indicate that in 2008/09; about 2.5 million farmers and 1.5 million hectares of farm lands were covered by the extension package programs which have been implemented by the Ministry of Agriculture and Rural Development (CSA 2009c). The coverage of the extension package is, therefore, 12% and 22% in terms of the number of farmers and cultivated

[3] This doesn't include any land irrigated by large estates.
[4] In 2003/04, 120,643 hectares of land were irrigated by small farmers which indicate a 36% improvement during the same period.

farm lands, respectively. Despite this relatively low percentage, the progress over the past five years is good as the extension package program has reached about 40% of the farmers and cropped land during this period (CSA, 2009c, CSA, 2004).

Chapter 3

Livelihood Diversification in Rural Ethiopia: Status, Potentials and Constraints

3.1 Background

Ethiopia's population is growing by 2 million people each year (equal to about 38,000 each week). It is very difficult to make progress in reducing poverty at this rate, because the economy cannot keep up, among others, in creating enough jobs. In the same way, Ethiopia's rain-fed agriculture which is supporting the livelihood of over 80% of the population could not continue in absorbing the growing population without compromising its productivity and sustainability. Rural livelihoods should, therefore, diversify away from agriculture to agriculture-related and other non-farm employments. Policy makers' awareness of the need to stimulate non-farm employment opportunities for the rural poor has also grown recently, as clearly reflected in the Plan for Accelerated and Sustained Development to End Poverty (PASDEP), Ethiopia's guiding strategic framework for the five-year period, 2005-2010.

Diversified subsistence orientation is the diversification of sources of livelihood by farm households, and involves engagement in farm (as wage labourer) and non-farm activities (Mwabu, 2001). Diversification improves employment opportunities and augments farm income especially to those with marginal or no land. It also helps to utilize local talent and 'slack' resources which cannot be easily transferred and utilized in the urban sectors[1].

Reasons for livelihood diversification include increasing income and income prospects, smoothing consumption, and reducing risks associated with failures of credit and other rural markets. Literatures (e.g. Gordon, 2000; Islam, 1977) classified these factors broadly into two - growth-induced and distress-push - groups. The former implies diversification where rural people respond to new opportunities; while the later is a result of distress push where risk is a major 'push' factor and the chance for diversification into marginal activities that hold low potential for reducing poverty and sustainable growth is very high.

Despite the recent improved policy attention to the rural non-farm sector, rural development policies often neglect the role of rural non-farm activities and their link with agriculture. This might be because the role of the rural non-farm sector is the least understood component of the rural economy; thereby, its role in the broader development process is not well known.

This study tries to assess the status of livelihood diversification in Ethiopia with the aim of providing insight to policy makers. Specifically the study[2] tries to answer the following questions:

- Does household wealth or ownership of productive asset have any relationship with its decision of livelihood diversification? Alternatively, which and why farmers engage in off-farm activities?

[1] It has also several other effects- largely positive but can also be negative (if the social cost exceeds private return of the activity). The net effect, among others, is affected by factors that lead farm households into diversification of their livelihood.

[2] This study is largely based on a paper the author (Samuel, 2009) presented recently at the Ethiopian Economic Association Seventh International Conference on the Ethiopian economy

- Does greater non-agriculture income diversification cause more rapid growth in earnings and consumption,
- Are there entry or mobility barriers to high return activities in rural non-agricultural sector, which limit exploitation of the opportunities they offer to the poor?

Moreover, attempt is also made to assess the relationship between off-farm and farm activities at household levels to get some insight on the potential of diversified subsistence orientation (rural livelihood diversification) on rural development. It also tries to see whether growth in the rural off-farm sector stimulates agricultural growth or vice-versa.

Data source

The data used in this study came primarily from a national survey conducted in 2006 by the World Bank and the Ethiopian Economics Association. The survey consisted of both household and community survey and undertook primarily to collect data to analyze the process and short-term impacts of the land registration and certification program. The survey covered 2520 households from 116 kebeles in 58 woredas drawn from the four major regions of Ethiopia- Amhara, Oromiya, SNNPR and Tigray.

3.2 The status of rural livelihood diversification

Non-agricultural income sources considered in this study include wage employments on farms, off-farms and in towns, public employments related to food-aid or cash-aid programs, remittances from relatives working away from home and self-employment in rural off-farm activities. Livelihood diversification into non-farm activities is very limited in rural areas especially when measured in terms of their contribution to rural income[3]. Samuel (2009), for instance, indicated that the share of non-farm income out of the rural income in Ethiopia is on average 23%[4] which is 10% to 25% less than the average of countries of South of Sahara (Table 3.1). Official report (CSA, 2007) also confirms the low level of non-farm employments in rural areas. According to the report, non-farm sources accounted for about 24% of rural household expenditure[5].

The report (CSA, 2007) also shows that almost 91% of rural economically active population employed in agriculture and agriculture-related primary activities (crop-agriculture, livestock-agriculture, hunting and fishing). The implication is that non-agriculture activities accounted for only 9% of the rural employment. This, however, should not be confused with participation rates. Households which took part in off-farm employments are expected to be far higher than this figure. Samuel (2009), for instance, showed that 26% and 16% of rural households participate in off-farm wage- and self-employments, respectively. Similarly, a study by Rijkers et al (2009) indicates that about 25% of all households in rural Ethiopia own one or more non -farm enterprises. Despite this relatively high participation rates, only about 2% of all households rely exclusively on non-farm enterprise activities (Rijkers et al, 2009).

[3] The larger the share of non-farm income in the total household income, the greater will be the degree of orientation of a livelihood strategy away from subsistence agriculture.
[4] This is based on the 2006 national survey conducted by the EEA and World Bank.
[5] Disaggregated by specific economic activities, the report shows that non-agricultural economic enterprise, wages and salaries, rent and remittance accounted for 8.2%, 3.3%, 5.8% and 6.7%, respectively, to household expenditure in year 2004/05 (CSA, 2007).

Table 3.1: The Status of off-farm employments in Ethiopia vis-à-vis other countries

Countries	Share of Rural non-farm employments	Survey year
Ethiopia	23% (in income)	2006 (Samuel 2009)
	24% (in expenditure)	2007, CSA
	9% (in employment)	2007, CSA
Other countries (share in income)		
Burkina Faso/sahel	52%	1982-85
Ghana	43%	1991-92
Senegal/southern	41%	1988-90
Uganda	26%	1992 & 1996
China	68%	1999
India	34%	1994

Source: Samuel (2009) and CSA (2007) for Ethiopia, for other countries: Byerlee et al (2005).

The types of off-farm activities smallholders engage in are few. Of all reported employments, wage or labor employments constituted 62% of all reported non-farm employments, while the balance 32% was the share of self-employments (Samuel, 2009). Among wage employments, the most common are casual unskilled labor and paid community development works (often financed through resources coming from overseas as food aid or cash aid). These two constitute about two thirds of all off-farm employments[6], with 35% casual unskilled labor being the top non-farm occupation, and donor-sponsored community development works contributed another 31%. The remaining one third employment is the share of 'skilled' casual labor like masonry, pottery (16%), agricultural wage labor (8%), and professional wage employment as teachers, health workers, and other office works in the public

[6] In this study, the term off-farm employment and non-farm employments are used interchangeably. Nevertheless, the former implies any activity including farming worked outside own farm, while the later indicates non-farming activities specifically.

sector (which accounts for 3%). Other type of activities contributed 7% to the reported off-farm employments (see Table 3.2).

Table 3.2: Type of off-farm activities rural residents engaged-in

Wage/labor employment		Self-employment	
Type of activity	**Percentage share**	**Type of activity**	**Percentage share**
Cash/food for work*	31%	Handicraft (weaving, pottery etc)	12%
Farm wage employment	8%	Fuel wood/charcoal/dung selling	14%
Non-farm wage employment	3%	Agricultural trade - grain	25%
Casual labor – 'skilled'	16%	Agricultural trade - livestock	7%
Casual labor – 'unskilled'	35%	Petty trade – consumer goods	13%
Other employments	7%	Petty trade – food and beverages	14%
		Others (traditional healers, renting pack animals, transport, milling)	16%
N	554		336

Source: computed from survey data (2006).

* From technical perspectives (especially in view that such employments have been initiated by outsiders and financed by resources coming from overseas), it is difficult to categorize cash/food for work activities as off-farm activities, but we keep it to make easier for comparison with many other previous studies which consider these activities as off-farm activities.

In an agrarian society, one of the earlier forms of occupational differentiation is the simultaneous emergence of farm "managers" or agricultural "entrepreneurs" and agricultural wage labourers (Clay et al, 2000). As reflected by very low share of agricultural wage labour, occupational differentiation in Ethiopian agriculture, however, is at its lowest point. This might be a reflection of small and egalitarian nature of farm land distribution/ownership[7], state ownership of land and restricted nature of rural land markets. As it seems that these factors will remain unchanged for the foreseeable future, the potential for farm wage labor employment (in the smallholder sector which manages over 90% farm lands) is also not promising.

Similar to the pattern in wage/labour employment, off-farm self-employments are also dominated by few activities. Despite the wide range of reported activities that include handicrafts (such as pottery, basket making, spinning, weaving, activities), renting of and transport by pack animal, and small trading activities of agricultural and consumer goods at open markets and at home, food/beverages making and selling, and petty trade are the most common activities. Nearly half of all non-farm self-employment activities are related to petty trades. Grain trade, marketing of livestock and livestock products and petty trade of consumer goods contributed 25%, 7% and 13%, respectively, to the reported self non-farm employments.

Fuel-wood, charcoal and dung cakes making and sale are also important livelihood diversification strategies for many farm households. Roughly one in every seven reported off-farm self-employment was related to this activity. Preparation and sale of food and local beverages (*tella*, etc) contributed another 14% to the reported self-employment, while about 12% is the share of handicraft-related employments (see Table 3.2).

There are some notable differences in regional distribution of some non-farm enterprises especially food/cash related public employments and agricultural (paid) employments. Not surprisingly, over 80% of off-farm employments

[7] Though the average farm size was a little above a hectare, over 55% of the agricultural holders cultivated farms less than one hectare. A little more than a quarter of the farmers (26%) cultivated farms less than 0.5 ha whereas those who cultivated larger than 2 hectares are not more than 16% of the farming community (CSA, 2008).

related to food/cash for work activities were reported in two regions – Tigray[8] and Amhara (see Table 3.3 and Annex Table 3.1). The other two regions, SNNP and Oromiya, accounted only for 12% and 6% of the reported food/cash for work related non-farm employments, in that order. The reverse is true in the case of agricultural wage employment (agricultural labor). Agricultural paid employment which has contributed only 8% to the national rural non-farm employments was disproportionately confined to Oromiya (66%) and SNNP (22%) regions. The share of Amhara and Tigray regions in agricultural paid-employment is only 7% and 5%, respectively.

Table 3.3: Regional distribution of off-farm employments in Ethiopia

Type of non-farm enterprises	Regional distribution of reported to have one or more member worked off-farm				N	F-value
	Tigray	Amhara	Oromiya	SNNP		
Self-employment	23%	11%	40%	26%	336	6.01***
Wage/labor employment > including cash/food aid related employment	31%	21%	29%	19%	554	5.48***
-> excluding cash/food aid related employment	22%	15%	40%	23%	382	4.09***
Food/cash aid related employments	49%	33%	6%	12%	162	9.76***

Source: computed from survey data (2006). *** significant at 1%

[8] Other studies also confirm the relatively better access to non-farm employments in Tigray region. The rate of participation in non-farm activities in two districts (Enderta and Adigudom districts) of the region was found 81% in early 2000. Of which, food-for-work employment accounted about 58% of the reported employment, while the remaining 43% was the share of non-food-for-work employments (Tassew, 2002).

The dominance of high value cash crops, fairly better supply of productive farm lands in the regions including the relatively high level of commercialization of agriculture in the regions could explain the high share of agricultural paid employments of the SNNP and especially of Oromiya regions. On the other hand, as traditionally food insecure areas where the potential for agriculture is relatively low might explain the dominance of food/cash-aid related public employments of the Tigray and Amhara regions[9].

3.3 Reasons why farmers diversify their livelihood

The status of livelihood diversification in rural areas and its characteristics including the geographical distribution of these employments were discussed in the above sections. Though these are important points, identifying the reason why farm households diversify their livelihood might be more important as it will help to reveal existing linkage between the rural farm and non-farm sectors and provide insight into the potential of rural non-farm enterprises to foster growth in rural areas[10]. Several studies have pointed out a range of factors that instigates livelihood diversification in rural areas. Most studies consider off-farm employments as a way to bridge the income shortfall that arises from stagnating farm production and growing population pressure. This implies that rural farm households participate in non-farm

[9] Though its share is less than 2 percent and might not cause any significant difference, the way how data are recorded especially for migrant (beyond their region) workers might slightly inflate the share of some regions especially of Amhara where relatively more migrant workers come from. In the survey data recorded as follows: if a household in region 'X' has a member migrated to other region and worked there, this employment is accounted in his/home region rather than where the activity is located.

[10] Getting farmers' views on the question, however, needs care as the question could bias respondents if it is asked directly. To avoid potential biasness, the question is framed systematically and instead of 'why you or a member of your family works off-farm', sample farmers were asked 'for what purpose the household spent the income they generated from off-farm sources. This approach has two advantages: first, it helps to get relatively true view of interviewed farmers, (ii) it also generates supplementary information that could highlight the linkage of non-farm employments with the farming sector.

employments when they suffer from deteriorating employment and income conditions from their farming activities. Another set of related factors that compel farmers to look for off-farm employments are related to risks in production and factor markets (incomplete markets in land, labor, credit and insurance)[11]. These are called distress-push factors as those who diversify their livelihood are poor farmers having little access to productive assets like land which are required for consumption or overcome unexpected risks (see Selim, 2006; Islam, 1977).

On the other hand, the shift of labor out of agriculture (temporarily or permanently) could also be due to the effect of increased income-earning opportunities provided by an expanding rural non-farm sectors and their increased and productive linkage with the farm sector. These factors are called demand-pull factors (ibid).

The majority of respondents were reported to have said that food purchase or the need to satisfy subsistence requirement of family members is the major reason for their livelihood diversification into off-farm employments. Over 80% of farmers engaged in non-farm wage-employments and over 70% of those who own and run small, non-farm enterprise spent their income generated from non-farm sources for the purchase of food (see Table 3.4). On the other hand, only about 8%, 3% and 5% of the sample households

[11] For example, individuals or households with special expertise in some craft will still continue farming because imperfections in land market and problems of monitoring will preclude the renting-out of farmland and the hiring of outside agricultural workers respectively. Another type of market failure could be that of product market failure of essential agricultural produce that forces households to diversify irrespective of where their comparative advantage lies. Credit market failure is also ubiquitous. A farm household may venture into non-farm activities to raise cash needed for agricultural investments, assuming the non-farm activity itself does not require substantial start-up cost (Barrett, Reardon and Webb, 2001; see Gajigo, 2007). The absence of insurance market and the presence of aggregate agro-climatic risk that cannot be addressed through risk sharing induce households to diversify into non-agricultural activities (Alderman and Paxson, 1992; see Gajigo, 2007).

have reported that they spent their income from non-farm sources for the purchase of farm inputs, to invest on small businesses or enterprises and child education or health, respectively.

Table 3.4: Purpose of livelihood diversification in rural Ethiopia (by region)

Reason/purposes	Tigray	Amhara	Oromiya	SNNP
	Percent of households			
Food purchase	84	91	77	71
Purchase of farm inputs	8	3	5	6
Invest in small business	3	1	2	1
Saving/expense for children	5	3	13	14
Others	0	2	3	8

Source: Samuel (2009)

This pattern of expenditure of incomes generated from off-farm employments highlights two points: (i) the data indicate the minimal level of productive linkage between farm and non-farm employments, and (ii) the fact that agriculture is unable to provide the subsistence requirement of those who diversified their livelihood into non-farm employments[12]. In general, lack of alternatives and low agricultural productivity are the major reasons for livelihood diversification into off-farm activities reported by the sampled farm households. They also indicate the low probability for expansion of existing non-farm employments and their productive linkage with the farm sector. Findings from other studies also indicate the stagnant nature of rural non-farm enterprises. Rijkers et al, (2009), for instance, indicated that existing non-farm enterprises provide no wage labor employment. The overwhelming majority of enterprises are one person enterprises and less than 1% of all enterprises employ more than 3 workers. In Amhara only 3% of all

[12] In view of the remarkable reported progress in agricultural production and productivity made over the past five years (see chapter 2), these arguments might not reflect (at least partially) the current situation.

enterprises hire workers. Almost all non-farm firms are small and own very little capital; the median capital stock is roughly 194 Birr (approximately 21 USD) (Rijkers et al, 2009).

3.4 Participation in off-farm employments opportunities

3.4.1 Location of non-farm employments

Survey results indicate that most off-farm employments were located in the village where farm households reside. Only 16% of the non-farm activities are located outside one's own village, and only 3% of farm households travel outside their Woreda (district) for off-farm works (Table 3.5). The pattern remains similar across the different regions with a slight exception for the SNNP region where employment outside own village and Woreda rose to 27% and 6%, respectively. This reflects the fact that the majority of non-farm employments could not provide incentive to migrate or work beyond one's own home/village. Rather than 'pulling' people away from agricultural activities, the non-farm sector absorbs labor that cannot be gainfully employed elsewhere. The lack of mobility/migration (in search of off-farm employments), on the one hand, and the growing population pressure on agricultural lands and other natural resources, on the other, should be a concern for policy makers.

Table 3.5: Location of non-farm employments (% of reported off-farm employments)

Location of Off-farm employments	Regions				
	Tigray	Amhara	Oromiya	SNNP	Total
My home/farmstead/village	91%	88%	85%	67%	84%
Other village in this district	7%	9%	13%	27%	13%
Other district in this zone	1%	0	1%	2%	1%
Other zone in this region	0	2%	0.5%	2%	1%
Other region	0.5%	1%	0.5%	2%	1%
Abroad	0.5%	0	0	0	0
N	171	111	144	105	531

Source: computed from survey data (2006).

3.4.2 Participants in non-farm employments

Like farming, non-farm employment is a family business in Ethiopia. However, Off-farm employments are predominantly the responsibility of children living with their parents. Children aged between 8 and 18 years[13] accounts for about 64% of all off-farm employment in rural areas of Ethiopia (Table 3.6). The dominance of children living with their parents in off-farm employments implies that poverty competes children's school time/future and the poor status of smallholder agriculture (at least among farm households diversified their livelihood)[14]. Household heads (husband/wife) account for about 16% of the employment in case of wage employments and 15% in own, self-employments, followed by spouses at 14% and 13% for wage and self-employments, respectively.

[13] In some cases, children less than 8 years are reported to take part in off-farm employments.

[14] In a growing marginally more productive non-farm sector, the data could be interpreted as an indicator of the entrepreneurial ability of the young generation and/or the attractiveness of the non-farm sector.

Table 3.6: Participants in non-farm employments

Household members that are employed in off-farm works	Wage (labor) employments (%)	Self-employments (%)
Household head	16.1	14.9
Spouse	13.7	13.1
Children	63.9	65.1
Grand parents	1.4	1.2
Sister/brother	1.3	1.4
Others	3.6	4.3
N	2282	1946

Source: computed from survey data (2006)

3.4.3 Participation of women in non-farm employments

Analyzing the role of gender in non-farm employment might help to generate information that could be used to design institutional support programs focused on a certain segment of households who are faced with some specific entry barriers. Farm households having male or female heads or with young and seniors could not have equal opportunity in diversifying their livelihood.

Consistent with the case in farming, the survey data indicate that nearly 86% of all off-farm employment is held by men. The highest female participation is found in Amhara where 16% (self-employment) to 25% (in wage/labor employment) off-farm employments were held by female headed households (Table 3.7). Disaggregated data at enterprise level also show similar pattern. The share of women in casual-unskilled labor and food/cash aid related public employments, for instance, is about 17% each, while they account 13% and 39% in retail trade (grains and others) and selling beverages (largely homemade), respectively.

Table 3.7: Participation of women in non-farm employments by regions

Region	Wage-employment			Self-employment		
	Female (%)	**Male (%)**	**T-value**	**Female (%)**	**Male (%)**	**T-value**
Tigray	13%	87%	2.19**	15%	85%	0.44
Amhara	25%	75%	3.41***	16%	84%	0.13
Oromiya	11%	89%	1.31	10%	90%	1.89*
SNNP	7%	93%	1.39	14%	86%	1.30

Source: computed from survey data (2006).
*,**,*** denotes level of significance at 10%,5% and 1%.

The mean age of participants is less than those not employed in off-farm activities by 3 years in both wage-employment and self-employment and the difference between the two groups is statistically significant. With the exception of Oromiya region, age (having older household head) was found to be an important entry barrier especially for wage/labor employments (Table 3.8). This might be associated with the relatively low access to farm lands among younger households[15] or entrepreneurial ability of households with young heads or both factors could play a role. However, the low return from non-farming activities (relative to farming) (see Table 3.9) implies that shortage of farmland could be the major factor of high participation in off-farm employments among the younger households. In terms of policy, this may imply one or more of the following (i) the need for enhancing labour productivity especially in the non-farm sector, (ii) the need to make agriculture more labour intensive. It may also indicate the need for attaining higher agricultural productivity and availing food at cheaper cost so that the relatively low income from non-farm sources could not lead to food poverty.

[15] In addition to this bivariate analysis, it is important to undertake further analysis with multivariate models where the relative significance of age is examined together with other factors that are expected to influence household decision or access to off-farm employments.

Table 3.8: Age of household heads of participants and non-participant households

Region	Wage-employment			Self-employment		
	Participants (%)	Non-participants (%)	T-value	Participants (%)	Non-participants (%)	T-value
Tigray	47	50	2.27**	48	48	0.10
Amhara	43	50	4.13***	45	48	1.15
Oromiya	48	49	0.68	46	49	1.78*
SNNP	44	48	2.34**	49	47	1.26
National	46	49	4.27***	45	48	2.37**

Source: computed from survey data (2006).

3.5 Access to assets and participation in off-farm employments

Farm households decision to diversify their livelihood or the type of enterprises to which they diversify their farm livelihood is expected to be affected by their wealth level especially their access to farm lands. Hence, it might be useful to examine whether both relatively better-off and poor households diversified into non-farm employments', and if diversification is not linked to the size of farm land, whether both relatively better-off and poor households diversify into activities that are similar in their remuneration. Based on a review of several studies carried out in different countries, Mauba (2001), for instance, indicated that a negative relationship has been observed, between wealth and non-farm incomes (both in shares and levels) in Asia and Latin American countries while the relationship was positive in SSA (Mauba and Thorbecke, 2001). Table 3.9 examines the role of farm lands (proxy for wealth but, because of government policy, cannot be used to generate cash through sale or collateral in case of credit)

Table 3.9: Access to productive assets and participation in non-farm employment

	Per capita land ownership (ha/person)				
	<0.1	**0.1– 0.25**	**0.25 – 0.6**	**> 0.6**	**F-value**
Participation					
off-farm wage-employments	37%	30%	19%	17%	21.26***
off-farm self-employments	22%	19%	10%	14%	16.49***
Productivity in farm and non-farm activities					
Farm income (Br/calendar day/hh)	15	24	28	26	9.04***
Non-farm income (wage) (Br/working day/hh)	10	15	7	12	2.01
Non-farm income (self) (Br/working day/hh)	36	42	11	12	1.51
Role of off-farm employments					
Per capita mean income from non-farm sources	81 (204)	74 (209)	38 (156)	71 (445)	4.35***
Share of non-farm income in household income (%)	32 (44)	19 (35)	9 (26)	13 (33)	34.65***
N					

Source: Samuel (2009).

***, ** and * indicate significance at 1%, 5% and 10% levels, respectively.

Note: Figures in parentheses are standard deviations.

Though both farm households with large farm size (i.e. better-off farm households) and those who cultivate small farm sizes (poor households) diversify their livelihood into off-farm activities, access to farm land is found to be important in the decision of livelihood diversification as indicated by high statistically significant difference in participation rate. Land-poor households participated more often in off-farm employments (100% higher in the case of wage-employments and over 40% in the case of self employments). Moreover, non-farm employments are more important in the livelihood of land-poor households as they generate relatively high proportion of their income from the non-farm sources.

Despite these differences in participation rates there is no evidence to support the hypothesis that better-off households diversify into better-paying activities (i.e. activities where wages are higher than those in agriculture). This is in contrast to most findings in Asia where studies (see Islam, 1997) document that the poorest groups (the landless and small-scale farmers) diversify into activities where wages are no higher than those in the agricultural sector, while higher income groups (larger scale farmers) also diversify, but into better paid sectors.

The fact that both relatively better-off and poor households engage in off-farm activities that pay less when compared to the return from farming demonstrate the similarities in the process or incentives that lead to livelihood diversifications in rural areas. In addition to the lack of opportunities for better-paying off-farm activities, the result also implies that farm households' poor access to finance, education or influential contacts forces them to exploit any remunerative off-farm opportunities.

3.6 Growth potential of non-farm enterprises and their linkages with agriculture

3.6.1 Potential for expansion of non-farm activities

Non-farm enterprises are expected to be dynamic, not to be low-productive activities of a residual nature to which farm households turn merely as a last resort if they have the potential for growth or expansion. Quantitatively, this can be assessed in two ways: by computing the marginal rate of return (MRR) of these activities or/and by computing the opportunity cost of non-farm activities (i.e. the forgone income because of households' participation in non-farm employments).

The opportunity cost of participation in non-farm activities could be a relevant indicator in assessing the growth potential of these activities only during peak agricultural seasons when employment in the non-farm sector could reduce labor supply for farming operations and when the likelihood for farm households to choose on-farm or off-farm employments is high. This, however, requires information on the labor supply and demand pattern of participant households especially for their farm activities which, among others, depend on their farm size and the seasonality of farming.

Survey data indicate that agricultural wage exceeds non-agricultural wage (see Table 3.9) which implies that owners of non-farm enterprises and other employers have little incentives to expand and invest in their non-farm enterprises. As mentioned earlier, this disparity in wages in favor of agriculture, however, could be valid only if participation in non-farm enterprise activities reduces the supply of labour to agricultural activities. A study by Rijkers et al (2009), however, indicates that non-farm enterprise activity does not drastically reduce the supply of labour to agricultural activities in rural Ethiopia. The difference in wage between on-farm and off-farm activities has, therefore, little implication on the growth potential of existing non-farm enterprises as prioritizing agriculture in farm household labor allocation has not reduced labor supply for off-farm activities either because of availability of enough labor or the time difference in labor requirement of the farm and non-farm enterprises.

Similar to the opportunity cost of farmers' participation in non-farm employments, marginal rate of return (of these employments) is a good indicator for growth potential of non-farm enterprises. Any sustainable expansion of non-farm activities necessitates a positive marginal rate of return. In other words, the return to the last day of employment (in case of wage employments) or last unit of investment (in case of self-employments) should be equal or greater than the rate of return to the preceding day employment (or unit of investment). But, any marginal productivity analysis demands time series data preferably at enterprise level.

Table 3.10: Productivity in agricultural and non-agricultural activities among households

	Duration of employment (number of days/annum/household)				
	<35	**36-99**	**100-250**	**>250**	**F-value**
Return to farming (Br/day)	8 (16)	27 (43)	18 (24)	22(41)	3.71**
Return to non-farm (self) employment (Br/day)	13(11)	13 (14)	11 (10)	8 (9)	14.2***
N					

Source: Samuel (2009).

Figure in parenthesis indicates standard deviations.

Though time series data at enterprise or household level are preferable, data from cross-sectional surveys could also be helpful to analyze the growth potential of non-farm enterprises and employments if there is sufficient degree of variation in employment period (the duration of employment) among the sample farm households. Accordingly, sample households were classified into four groups based on the number of days they spent on non-farm activities; then the rate of return among these groups was computed and analyzed. Data analyzed in this study (see Table 3.10) indicate that return from non-farm employment is inversely related to the duration of employment (especially for employments for over 3 months period) which highlights the low marginal productivity of labor (among households working for longer period) and limited expansion potential of existing non-farm enterprises.

In general, together with the low labor productivity in off-farm employments, this finding indicates that investing in and expanding (existing) non-farm enterprises might simply not be worthwhile or not attractive enough for farm households and rural persons having other alternatives.

A study by Rijkers et al (2009) also indicates the low growth potential of non-farm enterprises in rural Ethiopia. First, they find that most enterprise activities are worthwhile when other opportunities are lacking. The returns to running a non-farm firm are very low; on average about 5.6 Birr per day, and even lower for enterprises managed by women. These marginal returns are much lower than the going wage rate for casual workers. In Amhara, the wage rate for casual agricultural laborers is approximately 7 Birr for women and 10 Birr for men. Yet, wage labour opportunities are very scarce: combining primary and secondary employment 11% of the working age population in Amhara ever works for a wage. In addition, enterprise activity is highly countercyclical with agriculture, which suggests that non-farm enterprise activities are most appealing when the opportunity cost of labour is low (Rijkers et al, 2009).

In addition, existing firms are stagnant due to lack of investment. Very few firms invest or expand their workforce[16]. According to this study, no more than 8% of all firms have increased the number of employees and only 30% have increased the total number of labour days used during the year since start-up. A mere 19% of the firms have re-invested since they started. The lack of investment is due to the high risk environment that entrepreneurs face, the high cost of capital in rural areas, and precipitously diminishing returns to capital. The likelihood of investing falls as uncertainty proxied by the variability in agricultural performance induced by rainfall volatility increases. Investment is also negatively correlated with the household's ability to access emergency finance, suggesting that households with better insurance and/or access to credit are more likely to invest (Rijkers et al, 2009).

Moreover, markets are small and localized. For example, more than 90% of entrepreneurs walk to the market and very few firms sell to customers outside their own community. As a result of the prohibitively high transaction costs,

[16] Even though the returns to capital are high at the margin.

most firms are local monopolists and even if they are not, they have substantial market power, further limiting their incentives to invest.

Though further analysis especially at enterprise level[17] might be important, findings from this study and Rijkers et al (2009) indicate that there is a long way to make non-farm enterprises a pathway out of poverty for rural residents. Policy interventions seem essentials to address major constraints of these firms that holdback the productivity of these enterprises.

3.6.2 Non-farm activities linkages with agriculture

Although smallholder agriculture in Ethiopia remains the principal source of employment and income for the majority of the rural people, its dynamism, among others, depends on conditions prevailing in the rural non-farm sector which could stimulate growth in agriculture and local economy through its expected linkage with agriculture and source of income and employment for those who lack enough farm lands. Growth in non-farm sector creates opportunities for higher incomes and employment in the agricultural sector through production and expenditure linkages within the sectors. In particular, farm households tend to invest the income they earn from non-farm activities in farm equipment and consumable inputs such as fertilizers and insecticides. Similarly, better performing agriculture could enhance the demand for non-farm products and the incentives to invest in non-farm enterprises and wage-employments including migration.

Though the linkage expected between the farm and non-farm sectors runs in both directions, the analysis that follows examines only the one that runs from the non-farm to farm sector. Participation in off-farm employments has almost no impact on the use of modern purchased farm inputs; hence, its

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[17] In many of the analysis non-farm activities are categorized into two groups – wage- and self-employments. The study, however, might generate more information and insights had it been done at individual activity level.

direct production linkage with agriculture is barely negligible. Farmers who diversified their livelihood into non-farm activities were those who poorly participate both in farm input and output markets, in most cases much lower than their counterparts who specialize in agriculture. The survey data show that farm households who participated in non-farm wage-employment spent on average 22% less for the purchase of farm inputs. Similarly, farm households who own and run non-farm enterprises spent 12% less on their farms (Table 3.11).

Results from this household level analysis indicate that households' demand for food, non-food consumables and other services like education is high when farmers engage in off-farm employments, indicating the importance of non-farm activities for the emergence of cash-based economy in rural areas where agriculture is largely subsistence. Consumption of purchased food and non-food consumables including education exceeds by 16% and 23%, respectively, among farm households who diversify their livelihood into non-farm sectors. This could have a positive effect on growth especially if consumption focuses on agricultural goods and services produced locally. On the contrary, the effect of off-farm employments on factor markets is mixed – strong and positive on credit market (usually for consumption purpose) but weak and negative on land rental markets.

In general, the non-farm sector lacks the required attributes to be a catalyst for growth and a pathway out of poverty. Its major role is limited to provide income-earning opportunities to those lacking alternatives or generates too little from farming.

Table 3.11: Linkage of farm and non-farm activities

	Non-farm wage-employment			Non-farm-self-employment (Have/have not an enterprise)		
	Participants	**Non-participants**	**t-value**	**Participants**	**Non-participants**	**t-value**
Production (backward) linkage						
- Cash expenditure for farming						
- Br/household	165 (186)	211 (206)	4.03***	190 (208)	216 (208)	2.09**
- Br/hectare	419 (80)	529 (281)	0.23	616 (174)	441 (196)	0.35
- Use of fertilizer (% applied)	34% (47%)	33% (47%)	0.48	28% (45%)	36% (48%)	2.83***
- Use of improved seeds (% applied)	6% (23%)	5% (22%)	0.26	8% (27%)	5% (22%)	2.64***
- Use of pesticides (% applied)	9% (1%)	16% (1%)	3.87***	21% (2%)	16% (0)	2.47**
Factor Market linkage						
- HHs employs non-family labor (%)	23%	77%	5.51***	16%	84%	4.24***
- Participation in finance market						
- % borrowed	58% (49%)	39% (49%)	7.66***	59% (49%)	43% (50%)	5.70***
- amount borrowed	1099 (1122)	726 (797)	5.43***	961 (960)	778 (906)	2.52**
- Share of credit in farm cash expend.	23% (34%)	20 (29%)	1.57	20% (29%)	22% (30%)	0.76
- HHs rented out land (% rented-out)	25%	75%	4.52***	19%	81%	3.49***
- HHs rented-in land (% rented-in)	33%	67%	2.15**	15%	85%	2.32***
Consumption linkage						
Value of food/drinks purchased (Br/week/hh)	54 (38)	48 (39)	3.37***	58 (40)	47 (38)	4.92***
Annual expenses for education, tax etc (Br)	1567 (1196)	1385 (978)	3.45***	1712 (1227	1474 (1065)	3.91***
Monthly expenses for non-food items (Br)	172 (178)	167 (171)	0.59	212 (230)	175 (182)	3.74***
N	548	1,582		341	1789	

Source: Samuel (2009). ***, ** and * indicate significance at 1%, 5% and 10%, respectively

3.7 Constraints on dynamic and competitive non-farm sectors

A range of factors including the widespread poverty, shortage of farm land and high population pressure encourage the diversification of livelihood in rural areas. Only few rural residents are integrated into the off-farm labour market as employees and laborers in rural areas. Even for the few who are currently employed in the rural non-farm sector, most off-farm enterprises did not create sufficient opportunities for them to get out of poverty[26].

Several factors hamper the development of a dynamic and buoyant non-farm sector in rural Ethiopia. The lack of policy (at least until recently) and strategy that recognizes the role of the rural non-farm sector in the broader development process has been one of the major challenges, which might have contributed to the poor performance and stagnation of the rural non-farm sector in two ways. First, the lack of policy could weaken rural residents' access to finance, insurance and/or technical support that are needed to seize off-farm income-earning opportunities. Similarly, the lack of clear policy could also retard the growth potential of the non-farm sector by slowing down the production and expenditure link that otherwise could have prevailed in a dynamic non-farm and farm sectors.

The high degree of poverty and low agricultural productivity are not conducive for the growth and sustainable expansion of non-farm enterprises and their productive linkage with agriculture. Low productivity and income from agriculture denies the opportunity for income generated in the sector to be invested in high return activities in non-farm sector (including migration, wage and self-employment).

[26] This doesn't mean that they have no contributions to rural income.

On the other hand, most of the existing off-farm employment opportunities are dominated by traditional activities which could not provide any higher wages than agriculture. This discourages new investment in the rural non-farm enterprises and limits the possibility for strong productive linkage between the farm and non-farm sectors as it depresses the interest of better-off households to engage in non-farm enterprises. Moreover, the difference in the wage in favour of the agricultural sector suggests that supplying more farm labour to existing non-farm enterprises is not worthwhile.

Finally, imperfect factor markets especially rural land markets could hinder occupational shift of farmers having the resource and skill to get out from farming partially or fully. The policy that prevents land to be used as collateral for credit could hinder entrepreneur farmers' ability to generate cash to invest in the non-farm or farm sectors.

3.8 Conclusion and policy implications

Although the Ethiopian agriculture has been the intended beneficiary of rural development strategies of successive governments, it has also suffered from bad policies including policies and institutions that discriminate rural non-agricultural enterprises which has forced the agricultural sector to absorb the growing rural population. Given the high rates of population growth, dwindling land holding and the limited availability of cultivable land, the smallholder agriculture could not continue to absorb and retain the growing rural population and ease the social cost[27] of high rural-urban migration. A dynamic non-farm sector could also stimulate agricultural growth by contributing to growth in agricultural commercialization and productivity.

[27] Of course, food aid and other rural social welfare programs that are usually financed through donors-fund have also a crucial role in providing some employment (through public development programs like food or cash for work) and especially in averting the huge social cost of rural-urban migration.

Despite these apparent needs for livelihood diversification, findings of this study indicate that the nature of rural non-farm enterprises in Ethiopia is very much under developed– both in size, growth potential and alleviating poverty. Official data on the sectoral composition of the rural labor force and its change over time also indicate the stagnant nature of the rural non-farm sector in Ethiopia.

Though government policy documents (e.g. PASDEP) give better attention to rural non-farm activities in recent years, findings from this and other studies (e.g. Rijkers et al, 2009; Tassew, 2002) indicate the need for designing specific development programs and studies that will help to identify constraints to the existing rural non-farm enterprises and promote economic activities that offer the greatest potential for employment and income generation at grassroots level, so that non-farm employments in rural areas expand and productivity improvement in smallholder agriculture sector becomes more feasible.

In addition to its role in creating income-earning opportunities, a lot has to be done to make the rural non-farm sector a catalyst for growth and a pathway out of poverty for rural farm households whose income portfolio is very limited and narrowing with time.

Among others, findings from this study indicate the need for further location specific disaggregated study to identify constraints, growth-potential and linkage with the farm sector of existing non-farm enterprises. Such knowledge and information will help to design location specific development interventions that are helpful for the development of the rural non-farm sector and to foster the linkage between the farm and non-farm sectors. Likewise, studies on best country (Asian and African) experiences especially a thorough review of best practices in income-generation programs targeted to the rural poor is important.

Another potential avenue for development of non-farm sector in rural areas is their poor production linkages with the farm sector. As this is both due to the nature of participants of the non-farm sectors and the type of activities, it is important to identify incentive mechanisms and organizational supports that can both attract better-off households into the rural non-farm sector and enhance the productivity of these activities especially those having high linkage potential with farming activities.

Chapter 4

Changes in the Performance, Structure and Investment of Manufacturing Industries in 2007/08

This is a continuation of the series of annual reports on manufacturing industries. This year's, 2007/08 report focuses on major changes in the performance, structure and investment of large and medium scale manufacturing (LMSM) industries.[1]

4.1 Performance

In all aspects of performance measures, i.e., number of enterprises, employment capacity, capital and technology, etc, large and medium scale manufacturing sector is still in its infancy. In 2006/07 there were only about 1400 firms, employing 133000 workers and operating at a production capacity worth about birr 17.7 billion ($1.7 billion), and that for a population of over 76 million (NBE, 2007/08). The report refers to this infant manufacturing sector.

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[1] The report is based on the regular annual surveys of large and medium scale manufacturing and electricity industries by Central Statistical Agency (CSA). By the time this report is being written (second quarter of 2009), the latest publication available is that of the 2006/07 survey result.

4.1.1 New establishments

Nearly 200 firms were newly established in 2006/07. This is an increase of about 16 percent over the previous year's stock of enterprises and the highest recorded in the last few years. However, additional establishments were not evenly distributed across industrial groups. The change materialized only in few industries and there are industrial groups where firms were closed down in large numbers. Of the total additional firms in the sector 58 percent (about 115 firms) were in the production of articles of concrete, cement, and plaster (i.e., production of bricks and blocks for buildings) (Figure 4.1). This was driven by the recent upsurge in building construction country-wide. Had it not been for the shortage of raw materials, particularly cement, this activity would have increased much higher as it requires little capital and, literally, no a priori skill to establish a new enterprise. 57 other firms were established in printing and publishing services, and manufacturing of furniture.

It should, however, be noted that though expansion of such industries (as manufacturing of articles of cement and concrete) is commendable, their employment generation and new additional value creation capacity is highly limited as the initial capital required is too small and a priori skill needed is quite rudimentary.

Unfortunately, in industries of great importance for industrialization, such as capital goods industries, a large number of firms (about 30), were closed down during the reference period: 20 firms in manufacturing of fabricated metals; 5 in basic iron and steel ; and 4 in machinery and equipment.[2] But what could be some of the probable reasons?

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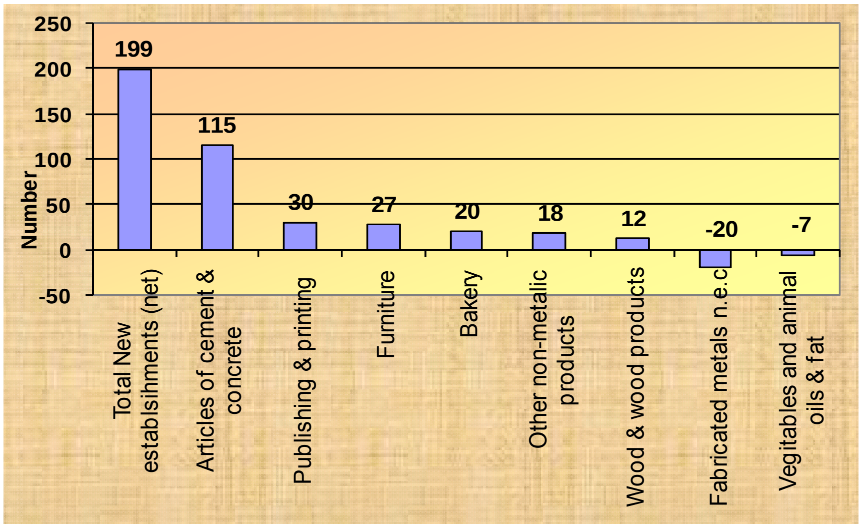
[2] CSA surveys do not account for the reasons why firms are closed down. It requires conducting separate additional survey/study to fill the gap.

Figure 4.1: Major changes in new establishments by industrial group in 2006/07



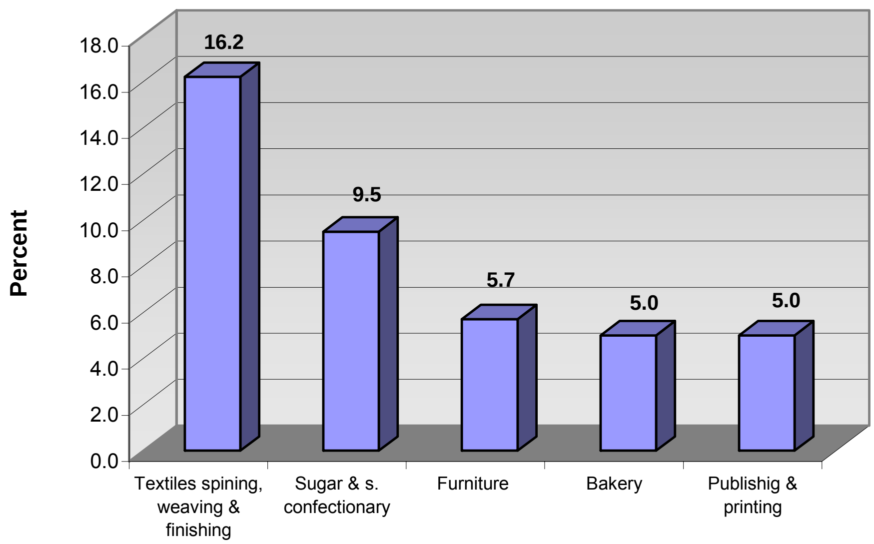
Source: CSA, 2008

4.1.2 Employment generation

As noted earlier, large and medium scale manufacturing industries employ an infinitesimal proportion of the total population – about 0.17 percent. Moreover, even this small level of employment is generated in few industrial groups, all engaged in simple processing activities.

As shown in Figure 4.2, for the 4.3 years average (2004/05-2006/07), five industrial groups alone account for over 40 percent of the total employment in the sector. Textile spinning, weaving and finishing industry alone employs over 19000 workers, i.e., over 16 percent of the total, while the next largest industry – Sugar and sugar confectionary – accounts for another 11400 employees, nearly 10 percent of total. Another 3 industrial groups: furniture, publishing & printing and bakery accommodate 15.7 percent of the total. Hence, the employment configuration is quite skewed. It should also be emphasized that the low employment capacity of industrial groups other than these ones is primarily due to their small size, but not of their capital intensiveness.

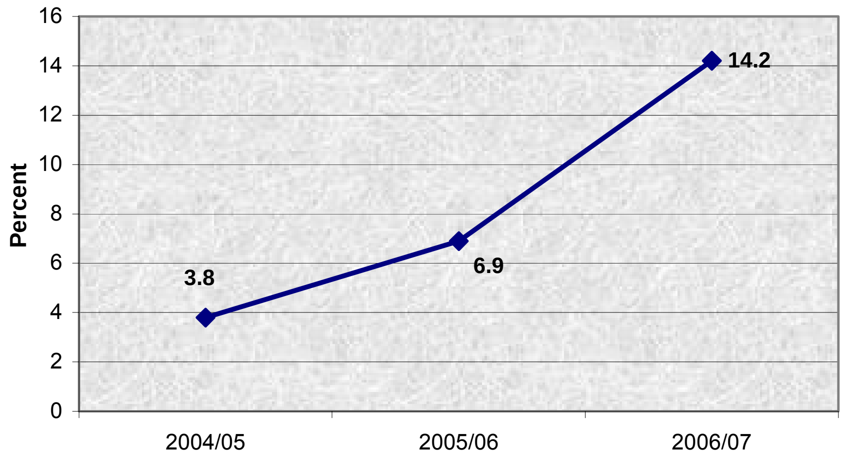
Figure 4.2: Major employment generating industrial categories (2004/05 – 2006/07)



Source: CSA, 2008

As noted earlier, employment level in 2006/07 was just about 133000. This represents additional 16627 workers over the previous year, equivalent to about 14 percent growth. Again, like the number of establishments, this is the highest level of increment secured over the previous few years (Figure 4.3). Figures/numbers not visible

Figure 4.3: Short term employment growth pattern



Source: CSA, 2008

However, additional employment was not largely generated by the same industrial groups where relatively large numbers of new enterprises were established. This time major employment was created in 4 industrial groups (Table 4.1). As a result of only two newly established firms, the bulk of net additional employment, about two-thirds, was generated in sugar and sugar confectionary. As newly established industries, particularly in the very early years of their establishment, inevitably operate at low capacity, it is logical to expect that further increase in employment would take place in the coming few years as the enterprises build up their capacity utilization. Another significant additional employment, about 3500, was made in wearing apparel production. In light of the external market opportunities availed in the past few years, this industrial activity should have expanded at a much faster rate than that prevailing today. It is believed that it will continue to pick up further in the foreseeable future.

Table 4.1: Major changes in employment level in 2006/07 by industrial group

Industrial group	Change in employment
Total net additional employment	16627
Sugar and sugar confectionary	10810
Wearing apparel	3505
Articles of cement and concrete	1710
Chemical and chemical products	1362
Production of cordage, rope etc.	1040
Textiles spinning, weaving, etc	- 1443
Capital goods industries	- 885

Source: CSA, 2008

Further additional employment opportunities were also created in industrial groups, such as manufacturing of articles of cement and concrete, and manufacturing of parts and accessories of motor vehicles. Note that as underlined above, though large numbers of firms (about 115) were established in the manufacturing of articles of cement and concrete, their employment capacity is highly limited – only about 1740 additional workers. Such enterprises employ, on average, around 13 workers per enterprise.

On the other hand, a number of industrial groups, mainly textiles and capital goods producing sub-sectors have either reduced their operating capacity or closed down temporarily, thereby reducing their employment level. From the same Table, about 1443 workers in textiles, and around 885 in capital goods industries, workers were laid-off in the same year. The latter includes manufacturing of fabricated metal products (579), basic iron and steel (199), machinery and equipment (95), and motor vehicles (12). Note that in the case of capital goods industries many firms were closed down in the same year, probably because of the steep rise in the price of raw materials – particularly, structural metals.

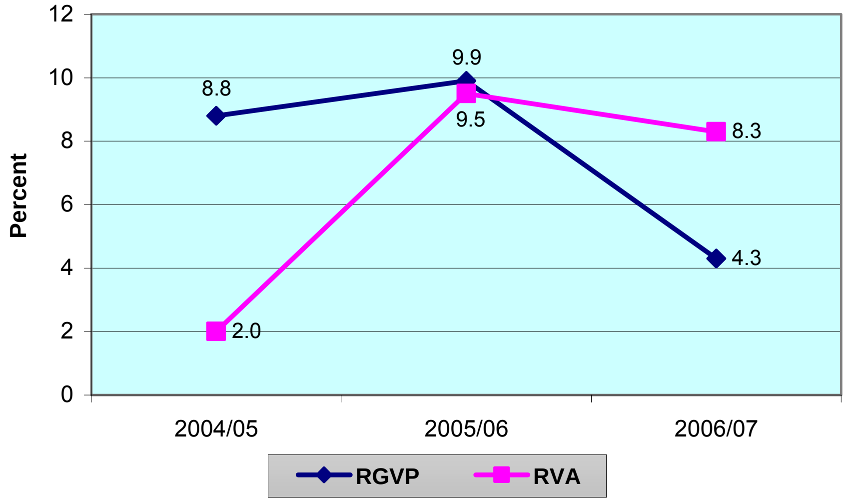
4.1.3 Production capacity

In 2006/07 the gross value of production (at current market price) of the sector, amounted to Birr 17.7 billions, equivalent to the value of manufactured goods worth only 233 birr per person per year, leaving a wide supply gap to be addressed through imports. This is quite a reflection of an economy with little industrial base. Currently, the sector operates, on average, at half its maximum capacity (around 55 percent). However, even if it operates at full steam, with improved firm level productivity and a policy environment retuned to create favorable market and demand conditions, there would still exist considerable supply shortfall that can only be met through imports. Hence, a fundamentally revised industrial strategy, other than what is practiced today, would be required to expand the industrial base of the economy.

In the same year, 2006/07, the gross value of production in real terms (at 1999/00 prices) increased by 4.3 percent, but was lower than the rates recorded in the preceding couple of years (Figure 4.4).[3] Most large firms registered positive changes, though at low rate. However, as in the case of employment and number of new establishments, most firms in the capital goods industries (except in motor vehicles) recorded, in real terms, declines in their production levels.

[3] For most industrial groups, GVP is deflated by the respective National Consumer Price Index, with 1999/00 as the base year (EEA, June 2009). For others the non-food price index is used.

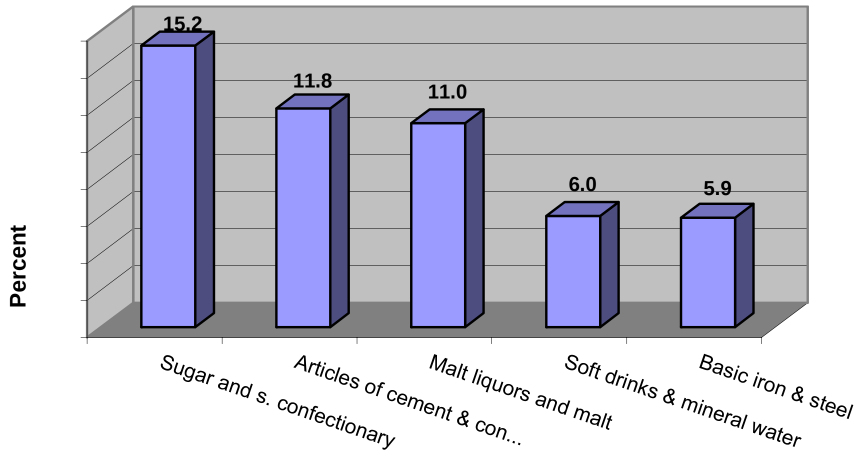
Figure 4.4: Short term growth trend of real GVP and value added



Source: Annex Tables 4.1 and 4.2

The capacity of the sector to generate new value added, i.e., the capacity to turn out new/additional products through the process of physical and chemical transformation of raw materials/inputs, is highly limited due to mainly technological capability constraint – as a result of both deployment of earlier generation hardware (machinery and equipment) as well as poor educational (technical) background of workers; hence, very low productive capacity. At current market prices, the total value added generated in 2006/07 by all industries was only birr 7.07 billion. This attributes to labor (wages and salaries), capital (depreciation and interest rate), rents (building, ware house, vehicles, etc), and profit (entrepreneurs remuneration). Nearly half of the total value added is generated by few industrial groups. As shown in figure 4.5, for the 3 years (2004/05-2006/07) average, the major industries generating relatively high value added include sugar and sugar confectionary, articles of cement and concrete, malt liquor and malt, soft drinks and mineral water, and basic iron and steel. These four industrial groups together contributed nearly 44 percent of the total value added.

Figure 4.5: Value added share by major industrial group (2004/05 – 2006/07)



Source: CSA, 2008

It should be noted that this may not necessarily be an outcome of higher productivity level (see section on productivity below). The size of a firm is also a significant factor. The larger the size, the larger the value added.

In 2006/07, real value added (at 1999/00 prices) for the sector increased by an appreciable 8.2 percent over the previous year. The bulk of the net increment for the year was made by a single industry – manufacturing of articles of cement and concrete. Other industrial groups such as manufacturing of malt liquors and malt, wearing apparel, and textiles have also contributed significantly. However, there were also industries that recorded declines including manufacturing of rubber and plastic, and paper and paper products.

4.1.4 Productivity level

As hinted earlier, a general and indirect indicator of the level of productivity is the capacity to generate value added – the ratio of value added to GVP.[4] This is shown in Figure 4.5. What is regarded as 'value added' is the value of newly created goods (and services) by labor and capital over a fixed period of time – conventionally a year – in a given activity. Hence, the value added as a proportion of total value of production (the latter includes the value of all inputs as well as the newly created value added) provides a general indication of the level of total productivity.

For the sector as a whole and for the past several years, this proportion of value added to gross value of production has never exceeded 40 percent. Table 4.2 shows relatively best and least performing industrial groups for the three years average (2004/05-2006/07). Accordingly the best performing industries: distilling, rectifying and blending spirits, and tobacco generate a value added nearly about two-thirds of the gross value of production.

Another seven industrial groups have the capacity to generate 50 percent and above. Only about 10 industrial groups out of 48, have the capacity to generate value added higher than 50 percent of their respective gross value of production. At the bottom end of the spectrum, industries such as leather tanning and dressing, grain milling, and manufacturing of accumulators and batteries have capacities not more than 17 percent.

[4] A rigorous estimation of factor productivities require a reliable data of both labor (or wages) and capital. However, the value of fixed assets is given for only limited firms. Moreover, even what is availed is quite unreliable as there is no any standard valuation method, particularly in the method of calculating depreciation. It is largely a crude estimate. As a result, only proxy variables are used for productivity.

Table 4.2: Value added to GVP ratio by select industrial group (2004/05 – 2006/07)

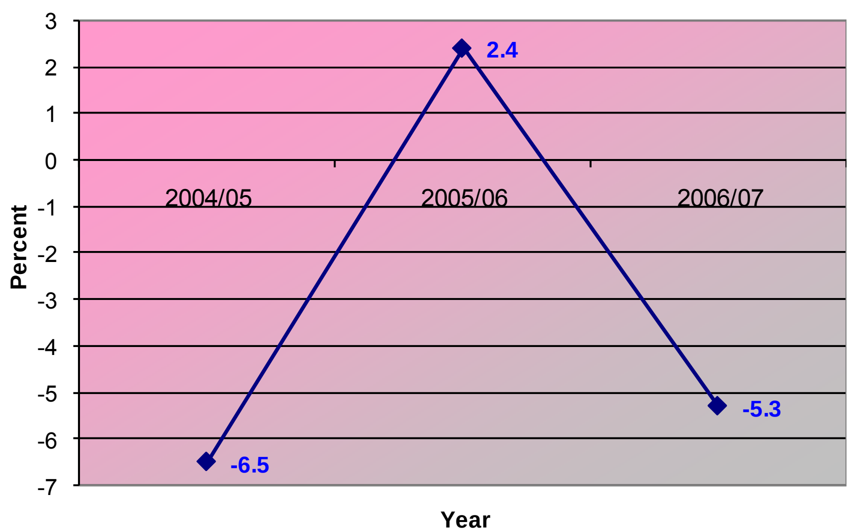
Industrial group	VA/GVP ratio (%)
Distilling, rectifying and blending spirits	67
Tobacco manufacturing	62
Manufacturing of parts and accessories for motor vehicles	58
Manufacturing of wine	58
Manufacturing of sugar and sugar confectionary	57
Manufacturing of cement, lime and plaster	57
Manufacturing of malt liquor and malt	56
Manufacturing of machinery for food and beverages processing	56
Manufacturing of glass and glass products	51
Grain milling	17
Manufacturing of accumulators, primary cells and batteries	16
Leather tanning and dressing	16
All industries	39

Source: CSA, 2008

Another proxy indicator of the level of productivity is value added per unit of labor employed in the production process. This is not labor productivity proper as the value added cannot be attributed altogether to labor alone. Other factors including capital, quality of inputs, rent, etc, are also part and parcel of the process of generating value added. For the 3 years average, for all industries and at current market prices, the value of newly produced goods per unit of labor per year is, on average, about birr 48,288 birr (Annex Table 4.1). But we know that this is attributed to all factors, including labor (wage), capital (depreciation and interest rate), rent and entrepreneurship remuneration (profit). But the yearly average wage of labor for all industries is about birr 9,285 (Annex Table 4.1), which is about 19 percent of total value added. This means, what is attributed to capital, rent and profit is just over 80 percent of the total value added. Note also that given these figures, average wage of labor is about birr 775 per month (or $2.58 per day).

A distinguishing feature of value added per unit of labor is its cyclical trend over time.[5] For the sector as a whole, real value added per unit of labor employed (at 1999/00 prices) in 2006/07 declined by over 5 percent after a modest rise in the previous year – 2005/06 (Figure 4.6). In 2006/07, only about half of the industrial groups recorded real growth, and that at low rates. Between 2004/05 and 2006/07, for all industrial groups – except for three industries: manufacturing of malt liquors & malt, wine and Tobacco – growth had never been consecutively positive for even two years.

Figure 4.6: Short term trend of real value added per unit of labor



Source: Annex Table 4.2 & CSA, 2008

[5] See also EEA, Annual Report Vol. VI. Significant change is also observed annually in the data, particularly for employment and value added in nominal terms which raises concern about the reliability of the data.

Table 4.3 depicts selected industrial groups with relatively high real value added per unit of labor. Considering a 3 years average (2004/05 – 2006/07), three industrial groups, namely manufacturing of tobacco, manufacturing of cement, lime and plaster, and production of malt liquor and malt, respectively recorded real value added per labor of birr 337.6, 169.4 and 157.3 thousands per year. These values are 4 to 8 times greater than the average for all industries, which was birr 39.7 thousands. As shown in the same Table, other industrial groups with relatively high real value added per labor include manufacturing of wine, parts and accessories for motor vehicles, and sugar and sugar confectionary. On the other hand, at the other end of the scale, industrial groups such as manufacturing of articles of cement and concrete, production of accumulators, primary cells and batteries, wearing apparel, textiles spinning, weaving and finishing, and bakeries have real value added per labor, as low as birr 8.0, 9.3, 10.1, 13.0, and 13.1 thousands, respectively.

Table 4.3: Real value added per unit of labor per year for selected industrial group

Industrial group	**RVA per labor ('000 birr)**
Tobacco manufacturing	337.6
Manufacturing of cement, lime and plaster	169.4
Manufacturing of malt liquor and malt	157.3
Manufacturing of basic iron and steel	118.1
Textiles spinning, weaving and finishing;	13.0
Wearing apparel	10.1
Manufacturing of bricks and blocks	9.3
Manufacturing of accumulators, primary cells and batteries	8.0
All industries average	39.7

Source: Annex Table 4.2 & CSA, 2008

The implication of the wide real value added per labor gap between industries is quite obvious. Industrial groups with higher real value added per unit of labor are relatively more capital intensive than others. In the first 4 industrial groups listed in the Table, wages are only 8.3, 6.7, 11.6 and 8.8 percent of the respective value added. And, on average, wage rates are much higher than in other industrial groups, 2 to 3 times higher than the average wage rate. Hence, industrial groups of higher value added per labor employ few but relatively skilled labor than the rest. Note also that regarding industries with low value added to labor ratio, such as, for instance, textiles, wearing apparel, etc, in addition to their capacity to engage in export trade, it is their capacity to generate relatively more employment that gave them a strategic advantage for short-term growth. That is why such industries are regarded strategic by government (FDRE, August 2002).

4.2 Structural feature of large and medium scale manufacturing industries

4.2.1 Sectoral share in national income

As underlined earlier large and medium scale manufacturing industries have limited role in the economy – be it in employment, production or export. For decades, the share of large and medium scale manufacturing sector in the national income (GDP) remains stagnant, while other sectors such as trade, construction, services, etc, have shown notable changes. As shown in table 4.4, for the last few years its share was about 3.4 percent; and for long, its share has never exceeded 3.5 percent.

As all other least developed countries, Ethiopia's economic structure reveals a feature of a subsistence economy. A significant structural change in the economy would only come about with conscious industrialization strategy as opposed to the current 'no strategy' option (see EEA, Vol. III, 2003/04).

Table 4.4: Broad sectoral structure of the economy

Economic Sectors	2004/05	2005/06	2006/07
Agriculture and allied activities	47.0	46.7	45.9
Mining and quarrying	0.4	0.4	0.4
Manufacturing	5.2	5.1	5.1
Large and medium scale	3.4	3.4	3.5
Small scale and cottage industries	1.8	1.7	1.6
Electricity and water	2.2	2.1	2.1
Construction	5.7	5.7	5.7
Services	39.5	40.0	40.8
Total	100.0	100.0	100.0

Source: National Bank of Ethiopia, 2006/07

4.2.2 Industrial structure

As early as the 1920s, manufacturing industries in Ethiopia kicked-off with simple processing industries based on easily exploitable natural resources of the country, such as textile, leather, food processing, etc. Such industrial groups still remain dominant. Table 4.5 portrays the relative share of manufacturing industries by broad industrial groups for two consecutive period of time: 1999/00 – 2002/03 and 2003/04 – 2006/07.

For one thing, food and beverage processing still holds over 40 percent of the total manufacturing output (at 1999/00 price), though gradually declining over time. For instance, in the second 4 years period, its share declined from that of the previous period by 6 percentage points, which is quite significant.

The second dominant industrial group – clothing and footwear, however, does not seem to show any change during this specific period. This is the industrial category that is accorded top priority and where currently the process of updating state-owned enterprises is proceeding (see section 3 below).

Table 4.5: Relative production share of broad industrial groups (%)

Broad industrial group	1999/00 –2002/03	2003/04 –2006/07
Food, beverages and tobacco	45.4	39.0
Clothing and footwear	18.5	18.3
Wood and wood products	2.1	2.6
Paper, paper products and printing	4.6	5.6
Chemicals and chemical products	5.9	6.3
Rubber and plastic products	5.1	5.7
Non-metallic products	8.1	9.5
Capital goods industries	10.2	12.9
Total	100.0	100.0

Source: CSA, various issues of Report on Large and Medium Scale Manufacturing and Electricity Industries, 2005 – 2008.

The capital goods industrial group has a share of just above 10 percent. Over the two periods, it increased by 3 percentage points. But this is due to a single enterprise group – manufacturing of basic iron and steel which has been increasing very recently due to the expansion of the construction sector. Both demand and prices of construction materials, as iron and steel, have been steeply rising for the last few years. The non-metallic sub-sector which increased by one percentage point is also due to the same factor which augmented the demand and price of cement, lime, plaster and articles thereof.

It should, however, be noted that the high demand and sky rocketing price of construction materials which has been revealed in the past few years, may not be sustained for long as such demand is not strictly economic motivated. It is rather due to government's political economy initiative. The current high demand for construction materials and steep rise of prices of the same, may subside to some extent as government's investment target shifts to other sectors and as more construction materials producing enterprises, currently under establishment, begin to operate at full scale.

Yet, capital goods industries, including machinery and equipment, and related fabricated metal manufacturing need to be encouraged further on a priority basis, if other industrial sectors have to expand. No successful industrialization would take place without industries, such as metal foundries, manufacturing of motors, instruments, essential tools, etc, which currently do not exist at all.

The other industrial group of critical importance for manufacturing in general is chemical manufacturing. Literally, there is no chemical industry in the country of importance for industrial development. There are few chemical products enterprises such as manufacturing of soap, detergent, perfume, etc, but not basic industrial chemical production per se. Such enterprises do not exist in the country. As noted earlier, chemicals account for about 50 percent of imports of the manufacturing sector. It is practically impossible to expand the sector without establishing such essential industries. Recently government has been conducting studies on chemical industries. It is hoped that a policy environment to promote such industries would soon be in place.

It should also be noted that similar to basic and industrial chemicals, other critical industries for industrial development, such as electrical and electronics industries, which are today leading industries in East Asia and other industrializing economies, does not exist in Ethiopia. Such industries are key factors for general industrial innovation.

4.2.3 Input structure

The proportion of imported inputs (raw materials and intermediates) in total, is also an indicator of the degree of dependency of domestic enterprises on foreign sources for their inputs. Table 4.6 indicates proportions of the value of imported raw materials to total inputs for the three years period, 2004/05 – 2006/07.

Primarily, there are few industrial groups that largely depend on domestic inputs; most depend, nearly entirely, on imports. Even the least dependent sub-sectors such as manufacturing of non-metallic products, and food processing, require imported inputs, on average, from 10 to 20 percent of total inputs. Natural resource based industries, such as leather, textiles, and wearing apparel, regarded as strategic for foreign exchange earnings, need imported inputs for up to half of their total intake. The implication is profound. These are the major foreign exchange earning industries in manufacturing. For instance, in 2006/07 these industrial groups together shipped out about 73 percent of total manufacturing export. But in the same year their raw material import need was nearly three-quarter of their export earning; So, little is remained from their export proceeds. As can be referred from the same Table, imports of the rest of the industrial groups range from 75 to 99 percent of the corresponding total inputs hence, heavily dependent on foreign industries. These sectors actually resemble much like out-post industries, with parent industries located externally.

Table 4.6: Input structure (imported to total) by industrial group (percent)

Industrial Group	2004/05	2005/06	2006/07
Food and beverages	20.5	20.6	23.8
Leather	16.2	21.0	21.6
Non-metallic products	5.4	9.5	19.2
Textiles	39.6	40.9	41.5
Wearing apparel	21.2	31.2	52.7
Chemical and chemical products	85.7	83.1	78.5
Rubber and plastic products	97.7	91.8	95.4
Basic iron and steel	60.8	67.2	98.9
Fabricated metal	81.2	92.6	87.5
Machinery and equipment	96.1	99.7	96.2
Parts, accessories and bodies for motor vehicles	98.6	94.7	85.0
All industries	46.0	50.1	58.3

Source: CSA, 2007 & 2008

Given that foreign exchange constraints are one of the challenges of industrialization, a strategy which exclusively focuses on natural resource based industries should expand its vision towards import replacement industries. It should be appreciated that the East Asian industrialization strategy considered export promotion and import substitution as complementary strategies, and not substitutes (EAA, 2003/04)

4.2.4 Market structure

Rightly so, most manufacturing industries were primarily established to meet local market demand. As hinted in the previous paragraphs, currently only a handful of industrial groups, including leather tanning, clothing and footwear, sugar and sugar confectionary, and food (fruits and vegetables) processing industries, are regularly exporting, while some others are attempting to find markets, meanwhile shipping out small bundles occasionally.

Between 2004/05 and 2006/07, on average, over half of the total manufacturing export was generated by the leather tanning and dressing industry. During this period, on average, about 70 percent of its total sale was shipped to foreign markets (Table 4.7). For the same period, just over 20 percent of total manufactured export was sugar. Sugar manufacturing is primarily meant to satisfy local markets. But as a result of the European Union Everything But Arms (EU-EBA)[6] export opportunity scheme for ACP countries, on average, about 15 percent of its output found its way to the EU markets, while the remaining large proportion was supplied to local markets. Similarly, other food processing industries (fruits and vegetables) exported, on average, about 19 percent of their output, but their share in total export of manufactured goods was too small (2.7 percent). Textile manufacturing is the other sub-sector trying to break into the international market, currently

[6] See http://ec.europa.eu/...

supplying only about 10 percent of its total output. However, its fundamental problem is not market access, but supply capacity.

Table 4.7: Share of export to total sales by industrial group (percent)

Industrial group	Export value as a proportion of total sales (percent)			
	2004/05	2005/06	2006/07	Average
Leather tanning and dressing	80.1	77.7	51.2	69.7
Sugar and sugar confectionary	19.9	14.4	10.2	14.8
Other food products (fruits and vegetables)	29.1	15.5	12.4	19.0
Textiles spinning, weaving, and finishing	9.7	10.8	11.9	10.8
Footwear	11.3	5.0	13.5	10.0
Wearing apparel	0.3	1.1	17.0	6.1
All other exporting industries	0.4	0.4	1.3	0.7
All exporting industries average	16.2	11.4	12.8	13.5

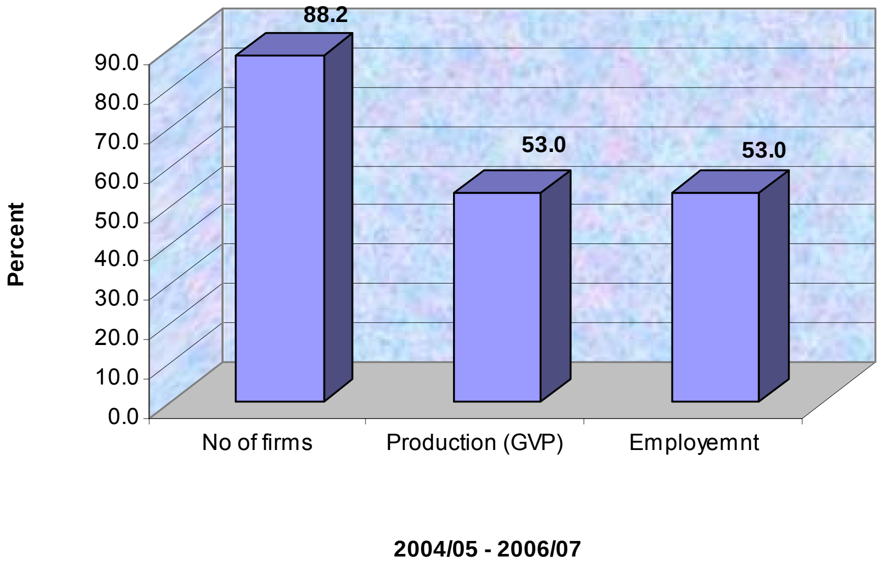
Source: CSA, 2008

All other exporting industries are supplying small bundles to the export market, and even that irregularly. In general, considering all manufacturing industries, between 2004/05 and 2006/07, altogether, they supplied to foreign markets, on average, only 15 percent of their total output, while the bulk was destined to the local markets.

4.2.5 Ownership structure

Despite the fact that active privatization has been stalled for long, the share of the private sector (both private proper and so called ‘endowments’) in manufacturing is still increasing and getting momentum. Today the private sector has an equal share with the public sector in employment and production.

Figure 4.7: Private share in the number of establishments in manufacturing



Source: CSA, 2008

As shown in Figure 4.7, in fact the private sector has a dominant share (88 percent) in the number of enterprises. However, its share in production and employment is much lower, just above 50 percent. This is primarily because of the fact that public-owned enterprises have much larger scale than private ones. In fact, government consciously privatized smaller scale enterprises while retaining larger ones under its control. It is also the case that newly established private enterprises initially operate at much lower scale than full capacity. It takes time to move to higher capacity production.

4.3 The structure of manufacturing investment: What holds for future industrialization?

The underlying reason for the manufacturing sector to remain dwarf for over half-a-century is the lack of any appreciable investment in the sector. Over the last decade and a half, investment in modern manufacturing has been gaining more significance than investment in other economic sectors. Table 4.8, shows total sectoral investment, largely incentive driven private investment, over the last 16 years (1993-2008).[7]

Table 4.8: Total sectoral investment (July 1992 - June 2008)

Economic Sector	Investment capital (birr millions)	Investment share (%)
Agriculture, hunting and forestry	7935	18.9
Fishing	7	0.0
Mining and quarrying	394	0.9
Manufacturing	13393	31.9
Construction	3931	9.4
Electricity, gas, steam and water supply	2241	5.3
Transport, storage and communication	3363	8.0
Wholesale, retail trade and repair service	993	2.4
Hotels and restaurants	857	2.0
Real estate, renting and business activities	6102	4.5
Education	2315	5.5
Health and social work	416	1.0
Other community, social and personal service activities	94	0.2
Total	42042	100.0

Source: Ethiopian Investment Agency, January 2009.

[7] Incentives are attached to investment projects, each with a minimum initial capital of birr 250 000 (about US $ 25000).

Nearly 40 percent of total capital invested (which is by far the largest share) was made in manufacturing. The next highest share, 19 percent, is only two-third of that in manufacturing. This might be taken as an indicator of the trend that industrial development is gearing up. While this is so in relative terms, it is not actually the case for two reasons: one is that the amount of investment is quite miniscule. The total capital invested over the 16 years period was only birr 13393 million, which implies an annual investment of 837 million (i.e., around US $83 million). The idea of building an industry based economy, at this rate of investment, is too remote to realize.

The other factor that determines the pace of industrialization is sub-sectoral allocation of investment within manufacturing. Balanced linkage between industries within manufacturing is an essential element for industrialization. This comes about more through conscious and deliberate investment coordination, rather than through solo market arbitration. In the case of Ethiopia such industrialization strategy at national level is not yet known. To some extent, incentives are provided more to industries with strong linkages to agriculture, and which are, at the same time, export-oriented (FDRE, August 2002). In the Ethiopian context, this means a continuation of the past investment allocation that has been operational for over half a century.

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Table 4.9 shows total invested capital over the last sixteen and a half years in manufacturing. Nearly 40 percent of the total capital has been invested in food processing, beverages and textile industries. But this is typical of the remote past. For decades, these sub-sectors attracted relatively high investment for simple reasons, such as less capital requirement, availability of raw material inputs at arms length, low technology and hence technical knowhow requirement, labor intensiveness, domestic/easy market access, etc. But while some of these are important factors for minimizing the risk associated with initial investment, further progress demands to move to higher stages of production – better technology and organizational technique, skilled labor, larger market access, etc. Despite the relative high investment, the strategic importance of these sub-sectors, with respect to technological progress, linkages with other industries, etc, is highly limited. No matter how large the investment in these sub-sectors is, the impact on industrialization would remain insignificant.

Table 4.9: Total capital invested in manufacturing industries (July 1992 – April 2009)

Manufacturing sub-sectors	Investment capital (birr millions)	Investment share (%)
Manufacturing of food products and beverages	2991	21.1
Textiles and clothing	2436	17.4
Manufacturing of Chemical and C. products	1932	13.7
Manufacturing of structural metal and m. products	1460	10.3
Manufacturing of rubber and plastic	1328	9.4
Manufacturing of non-metallic mineral products	1244	8.8
Manufacturing of leather and l. products	875	6.2
Manufacturing of Electrical and electronics goods	508	3.6
Machinery and equipment	268	1.9
Manufacturing of furniture	224	1.6
Manufacturing of w. products	254	1.8
Printing and publishing	180	1.3
Manufacturing of motor vehicles and accessories	175	1.2
Manufacturing of paper and p. products	165	1.2
Manufacturing of tobacco	54	0.4
Manufacturing of glass and g. products	16	0.1
Total Investment capital	14110	100.0

Source: Ethiopian Investment Agency, May 2009

Chemical industries have pivotal role in industrialization. A number of industries such as leather, textile, rubber and plastic, food preserving, printing, etc, require industrial chemicals as intermediate inputs. Chemical industries are also critical inputs in the production of pharmaceuticals, fertilizer, pesticides, etc. Hence, the importance of such industries cannot be over exaggerated. From the same Table, chemical and chemical products industry is the other sub-sector with a relatively high investment share (13.7 percent). However, a thorough investigation of the details of this industry shows that there was literally no investment in basic industrial chemicals, but only in chemical products manufacturing, such as, as noted above, detergents, cosmetics, soap, insecticides, etc. For instance, of the total investment in this sub-sector, the bulk of it, 98.8 percent, was invested on chemical products manufacturing; and only the meager balance (1.2 percent) went for basic chemical industries per se. So, literally there is no industry in the country that produces basic/industrial chemicals.

Following the recent upsurge in construction, some investment has been made in manufacturing of structural metals but still the bulk of construction materials needed have been imported. But this sub-sector is devoid of any investment on what could be regarded as foundation enterprises – i.e., foundries. Foundries are the basis for the production of basic iron and steel. There is not a single foundry in the country. But as every investment involves construction, heavy investment in foundries would be of great importance for industrialization. In light of the relatively large initial capital required to establish such industries, it might call for a special incentive scheme to foreign as well as domestic investors to overcome the constraint.

Most important of all for industrial development, is investment in industries producing machinery and equipment – both electrical and mechanical. In the Ethiopian context, it is the least developed industry, and the one with least priority despite the fact that such goods as machinery and equipment constitute over one-fifth of the total imports of the country (see also Chapter on trade structure in the same publication). From the same Table and over the same period of time, total investment in this industry was only birr 268 million, equivalent to birr 17 ($1.7) million per year. In light of its importance for industrial expansion, this level represents quite a petty amount. It is obvious that such an industry requires heavy capital, which in turn calls for substantial incentives. But the current policy involves no such specific incentive package.

One other sub-sector which is recently emerging to the limelight is manufacturing of electrical and electronics products. A decade or so before, there had been no investment in this industry. Against this background, in the last few years this sub-sector attracted appreciable investment. During the same period of time about 3.6 percent of the total manufacturing investment was made in this sub-sector and is also growing fast. This is an industry of significant technological importance. But again, currently the type of investment is not of high quality, i.e., it is largely on assembly plants and simple manufactures rather than production of electrical and electronics components. Of course, one cannot expect at this stage, investment in microchips manufacturing which is dominant in fast growing Asian economies.

In general, therefore, investment in strategic sub-sectors that are pivotal for industrialization such as manufacturing of basic chemicals, basic iron and steel, machinery and equipment, electrical and electronics is still insignificant. Hence, today's structure of the manufacturing sector will remain so for a long time to come. It will be challenging to realize it so long as the current investment policy, and literally no industrialization strategy, which heavily focuses on agricultural raw material processing and simple low technology manufacturing, remains the only focus of the development strategy of the country.

Chapter 5

The Changing Trade Structure of Ethiopia

5.1 Introductory remark

For Long, Ethiopia's main trading partners have been advanced countries such as the EU, Japan, USA, etc. This is natural in the sense that there are near perfect trade (import-export) complementarities between developing and developed economies. Moreover, such trade partnership is further supported by agreements which often go beyond trade per se to general development aid, such as, for instance, the long-standing European Union and African, Caribbean and Pacific Countries (EU-ACP) agreements. Traditionally, high correlation prevailed between Ethiopia's origin of imports and destination of exports. For instance, the same few countries in the EU are major destinations of exports as well as origins of imports.

However, this traditionally uni-modal trade pattern, where both origins of imports and destination of exports converge into few trading partners is beginning to change. Ethiopia is diversifying its trading partners. Today, East and South Asian countries (particularly China) are becoming Ethiopia's major sources of imports. Moreover, import diversification takes place largely as a result of trade creation rather than diversion. Also, some degree of diversification with respect to export destinations is taking place, though less significantly than import origins. Though the EU is still by far the major export destination, both Asia and the Middle East are increasingly becoming major importers of Ethiopia's goods.

But, a question that may arise in this regard is that though Ethiopia's trade volume is quite miniscule, particularly compared to the large capacity of its major trading partners, hence of little concern for the latter, can import diversion away from countries of export destination be sustained for long without at the same time creating corresponding market access for the latter? Specifically, would the EU remain indifferent to losing its export markets in Ethiopia (and broadly in Africa) while at the same time offering market access to these countries? This Chapter discusses such issues in the context of Ethiopia's trade diversification with respect to its trading partners.

5.2 Preferential market access opportunities

Ethiopia enjoys preferential trade offers from a number of countries. Under the various Generalized System of Preference (GSP) schemes, Ethiopia is one of the beneficiaries of preferential trade access for a wide spectrum of commodities from a number of countries, including, among others, Australia, Canada, the European Union (EU), Japan, Norway, the United States of America (USA), China, etc.[1] Ethiopia has also access to other specific benefits offered to least developed countries (LDCs), such as, for instance, EU's Everything But Arms (EBA) scheme.

The two most important verities of GSPs that Ethiopia currently enjoys are the EBA and African Growth Opportunity Act (AGOA). Being a least developed economy, Ethiopia is one of the 42 LDCs currently benefiting from the full quota and duty free privilege to the EU markets. Given Ethiopia's relative proximity and the large size of the EU market, the EBA scheme is, perhaps, the most important preferential market offer for its exports.[2] Moreover, traditionally, the long-standing EU-ACP countries trade agreements have been complemented with development aid. As a result, Ethiopia's major trading partners in both import and export trade have been, for long, EU member countries.

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[1] See WWW.UNCTAD.ORG/GSP

[2] . http://ec.europa.eu/trade/issues/global/gsp/eba/ug.htm

Newly emerging East Asian economies, as part of their drive for acquiring increased raw material inputs and market access, are also offering preferential access to their markets such as, for instance, China's offer to Ethiopia and other African countries. Such offer creates further trade integration with Asian countries either through trade creation or diversion or both.

African Growth Opportunity Act (AGOA) is the other major quota and duty free privilege granted to exports from SSA countries to the US market. It is considered as an improvement over the pre-existing general GSP scheme as it focuses only on Sub-Saharan African countries and the number of products eligible for quota and duty free treatment is significantly higher. Ethiopia is currently one of the 40 Sub-Saharan African countries having access to AGOA.[3]

As a least industrialized economy, Ethiopia has not been expected to offer preferential treatment to any of its major trading partners, at least, not to date. However, as an aspirant to join the WTO and EU's Economic Partnership Agreement (EPA) scheme, it may be expected to do so in the medium to longer term period (Busse et al, 2007 & Kune C, 2004). From the point of view of development policy and in light of countries' industrialization experience, however, reciprocity is a highly debatable issue and of great concern for least developed economies. Ethiopia has to address the repercussions of this policy measure before making the decision to go for it.

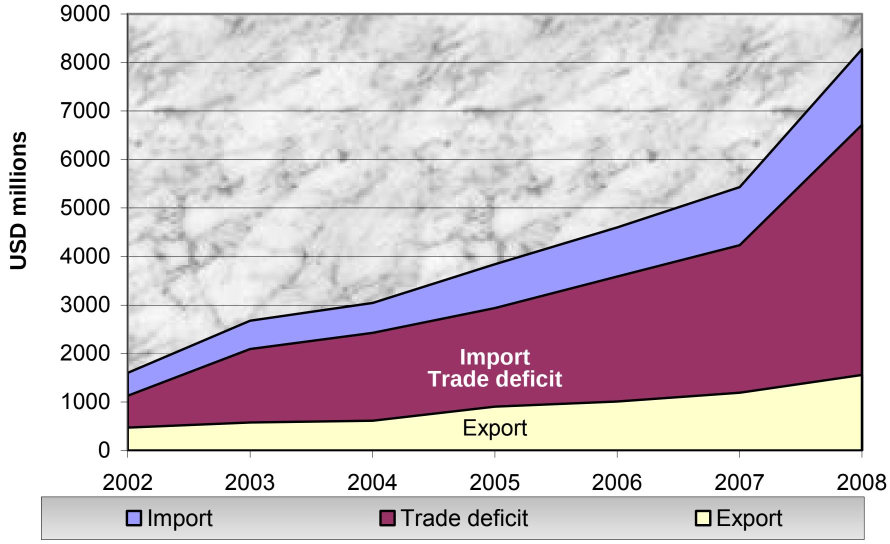
5.3 Trade flows

In the last decade or so, Ethiopia's external trade has increased substantially. Between 2002 and 2008, the value of imports (in nominal terms) surged from $ 1.6 to 8.3 billions, where as the corresponding value of export increased from $ 473 millions to $ 1.55 billions. The latter is about one-fifth of import

[3] www.agoa.gov/eligibility/country_eligibility.html

value for the same year (Figure 5.1). This left large trade deficits over the same period, which significantly exceeded corresponding export values. On average, the trade deficit was 3.6 times higher than exports.

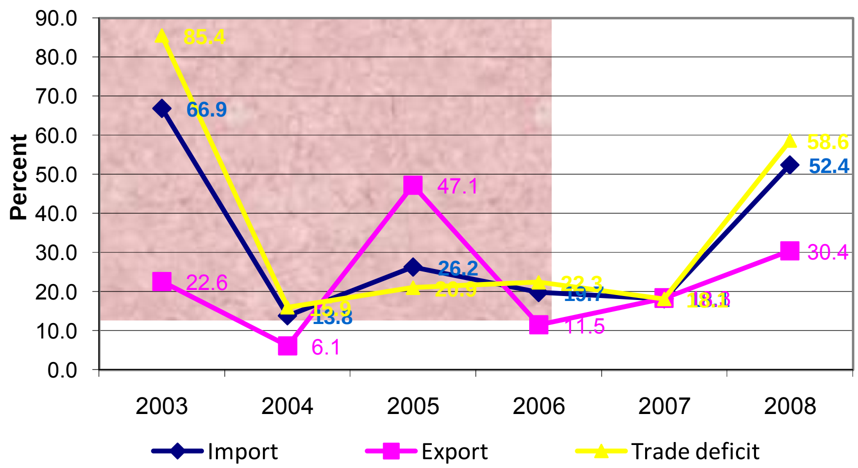
Figure 5.1: Trends of external trade values



Source: Annex Tables 5.1 & 5.2

This implies that the trade deficit has been increasing even faster than imports. As shown in Figure 5.2, for most of the periods (except in 2005), the trade deficit increased faster than exports as well as imports. The one time sharp rise of exports in 2005 was due to substantial increase in non-traditional exports, particularly, live animals, meat and cut flower. In this particular year, the proceeds from oil seeds also increased substantially. So, except for the sharp rise in 2005, export has been increasing rather very gradually and at a much lower pace than import and the corresponding deficit (Figure 5.2). In 2004, as a result of the 2003 severe drought, export increased by only 6 percent. For the seven years period, trade deficit, import and export, on average, increased annually by 36.9, 32.9 and 22.7 percent, respectively. Note that despite the low rate in relative terms, the increase in export has been in general quite respectable.

Figure 5.2: External trade: Annual growth

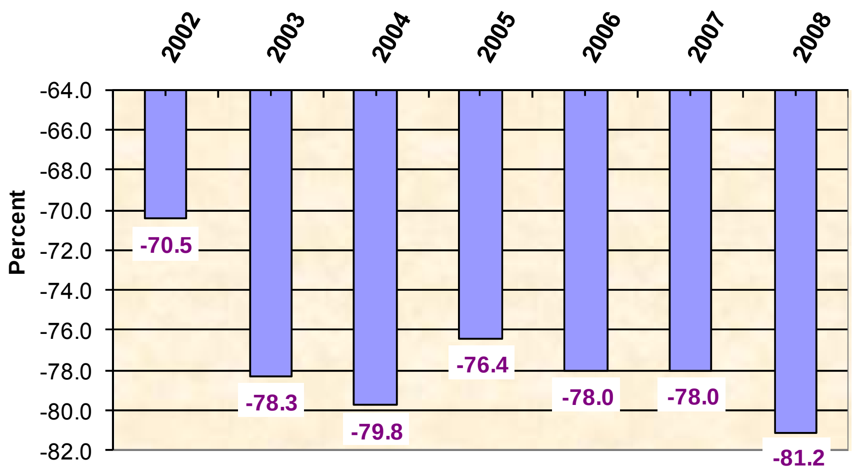


Source: Annex Tables 5.1 & 5.2

Figure 5.3 also shows the deficit as a proportion of imports over the same period of time. It consistently increased from 78.3 percent in 2002 to 81.2 percent in 2008. Again, the deficit was relatively lower only in 2005 (76.3 percent)

This implies that aid (concessional loans and public grants) has been the major driving factor for imports. However, even if loan is assumed to continue to flow, it can hardly be sustained over a long period as the burden of financing it would soon turn out to be unsustainable. Moreover, the extent of grants, which is largely a function of non-economic factors, could any time decline significantly, thereby limiting the volume of imports.

Figure 5.3: Trade deficit as a proportion of import



Source: Annex Tables 5.1 & 5.2

5.4 Trade structure by type of goods

5.4.1 Product structure of imports

Similar to all other least developed and many non-oil exporting developing countries, Ethiopia's major imports constitute petroleum and manufactured products, particularly machinery and equipment and electrical and electronics appliances. Table 5.1, shows the share of major import product groups in the total import value, for the seven years period ending in 2008.

Major import product categories (having a share of more than 5 percent) altogether account between 50 to 60 percent of total import. Over the seven years period, the share of the import value of the single most dominant item, petroleum oils, nearly doubled, increasing steeply from 12.6 in 2002 to 25 percent of total import in 2008. This, however, is largely due to the sharp rise in the price of petroleum over the years rather than increase in volume. Of the total increase in the value of petroleum during the past seven years, about 70 percent is due to prices, while the volume of import accounted for the balance.[4] In 2008, this single product group, i.e., petroleum oils and oil products, accounted for one-fourth of total import value. Machinery and equipment, and electrical appliances, too, increased over the years, though marginally; together, these two product categories hold for about one-fifth of total import in 2008.

Table 5.1: Share of major import product groups in total import value (percent)

HS code	Commodity group	2002	2003	2004	2005	2006	2007	2008
10	Cereals	7.2	13.7	6.5	6.7	2.1	2.7	7.1
27	Petroleum oils & oil products	12.6	12.5	14.9	16.6	22.4	14.7	24.9
84	Machinery and mechanical/electrical appliances	11.6	9.8	10.5	12.8	12.5	14.4	9.8
85	Electrical machinery and equipment	7.6	10.1	12.4	10.7	7.4	9.7	12.2
87	Vehicles (except train & tram)	12.3	9.8	10.0	7.4	12.7	10.0	5.3
Others	All others	51.3	55.9	54.3	54.2	57.1	51.5	59.3
	Total Import ($ millions)	1601.9	2673.1	3041.3	3839.2	4597.2	5430.2	8274.2

Source: Annex Table 5.4

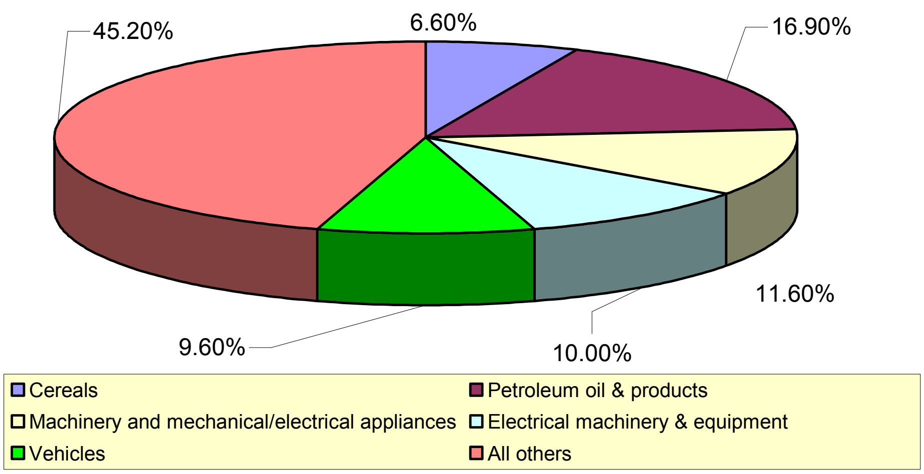
Despite the fact that the country is often said to have vast agricultural resource, it still has no capacity to produce enough to meet total food demand. As a result, cereals (mainly wheat) constitute one of the major

[4] Figures are based on aggregate volume and value of all types of petroleum imports. Hence, caution is necessary as it may involve some aggregation bias.

imported product categories. Between 2002 and 2008, on average, about $275 millions worth of cereals have been imported every year.

Figure 5.4 portrays the average import share of major product categories for the seven years period. These five product categories alone accounted, on average, for about 55 percent of total import, of which petroleum alone had a share of 17 percent, electrical machinery and equipments 10 percent, appliances 11 percent and vehicles 10 percent. Using the two digits Harmonized System (HS) code, Ethiopia imports about 90 commodity items. But every other commodity category, except the major ones noted above, has a share of less than 5 percent of total import. Hence, the product structure of imports is highly skewed in favor of few product categories.

Figure 5.4: Average share of major product groups in total import (2002-2008)



Source: Annex Table 5.4

Such a structure inevitably raises a number of issues, of which resource allocation is the central one. How could industrialization come about in such an economy where 80 percent of the total import is acquired through aid?

How could a country afford to postpone a conscious industrial development strategy given that it is entirely dependent on imports for the most critical manufactured inputs for its development, including for the transformation of agriculture? Doesn't this skewed structure question the appropriateness of the policy currently in place and toll for an alternative one?

5.4.2 Export commodity structure

Given the above portrait of the import structure, it shouldn't be difficult to tell what the structure of export would look like. With manufactured goods dominating imports, it is obvious that primary commodities would dominate exports. A handful of largely unprocessed (raw) agricultural commodities make up for more than three-fourths of Ethiopia's export bundle. Only about 10 percent of exports involve semi-processed manufactures. Table 5.2 is a mirror image of the import structure. It tabulates export shares of the top most important export commodities over the last seven years.

Table 5.2: Share of major export commodity groups in total export value (percent)

HS code	Commodity group	2002	2003	2004	2005	2006	2007	2008
06	Cut flower & ornamental foliage	--	--	--	--	--	7.4	8.0
07	Edible vegetables	9.1	4.3	6.7	4.2	5.9	8.9	14.5
09	Coffee, tea & spices	36.4	33.1	41.5	40.6	43.5	35.9	36.9
12	Oil seeds	8.9	10.6	14.7	19.5	12.8	13.4	16.6
14	Vegetable products nes	9.0	27.4	--	7.5	8.7	9.0	--
41	Hides & skins and leather	13.6	9.8	11.1	7.9	8.1	7.8	6.0
71	Gold (precious metals)	8.0	2.4	12.9	4.9	5.1	5.0	5.2
All others	All Others	15.1	12.5	13.1	15.3	15.9	12.6	12.8
	Total export ($ millions)	473.3	580.2	615.4	905.6	1009.3	1194.1	1556.9

Source: Annex Table 5.5

The bulk of Ethiopia's export constitutes coffee, oil seeds, edible vegetables and vegetable products, and hides and skins. Recently cut flower and ornamental foliage are also gaining importance. Despite wild variations in prices from time to time, coffee is still the most dominant export commodity with a share of 33 to 40 percent of total export earnings during the seven years period – 2002 to 2008 (Table 5.2). For this particular period, except in 2003, where international price of coffee declined marginally, and in 2007, where the volume of export fell substantially from that of the previous year level, coffee export earning has been increasing. As a result, despite appreciable increase in the share of other commodities, coffee maintained its high share – at about 38 percent, on average.

Earnings from oil seeds increased consistently, except in 2006 when the volume shipped out fell considerably, by about 25 percent, from that of the previous year level. International prices of oilseeds increased throughout the period, except for a marginal decline in 2005.[5] As a result, its share in the total export value has doubled (16.6 percent) from that of the 2002 level.

Irrespective of the priority accorded to the leather sector, hides and skins, the only manufactured items of some significance for export, have been losing their relative importance over the period. Though prices of hides and skins have been rising for most of the years, the volume of exports has not changed much. As a result, the share of hides and skins consistently declined from 12 percent in 2002 to 6 percent in 2008. As a result, the degree of concentration of the few primary commodities for export has been even increasing. This raises the concern that little or no diversification is taking place even within primary commodities, let alone towards manufactures. Had it been a promising economy showing some sign of progress in the right direction, the pattern would have been the other way round, i.e., the share of manufactured exports should have been increasing while that of primary commodities decreasing.

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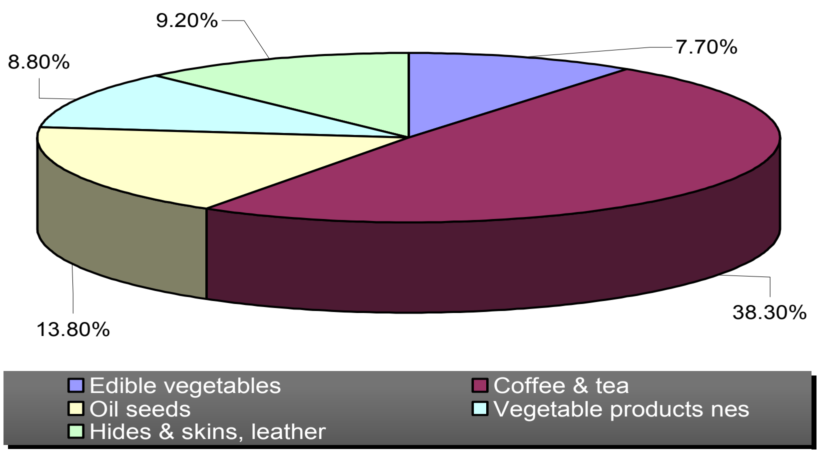
[5] Note that unit prices are calculated as total value per unit of volume exported. Hence it doesn't account for quality change.

Figure 5.5 depicts average shares of major export commodities over the same period of time, 2002 - 2008. These five commodities altogether accounted for about 84 percent of total export, of which coffee's share alone was about half. This pattern will continue so for a very long time to come as there is no any conscious industrialization strategy capable of inducing substantial change in the structure of the economy, which is heavily based on subsistence agriculture.

Figure 5.5: Average share of major export commodities (2002 – 2008)



Source: Annex Table 5.5

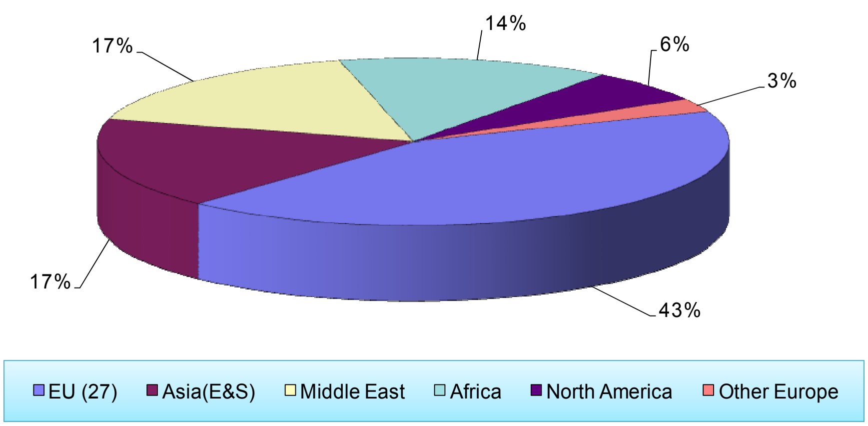
5.5 Trade structure by trading partners

As was the case with many other developing countries, EU member countries have been, by and large, Ethiopia's major trading partners, both for exports and imports. As noted above, this was primarily due to EU's preferential trade treatment as well as development grant extended to the country in line with the various agreements – such as the Lome and Cotonu EU-ACP agreements. However, recently, Ethiopia's trade structure, particularly origins of imports, is conspicuously changing. This section explains the recently changing pattern of trade.

5.5.1 Export destination

The EU countries are still Ethiopia's major export destinations. For the last seven years (2002-2008), the EU (27) alone absorbed, on average, about 43 percent of Ethiopia's total export (Figure 5.6). The other two major export markets – Asia (East & South) and the Middle East, each with a share of 17 percent of total, together accounted for about one-third of total export.

Figure 5.6: Average shares of Ethiopia's export by destination (2002-2008)



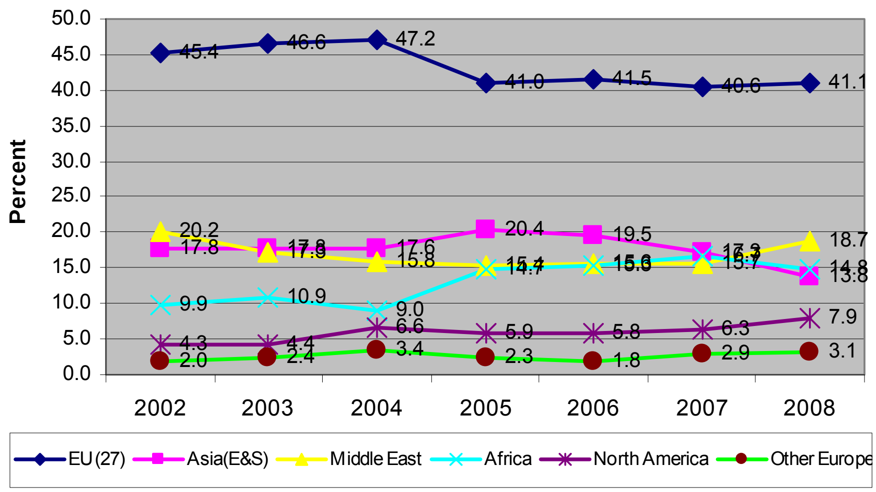
Source: Ethiopian Customs Authority, 2009

Also, as of 2005, African markets are becoming important destinations. During the same period, Ethiopia shipped out, on average, 14 percent of total export to African markets. But, this is mainly due to a particularly clever activity that has been going on in Djibouti and Somalia, on which Ethiopia depends for its sea ports. These countries import edible vegetables and vegetable products from Ethiopia and re-export directly, without any new value added, to the Middle East.

The catch being that as Ethiopia pays significant charges for ports, while exporters in the respective countries either don't pay at all or pay relatively nominal fees, the latter emerge more competitive than Ethiopian exporters to the Middle East. These countries have been importing literally nothing while Ethiopia had been using its own port – Assab.

Figure 5.7 traces out the dynamics of exports. While exports to all regions, except to Latin America, have been, on average increasing in absolute terms, the shares of the major markets, including the EU, Asia and the Middle East have been declining, though marginally in the latter case (Figure 5.7). Asia's share declined, on average, by about 3.5 percent and the EU's by 1.5 percent annually, over the seven years period. On the other hand, regions including Africa, North America and Non-EU member European countries, have been increasing their respective shares to Ethiopia's export considerably at a rate raging between 10 to 12 percent annually.

Figure 5.7: Shares of Ethiopia's export to major trading regions



Source: Ethiopian Customs Authority, 2009

Considering individual markets, some non-EU member countries are also emerging as key export markets for Ethiopia. As shown in Table 5.3, though Germany still holds the highest share, Saudi Arabia and Japan are closely following with significant shares – each having greater than 7 percent. The United States and China are also becoming important markets with fast growing shares. Other traditionally long standing destination markets, such as Italy and Switzerland still have considerable shares.

Table 5.3: Ethiopia's export shares to major trading partners

Major trading Partners	2002	2003	2004	2005	2006	2007	2008	Average
Germany	10.7	12.2	12.6	14.1	13.0	10.1	10.7	11.7
Saudi Arabia	8.3	7.5	6.9	6.5	7.0	7.3	7.8	7.3
Japan	8.3	9.2	10.2	7.7	8.7	6.5	3.9	7.1
Switzerland	9.4	10.2	8.8	6.8	5.7	4.9	6.3	6.8
Italy	9.0	7.6	6.3	5.7	6.3	6.8	5.3	6.4
United States	3.9	4.9	6.1	4.9	5.1	5.7	7.3	5.7
China	1.7	1.5	2.4	8.8	7.2	5.7	5.2	5.3
Netherlands	0.9	1.2	3.1	3.9	4.5	6.6	7.6	4.9

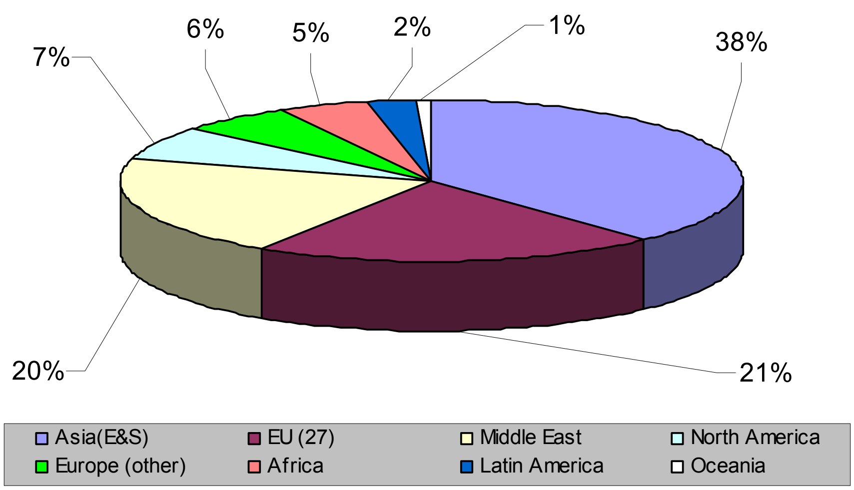
Source: Ethiopian Customs Authority, 2009

Over time, Germany's and Saudi's shares remained almost stagnant, while that of Japan and Switzerland have been falling, on average, by 5 to 7.6 percent yearly. But export to the Netherlands, China and the United States increased substantially by 50, 44 and 12 percent respectively. As noted above, while the AGOA scheme stimulated exports to the US markets, China's aggressive economic partnership drive with Africa and beyond, along with its GSP scheme, accelerated Ethiopia's export to the Chinese markets.

5.5.2 Origin of imports

It is often the case that a developing country's export destinations largely correspond with origins of imports. In the case of Ethiopia, however, such correspondence, which has been holding for long, has started to lose significance as of the past few years. The EU, Ethiopia's major export destination is not so for imports, though still having significant share. As shown in Figure 5.8, for the same period of time (2002-2008), Asia accounted, on average, for over one-third (38 percent), while the EU and the Middle East, each supplied about one-fifth of Ethiopia's total imports.

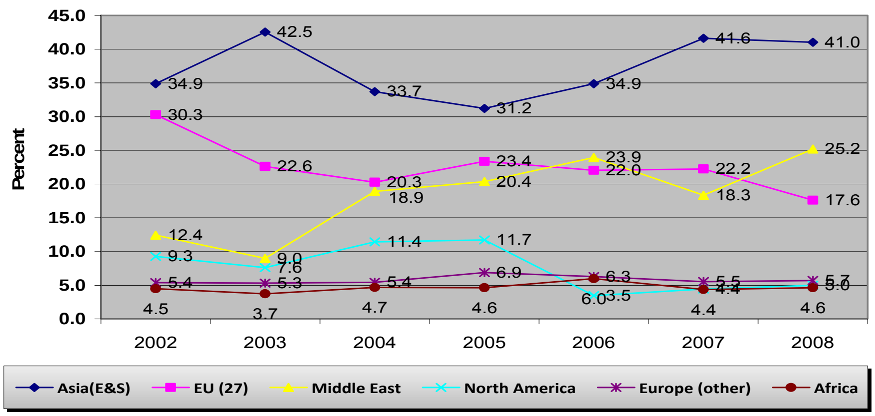
Figure 5.8: Average import share of Ethiopia by regional block 2002-2008



Source: Ethiopian Customs Authority, 2009

As shown in Figure 5.9, though EU's export to Ethiopia has been still increasing in absolute terms, its share has been declining, on average, by 7.7 percent yearly. On the one hand, the corresponding shares of the Middle East and Asia have been rising respectively, by 20 and 4 percent annually. So, as it stands, and with no change in policy, the EU seems to be losing ground of its market in Ethiopia in favor of Asia and the Middle East.

Figure 5.9: The dynamics of Ethiopia's import structure by regional block



Source: Ethiopian Customs Authority, 2009 (soft copy release)

In the case of individual trading partners, during the seven years period, one-third of total imports was from China and the Middle East, and another one-fifth from India, United States and Italy (Table 5.4). On the other hand, Germany, Ethiopia's single most important export market, had a share of only 3.3 percent when it comes to imports. Moreover, over the last seven years, the shares of China, Saudi Arabia and United Arab Emirates (in fact, India too) have been increasing fast, on average, at rates of 12, 22, and 47 percent annually, while decreasing for the rest, including Italy and Germany (Table 5.4).

Table 5.4: Shares of imports by origin (percent)

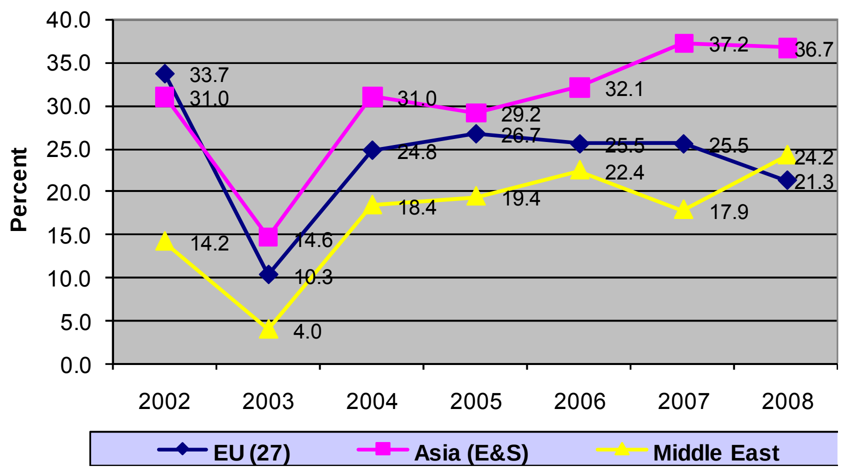
Country of origin	2002	2003	2004	2005	2006	2007	2008	average
China	11.1	11.7	11.0	13.5	14.4	20.4	20.6	16.8
Saudi Arabia	7.3	6.8	15.3	15.6	21.1	14.9	14.	15.0
India	6.8	7.2	5.7	7.2	7.2	7.7	7.7	7.4
United States	9.3	9.5	12.7	11.0	3.5	4.4	4.4	6.4
Italy	9.2	8.3	4.8	4.9	7.4	5.6	5.6	6.2
United Arab Emirates	2.5	2.1	1.8	1.2	1.1	8.7	8.7	4.0
Japan	7.4	4.0	4.2	3.5	3.8	4.0	4.0	3.8
Germany	5.5	4.2	4.0	4.0	2.9	2.8	2.8	3.3

Source: Ethiopian Customs Authority, 2009

5.6 Total trade structure

The discussion above on exports and imports indicates the changing trade structure of Ethiopia with respect to its trading partners. As of 2004, the trade shares of Ethiopia's major trading partners have been shifting away from its traditional trade partners, i.e., EU member countries, to the newly emerging Asian and Middle East countries. The EU, which had been the topmost trading partner of Ethiopia before 2003, began to lose ground since 2004.

Figure 5.10: Development of Ethiopia's trade shares with major regional blocks



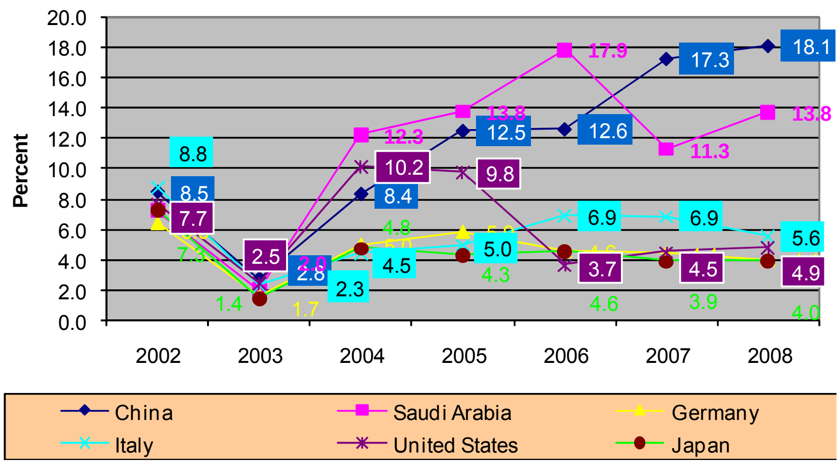
Source: Ethiopian Customs Authority, 2009

As shown in Figure 5.10, Ethiopia's trade share with Asia, which was nevertheless equal to that with the EU in 2002 and 2003, has been rising sharply as of 2004. By 2008 it increased to 37 percent, much more than that of the EU (21 percent) by 16 percentage points. Similarly, trade share with the Middle East, which was about half of that with the EU in 2002, steeply increased to a level of 24 percent in 2008, exceeding that of the EU by 3 percentage points. Since 2002, Ethiopia's trade shares with these two regions, Asia and the Middle East, have been rising annually, on average, by 37 and 54 percent respectively.

Corresponding shifts have also been observed with individual trading partners. Countries such as Italy, Germany, Japan, etc., that had been major trading partners with Ethiopia, up until the beginning of the millennium, have been losing their trade shares since 2004. For instance, trade shares of these countries, which were respectively 8.8, 6.5 and 7.3 percent of Ethiopia's total trade in 2002, fell to 5.6, 4.1 and 4.0 percent in 2008 (Figure 5.11). Corresponding shares for China and Saudi Arabia, however, surged from 8.5 and 7.3 percent in 2002 to 18.1 and 13.8 percent in 2008 respectively.

So a clear picture seems to be emerging, with Asia and the Middle East becoming topmost trading partners of Ethiopia at the expense of the EU.

Figure 5.11: Trend of Ethiopia's trade share with individual major trading partners



Source: Ethiopian Customs Authority, 2009

But is this a positive trend? The fact that such shifts come about along with trade creation and not diversion, is a positive development for Ethiopia, as well as for its trading partners. As such, it needs to be encouraged. However, as noted earlier, such shifts are taking place largely as a result of trade initiatives, particularly of the export drive of Ethiopia's newly rising trading partners, but not that of Ethiopia's motivation. Obviously, the latter too benefits from such initiatives provided goods are imported at competitive/cheaper prices. But unlike its traditional trading partners, such as the EU, this led to a wide trade deficit, as Ethiopia's export to these new trading partners is insignificant. For a developing economy such as Ethiopia, export is the prime concern than imports. Table 5.5 shows the extent of Ethiopia's trade deficit with its major trading partners.

Ethiopia's trade deficits with Germany, Japan and Italy are relatively modest, on average, 23.7 60.5 and 77.7 percent of the respective imports, over the seven years period, respectively. On the other hand, the corresponding figures for China and Saudi Arabia are as high as 93 and 89 percent respectively. The trade deficits with the latter two countries imply that Ethiopia's trade relation is lop-sided – largely based on imports. As such the shift in Ethiopia's trade relationship away from traditional partners does not seem to be a strategic one. The issue of maintaining a reasonable trade balance is an outstanding issue of concern.

Table 5.5: Average Ethiopia's trade deficit with its major trading partners as a proportion of imports (2002-2008)

Country	Trade deficit (%)
China	92.8
Saudi Arabia	88.8
Germany	23.7
Italy	77.7
Japan	60.5

Source: Ethiopian Customs Authority, 2009

5.7 What holds for Ethiopia's future trade structure?

As it stands today, Ethiopia, nevertheless, holds a comfortable position with respect to its export destination and import origin. Currently it is facing little market access constraint – suffice to mention that today it is not even capable of exploiting to any appreciable extent EBA and AGOA duty and quota free opportunities; it has opened its market only partially, thereby allowing cheaper imports from Asia in bulk while at the same time retaining some policy space (though inadequate for a least developed economy) to control imports if and when it arises.

But this may not continue for long for a couple of reasons. One is that Ethiopia is negotiating accession and is likely to join the multilateral trading system in the foreseeable future. Despite its LDC status, hence the privilege for special and differential treatments, there is no doubt that it would be under continuous pressure to make further liberalization measures. This, however, would not be expected to bring about any significant change in the structure of exports or imports from what is prevailing today. Hence, the currently ongoing change in the structure of trade is likely to continue.

However, the most challenging pressure may come from Ethiopia's most favorable and traditional trading partner – the EU. The demand of the latter to accept the EPA reciprocity agreement, may not only significantly change the current trade structure in favor of the EU, but may as well result in the deterioration of the already diminishing policy space of the country. Moreover, if the reciprocity agreement significantly changes the trade structure (mainly imports) in favor of the EU, it is very likely that this precedence would create a contagion effect which may motivate other major trading partners, such as China, to demand for a similar agreement. If so, the substantial loss of policy space that may follow would have severe consequences on the industrialization policy option of the country. The repercussion of the EPA on the Ethiopian economy would be quite severe and long lasting. Even the possible development grant that may come along with it would not compensate the adverse impact due to the loss of policy space. Therefore, why Ethiopia (and for that matter, other African countries too) should sign a reciprocity agreement remains an outstanding question.

CHAPTER 6

Health Sector Performance at National and Regional Levels

6.1 Introduction

As in other sectors, performance assessment of a health sector is a difficult exercise given the multiplicity of resources used and outputs produced by a given health care system (WHO, 2000). Using official data, which have been regularly published by the Ethiopian Ministry of Health, this chapter makes a brief review of trends in access to health services, utilization, and health status at the national level and also across the different regions within the country. The period under review is 1999/00-2007/08 and we chose indicators for measuring performance based on the availability of comparable data for inter-temporal and cross-sectional analysis.

6.2 Background: The Ethiopian health system

Broadly speaking, health services in Ethiopia are obtained from both modern and traditional sources. Due to the lack of data availability, this report, however, focuses on the former than the latter. The beginning of basic health care services in Ethiopia began during the Imperial regime in 1946 (Kloos, 1998). However, access and utilization of modern health care is very limited until today.

As a consequence, ensuring adequate health care has received an increased government attention in Ethiopia. In this respect, a closer look at the country's health problems could indicate that the problem is associated with both supply-side and demand-side factors. The major supply side factors include the limited availability of health facilities (hospitals, health centers, clinics, pharmacies, drug stores), human resources (physicians, nurses), and inappropriate policies and strategies of the past governments. Until recently, the main concern of the health sector policy had been curative care instead of preventive health care. As a result, Ethiopia had experienced severe health problems particularly among women and children. This implies that there was a limited opportunity to get health services aimed minimizing mortality and morbidity caused by preventable causes to the population.[1] On the demand side (as will be discussed later), low level of income and education, location and cultural factors contribute to inadequate utilization of health services in the country.

To ameliorate these problems the Ethiopian Government has adopted a new health policy in 1993. The policy stipulated to increase access to equity and utilization of health services to the population. The policy has recognized and supported the creation of decentralized decision making powers for various local governments and population. Furthermore, the new policy recognized and supported preventive health care as main mode health services delivery in the country. In 1997 the Ministry of Health formulated a twenty-year health sector development program, which is in turn divided into successive short-term programs for the sector, to translate the policy objectives into practice. The sector's successive development programs were aligned to the country's over-all development program.[2] The Ethiopian health system is organized into a four-tier system which comprises of a primary health care unit, a district hospital, zonal hospital and specialized hospital (MoH, 2005). Health services in the country are financed by the government (central and regional), bi-

[1] About 60-80% of Ethiopia's health problems are caused by preventable infectious and communicable diseases (MoH, 2006).
[2] While both HSDP I and HSDP II were aligned with Ethiopia's SRDP, HSDP was included in the country's PASDEP (MoFED, 2002, 2006).

lateral and multilateral donors, non-governmental organizations, the private sector and households.

The percentage of fully immunized children increased from 22% to 63% between 1999/00 and 2007/08. Similarly, the provision of basic health infrastructure has improved: numbers of health centers and hospitals increased, pharmacies and drug shops rose, and village health posts increased. By 2004/05, for instance, about 51%, 61%, 41% and 19% of the total households in Ethiopia, respectively, resided within a distance of less than 10 kilometers from the nearest health post, clinic, health center, and hospital. As a consequence of these improvements in the health sector and parallel improvements in the performance of the rest of the economy, the country has witnessed significant improvements in health status to its population. The IMR, for instance, decreased from 110 deaths per 1000 live births in 1999/00 to 77 deaths per 1000 live births in 2007/08.

Despite rapid increase in supply of health services, progress on most health indicators including child health are still low and the progress made in the sector has not been uniform across different regions. Put in other words, there remains a substantial disparity within the country in the pace of access to health care and improvement in health status. The main aim of this report is, therefore, to review patterns and trends of the progresses achieved and challenges encountered across the different regions in the country over the period 1999/00 to 2007/08. In particular, the report aims (1) at assessing whether and to what extent the different health indicators change across different regions and (2) measuring disparities in the changes made across the regions. The main data and information for this report came from Health and Health-Related Indicators, a regular annual publication of the Ministry of Health (MoH, various issues).

6.3 Health care access and utilization

6.3.1 National level indicators

6.3.1.1 Health access

Shortage of health facilities and trained medical personnel on one hand and their uneven distribution on the other hand have been the major health care problems in Ethiopia. Cognizant of this problem the Ethiopian Government has increased health sector investment to expand both health care facilities and health personnel throughout the country. As can be seen in Table 6.1, public health expenditure per capita has increased by 8% between 1999/00 and 2007/08. In similar manner, the number of persons per physician, and per nurse, respectively, has been reduced from 50,273 to 37,995 and 9,458 to 4,725 people during the above mentioned period.

Table 6.1: Trends in access to health facilities and trained medical personnel

Indicators	Year		Average growth rate (%)
	1999/00	2007/08	
Human resources			
Population per physician	50,273	37,995	3
Population per nurse	9,458	4,725	9
Population per health extension worker*	---	3,224	7
Health facilities			
Population per hospital	616,453	531,684	2
Population per health center	178,355	108,225	7
Population per hospital bed	5432	6026	0.00
Health expenditure			
Public health expenditure per capita (in Eth. Birr)	8.29	22.3	8

Source: Ministry of Health database; and author's calculations.

Launched in 2003, the health extension program has increased health service availability in Ethiopia. By the end of 2007/08, for instance, on average one health extension worker was available for every three thousand population. At the same time, availability of health facilities such as hospitals and health centers also increased. It should be noted however that there is much more to be desired for Ethiopia to meet the health demands of the population. The availability of physicians, for instance, remains one of the lowest in Africa and far below the World Health Organization's recommended standard of 10,000 people per physician, and the number of hospital beds per capita has not been improved. More importantly (as discussed later), access to health services has not been uniform across the different administrative regions within the country.

6.3.1.2 Utilization

Supply of health services is only one among the many forces that determine the performance of a given health care system. To become useful, for instance, available health services should be properly used by those who need them. But effective utilization depends on demand factors such as education, information, income and other socio-economic characteristics of intended users apart from the availability the required health services.

An improvement in utilization of the health services can be measured using alternative indicators. The most frequently used indicators in measuring utilization of health care services include uptake of immunization, attended delivery, and family planning. Access to immunization against the six fatal childhood illness is used to measure the extent to which investment on preventive health care is made. Fully immunized children are those who received one dose of BCG, three doses each of DPT and OPV, and one dose of measles. Apart from full immunization, we also examine the coverage rate of vaccination against DPT3 as this is also regarded as a standard indicator for vaccination program effectiveness (WHO, 2006a).

Trends in the utilization of child health services show dramatic improvement over the last ten years. As noted in Table 6.2, on average, full immunization coverage increased from about 22% in 1999/00 to nearly 63% in 2007/08, a 15% growth per annum during the same period.[3] For maternal health services, we also found that antenatal care and attended delivery have increased by 10% each per annum over the same period. Postnatal care and family planning increased respectively, by 21% and 16%. Notwithstanding these improvements, Ethiopia's performance on maternal health still remains significantly lower than the average of 45% for Sub-Saharan countries (World Bank, 2009). In fact, births attended by health professionals in Ethiopia are lower than many of the countries in the sub-region including Eritrea (28%), Kenya (27%), Sudan (49%).

Table 6.2: Trends in utilization of some health services

Health services	Year		Average growth rate (%)
	1999/00	2007/08	
Full immunization (%)	22.32	62.6	15
DPT3 (%)	41.91	81	62
Antenatal care (%)	29.06	59.4	10
Births attended by health staff (%)	9.6	20.3	10
Postnatal care (%)	5.48	25.1	21
Family planning (%)	13.34	50.9	16

Source: Ministry of Health database; and author's calculations.

6.3.1.3 Health outcomes

The ultimate objective of health investments is to improve health outcomes. Depending on data availability, several measures can be used to track

[3] Growth rates were computed using Ordinary Least Squares technique in which we regressed the natural logarithm of the variable of interest on time and a constant term. Then, growth rate per annum is obtained by taking the antilog of the coefficient of the time variable and subtracting one from it.

observed changes in health outcomes. The literature indicates that different measures of health outcomes have different merits and demerits. However, IMR and U5MR are the most sensitive indicators of inequalities in access to child health services and differences in socio-economic factors (WHO, 2006b). Using these indicators we compare performance both cross-sectionally and over time over the review period. As shown in Table 6.3, both IMR and U5MR witness consistent improvement in health outcomes over the last ten years in Ethiopia. In particular, the IMR declined from 110 deaths per one thousand live births in 1999/00 to77 deaths per one thousand live births in 2007/08, a five percentage point reduction over the decade.

During the same period, the U5MR decreased by four percentage points in 2007/08, from 161 deaths per one thousand live births in 1999/000. Despite this improvement, U5MR are still large compared to most neighboring countries such as Eritrea (74), Kenya (121) and Sudan (89) (World Bank, 2009).

Table 6.3: Trends in infant mortality rate and child mortality rate

Indicators	Year		Average reduction rate (%)
	1999/00	2007/08	
IMR per 1000 live births	110	77	5
U5MR per 1000 live births	161	123	4

Source: Ministry of Health database; and author's calculations.

6.3.2 Regional differences in health access and utilization

The World Health Organization (WHO, 2000) and the Organization for Economic Co-operation and Development (Hurst and Jee-Hughes, 2000) stressed the need for measuring differences in access, coverage, and utilization of health services and the resulting health outcomes in an effort to reduce health disparities at different levels, namely, at the region, district, community and household levels. In this report we focus on tracking changes made in various health indicators at the regional level.

Several measures including coefficient of variation, ratio of maximum to minimum value, Gini coefficient, Theil's index, or other convergence indicators can be used to assess the extent of regional variations in health care access and utilization. In this report, we applied coefficient of variation and the ratio of a maximum value to a minimum value of variable of interest.

In spite of progresses made in addressing the health problems, enormous health challenges still remain. As discussed earlier, Ethiopia still has poor health indicators and the improvements at the national level are not uniformly shared across the different regions within the country.

6.3.2.1 Access to health services and health expenditure

As shown earlier, Ethiopia has recorded rapid improvements in the supply of health facilities and medical personnel from a low base. However, within Ethiopia these improvements have not been uniform. We used rates of health resources per population to measure the supply side determinants of health sector performance. In particular, we computed number of persons per physician, per nurse, and per health extension agent to measure the availability of medical personnel for the population. Likewise, we applied number of population per hospital, per health center and per hospital bed to assess the supply of health care facilities for the population. In addition we also computed per capita public health expenditure. As most of these indicators are expressed in terms of population density with respect to interest of health care resource, a rise/decline in access to a health resource leads to a decrease/increase in the indicator in a given region. However, since our assessment was based on data disaggregates at the regional level; the results of our analysis do not lead to any conclusion regarding intra-regional differences in various health indicators.

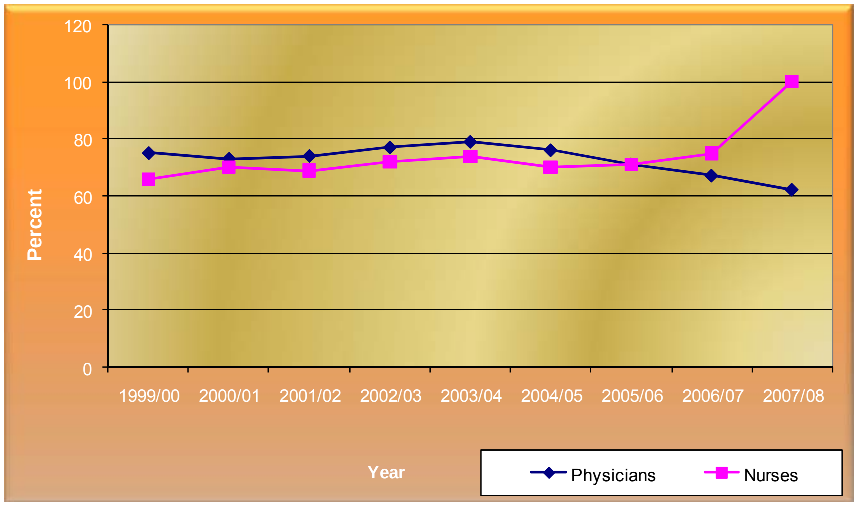
As can be noted from Table 6.4, and Figure 6.1 regional disparities tended to grow for many of the health facilities and health personnel. The population per physician, for instance, was the lowest at the beginning of the review period and the highest in 2006/07. In terms of health care spending, per capita public health expenditure has increased over this period. However, one has to note that the extent of the increment also differs across the regions.

Table 6.4: Health personnel availability, 1999/00-2007/08

Year	Mean	Min	Max	Max/Min
Physicians (no. of persons/physician)				
1999/00	45,237	3,208	93,235	29.06
2000/01	49,773	3,387	99,921	29.5
2001/02	51,101	4,914	106,000	21.57
2002/03	51,852	3,358	109,067	32.48
2003/04	61,806	3,700	124,267	33.59
2004/05	67,949	4,623	142,183	30.76
2005/06	80,879	5,939	145,895	24.57
2006/07	85,889	4,951	183,248	37.01
2007/08	72,309	5097	133351	26.16
Nurses (no. of persons/nurse)				
1999/00	6802	1232	12677	10.29
2000/01	6,227	1,114	12,155	10.91
2001/02	5,875	1,333	11,298	8.48
2002/03	5,612	885	12,313	13.91
2003/04	5,195	864	11,482	13.29
2004/05	4,890	885	10,956	12.38
2005/06	4,770	882	10,715	12.15
2006/07	4,730	732	9,946	13.59
2007/08	4680	785	16627	21.18
Health extension workers (no. of persons/health extension worker)				
2004/05	17508	3868	34888	9.02
2005/06	9299	3510	22321	6.36
2006/07	9356	3298	32918	9.98
2007/08	4631	2212	8216	3.71

Source: Ministry of Health database; and author's calculations.

Figure 6.1: CV for availability of physicians and nurses among regions



Source: Ministry of Health database; and author's calculations.

6.3.2.2 Utilization of health services

As already stated, access to health services is not enough to improve health status. In other words, availability of health resources or physical proximity to these resources may not lead to their actual utilization. Previous studies elsewhere have shown that actual utilization of health services is significantly influenced by demand side factors such as income, education, culture and location even when health services are rendered freely to users. In view of this fact, we examine (as indicated below) whether and to what extent utilization of different health services vary within Ethiopia.

Child health care

As shown in Table 6.5, childhood immunization coverage has significantly increased for all regions except for Addis Ababa between 1999/00 and

2007/08. In 2007/08, the highest proportion of fully immunized children was found in SNNPR followed by Harari and Tigray, in that order. On the other hand, the lowest records were found in Somali region followed by Gambella. Clearly, one can observe from Table 6.5 that while 3 regions (Harari, SNNPR and Tigray) registered full immunization rates well above the national average, the remaining had rates less than the national average.

Table 6.5: Child immunization coverage*

Regions	DPT3			Full immunization		
	1999/00	2007/08	Avg. growth rate (%)	1999/00	2007/08	Avg. growth rate (%)
Tigray	75.54	86.2	4	49.73	74	4
Afar	4.56	42.6	7	0.84	42.2	66
Amhara	61.62	73.2	12	24.37	60.9	12
Oromiya	33.97	74.4	13	22.19	60.4	13
Somali	8.6	14.6	21	8.6	23.2	21
BenishangulGumuz	27.32	83.6	20	16.33	51	20
SNNPR	31.53	91.4	25	17.74	84.9	25
Gambella	16.55	34.6	19	3.45	25.7	19
Harari	59.32	68.3	6	47.89	75.5	6
Addis Ababa	64.57	42.8	-5	---	39.5	-5
Dire Dawa	41.26	59.5	19	12.9	44.2	19
Min	4.56	14.6		0.84	23.2	
Max	75.54	91.4		49.73	84.9	
Max/Min	16.56	6.26		59.2	3.66	

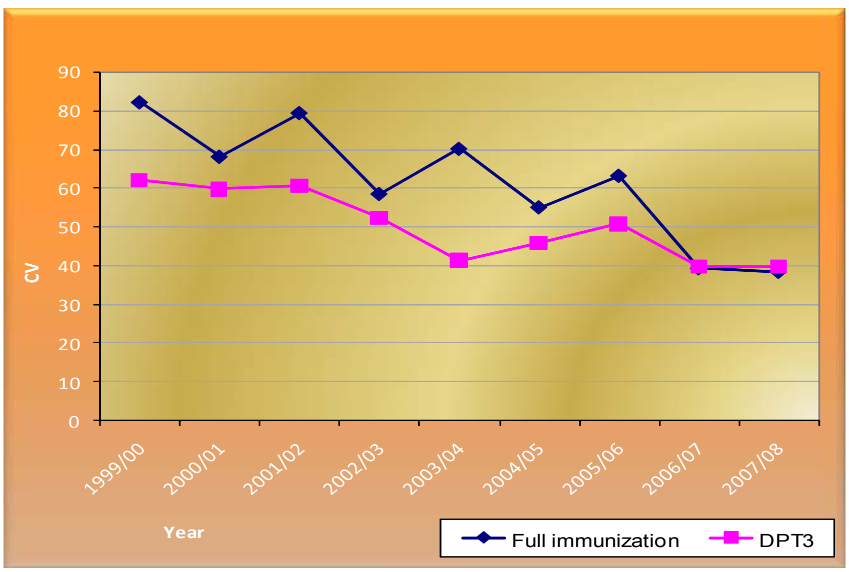
* Data for 2007/08 is from 2006/07.

Source: Ministry of Health database; and author's calculations.

Interestingly, the descriptive results also reveal that regions generally showed a meaningful process of convergence in the utilization of preventive health services for children. In fact, regions which had smaller initial child immunization rates generally achieved larger growth rates per annum in the proportion of children who are immunized.

Looking at the difference in the maximum and minimum value of immunization rates we found evidence for narrowing gap in inter-regional inequalities in health service utilization. In particular, the ratios of the maximum value to the minimum value of full immunization and DPT3 rates, respectively, have dramatically declined by a 55 and 10 percentage points between 1999/00 and 2007/08. Moreover, coefficient of variations for full immunization and for DPT3, respectively, decreased by more than forty and twenty percentage points during this time period (see Figure 6.2). This implies inter-regional inequality in utilization of child health services has decreased over this period. The declining disparity in the availability of health services among regions seems to be the main contributing factor for the narrowing gap in immunization coverage across the different regions.

Figure 6.2: CV of child immunization coverage



Source: Ministry of Health database; and author's calculations.

Maternal health

As noted earlier, consultation with a skilled health professional during pregnancy, referred to as antenatal care, and attended delivery are key indicators for monitoring progress in maternal health status. Table 6.6 provides descriptive analysis of the trends and patterns of progress made by different regions with respect to the above mentioned maternal health indicators. As can be noted from the table, the proportion of attended deliveries was larger in 2007/08 than in 1999/00 for over 80% of the regions. Similarly, the proportion of pregnant women who received antenatal care was larger in 2007/08 for all regions. However, as one may expect different regions registered different rates of improvement over this period. Furthermore, rates of improvement varied between antenatal care and attended delivery services across and within regions. For instance, attended delivery has double digit growth rates per annum in Afar, Oromiya and SNNPR and negative growth rates per annum in Benishangul Gumuz, Gambella, and Tigray between 1999/00 and 2007/08. Nonetheless, the proportion of births attended with health professionals in a number of bigger regions (e.g. Amhara, Oromiya, and Tigray) was less than the national average (20.3%).

Table 6.6: Antenatal care and attended delivery

Regions	Antenatal care			Attended delivery		
	1999/00	2007/08	Avg. growth rate (%)	1999/00	2007/08	Avg. growth rate (%)
Tigray	71.56	80.4	1	31.3	11.7	-15
Afar	5.44	49	18	0	23.76	36
Amhara	24.78	55.2	11	6.19	16.68	9
Oromiya	27.97	51.4	7	0	16.7	26
Somali	6.02	10.9	4	2	8.84	9
Benishangul Gumuz	25.17	42.3	2	10.6	12.12	-2
SNNPR	26.53	85.4	17	6.44	33.92	25
Gambella	27.07	36.6	0.00	7.79	6.12	-7
Harari	50.83	85.2	7	25.62	63.14	16
Addis Ababa	87.16	91	-1	40.82	43.55	00.00
Dire Dawa	24.26	62.3	9	18.84	44.43	5
Min	5.44	10.9		0	6.12	
Max	87.16	91		40.82	63.14	
Max/Min	16.02	8.34			10.32	
Coefficient of variation	74.54	41.9		100.1	72.16	

Source: Ministry of Health database; and author's calculations.

Family planning and hospital beds

Utilization of family planning services within Ethiopia varies from region to region. While regions such as Tigray, Afar, Amhara, Oromiya, SNNPR, Addis Ababa and Dire Dawa registered positive growth rates per annum, Somali, Benishangul Gumuz, and Gambella experienced negative growth rates per annum in the utilization of family planning services. A closer look at the descriptive results also indicate that only Tigray, Amhara, SNNPR and Dire Dawa had rates larger than that of the national average (50.9%) in 2007/08.

Interestingly enough, inequality in utilization of family planning services had significantly declined over the review period even though the coefficient of variation still remains above 60% by the end of 2007/08. In 2007/08, the highest and lowest utilization rates for family planning services were registered, respectively, in SNNPR (85%) and Somali (3.4%) regions.

The descriptive results presented in Table 6.7 also reveal that the number of persons per hospital bed increased in 7 out of 11 regions over the review period. This implies that the rise in number of hospital beds in these regions had not been commensurate with rise in the number of persons within the respective regions. Harari and SNNPR had experienced the highest growth rate per annum in hospital bed availability for their population.[4]

Table 6.7: Utilization of family planning services and number of persons per hospital bed

Regions	Family planning			Hospital beds		
	1999/00	2007/08	Avg. growth rate (%)	1999/00	2007/08	Avg. growth rate (%)
Tigray	45.27	55.9	3	2,914	3,105	0.2
Afar	6.49	20.5	5	5,711	11,877	11
Amhara	16.8	57.1	16	9,700	12,014	0.1
Oromiya	9.15	38.9	19	8,208	7,989	-3
Somali	1.84	3.4	-4	14,524	10,458	-3
Benishangul Gumuz	21.75	29.1	-6	3,058	3,184	0.5
SNNPR	12.13	85.2	25	12,598	12,252	-4
Gambella	4.42	14.2	-1	2,313	2,877	2
Harari	6.61	35.7	-9	596	294	-8
Addis Ababa	7.59	35	14	1,140	3,394	13
Dire Dawa	33.25	71.4	3	1,245	1,712	5
Min	1.84	3.4		596	294	
Max	45.27	85.2		14,524	12,252	
Max/Min	24.6	25.06		24.37	41.67	
Coefficient of variation	95.14	60.9		86.99	74.00	

Source: Ministry of Health database; and author's calculations.

[4] A rise in number of persons per hospital bed indicates increasing scarcity of the health service, we use the inverse of this indicator to evaluate improvement in access to hospital beds in the respective regions.

6.3.2.3 Health outcomes

Our analysis of the available data reveals that health outcomes as measured by IMR and U5MR have improved for the majority of the regions. However, for some regions, such as Amhara and Gambella, the IMR and U5MR did not show any rate of reduction. On average, IMR and U5MR for Gambella region increased by one and four percentage points between 1999/00 and 2007/08, respectively. In Amhara region, U5MR increased by one percentage point during the same period.

It is also important to note that the extent of improvement in IMR and U5MR strongly vary between the two indicators and also across the different regions. The result is more troublesome if we look at the regionally disaggregated rates in detail. Some regions such as Amhara, SNNPR, Benishangul Gumuz and Gambella had experienced mortality rates larger than the national average for both infants and children under the age of five.

In 2007/08, highest and lowest IMR were observed for Dire Dawa and Amhara regions, respectively. In particular, in 2007/08, the ratio of the maximum value to the minimum value of IMR was about 2 suggesting that death risk faced by children born in Amhara region was twice larger than those born in Dire Dawa. In the case of U5MR, the highest and lowest mortality rates were recorded for Benishangul Gumuz and Dire Dawa regions, respectively.

Descriptive results also indicate a widening inter-regional difference in IMR and U5MR (Table 6.8). The coefficient of variation grew from about 15% in 1999/00 to 21% in 2007/08 for IMR, and from around 16% to 23% for U5MR during the same period. Both health and non-health factors may be responsible for these variations.

Table 6.8: Trends in regional discrepancy in child health outcomes

Regions	Infant mortality			Under-five mortality		
	1999/00	2007/08	Avg. reduction rate (%)	1999/00	2007/08	Avg. reduction rate (%)
Tigray	116	67	7	171	106	6
Afar	112	61	8	167	123	3
Amhara	109	94	1	159	154	-1
Oromiya	111	76	5	163	122	3
Somali	96	57	6	139	93	5
Benishangul Gumuz	131	84	6	196	157	2
SNNPR	121	85	4	179	142	2
Gambella	92	92	-1	132	156	-4
Harari	106	66	6	156	103	5
Addis Ababa	72	71	3	100	136	1
Dire Dawa	107	45	8	157	72	5
Min	72	45		100	72	
Max	131	94		196	157	
Max/Min	1.82	2.09		1.96	2.18	
Coefficient of variation	14.73	21.11		16.35	22.69	

Source: Ministry of Health database; and author's calculations.

6.4 Conclusions

Measured by various health indicators, Ethiopia has recently registered significant improvements. For instance, infant and child mortality rates have declined and usage of maternal and family health services have increased. Health facilities of all kinds have increased in number.

Notwithstanding these improvements, Ethiopia still has low level of health status to her population compared to most neighboring countries. Furthermore, the extent of improvements made in many of the health indicators reviewed here are not uniform across different regions within the country despite the Ethiopian Government's policy of equitable access to health care. The report has identified that improvements in various health indicators are heterogeneous. Improvements were different for different health indicators and also among different regions. The results presented in this report are of interest for health policy makers and development stakeholders who are working to improve health for all and reduce disparities in access to and utilization of health care services in Ethiopia.

PART II

DEVELOPMENT, PROSPECTS AND CHALLENGES OF THE ENERGY SECTOR IN ETHIOPIA

Introduction to Part Two

The Ethiopian Economics Association has been preparing annual report on the Performance of the Ethiopian Economy since 1999/2000. In 2008 it published the Sixth annual report on the Ethiopian Economy, "THE CURRENT STATE OF THE CONSTRUCTION INDUSTRY" being its thematic issue. For the seventh Annual Report, **Development, Prospects and Challenges of the Energy Sector in Ethiopia** has been chosen to be the thematic issue. The energy sector has been identified as a thematic area owing to several considerations. First, the issue of energy and development is timely; second, the sector is currently facing a mounting pressure due to an enormous rise in energy demand for production, services and household uses; and third, despite the acknowledged existence of a huge resource potential for energy development in the country, the exploitation of these resources to date is minimal. Moreover, there is a limited diversification of the energy sources. Finally, despite the importance of the energy sector in the socio-economic development of the country, the sector has not been assessed in a comprehensive manner to enable one to understand its nature and complex challenges.

The major sources of data used in this assessment of the energy sector include MME, EEPCO, EREPDC, MoARD, MoFED, CSA, Ministry of Transport and Communication and other agencies directly or indirectly related to the energy sector. Besides, qualitative information were gathered through an extensive discussion with experts and managers working in the various organizations related to energy.

Part II of this report is organized into seven chapters, i.e., Chapters 7-13. The seventh chapter introduces the study, focusing on the rationale and the methodology employed; the eighth chapter covers the linkages between energy and socio-economic development, concepts of energy security, provides highlights of energy and environment, describes categories of energy users, the challenges and constraints of energy sector in Ethiopia; the ninth chapter deals with energy policies, strategies, development programs and institutions, infrastructure and capacity; the tenth presents the analysis of energy demand, supply and access in Ethiopia. Chapter eleven deals with the prospects for environment-friendly path of energy development; chapter twelve deals with finance and energy development including the private sector issues; the last one is chapter 13 which provides summary and recommendations that include future policy and strategy options for the development of alternative energy for Ethiopia, and measures towards enhancing supply and distribution capacity and energy sustainability.

Chapter 7

Introduction

7.1 Why deal with energy: the rationale, objectives and significance

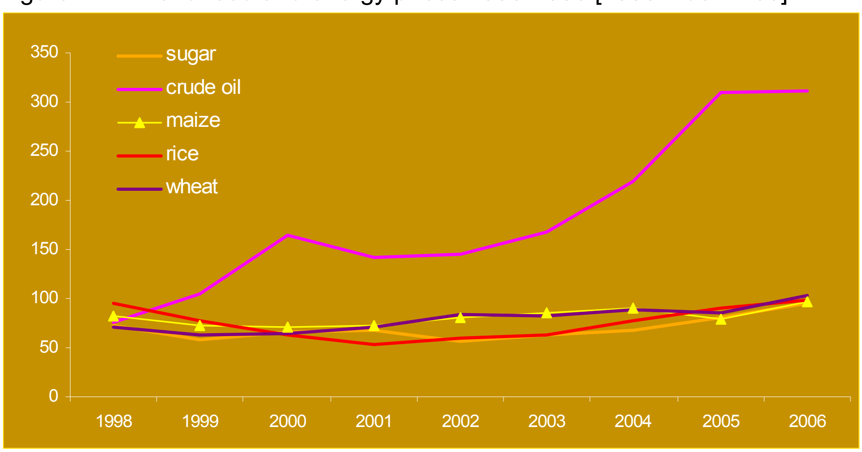
Modern energy development is among the human achievements that have facilitated and enhanced civilization and modernization. Modern energy has significantly contributed to the advancement of science and technology, industrialization, enhanced productivity, and improved living standard and human welfare. These being the background rationale why the power energy sector is so important for any country and national economy in general, the current trend of the socio-economic development, expanding urbanization, increasing demand for energy and power supply for the various economic sectors calls for emphasis to be given to energy and power in Ethiopia.

The low level of energy and power sector development in Ethiopia as reflected in the low per capita energy consumption by any standard, the insurmountable budgetary burden of import of petroleum fuel, the consumption of a huge amount of biomass energy and implications for environmental sustainability justify why the issue of energy sector development is among the critical national development issues. Furthermore, there is no doubt that Ethiopia's low level of socio-economic development is also attributed, among other factors, to the low development in the energy infrastructure and services. While the country is also known to have large and diversified potential sources of energy, to date the development of these resources is insignificant owing to several factors including lack of a long-term energy sector development policy and strategy, scarcity of investment capital, technological and skill limitations, etc.

The critical nature of energy sector in economic development is also a globally recognized fact. For instance, at the World Summit for Sustainable Development (WSSD) held in Johannesburg, South Africa, in 2002, leaders from around the world highlighted the critical role of energy in reducing poverty and enhancing sustainable development. Electricity and modern fuels are integral to economic development and trade and underpin agriculture, industry, transportation, and commercial enterprises in all countries (USAID, undated).

Globally the energy sector (especially use of fossil fuels) is often criticized for causing global warming and climate change. On the other hand, hydroelectric power has added-value for being environment friendly and renewable energy. In Ethiopia, the large share of imported fuel is used for transport energy. Given the rising world price of petroleum fuel it is well known that the import of petroleum has been creating huge pressure on the country's economy by consuming a significant portion of its foreign trade earnings (see Figure 7.1). Given these critical facts, it is high time that policies, strategies and measures for the development of alternative (and renewable) energy be given sufficient attention.

Figure 7.1: World food and energy prices 1998-2006 [1995 index=100]



Source: Von Braun (2007).

As shown in the Figure 7.1, world crude oil price increased over three-fold over the period 1998-2006. It shows grave implications for the national economies of oil importing countries in terms of effects on balance of payment of trade as well as burden on import bills and the scarce foreign exchange resource allocation.

Ethiopia being a tropical country, renewable sources of energy with high potential including solar, wind, and thermal energy provide valuable development opportunities. Given these facts and rationale, the current study aims at exploration of the status of the energy sector in terms of policies, strategies, development programs, energy demand and supply, capacities, challenges and opportunities. In addition, attempt is made to address the future prospects in energy supply and demand and implications for investments and energy sector development. In general, this study is designed to critically analyze the energy sector in Ethiopia and forward recommendations to inform public policy makers on the development of the sector.

Specifically, this study is expected to address the following relevant questions related to the Energy Sector in Ethiopia:

1. What is the current status of development and the role of the Energy Sector in the national economy?
2. What are the levels of coverage and quality of the power and energy generation, dissemination and utilization?
3. Given the growth in the national economy, energy needs and consumption, what will be the implied energy demand, investment requirement, import needs, and environmental impact?
4. Given the rising pressure of high petroleum fuel price in the world economy, what would be the future policy options for the development of alternative energy sources for Ethiopia?

5. What are the policy, institutional and technical constraints that hinder adequate development and promotion of alternative and renewable energy sources in Ethiopia?
6. What are the implications and consequences of the current energy development and utilization policy, strategy and practices for environment? What will be the effects of future power and energy sector development in this respect?
7. How would environment and climate change influence future energy strategy?
8. The role of the private sector in energy sector development: capacity, incentives, contributions?
9. The current and future status of research, innovation, and adaptation in energy technology?

7.2 Methods and data sources

The methods used for carrying out this study include: (a) desk review of key documents, (b) interviews and discussions with officials and experts of key energy sector institutions, and (c) analysis of cases. In this study various sources of data and information were explored. The sources of data are official secondary data collected or obtained from the different organizations related to the energy sector; various study reports including those obtained from internet facilities, project documents, and others. In most cases, relevant time-series data particularly on the supply, consumption and prices of biomass fuel, petroleum fuels and renewable energy sources were non-existent.

An extensive consultation and discussions were held with the experts and management of different organizations that are directly and indirectly linked to the energy sector. These are the management and experts of the Ministry of Mines and Energy (MME), The Ethiopian Electric Power Corporation (EEPCO), the Ethiopian Petroleum Agency (EPA), the Transport Division at the Ministry of Transport and Communication (MTC), The Ministry of Agriculture and Rural Development (MoARD), Universal Rural Electric Access Program, The Ethiopian Rural Energy Development and Promotion Center (EREDPC), and others. Names of organizations and experts consulted are provided in Annex Table 7.1.

7.3 Summary

The history of development of nations and human civilization has witnessed the important role of energy. Energy significantly affects socio-economic development, and the overall quality of life. Despite this fact, the development of the energy sector and energy consumption in Ethiopia is at a low level even by African standards. Nevertheless, the growing energy demand triggered by the economic growth is putting the sector under pressure.

The low level of energy sector development in Ethiopia, the insurmountable budgetary burden of import of petroleum fuels, the consumption of a huge proportion of biomass energy and its implications for environmental sustainability justify why the issue of energy sector development should be among the critical national development issues. While the country has a large and diverse sources of energy, to-date the development of these resources is insignificant. This could be due to several factors including the lack of a long-term energy sector development policy and strategy, scarcity of investment capital, technological and skill limitations.

Given these facts, it is high time that policies, strategies and measures for the development of alternative (and renewable) energy be given sufficient attention. The current study aims at exploration of the status of the energy sector in terms of policies, strategies, development programs, energy demand and supply, capacities, challenges and opportunities. It also attempts to address the future prospects in energy supply and demand and implications for investments and energy sector development.

Chapter 8

The Significance of Energy in the Socio-Economic Development of Ethiopia

8.1 The link between energy and development: Some review and conceptualization

Energy development, interpreted broadly to mean increased provision and use of energy services, is an integral part of enhanced economic development (Toman and Jemelkova, 2002). The development and status of the energy sector is very much related and dependent on a country's level of socio-economic development. Toman and Jemelkova (2002) also elaborated on the Conceptual Linkages of Energy and Development. The linkages among energy, other inputs, and economic activity clearly change significantly as an economy moves through different stages of development. This phenomenon is described as an energy ladder, though the ladder concept does not imply a monotonic transition from one type of energy to another. At the lowest level of income and social development, energy tends to come from harvested or scavenged biological sources (wood, dung, sunshine for drying) and human effort (also biologically powered). More processed bio-fuels (charcoal), animal power, and some commercial fossil energy become more prominent in the intermediate stages. Commercial fossil fuels and ultimately electricity become predominant in the most advanced stages of industrialization and development. Again, energy resources of different levels of development may be used concurrently at any given stage of economic development: electric lighting may be used concurrently with biomass cooking fires. Changes in relative opportunity costs as well as incomes can move households and other energy users up and down the ladder for different energy-related services.

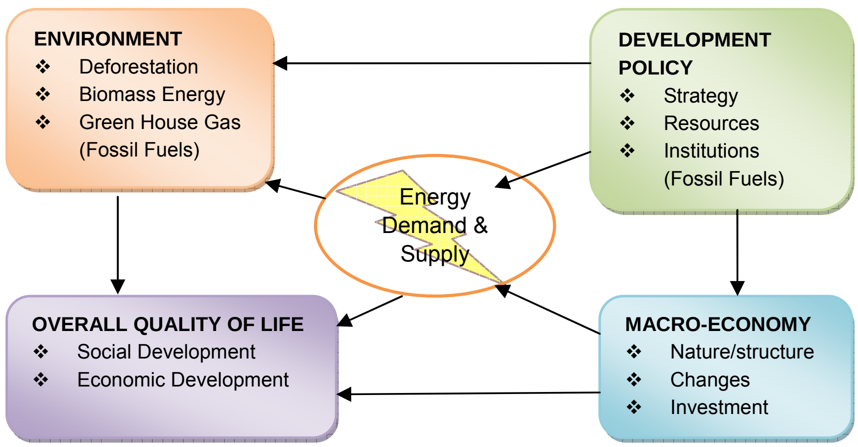
A study report by USAID (undated) wrote about Energy-Economic Growth and Trade Nexus. It states that energy advances economic growth and trade activities via: (i) industrialization, (ii) e-commerce, (iii) agricultural markets and trade, (iv)increased productivity, (v) small, medium, and micro-enterprises (SMEs), and (vi) Job creation and income generation. The data compiled by the Energy Information Administration[1] for the periods 1980 to 2006 show that GDP per capita and energy consumption per capita have strong correlation coefficient of 0.60. Energy use increases as more economic sectors develop and more channels for flow are opened. Economic diversity, as measured by the number of economic sectors using energy and the equitability of flows between them, generally, increases. As diversity increases the efficiency of generating outputs with a given amount of energy also increases (Paul, 1998). The same author also noted that there are two distinct development strategies regarding energy use - one which promotes energy use and one which emphasizes diversity and the sustainability of energy. While most countries are said to have employed a strategy of mixing the two, developing countries generally rely more on increasing energy use to increase output while developed countries tend to become more diverse as a means of increasing outputs. Sustainability is enhanced by strategies which promote diversity and resource use efficiency in economic systems.

There is a strong connection between the energy sector and a national economy. On the one hand, energy demand, supply and pricing have significant impact on socio-economic development and the overall quality of life of the population. On the other hand, the nature of economic structure and the changes in that structure, the prevailing macro-economic conditions are key factors of energy demand and supply. In addition, energy affects environmental quality through deforestation associated with unsustainable

[1] http://www.eia.doe.gov/emeu/international/other.html#IntlGDP

biomass energy dependence and greenhouse gas emission from fossil fuel (see Figure 8.1).

Figure 8.1: Conceptualization of the linkages of energy and socio-economic development

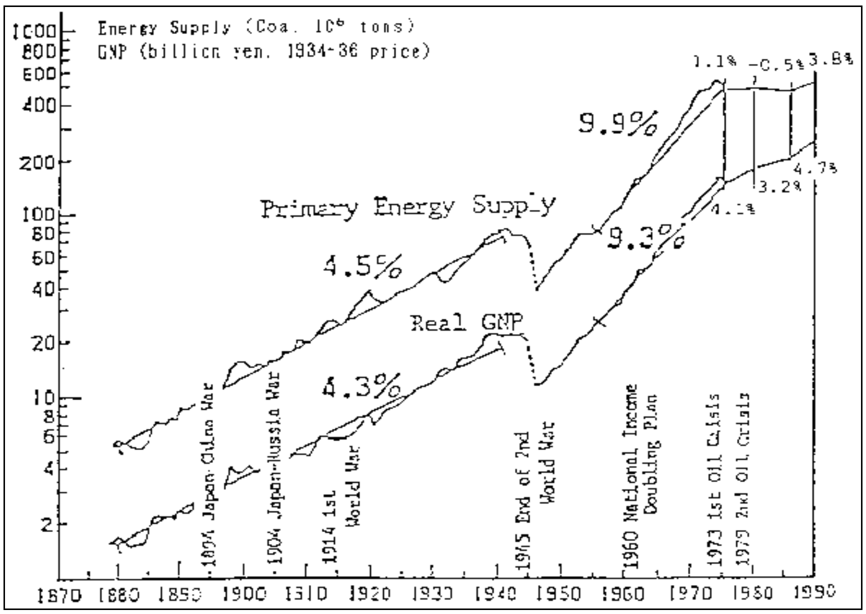


Source: Adapted from Toman and Jemelkova (2002).

Energy is an important input in production process. The energy price is a major determinant of variable costs in production. Its rise boosts the price level, generating inflation through at least four channels (Piana, 2004-2009): (i) the increase in production costs of energy-intensive manufacture; (ii) the rise of transport costs; (iii) the rise in prices of purchased goods; and iv) the direct increase in the energy bought by final consumer (e.g. fuel for cars).

The economic history and development experience of countries around the globe show that the pace of economic growth is greatly linked to the rate of energy consumption. An illustration of this fact is given taking the Japanese hundred years of economic development experience (Figure 8.2). As shown in the figure, the rate of Real GDP growth and growth rate of primary energy supply was strongly linked. In fact, the two growth rates were almost equal. This observation over a long period of time provides a strong evidence of how energy development and consumption supports economic growth of nations.

Figure 8.2: Trends in Japan's GNP and primary energy supply, 1880-1990 (average change rate, % p.a.)



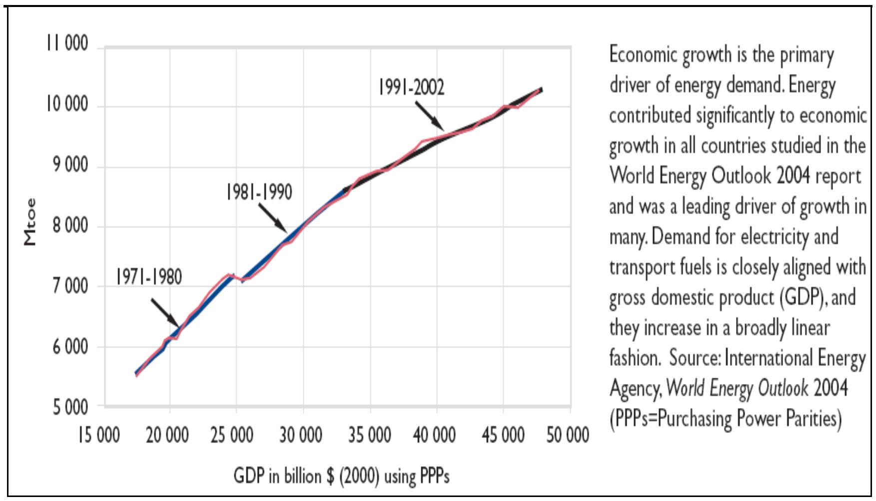
Source: Watanabe (undated).

A report in the world energy outlook in 2004 also shows a strong association between economic growth and energy demand. Data taken for a period that spans over three decades shows that while energy has significantly contributed to the growth of world countries, economic growth, in turn, has been the primary driver of energy demand (Figure 8.3). An average world

GDP for the period 1971-1980 was estimated to be 20 Trillion USD while the value increased and doubled to 40 Trillion by 1991-2000.

The above being the general fact, however, other studies conducted on African countries gave mixed results about the link between electricity consumption and economic growth. A study by Yemane (2004) reported that while the availability of electricity by itself is not a panacea for the economic and social problems facing Africa, the supply of electricity is nevertheless believed to be a necessary requirement for Africa's economic and social development.

Figure 8.3: World primary energy demand and GDP, 1971-2002



Source: USAID (undated). 'ENERGY, ECONOMIC GROWTH, AND TRADE'.

The study tested the long-run and causal relationship between electricity consumption per capita and real gross domestic product (GDP) per capita for 17 African countries for the period 1971–2001 using a co-integration test and a modified version of the Granger causality test. The result shows that there was a long-run relationship between electricity consumption per capita and real GDP per capita for only 9 countries and Granger causality for only 12 countries. For 6 countries there was a positive uni-directional causality running from real GDP per capita to electricity consumption per capita; an opposite causality for 3 countries and bi-directional causality for the remaining 3 countries. The author, however, warns that the result should be interpreted with care as electricity consumption accounts for less than 4% of total energy consumption in Africa and only grid-supplied electricity is taken into account in his study.

8.2 Description of the energy sector

Ethiopia has considerable energy resources that need to be exploited to accelerate its socio-economic development. The energy resources include hydropower, geothermal, wind, solar, woody biomass, natural gas and coal. Resource exploitation, however, has been largely limited to biomass and hydropower. The proven fossil fuel resources in the country are limited to natural gas and coal and these have yet to be developed.

Despite the presence of a variety of energy resources, the bulk of the national energy consumption is met from biomass energy sources. Biomass energy (fuelwood, charcoal, wood, waste wood, crop residues and animal dung, including biogas) accounted for 89 percent of total national energy consumption in 2006 (Mekonnen, 2009). Petroleum fuels and electricity met merely 7.6% and 1.1% of the national energy consumption, respectively.

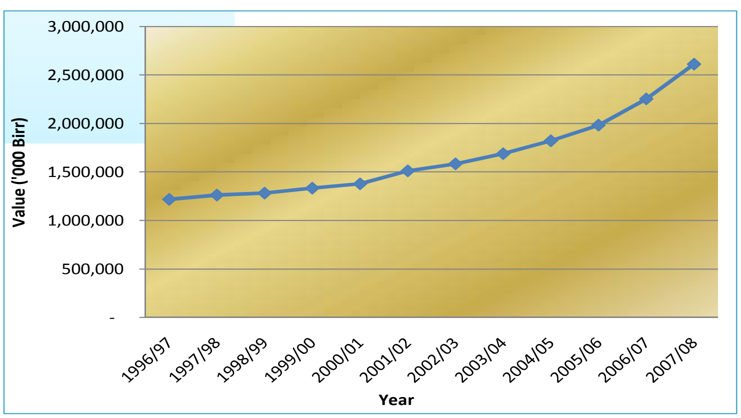
The energy sector in Ethiopia is characterized by the predominance of the household sector, accounting for 89% gross energy consumption in 2006. Domestic energy requirements are mostly met from wood, animal dung and agricultural residues. About 81% of the estimated 16 million households use firewood while 11.5% cook with leaves and dung cakes and only 2.4% kerosene for cooking.

Petroleum fuels are mainly used in the transport sector with a smaller share of the demand from the household sector (kerosene for cooking and lighting) and industrial sector (fuel oil for thermal energy). Electricity consumption among the sectors was 33% by households, 40% by industries and 26% by service sector.

8.3 The contribution of energy sector to the national economy

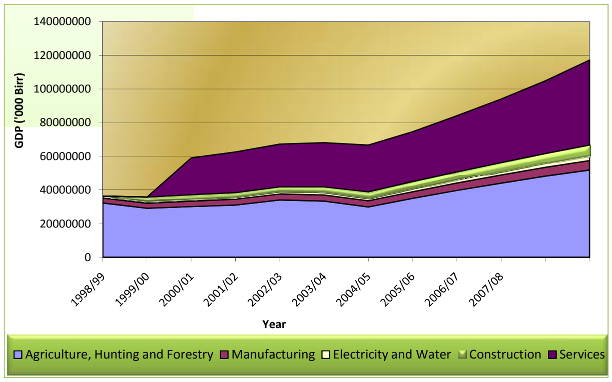
The energy sector is an important sector in Ethiopia in terms of input to the economic activities, revenue generation and its role in investment. Data provided by MoFED for the fiscal year 2005/06, show that the value-added of Electricity and Water (at constant market prices) was 2.02 billion Birr (see Figure 8.4). The value has been increasing over time. However, the share of the sector, compared to agriculture, industry and services, is still minimal due to the low development of the sector (Figure 8.5).

Figure 8.4: Real GDP of electricity and water in Ethiopia



Source: The MoFED data.

Figure 8.5: GDP by economic activity at constant prices ('000 Birr) in Ethiopia



Source: The MoFED data.

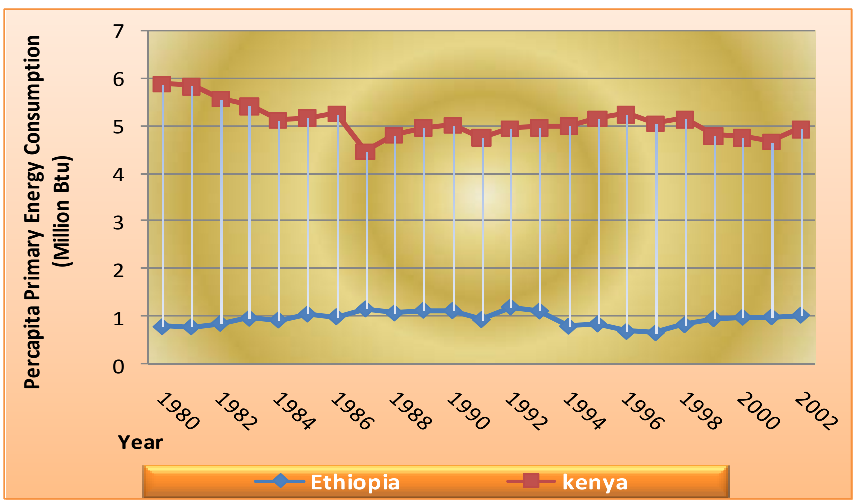
Power is also an important input for value-add in other sectors of the economy. In the year 2005/06[2], the government's capital expenditure in Mining and Energy sector was 264 million Birr (3% of the capital expenditure for economic development). Both the traditional and modern energy sources play a major role in production and livelihood activities in Ethiopia. Energy, specially electricity and power play a great role in automation and boosting productivity by significantly reducing the time it takes in production of goods and services and by increasing the rate of output.

As reported in the PASDEP (MOFED, 2005), Ethiopia is still at low level of development of energy infrastructure and access to energy. It is noted that

[2] Ibid.

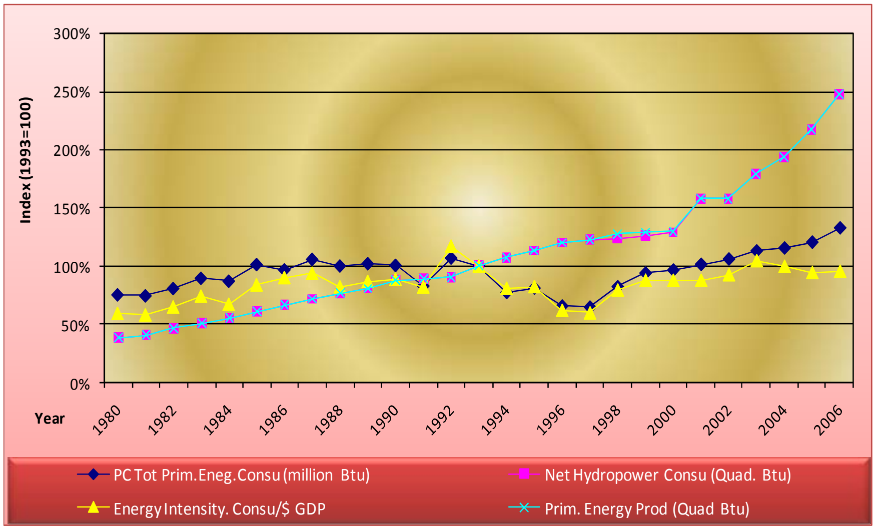
while developing countries' average figure for Electric Power (kW installed capacity per 1000 persons) is 272, Ethiopia achieved only 8 kW. Also in terms of Electricity Consumption (kWh per capita in the year 2001) Ethiopia averaged at 24 kWh while the developing countries' average was 938 kWh. About 94% of the country's electric power generation relies on water resources. A study by Ethio Resource Group *with* Partners (2007) shows that with only 6% of households connected and 15% of the population having access to electricity from Ethiopian Electric Power Corporation (EEPCo), access to electricity in Ethiopia is one of the lowest by any standards. Despite the fact that 80% of the population of Ethiopia live in rural areas, electricity supply from the grid is almost entirely concentrated in urban areas. Among other things, dispersed demand and very low consumption level of electricity among rural consumers, limited grid electricity penetration and coverage of less than 1% of the rural population have been the situation that explains how the service was at low level of development until very recent times.

Figure 8.6: Energy consumption in Ethiopia as compared to a neighboring country



Source: Based on the data from Energy Information Administration in USA.

Figure 8.7: Energy production, consumption and intensity in Ethiopia



Source: Computed based on the data of Energy Information Admisnitartion.

Time series data compiled (for world countries) by the Energy Information Administration in USA show that the per capita primary energy consumption for Kenya is five to six-fold that of Ethiopia implying the low level of development of the energy sector services in the latter (Figure 8.6).

Data obtained from the Energy Information Administration for a period that covers 1980 to 2006 show that while primary energy production has steadily rose over the reference period, per capita total primary energy consumption has not improved. The change in terms of index (1993=100) shows that primary energy production increased more than double while per capita energy consumption until the year 2002 was equal to the level of 1980s (Figure 8.7). Similarly, there has not been any meaningful improvement in energy intensity or efficiency i.e. the amount of energy consumed per economic value generated.

There is no doubt that better access to power and energy contributes to improved productivity through enabling more production per unit of inputs and higher labour productivity and enhanced quality of production. Power and energy is also a means for poverty reduction and better quality life through development and better access to quality social services like education, health, infrastructure and communication. The UN Report on Energy (UNIDO, 2008) underlines that energy today is at the heart of economic, environmental and developmental issues. It is also noted in the report that the world needs clean, efficient and reliable energy services to meet its long-term needs for economic growth and development. Developing countries need to expand access to reliable and modern energy services to alleviate poverty and increase productivity, to enhance competitiveness and economic growth.

In this respect, a study report by Roger M. Gaillard (2008) underlines that access to sustainable energy is a key factor for promoting social progress and economic growth—both of which are closely linked to sustainable poverty reduction. Energy plays a critical role in underpinning efforts to achieve the Millennium Development Goals (MDGs) and improving the lives of poor people across the world. Lack of access to adequate, affordable, reliable, safe and environmentally-friendly energy is a severe constraint on development. The author notes that research works and history show that there is a close correlation between the use of energy (electricity) and the quality of life. He refers to surveys and data-based evidences in the nineties that there exist two critical thresholds for developing countries to achieve sustainable socio-economic growth when measured with the yardstick of energy consumption. Below 1000 kWh of annual per capita consumption of electricity (which constitutes 60% of the world population) indicators like literacy rate and access to potable water remains, respectively, below 50 and 40 %. When the per capita consumption reaches 2000 kWh, the same indicators rise to 85 and 90%. It was further indicated that the same correlation has been established also for human development indicators like infant mortality or life expectancy.

Compared to other countries, rural electrification in Ethiopia is much overdue. The low development of the energy sector, remoteness (inaccessibility) of much of the country's rural side, and the lack of policies and strategies that address the rural electrification and energy needs contributed to this. Against this big backlog and shortcomings in the past, the universal electric access program recently launched for rural villages and towns by the government is the right intervention. The existing pattern of rural settlement, adequate follow-up of the implementation and continuity of the program (given the huge resource requirements) are the major concerns in this respect.

Estimates show that Ethiopia's hydroelectric power generation potential is in the range of 15,000 to 30,000 Megawatts (MW). What has been developed so far amounts only to 663 MW[3] or only 2 to 4% of the total potential[4]. Among the modern energy sources, hydroelectric power energy is the main source of energy in the country. Although the country has an immense potential for hydroelectric power and energy development, to-date little share of this potential is utilized. These facts and figures show the daunting tasks and challenges ahead in terms of the development and expansion of energy services in the country.

A recent report by the Ministry of Mines and Energy (2009) acknowledges that in Ethiopia, currently the energy consumption per capita is at low level, and unsustainable due to over-dependence on bio-mass (fuel-wood). Energy consumption in Ethiopia is low in per capita terms, and its structure is underdeveloped. The current energy supply is made up of less than 1% electricity, about 5.4% hydrocarbon fuels, while the balance is from traditional biomass fuels. Most of the petroleum products are consumed in the transport sector, whereas household energy comprises primarily of biomass fuels. The available evidences also show that about 40 million tons of fuel wood and 8 million tons of agri-residue are consumed annually.

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[3] Recent updates give a figure above 900 MW.
[4] PASDEP document (MoFED, 2006).

In Ethiopia bio-mass is the largest source of household energy. Official survey data that provide the percentage distribution of households by type of fuel used for cooking show that, in the year 2004, in rural areas 81% of the households used collected firewood, while still a large share (49%) of households in urban areas used purchased firewood. On the other hand, Kerosene/Butane Gas, and Electricity were used by only 0.4% of the rural and 19% of the urban households for the same purpose. This excessive dependence on biomass energy sources (mainly fuel wood, animal dung, crop residues) has important implications for soil and land management, agricultural land productivity, environmental and health effects via channels like clearance of the vegetative cover of land, deforestation, soil erosion and other complex consequences for climate change.

The steps taken by the Ethiopian government in the past few years through the current development programs that give higher attention to the energy sector is encouraging. The current development is appreciated not only for expanded and big investment commitments for energy development, but also for envisaged energy access to the rural villages. As stated in the current development plan under implementation (2005 -2010 i.e. PASDEP period), power supply will be increased by three-fold, with the construction of 5 major new dams, and addition of 668 MW of generating capacity. It is also indicated that a major rural electrification program is being undertaken, so that at the end of the plan period 50% of the population will have access to electricity, compared to about 17% today.

A study by Ethio Resource Group *with* Partners (2007), reports that the Long-range Energy Alternative Planning model (LEAP) is used to analyze and project energy demand and supply. Scenario analysis is made to determine possible development for energy supplies, i.e. conventional source dominated scenario vs. solar and wind energy friendly scenario. It is shown that the energy demand forecast carried out with the model indicates that demand can be expected to grow from 700 PJ (194 TWh) in 2000 to just over 1900 PJ (527 TWh) in 2030, a growth rate of 3.5% per year. Sectoral energy shares change where energy demand from the household sector drops from 91% in 2000 to 78% in 2030 with corresponding increases in the other sectors. Fuel shares in the energy balance also change with share of biomass from total demand declining from 93% in 2000 to 82% in 2030. The study also reports that in terms of supply the reference scenario shows that the nearly exclusive dependence of the electric grid continues into the future and hydropower plants will contribute 96% to total generation on the grid in 2030. In electrified rural areas supplies are currently mostly from off-grid systems but in the future the contribution of grid electricity will increase and by 2030 grid power will account for 66% of total rural electricity demand. Supply shortfalls appear for electricity in 2017 for the grid and immediately for off-grid systems. In the Reference scenario, shortfalls are met with the same supply mix as the base case whereas for the Alternative scenarios the shortfalls are met with solar and wind energy.

The detailed analysis by the same study[5] shows that solar and wind energy may supply the shortfall of 1TWh of grid electricity in 2017 and 12.8TWh in 2030; for off-grid electricity, shortfalls appear the year after the base year and it was estimated that solar and wind energy could provide 7.3GWh in 2001 and 300 GWh in 2030; for home systems the potential for solar and wind energy would be in 28MWh in 2001 and 13GWh in 2030; and for solar water heaters the potential would be 31GWh in 2001 and 2TWh in 2030.

8.4 Energy security and energy transition concepts

For energy security there appear to be the 'narrow' and 'wider' definitions. The narrow definition is centered on the notion of maintaining a sustained supply of energy to meet demand. The wider definition, on the other hand, includes security of energy supply infrastructure against intentional/criminal

[5] Ibid

acts as well as inadvertent failure. It also considers security against harmful fallouts from normal operation, malfunction, damages and breakdown of energy supply infrastructure, including effects on national well-being (peace and security), socio-economic activities, and the natural environment, among others. The wider definition emanates from the pervasive nature of energy, in the sense that energy is a vital input in almost every activity, and therefore its interruption is felt across all walks of life. Besides, the production, transportation and conversion of energy affect the natural environment in various ways and appropriate safeguards need to be put in place as part of energy security measures. In relative terms, the wider definition would be more relevant for developed economies with their higher degree of automation and technological sophistication.

Energy transition denotes a gradual but sustained switch to the use of different fuels on the basis of prices, affordability, availability, access, preference, ease of use, safety, health issues and environmental benignity, etc. For developing countries, it is normally expected that the energy transition is from traditional biomass fuels towards the more modern fuels like petroleum and electricity. This is also referred to as moving up the "energy ladder". The energy ladder is conceived as being a pyramidical ladder, with a broad base representing the more abundant biomass-based fuels, and the apex symbolizing the not -so- abundant fuels. The quality of the fuel gets higher as one moves up the ladder, but so does the price.

8.5 The problems and challenges of the energy sector in Ethiopia

The problems and challenges in the energy sector may be viewed along the lines of the major fuels, i.e., electricity, petroleum and biomass fuels. The major problem and challenge areas may be listed as follows:

i. Shortage of electricity generation capacity as evidenced by rampant power shedding through the years
ii. Low level of access to electricity supply
iii. The huge investment finance required for implementation of generation and transmission projects/ programs
iv. Need for better handling of environmental issues encountered in developing electricity supply infrastructure
v. Heavy financial burden resulting from import of petroleum fuels
vi. Lack of substitutes / supplements for biomass fuels used in households, in the face of decreasing availability of fuel wood
vii. Low level of efficiency of use of energy in all sectors
viii. Low level of renewable energy development outside large scale hydropower development
ix. Low level of entrepreneurial capacity in the energy sector
x. Lack of a comprehensive energy policy and strategy tuned to the current and impending challenges and opportunities
xi. Lack of a comprehensive development program for the sector.

8.6 Summary

Energy development, interpreted broadly to mean increased provision and use of energy services, is an integral part of enhanced economic development. The development and status of the energy sector is very much related and dependent on a country's level of socio-economic development. The linkages among energy, other inputs, and economic activity clearly change significantly as an economy moves through different stages of development.

Ethiopia is still at a low level of development of the energy infrastructure and access to energy. Ethiopia is by far less than the average for developing countries when one looks at both the installed capacity per person and per capita consumption for electricity. While 85% of the population of Ethiopia lives in rural areas, electricity supply from the grid is almost entirely concentrated in urban areas. Electricity coverage of rural population is less than 1% reflecting how the service was at low level of development until very recently when the Rural Electrification program was initiated.

It is well recognized that access to sustainable energy is a key factor for promoting social progress and economic growth—both of which are closely linked to sustainable poverty reduction. Energy plays a critical role in underpinning efforts to achieve the MDGs and improving the lives of poor people across the world. Lack of access to adequate, affordable, reliable, safe and environmentally-friendly energy is a severe constraint on development.

In Ethiopia bio-mass is the largest source of household energy. This excessive dependence on biomass energy sources (mainly fuel wood, animal dung, crop residues) has important implications for human health, soil and land management, agricultural land productivity, and environmental effects via channels like clearance of the vegetative cover of land, deforestation, soil erosion and other complex consequences for climate change.

Several challenges face the Ethiopian energy sector. These include, but not limited to, shortage of electricity generation capacity as evidenced by rampant power shedding through the years, the huge investment finance required for implementation of generation and transmission projects/ programs, lack of substitutes / supplements for biomass fuels used in households in the face of decreasing availability of fuel wood, low level of efficiency of use of energy in all sectors, low level of renewable energy development outside large scale hydropower development, lack of a comprehensive energy policy and strategy tuned to the current and impending challenges and opportunities.

Chapter 9

Energy Sector Policies, Strategies and Programs

9.1 Energy sector policy and strategies

9.1.1 Review of other national, sectoral and multi-sectoral policies

Energy is one of the key inputs for socio-economic development. Hence, not only there is a need for the development of energy policy but also other national economic, sectoral and multi-sectoral policies. The later helps in guiding the formulation and implementation of energy sector policy. In Ethiopia there are policies that have direct impact on the energy policy and others that are, in turn, impacted by the energy policy. These policies include national resources and environment policy, science and technology policy, water resource management policy, health and education policy, and others.

Following the change of government and national economic reform in 1991, the Economic Policy was provided in 1991. This is a policy that provides the basis for the principles of all sectoral and multi-sectoral policies that came thereafter. The major effect of this policy was shifting the role of government in managing the economy in a central planning mode to a market-oriented and private sector led one. The policy considers the need for peoples' participation in development endeavors.

Another major economic development strategy document is the Rural Development Strategy provided in 2001. Considering the fact that the national economy is largely dependent on agriculture, the strategy emphasizes the need for a rapid increase in agricultural productivity to improve the livelihood of millions of farmers and agricultural products consumers. It is also thought that rapid transformation of the agricultural sector will benefit the industrial and service sectors through direct and indirect linkages. This goal of raising agricultural productivity aimed by the strategy, also leads to the subsequent formulation of strategies for improving access to finance (for agricultural inputs and markets) and the development of the physical infrastructure. Energy being one of the essential rural infrastructures, the Rural Development Strategy addresses the issue of rural electrification and its implementation by both the public and private sectors. Furthermore, the strategy considers that solar and wind energy are potential alternatives for rural electrification. While electricity infrastructure is a sort of having first priority, the need for sustainable resource management and utilization is underlined for the traditional energy sector. It also emphasizes that participation of the non-government sector would be crucial in the application of solar and wind energy in rural areas.

Another policy with high relevance for the energy sector is the Natural Resources and Environment Policy of 1994. For Ethiopia’s large source of energy coming from the natural resources, this policy has a strong linkage with the sector. In connection with the energy sector, the issue of biomass energy sustainability is raised in this policy. It was noted that the non-sustainable exploitation of biomass resources is one of the key issues for the policy. The non-sustainable exploitation of forests is indicated to have contributed to soil erosion and degradation of water resources quality with consequent impacts on the hydropower potential of the country.

The Ethiopian Science and Technology policy issued in 1993 has the objective of facilitating capacity building in generation, development, use and dissemination of appropriate technologies to contribute towards national development goals. The policy also addresses the rationale and efficient utilization of natural resources including biomass energy utilization. It also recommends a wider dissemination of renewable energy technologies.

The investment Proclamation provided in 1998 contains general investment regulations that also apply to the energy sector. The regulations limit foreign investment for certain power generation facilities. Electricity generation from sources other than hydropower is reserved for the government and local developers while electricity generation from hydropower is open to both local and external investors without limit on capacity.

The development of non-hydro plants larger than 25MW is left to the government while those below this are left to the local private sector.

9.1.2 The national energy policy

i. Preamble: The National Energy Policy of Ethiopia was provided in 1994. The policy, in its preamble, emphasizes the fact that Ethiopia's Energy consumption is predominantly based on biomass energy sources, and an overwhelming proportion (94%) of the country's energy demand is met by traditional energy sources. It also stresses that the most important issue in the energy sector is the supply of household fuels, which is associated with massive deforestation and the resultant land degradation. The increasing scarcity of fuel wood is compounded by Ethiopia's high population growth rate. The policy document also cites figures of the various potential energy sources, and mentions that the country could not be able to develop, transform and utilize these resources for optimal economic development. In this connection it mentions that the Transitional Government of Ethiopia believes it is imperative to provide the economy with the necessary energy inputs at the right time and affordable prices.

ii. The rationale for the policy: considering that energy is critical for economic development, it is indicated that the need for energy policy is based on the following rationale:

a) To develop and utilize the country's energy resources on the basis of Ethiopia's overall development strategy priority along with the introduction of energy conservation and efficiency strategy.
b) To support other economic sectors to meet their development objectives by putting in place a clearly defined energy policy;
c) To save scarce foreign exchange resources and to ensure that energy is efficiently utilized;
d) To ensure reliable and secure energy supplies to cushion the economy from external and internal disruptions of supply as well as price fluctuations;
e) To change the current energy production and utilization practices and ensure that energy development is based on sound management practice and is benign to the environment.
f) To formulate comprehensive energy prices in order to ensure financial and economic profitability;
g) To ascertain what energy technologies and equipment are appropriate for and compatible with the country's economic development needs; and
h) To raise the efficiency of the energy sector and develop the necessary institutional and manpower capabilities by introducing appropriate incentive measures, to undertake energy development programs.

iii. Policy objectives: The general objectives of the energy policy are:

a) To ensure a reliable supply of energy at the right time and at affordable prices, particularly to support the country's agricultural and industrial development strategies adopted by the government.
b) To ensure and encourage a gradual shift from traditional energy sources use to modern energy sources.
c) To streamline and remove bottlenecks encountered in the development and utilization of energy resources and to give priority to the development of indigenous energy resources with a goal toward attaining self sufficiency.

d) To set general guidelines and strategies for the development and supply of energy resources;
e) To increase energy utilization efficiency and reduce energy wastage; and,
f) To ensure that the development and utilization of energy is benign to the environment.

iv. **General policy:** the policy document provides that the government of Ethiopia's general energy sector policy is:
a) To enhance and expand the development and utilization of hydrological resources for power generation with emphasis on mini hydropower development.
b) To promote and strengthen the development and exploration of natural gas and oil;
c) To greatly expand and strengthen agro-forestry programs;
d) To provide alternative energy sources for the household, industry, agriculture, transport and other sectors;
e) To introduce energy conservation and energy saving measures in all sectors;
f) To ensure the compatibility of energy resources development and utilization with ecologically and environmentally sound practices;
g) To promote self-reliance in the fields of technological and scientific development of energy resources;
h) To ensure community participation, especially the participation of women, in all aspects of energy resources development and encourage the participation of the private sector in the development of the energy sector.
i) To stage popularization campaign through mass media using various national languages to create awareness among the general public and decision makers regarding energy issues; and,
j) To create appropriate institutional and legal frameworks to handle all energy issues.

v. The priority of the policy: the energy sector policy priorities are:

a) To place high priority on hydro-power resource development, as hydrological resources are Ethiopia's most abundant and sustainable energy forms;

b) To take appropriate policy measures to achieve a gradual transition from traditional energy fuels to modern fuels;

c) To set, issue and publicize standards and codes which will ensure that energy is used efficiently and properly;

d) To develop human resources and establish competent energy institutions;

e) To provide the private sector with necessary support and incentives to participate in the development of the country's energy resources; and

f) To pay due and close attention to ecological and environmental issues during the development of energy projects;

vi. The main policy issues: the policy document enumerates and discusses the following main policy issues.

1. **Energy resources development:** with respect to energy resources development traditional fuels are identified as one of the major areas. It was indicated that country-wide afforestation program will be undertaken to enhance the supply of fuel wood to consumers. In addition, the document mentions that to reduce the negative effects of agri-residue use for energy on soil fertility, measures will be taken to modernize and increase the efficiency of the utilization of agri-residue as energy sources. With respect to modern energy, hydro power will form the backbone of the country's energy sector development strategy, as it is the country's most abundant and sustainable energy resource. Furthermore, the document promises that Ethiopia's geothermal and coal resources will be developed on the basis of their economic profitability; and natural gas resources will be developed and utilized to meet as much of the country's energy demand as possible; and promising areas for oil and natural gas will

be explored by providing incentives to oil companies to encourage them to take in exploration activities.

Another aspect mentioned is alternative energy resources development that refers to solar, wind and coal resources. The document mentions that solar and geothermal energy will be used, wherever possible, for process heat and power generation. It is stated that Ethiopia's wind energy resources will be developed to provide shaft power for water pumping and irrigation. Coal will be developed and introduced as an alternative fuel.

2. **Energy supply:** with respect to energy supply, it is indicated that the government's household energy policy is to achieve a balance between the supply and demand for household fuels. The government will seek to stabilize prices by increasing the supply of alternative fuels and relieving the pressure on wood resources. **Transport energy supply policy:** the transport energy supply policy is meant to serve several purposes: i) To formulate policy measures and give emphasis to the introduction of improved and appropriate transport technologies in the rural areas; ii) To adopt conservation measures in order to reduce the use of petroleum products in the transport sector; iii) To decrease the use of petroleum products in the transport sector by substituting, wherever possible, to new non-petroleum fuels. T**he agriculture energy supply policy:** the government's agricultural sector energy supply policy is to increase the supply of modern energy sources to the agricultural sector. **Industrial energy policy:** the government's industrial sector energy policy wishes to ensure that industrial energy supply will be compatible with the industrial development of the country; and ensure that industrial energy use and supply will be based on economic and efficiency criteria.
3. **Energy Conservation and Efficiency:** the policy document indicates that it is necessary to adopt energy conservation and efficiency measures in all sectors. It is mentioned that it is necessary to establish the necessary mechanisms to ensure adherence to such

standards and codes. With respect to the households' energy, the policy is to increase energy efficiency in the household sector by instituting conservation and energy saving measures. In industrial energy sub-sector, the policy aims to improve the efficiency of industrial equipment to conserve and reduce energy consumption. With respect to the transport energy the policy wishes to institute and enforce measures to improve energy efficient use and conservation in the transport sector in order to decrease petroleum product consumption. In agricultural energy the policy is, wherever possible, that energy demand in the agricultural sector will be met through locally-produced modern energy resources. In the commercial and service sector the government planned to adopt energy efficiency measures to eliminate energy waste that arises from inefficient end-use devices. In the mining and construction sector, energy saving measures will be adopted to decrease energy wastage.

Although the policy contains these important aspects and promised towards achieving energy efficiency in the various sub-sectors, to date not much seems to have been achieved in this respect.

4. **Comprehensive policy measures**: the energy policy document also addresses other cross-cutting issues that are essential and related to the energy sector. These are energy and environment, energy science and technology, energy policy, planning and management. The latter includes issues of creating and maintaining an energy data base to assist in energy planning, management and informed decision making. Manpower development and energy Education is mentioned as one of the necessities to effectively undertake energy development programs and least cost energy planning to develop the necessary manpower on all aspect of energy development and utilization. It is also noted that to enhance energy saving it is necessary to create awareness about the critical role of energy by educating the public on general energy issues. The last aspect is the institutional issues of energy. It was underlined that it is imperative to create an institution which is entrusted with policy formulation, priority

setting and coordination of all energy sector development activities in order to coordinate and ensure consistency in energy resource development, and to avoid resource wastage and duplication of efforts.

9.1.3 Energy sector strategy

The Ministry of Mines and Energy (MME) has developed a five year Strategic Plan for Mines and Energy sub-sectors for the period 2006 to 2010 (MME, 2007). The strategy document thoroughly discussed the general status of the development of the two sub-sectors, the challenges, the institutional mandates, the visions, missions and goals of the MME. It also discussed the backgrounds of the strategic plan, development programs, implementation capacities in mines and energy sub-sectors. In the energy sub-sector, the document comprises of issues of strategic plans for electric energy industry, electric energy supply service and regulatory aspects, the national petroleum depot, and issues of the Rural Energy Development and Promotion. The other issues addressed include the assumptions of the strategic plan, plans of implementation, monitoring and evaluation, and expected outputs by the end of the plan period.

The Strategic Plan document contained a detailed account of the program implementation strategies for the major sub-sectors in the energy i.e. for the electric industry, electric service supply regulatory works, the National Petroleum Depot, and the Rural Energy Development and Promotion (MME, 2007).

9.1.4 Gaps and shortcomings of the energy policy

One of the criticisms that energy policy faces is that it is now 15 years since the policy was provided in 1994. In the face of the changing and emerging complex challenges and opportunities in the national context and global arena (in relation to the recent international energy and fuel crises and price instability), the policy should have been updated to take account of these facts. The other major and obvious comment that can be raised is the fact that now after 15 years most of those good intentions and expectations of the development in the energy sector have not materialized. The reasons why the country could not achieve the desired goals might emanate from several factors including the ambitious plans, lack of adequate capital and implementation capacity, lack of implementation guidelines, weak program and project monitoring and evaluation, and others. In terms of the policy implementation and achievements of the desired goals in the energy sector, the following shortcomings can be mentioned.

1. Countrywide afforestation program was promised to enhance the production of traditional fuels. Although investment is left to the private sector engagement, it is not known how much has been done in this area. We learnt that there was no assessment done.
2. Although the energy policy document mentions that to reduce the negative effects of agri-residue use for energy on soil fertility, measures will be taken through modernizing and increasing the efficiency of the utilization of agri-residue as energy sources, not much has been achieved yet. The Agricultural extension service has been trying to introduce some techniques of on-farm compost production by farmers for use in soil fertilization. The application, however, is at low level and takes a small share of means of soil fertilization. The global energy crisis and the ever rising fertilizer price are expected to have impact on farmers' attitude and practices in this respect.
3. With respect to energy supply, the policy document provides households' energy policy that the government's aim is to achieve a balance between the supply and demand for household fuels. It was stated in the policy document that the government will seek to stabilize fuel prices by increasing the supply of alternative fuels and relieving the pressure on wood resources. However, although kerosene fuel consumption subsidy has been in place in the past in order to reduce a burden on consumers,

in recent times the lifting of subsidy witnessed price escalation on household fuels, and has negative consequences on welfare of the poor households.

4. The energy supply policy of the government aims to increase the supply of modern energy means to the agricultural sector. Little is known about the achievement and implementation in this sector beyond the recent attempt of universal rural electrification program whose immediate services will obviously be limited to household lighting rather than use in productive agricultural activities. Neither the Ministry of Agriculture and Rural Development nor the Ministry of Mines and Energy has an organized data on petroleum fuel use in agriculture.
5. The Policy and strategy are somehow dominated by hydro-power undermining other potential sources of energy. There are also arguments that given the mounting climate change and effects on the hydro-ecology of the country, sole reliance on hydro-power could be unsustainable.

Other previous studies have also critically assessed the Energy Policy and identified the major gaps. Few of them are indicated below:

I. A study by the Ethio-Resource Group with Partners on Solar and Wind Energy Utilization and Project Development Scenarios reported in 2007 has made the following comments on the energy policy.
   a) *The rural sector is omitted in the policy*. The greatest drawback of the policy is its total disregard to the rural sector. Rural areas are mentioned only once in the policy document and only in relation to “appropriate rural transport technologies.” This flaw has made the policy analysis overlook resources and technologies that would be suitable in the rural setting.
   b) *The policy was not based on detailed needs analysis*. The policy makers seem to have followed a top down approach where little demand analysis was made at sub-sector level (for example the rural sub-sector).

c) *The policy was formulated based on inadequate information*. Wind energy is proposed for mechanical applications only. The role of wind energy was limited to mechanical power because the available data at the time indicated wind speeds to be below 5m/s for all parts of Ethiopia. This is an example of policy made on inadequate information;
d) *No strategies were set for private sector participation*. Another failure of the policy is its lack of strategies for its policy statements (at least as indications). For instance, although private sector participation (and incentives) is stated as a major policy, there is no indication in the document of how this may be achieved. The main reason for private sector participation is to mobilize private resources to reduce government budgetary burdens.
e) *Financing was overlooked*. Resource mobilization, and specifically finance mobilization, is a critical issue for any sector development. This issue has, however, not been addressed at all in the policy.
f) Renewable energy resources in Ethiopia, with the exception of biomass, have not been actively incorporated into the national energy program. Apart from very few donor driven and project-based markets there has been hardly any development in the utilization of renewable energy resources and dissemination of such technologies.

The report concludes that there is a need for a new energy policy for Ethiopia.

II. An Assessment of the Ethiopian Energy Policy and Bio-fuel Strategy (Bekele, 2008). The report gave the following comments on the implementation and challenges of the energy policy.
   a. Most of the policy statements are too general to show/indicate concrete measures to be taken to improve the development of the sector.
   b. Except for the bio-fuel sub-sector, the policy does not have a general implementation strategy and action plan.

c. In terms of the policy direction, the focus on renewable energy is predominately only on hydro-electricity, especially the small-scale one.
d. The policy does not say anything about energy trade and regional cooperation in this respect.
e. The policy does not address the issues of bio-fuel, solar, wind and thermal energy, and the need for national capacity and technology building in this respect.
f. The policy document does not contain a clear idea on energy development financing and budget issues.
g. Given the high dependence on hydro-electric power, and the weather shocks that could easily affect the country's water resource, the policy document does not give attention to the need for a strategy of mixing and developing the various energy sources to overcome the challenges of vulnerability to weather shocks.
h. The policy document does not say anything about the private sector energy producers.
i. The policy does not adequately address the issues of energy efficiency and how this could be done and achieved. For instance, a concern about the annual inspection of the fuel efficiency status of cars.
j. The policy does not mention the need to coordinate the different institutions and organizations that work in energy sector under one Ministry.
k. In relation to the policy's desire to avail the required energy at the right time and affordable price, the policy has weakness in the areas of traditional energy during its 13 years of implementation.
l. In view of the escalating petroleum price and heavy impact on the country's trade balance, no meaningful effort has been made to develop alternative domestic energy sources like coal.
m. The second major area of the policy focus is the shift/transition from traditional to modern energy. In this respect, no large-scale program has

been designed to address the issue of access to modern energy (like solar energy) in the remote areas that are far off the electricity grid.

n. No meaningful result has been achieved in terms of promoting modern household fuel energy in rural areas while this has been partly achieved in urban areas.

9.2 Energy sector programs, projects, infrastructure

The electricity supply infrastructure consists of the generation, transmission and distribution network which reaches out to demand centers in the country. Until recently, the out -reach was limited to the urban areas, but effort is being made currently to bring in the rural areas into the network. The infrastructure is dominated by the hydro system, which accounts for over 95% of the generation. Power export to neighboring countries is being planned, and transmission lines are being constructed to this end, too. Almost the entire electricity supply infrastructure is publicly owned.

Petroleum fuels supply network consists of oil storage depots (both publicly owned strategic reserve depots and depots that are owned by oil distribution companies), storage facilities at oil- filling/retail stations, and bottling and sales stations for light petroleum gas (LPG).

Oil and gas is transported by road or rail, and, therefore, no oil or gas pipeline infrastructure exists in the country currently. Since oil and gas is imported in the form of refined products, no refinery infrastructure exists either.

Biomass fuels production, transport and sales is effected entirely by the private sector. As such, no permanent or formal infrastructure exists for biomass energy supply.

Public sector programs in the energy sector mainly consist of:

- Expansion of electricity generation transmission and distribution infrastructure
- Expansion of the national petroleum reserve depots construction, and
- Small -scale alternative/ renewable energy technology studies, development and promotion for rural household and community applications.

Except for the petroleum reserve depots' construction, which is wholly financed from Treasury sources, the rest of the programs are financed through a combination of Treasury sources, loans, grants and enterprise - generated own fund, the latter in the case of electricity sector programs.

9.3 Capacity in the energy sector: organizational setups, human resources, technology

9.3.1 Organizational set-up

The Ethiopian energy public sector institutions are structured along the electricity, petroleum/ oil and alternative/renewable energy sub-sectors. Biomass energy, which constitutes the backbone of the energy sector, is subsumed within forestry development, and, therefore, the responsibility for planning and implementing biomass energy programs does not explicitly fall under any institution.

The overall supervision of public sector energy institutions has largely rested with the Ministry of Mines and Energy (MME), except for a brief period (2001-2005) when this role was shared between the Ministry of Infrastructure and the Ministry of Rural Development. However, petroleum fuels import and distribution remains outside the purview of the MME, while overseeing oil and gas exploration activities, as well as petroleum reserve depot construction fall under the Ministry's mandates.

The electricity sector has a regulator outside the MME. The regulator, the Ethiopian Electricity Agency (EEA), is responsible largely for the review of electricity tariffs, enforcement of operational / technical standards and licensing of operators in electricity supply.

The public electricity supply sub-sector is represented by the Ethiopian Electricity Power Corporation (EEPCO), a vertically integrated utility responsible for the generation, transmission and distribution of the bulk (over 95%) of electricity in the country. EEPCO is headed by a Board of Management.

Petroleum fuels import and bulk sales to distribution companies are carried out by the Ethiopian Petroleum Enterprise (EPE). EPE is also headed by a Board of management.

Petroleum reserve depot construction and administration is undertaken by the National Petroleum Reserve Depot Administration (NPRDA) which is accountable to the MME.

Alternative/renewable energy development is undertaken by the Ethiopian Rural Energy Development and Promotion Center (EREDPC). EREDPC is also accountable to the MME.

9.3.2 Human resources

By far the largest employer of human resources in the public energy sector is EEPCO. EEPCO's workforce numbered about 11,055 in 2006. Degree holders were 610, whereas diploma and certificate holders numbered 4244. The male/female ratio was about 13. The total workforce size increased significantly since 2003, and is likely to continue to grow with the expansion of electricity services.

EEPCO is fully self-reliant in the operation of its supply system and customer services. It also has the capacity to construct transmission and distribution lines, includign132 kV transmission lines and substations. It calls on foreign expertise for the design and construction of hydropower stations and higher voltage transmission lines.

9.3.3 Technology

The electricity supply system largely consists of imported hardware, except for distribution poles, dams and other civil structures. Reliability, efficiency and safety requirements dictate that the supply system is built per accepted standards, using modern technologies.

9.4 Summary

Energy is one of the key inputs for socio-economic development. Hence, not only there is a need for the development of energy policy but also other national economic, sectoral and multi-sectoral policies that are relevant for and affect the former. Energy being one of the essential rural infrastructures, the Rural Development Strategy of Ethiopia addresses the issue of rural electrification and its implementation by both the public and private sectors. Furthermore, the strategy considers that solar and wind energy are potential alternatives for rural electrification.

The Ethiopian Energy policy was adopted in 1994. It aims at ensuring a reliable supply of energy at the right time and at affordable prices, particularly to support the country's agricultural and industrial development strategies adopted by the government; and ensuring and encouraging a gradual shift from the use of traditional energy sources to modern energy sources. The policy places high priority on hydro-power resource development, owing to the fact that hydrological resources are Ethiopia's most abundant and sustainable energy forms. The policy also talks about providing the private sector the necessary support and incentives to participate in the development of the country's energy resources. However, now after 15 years most of those good intentions and expectations of the energy sector development mentioned in the policy have not fully materialized.

While activities and achievements in hydropower projects are significant and encouraging, other areas including alterative renewable energy, energy efficiency in the various sub-sectors, and private sector participation have not been achieved. Several factors including the ambitious plans, lack of adequate capital and implementation capacity, lack of implementation guidelines, weak program and project monitoring and evaluation, and other reasons might have led to the low achievement. While the energy sector has been facing complex development challenges to be addressed, it is, however, being guided by an old policy designed over one and a half decades ago. This policy needs to be updated in order to account for the current and emerging challenges that face the sector and to address the rising energy service demands in the country.

Looking at the modern energy development and distribution structure, the electricity supply infrastructure in Ethiopia consists of the generation, transmission and distribution network which reaches out to demand centers in the country. Until recently, the outreach was limited to the urban areas, but effort is being made currently to bring in the rural areas into the network. Biomass fuels production, transport and sales is effected entirely by the private sector. As such, no permanent or formal infrastructure exists for biomass energy supply.

Chapter 10

Energy Resources, Demand, Supply and Access in Ethiopia

10.1. Energy resources of Ethiopia

Ethiopia is endowed with various energy resources including hydro, geothermal, natural gas, coal, biomass, solar and wind energy. The gross hydro-energy potential of the country is estimated at 650,000 GWh per year (CESEN, 1986; WAPCOS, 1990), of which 25 percent (160,000 GWh per year) could be economically exploited for power. The gross hydropower potential of 650,000 GWh/year is second only to that of the Democratic Republic of Congo (DRC) (estimated at about 770, 000 GWh/year) in Africa.

The "economic" hydroelectric potential of 160,000 GWh per year (or 30,000 MW in installed capacity terms) can support electricity development at a scale fifty times the capacity of hydropower plants currently in operation in Ethiopia. This hydropower potential is distributed in 12 major river basins in the country, including the Abbay, Omo Gibe and Baro basins. Hydropower sites of various capacities abound, with over 20 sites believed to provide over 200 MW each.

Although the gross hydro potential of 650,000 GWh/year has not been contested since the CESEN and WAPCOS studies, the fraction of the potential that could be economically exploited has been raised to 40% in some reports. Accordingly, the economic hydroelectric potential is at times stated as 260,000 GWh/year and 45,000 MW.

With respect to geothermal resources, CESEN reports (CESEN, 1986) put the potential at about 700 MW in terms of electricity production. The resource is distributed along the rift valley running from Dallol in the north to the Kenyan border in the south. The main concentration of the geothermal resource is at the Dankil depression (170 MW), Tendaho Graben (380 MW) and Aluto area near Lake Langano (170 MW). Aquifer temperatures of around 200^{o}c have been cited in these sites. The geothermal energy at Tendaho Graben is particularly important, as the region is situated far from hydropower generation centers.

The Ethiopian Institute of Geological Studies has since carried out detailed investigation of the geothermal resources in the rift valley. Based on its findings, the institute has revised the resource potential to about 5,000 MW.

Based on the geographic distribution of sedimentary basins, oil and gas exploration and geological studies have been undertaken in the Ogaden, Bale, South Omo, Gambella, Abbay basin and Mekelle areas. Of these, the Ogaden area appears to have been investigated in relatively greater detail through geological studies and actual drilling. In particular, Sinclair (in the 1940s), Tanneco (in the 1960s and 70s), and the Soviet Petroleum Exploration Expedition-SPEE- (in the 1980s and 90s) carried out drilling in the Ogaden area. These studies have indicated the existence of about 70 billion cubic meters of natural gas reserves at Calub (Beicip Franlab, 1998), and a second gas reserve of about 40 billion cubic meters in Hillala locality. Exploration for oil and gas is still on-going in various parts of the country.

The natural gas reserve total of 110 billion cubic meters so far discovered in Ethiopia is not much in comparison to those of Algeria, Nigeria, Libya and Egypt, whose reserves are typically over a trillion cubic meters. However, the Calub gas reserve alone could yield about 30 million tons of middle distillate petroleum fuels if used as feedstock in gas to liquid convertor plants (see Mengistu, 1992). This is equivalent to about fifteen years of oil import for Ethiopia at present.

Biomass energy resources in Ethiopia have been studied in some depth by CESEN in the late 1970s, and the Woody Biomass Inventory and Strategic Planning Project (WBISPP) at the turn of the century. Both studies indicated that the biomass stock at the national level could sustain the domestic demand, but that the mismatch between the resource and demand locations created fuelwood shortages in several localities.

CESEN's estimate of woody biomass resources was based on "vegetation cover as revealed from Landsat image photo interpretation at a resolution of 200 to 250 meters and a field calibration covering a line length of about 10,000 km corresponding to some 10% of the Ethiopian territory" (CESEN, 1986). The study points out that this is a standard methodology, except that "the calibration and extension was based on a smaller sample density and less precise evaluation of the characteristics of forest ecosystems". The study also points out that, unlike the practice in other forest inventories, the estimate of both standing stock and annual biomass yield does include branches, twigs, leaves and roots, since these too are important combustible energy sources actually used by households in Ethiopia. The Landsat images used were those of the second half of the 1970s. WBISPP reports in fact refer to these images as being those of 1977.

Based on this approach, the study arrived at a total energy of 13 million Tcal and 897 thousand Tcal for the woody biomass stock and annual yield, respectively, for the late 1970s for Ethiopia, excluding Eritrea, as a whole. On the basis of 3,500 kcal/kg conversion factor, the standing stock and annual yield translate into 3,700 million tons and 256 million tons, respectively, of woody biomass. For the annual yield in particular, this translates into 7.8 tons per capita for the Ethiopian population of 32.7 million in 1977. This per capita yield is clearly much more than the per capita demand for woodfuel, which is usually estimated at about one cubic meter (0.6 ton) per year.

The more recent WBISPP study of woody biomass resources in Ethiopia was also an extensive undertaking to determine the size and geographic distribution of biomass resources of Ethiopia. The WBISPP estimate for the standing stock and annual yield of biomass was 1,149 million tons and 50 million tons, respectively, for year 2000 (WBISPP, 2004). This translates into a per capita yield of about 0.79 tons of woody biomass for the year 2000 population of 63.5 million in Ethiopia. This value of per capita yield too is above the per capita demand, and as such does not represent any immediate threat for the energy sector.

On the other hand, the contrast between the CESEN study estimates and those of WBISPP for the standing stock and annual yield for woody biomass resources is alarmingly huge. Ignoring methodological differences in the two studies, the standing stock values would represent an annual decline of 5.2% in the period 1977 -2000. This rate of decline is much higher than the rate of decline in dense forest area. The latter is estimated at about 2% per year (Ibid, pp. 20). The decline in standing stock, combined with population growth, would result in the per capita yield of woody biomass rapidly falling below the per capita demand of 0.6 tons.

The annual yield figures discussed in the foregoing paragraphs do not include non-woody biomass such as agri-residues and dry dung, which would gain importance in the energy scene as woody biomass resources dwindle. Also, neither study appears to have captured scattered woodstands and lone trees as are found on farm peripheries, compounds, river banks, etc. These resources would, nevertheless, continue to provide lifeline energy to rural households.

It should be noted here that the dwindling of woody biomass resources is not attributable to energy consumption alone. In fact energy consumption plays a relatively small role in deforestation. The main factors behind deforestation are believed to be clearing of woodlands for agriculture and settlement, logging of wood for industrial use and cutting wood for use as construction material (Mengistu, 1991). Expansion of urban centers is also becoming a significant factor.

Coal resources in Ethiopia are widely distributed over the country, including the western and south western parts of Ethiopia, northern Shewa and Gondar. The resource is estimated to be about 300 million tons (MME, 2009). The coal reserves in most areas are of low calorific value, high ash and sulphur content lignite. However, the reserves in the western and south western parts of Ethiopia, especially in Yayu, and Delbi Moye areas have attracted much attention due to their quality and size. Studies have so far been carried out to use the coal resource for power generation, industrial steam raising and production of coal - based fertiliser. Coal briquettes based on refining and compacting low - grade coal can also be used as a household fuel.

The areas of rich coal reserves in the western and south western Ethiopia are also associated with oil shale reserves. In all, about 250 million tons of oil shale is believed to exist in Ethiopia (Welela, 2006). Oil shale are rocks containing bituminous material/oil trapped within pores in their structures. The trapped oil can be extracted by crashing and heating the rock in retorts. It is then processed further and finally refined to yield petroleum products. There are also technologies being developed to extract the oil in situ, using radio waves directed at the oil shale strata. These new technologies are expected to cut down oil extraction costs, as well as reducing environmental disruptions.

With respect to solar energy, the national average radiation received at ground level is estimated at 5.20 kWh/m^2 per day. Obviously, there are seasonal variations (with a minimum of 4.55 kWh/m^2 in July, to a maximum of 5.55 kWh/m^2 in February and March), and also variations with physical locations (ranging from 4.25 kWh/m^2 for Itang in the south west to 6.25 kWh/m^2 for Adigrat in the north). The national average radiation value may be compared to that of neighboring Kenya, a tropical / equatorial country with an average radiation of 6.98 kWh/m^2 per day.

Solar radiation can be converted to electrical energy in PV systems at an average conversion efficiency of about 14% (EREDPC, 2007). Such PV systems can provide electricity for rural homes, schools, clinics, telecommunication stations, etc. In Ethiopia, the Ethiopian Telecommunications Corporation remains the only significant user of PV systems.

Solar thermal systems can provide hot water to industrial and commercial enterprises, offices, homes, schools, hospitals, etc., thereby contributing to reduction in electricity demand. However, this application of solar energy too is a rarity in Ethiopia at present.

Wind energy abounds in varying degrees in all parts of the country. The central highlands give rise to essentially two distinct wind regimes: the eastern and southern parts of the country falling on the windward side and consequently exhibiting higher wind potential, and the western and north western parts lying on the lee side with lower wind potential.

Wind energy is based on wind speed and, as in the case of the solar radiation, wind speeds are subject to variations with specific location of the site, height at which wind speeds are recorded, time of day and month of the year, among others. CESEN reports indicate annual mean wind speeds of 3.5 m/s - 5.5 m/s, measured at 10 meters from ground, for the eastern and southern parts of the country. This potential is, however, being revised upwards based on better measuring techniques for wind speeds. In fact, recent studies by the SWERA project point to several localities in the country with annual average speeds exceeding 7 m/s. The electricity generation potential of the wind resource in these localities (total area about 20,000 km^2) is estimated at about 100,000 MW (890,000 GWh/year).

The use of wind energy in Ethiopia was limited to water lifting in the rift valley communities. Currently, EEPCO is undertaking wind-based electricity generation projects for a total capacity of 120 MW. Wind-based electricity generation would be important for Ethiopia in complementing the hydro-based generation system which is susceptible to reservoir water shortages in times of drought.

On the global scene, wind-based electricity generation is proving a fast-growing and effective means to meet energy demand and combat climate change. In the European Union member countries, for example, wind -based generation capacity increased from 2,500 MW in 1995 to just over 40,000 MW in 2005, representing an annual growth rate of 32% (see EWEA website: www.no-fuel.org). Concomitantly, wind turbine technology has become more sophisticated, with unit generating capacity increasing and generation costs falling. There are now turbines with unit generating capacity of 5 MW. The lower and upper cut-off wind speeds for the turbines are about 2.5 m/s and 25 m/s, respectively. This is a favorable trend for wind energy to play an increasing role in Ethiopia's power supply system. The Ethiopian Energy resources are summarized in Table 10.1 hereunder.

Table 10.1: Energy Resources of Ethiopia

Resource	Unit of measure	Amount	Remarks
Hydropower	GWh/year**m**	160,000	25% of gross potential of 650,000 GWh/year assumed
Geothermal	MW	5,000	
Natural gas	Billion m^3	110	
Woody biomass			Standing stock and annual yield estimates for year 2000, per WBISPP reports
Standing stock	Million tons	1,149	
Annual yield	Million tons	50	
Coal	Million tons	300	
Solar (average radiation)	kWh/ m^2 per day	5.20	Amount shown is the national average
Wind	GWh/year	890,000	Potential in a 20,000 km^2 area with average wind speeds exceeding 7m/s
Oil shale	Million tons	250	

Source: Various, as indicated in the text on resources

10.2 Current energy supply and consumption

10.2.1 Energy supply

The primary energy supply in Ethiopia consists of indigenous resources and refined petroleum products. In 2006, biomass energy resources (fuel-wood, charcoal, crop residue and animal dung) contributed 91.3 percent of total net energy supply. Imported petroleum fuels amounted to about 1.54 million tons and contributed 7.6 percent of total energy supply. Diesel oil accounted for 57 percent, kerosene and Jet fuel for 26 percent, fuel oil for 10 percent and gasoline for 7.4 percent.

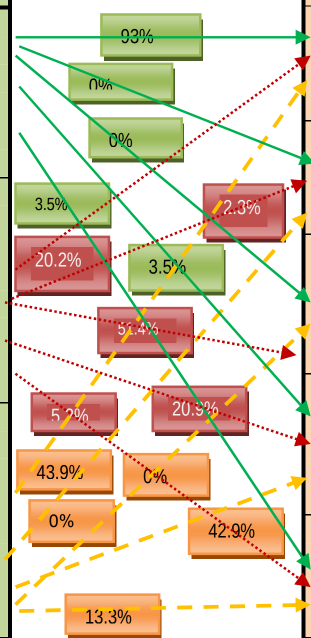
Electricity generated was approximately 2,900 GWh of which almost 99 percent was produced from hydro. Approximately 98 percent was generated within the Interconnected System (ICS) and the remaining 2 percent in the Self-Contained System (SCS). Of the total electricity generated, about 18 percent was lost in transmission and distribution. The share of electricity in total aggregate energy supply was just 1.1 percent. A summary of the National Energy Balance[1] which shows energy supply by fuel type and consuming sectors is shown in Figure 10.1.

[1] A national energy balance is a systematic accounting of a nation's supply, conversion and final consumption of energy. Its aim is to structure in a logical, systematic and consistent form the flow of energy from primary to useful energy and how final energy uses by each consuming sector and each fuel type, expressed in a common unit, matches numerically with primary energy supplies.

Figure 10.1: National energy supply and consumption, 1998 E.C. (2006)

Net Energy Supply

Fuel type	Tera Joules	%
Biomass	724,969	92.2
Petroleum	60,233	7.6
Electricity	8,579	1.1
Total	**793,781**	**100**



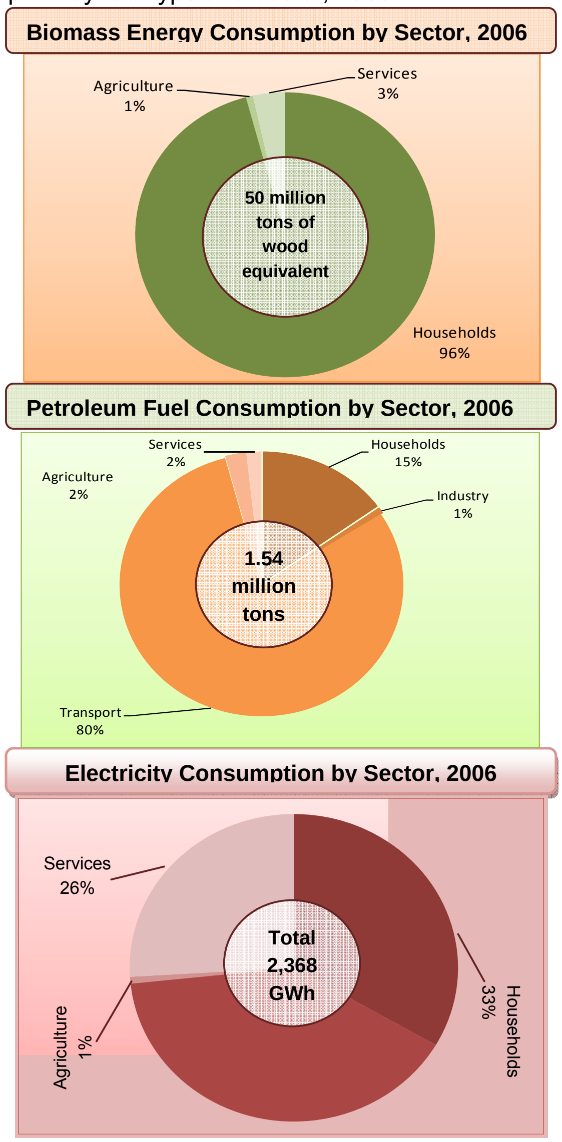
Energy Consumption

Consuming Sector	Tera Joules	%
Households	706,170	89.0
Agriculture	6,821	0.9
Transport	48,155	6.1
Industry	4,231	0.5
Services and Other	28,404	3.6
Total	**793,781**	**100**

10.2.2 Energy consumption

The energy sector in Ethiopia is one of the least developed in the world. This is reflected in low per capita consumption and excessive dependence on biomass energy. Total final energy consumption in 2006 was estimated at 794 Peta Joules as shown in Figure 10.1. Biomass fuels consumed during the same period was about 50 million tons of wood equivalent (TWE).

Figure 10.2: Energy consumption by fuel type and sector, 2006



Approximately 96 percent of the biomass fuel was consumed by households, 3 percent by services and 1 percent by agriculture (Figure 10.2). Petroleum fuels are mainly used in the transport sector (80 percent of the total consumption of petroleum products) with a smaller share of the demand from the household sector (kerosene for cooking and lighting) and industrial sector (fuel oil for thermal energy). Electricity consumption was about 2,400 GWh. Electricity demand among the sectors is as follows: 33 percent by households, 40 percent by industries and 26 percent by service sector.

The energy sector is also characterized by the predominance of the household sector, which in

2006 accounted for 89 percent of total final energy consumption (74 percent by rural and 15 percent by urban households). Energy demand in rural households is mainly for cooking fuels and for lighting. For meeting their cooking energy requirements, households depend almost entirely on traditional energy sources like wood, animal dung and agricultural residues. About 81 percent of the estimated 16 million households use firewood, 11.5 percent cook with leaves and dung cakes and only 2.4 percent use kerosene for cooking.

Major types of cooking fuel used by all households are firewood, leaves/dung cakes and kerosene. At country level, about 81.4 percent of the households use firewood, around 11.5 percent cook with leaves/dung cakes and only 2.4 percent use kerosene for cooking. The majority of rural households use firewood (84.4 percent) and few of them (12.7 percent) use leaves/dung cakes.

The use of modern source of cooking fuel such as butane gas, electricity and kerosene for cooking is uncommon in the rural areas (0.4 percent). Use of kerosene is not very common in urban areas which stands at 13.8 percent following firewood (65.4 percent). Charcoal (7.7 percent), electricity (2.4 percent) and leaves (5.3 percent) are also used rarely by urban households. On the other hand, only 0.2 percent of the households in rural areas are observed to use charcoal for cooking. In the previous surveys, however, no household was reported to use charcoal as source of cooking fuel. About 71.1 percent of the total households use kerosene for lighting followed by firewood (15.7 percent) and electricity (12.9 percent). A higher proportion of urban residents use electricity (75.3 percent) for lighting, while the use of kerosene (80.1 percent) and firewood (18.5 percent) are predominant in rural areas (CSA, 2004).

The next dominant sector is the transport sector accounting for 6.1 percent followed by the services sector which consumed about 3.6 percent. Energy consumption in the agricultural and industrial sectors was merely 0.9 percent and 0.5 percent of total final consumption, respectably. The agricultural sector in rural areas relies almost entirely on human and animal power and to a limited extent on commercial sources of energy like diesel. Most rural cottage industries produce food products or household goods such as clothes, woven articles, wooden utensils, handicrafts, pottery and metal products. These industries generally use very little fuel and are largely labour intensive.

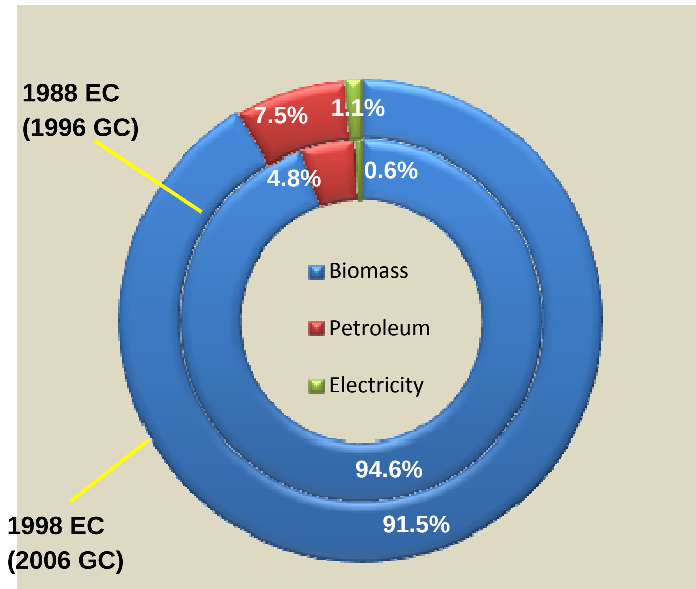
10.3 Energy demand trends and projections

10.3.1 Energy supply and consumption trends

Understanding patterns in energy supply and consumption by fuel type and end-use sectors is important to the development of projections. This section shows trends in energy supply and consumption. Energy supply and consumption trend over the decade 1996 to 2006 shows that the share of biomass energy decreased by only 2.3 percent, from 94.5 percent in 1996 to 91.3 percent in 2006, while the share of petroleum fuels and electricity increased from 4.8 percent to 7.6% and from 0.6 percent to 1.1 percent, respectively, over the same period (See Figure 10.3). Thus, while there is a gradual shift towards modern fuels (petroleum and electricity); biomass energy remains the main source of energy.

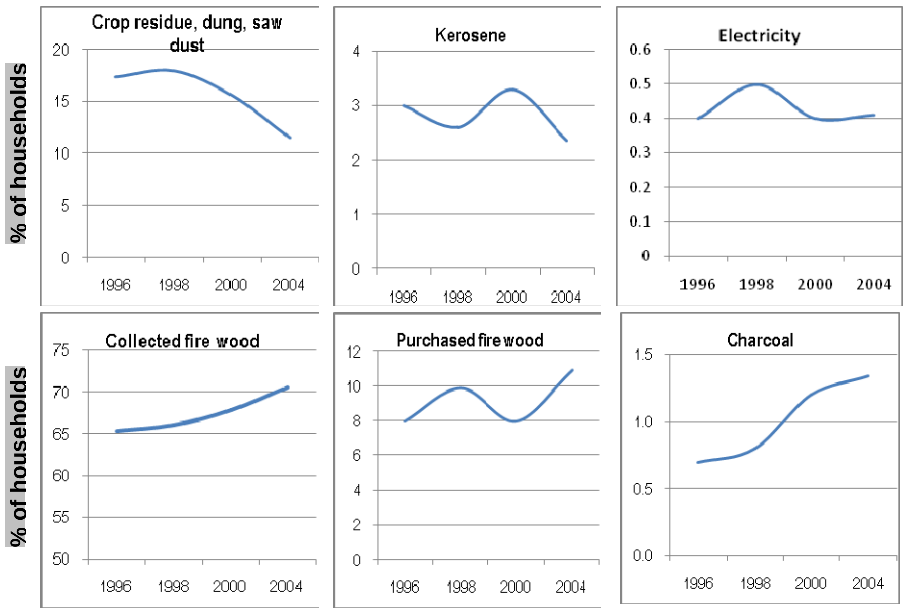
Cooking fuels use in the urban areas change quite frequently due to changes in prices and availability of fuels. A significant change has taken place between 1996 and 2004 where the number of households who reported kerosene as their primary cooking fuel has declined. Households that would have used kerosene as their primary cooking fuel have switched to other fuels by 2004.

Figure 10.3: Trends in energy supply and consumption , 1996 and 2006 (G.C.)



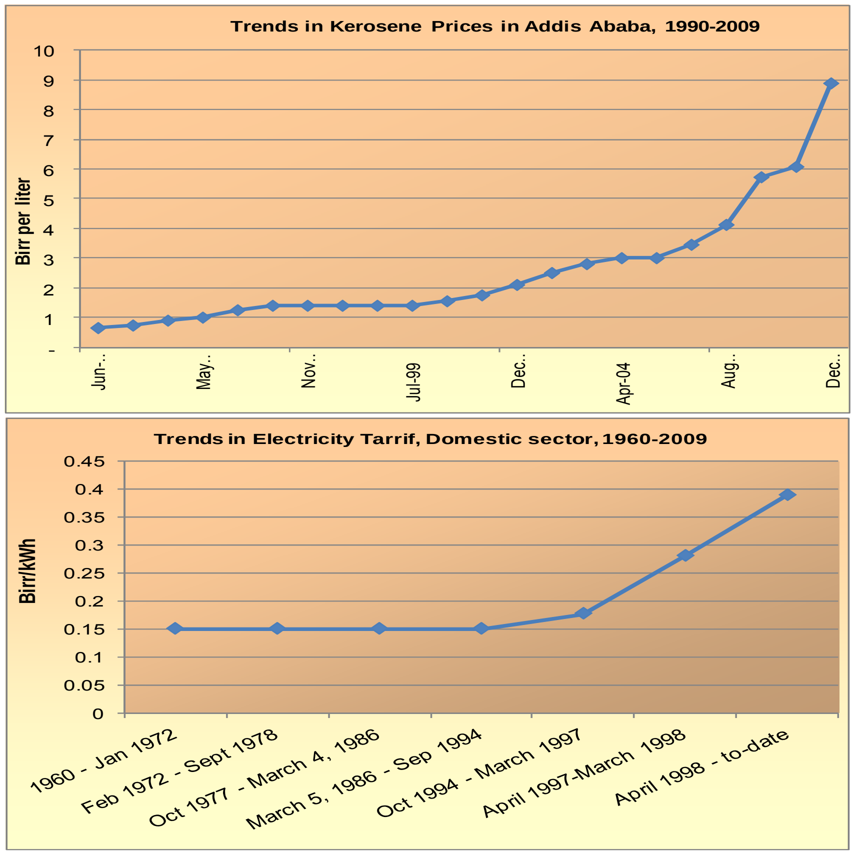
The reduction in kerosene and electricity users for cooking is accompanied by an increase in the number of households cooking with fuel-wood and charcoal (Figure 10.4). This suggests that a large proportion of kerosene and electric users may have shifted to fuelwood and charcoal or moved from using mostly kerosene and electricity for cooking to using mostly fuel-wood and charcoal. Such a shift towards a less convenient and efficient fuel suggests price may have been the main driver.

Figure 10.4: Trends in source of fuels for cooking, 1996 - 2004



Prices for cooking fuels have also risen considerably in the past two decades. Kerosene prices have risen from ETB 0.65 per liter in 1990 to ETB 8.88 per liter by mid December 2009 (an increase of 1366%, Figure 10.5). Similarly, the average domestic tariff has increased from ETB 0.15 per kWh in 1990 to ETB 0.4 per kWh today (an increase of 266%).

Figure 10.5: Trends in kerosene and electrcity prices, 1990-2009



The volume of petroleum fuels imports over the period 1965 to 2008, depicted in Figure 10.6, has exhibited substantial increase. The total volume of petroleum fuels imports has been growing at annual average growth rate of 7 percent over the past 10 years and 11 percent for the past 5 years. Rapid growth has been observed for diesel oil and jet fuel and kerosene. As the country entirely depends on importation, the burden on the balance of payment especially over the last few years has been very significant. In 2008, the value of petroleum imports was over US$ 1.62 billion and accounted for 24 percent of total imports and 110 percent of the total export earnings of US$ 1.47 billion (Figure 10.7).

Figure 10.6: Petroleum fuels consumption

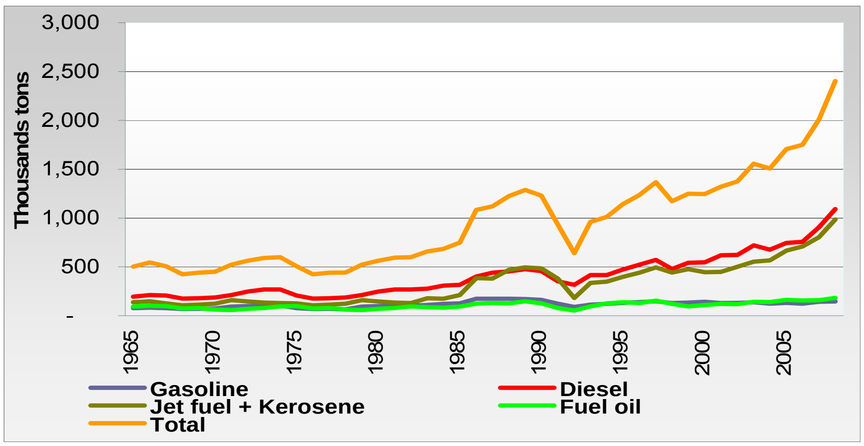
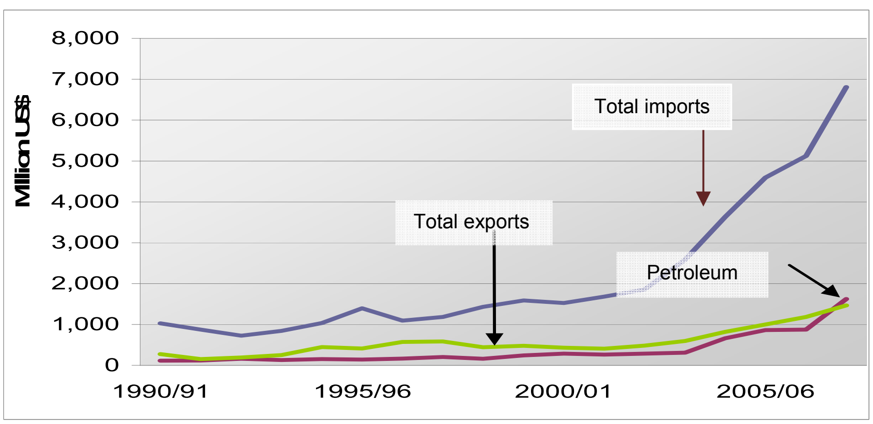
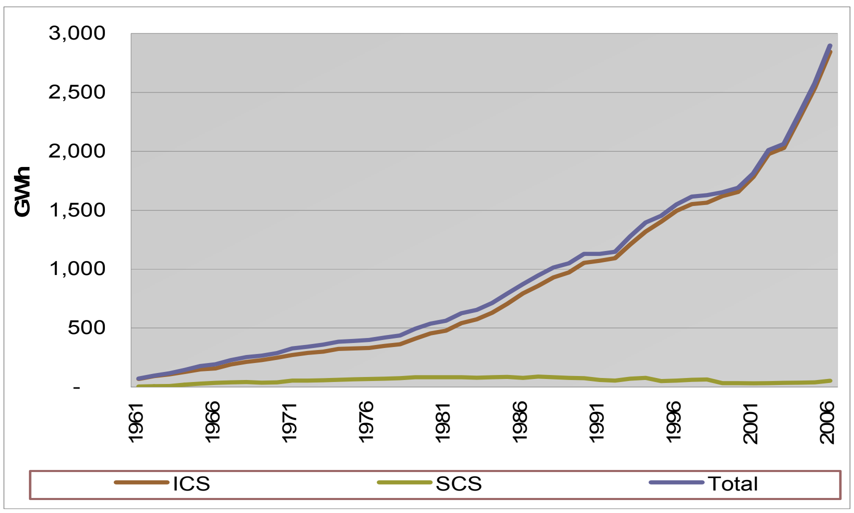


Figure 10.7: Value of imports of petroleum fuels



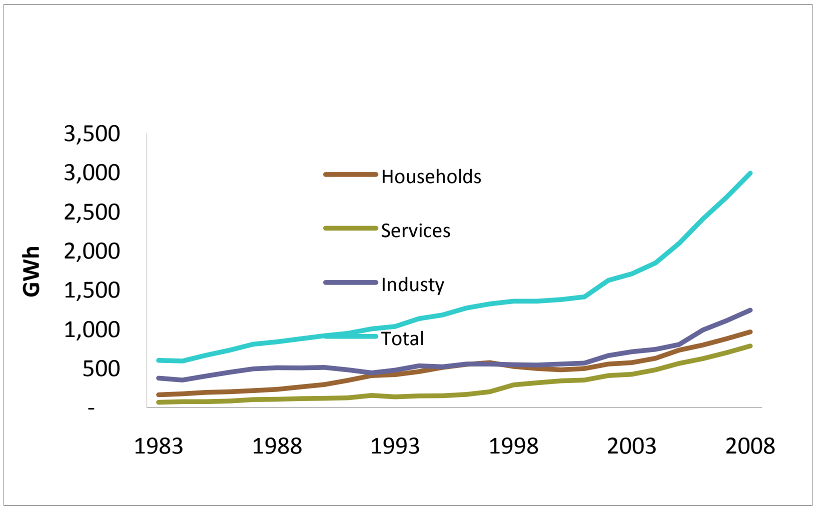
Electricity generation and consumption over the last four decades has grown on average by 8.8 percent per year, from 71 GWh in 1975 to almost 2,900 GWh in 2006 (Figure 10.8). The average annual growth rate was the highest (17 percent) for the period 1975 to 1990 while the lowest (4.2 percent) was registered for the decade 1991 to 2000. From 2001 to 2006, electricity consumption has increased on average at 9.5 percent per annum.

Figure 10.8: Electricity generation by system



Electricity consumption was growing at an average annual growth rate of 4.25 percent over the period 1975 to 2006. As can be seen from Figure 10.9, the growth rate for the past few years was relatively high: 8 percent for the past 10 years and 12 percent for the past 5 years. Electricity consumption by households increased on average by 12.9 percent (from 160 GWh in 1975 to approximately 800 GWh in 2006 or overall increase by 400 percent). A similar trend was observed in the service sector where electricity consumption increased almost ten times, from 66 GWh in 1975 to 624 GWh in 2006. The industrial sector's electricity consumption growth rate was relatively low: less than 4 percent per annum.

Figure 10.9: Electricity consumption by sector



10.3.2 Basic assumptions for demand projection

The development of energy demand will depend on socio-economic factors (demography, urbanization, growth and structural changes in the economy, etc), energy policy (energy prices, substitutions and energy rationalization measures, etc) and also on the availability of funds for investment and for imports through which supply can be increased.

The energy demand is projected for twenty years using energy consumption coefficients (i.e., energy intensity by end-use) and macro-economic variables such as gross domestic product, value added in all productive sectors, and population growth rates. The demand for each type of energy source is projected by sector and then aggregated to obtain the overall energy demand. The energy consumption coefficients are derived from the national energy balance for 1998 EC (2005/06 GC) and are assumed to remain constant throughout the projection period. The national energy balance divides energy consumption into households, agriculture, industry, services, and transport sectors and energy sources are grouped into biomass fuels, petroleum and electricity.

The ‘business-as-usual’ (BAU) scenario (which assumes that past trends and linkages are maintained and no energy rationalization policy is applied) was taken as the reference energy development scenario. Two alternative scenarios were developed based on PASDEP’s macro-economic scenarios, i.e., a base-case ('MDGs–Consistent') scenario, and a high-case ('MDGs Plus') scenario. Under the base-case scenario, real GDP is projected to grow at 7 percent per annum and value added in agriculture, industry, and services are expected to grow on average by 6.2 percent, 12 percent, and 7.1 percent, respectively. The High-case scenario, on the other hand, assumes annual average real GDP growth rate of 10 percent and value-added in agriculture, industry, and services at 6.4 percent, 18 percent, and 10.3 percent per annum, respectively.

The demand for biomass fuels is computed for the BAU scenario only. Energy demand by urban households is assumed to be a function of projected population size and non-agricultural income (value added by industrial and service sectors) while population size is assumed to drive energy demand by rural households. The total population of Ethiopia in the year 2007 was estimated to be 73.92 millions, growing at 2.55 percent per year (CSA, 2007). The urban population proportion of this total was 16.2 percent and is projected to be 21 percent by 2030 (Table 10.2). The demand for biomass fuels by urban and rural households is projected to grow at the respective annul population growth rates of 3.38 percent and 2.52 percent as shown in Table 10.3. Value-added in agriculture, industry, and services under the PASDEP Base-case scenario were assumed to drive biomass energy demand by these sectors. The BAU scenario assumes that electricity demand by households, industry and services sectors will grow at 10 percent, 12.1 percent and 12.3 percent per annum based on past trends. Similarly, the demand for petroleum fuels will grow based on past trends: diesel oil 9 percent, gasoline 5 percent, kerosene/jet fuel 8.6 percent, and fuel oil 4.7 percent.

Table 10.2: Rural and urban population projections, 2007-2032 G.C.

Year (G.C.)	Urban and Rural	Urban	Rural	Urban %
2007	73,918,505	11,956,170	61,962,335	16.2
2008	75,817,539	12,417,678	63,399,861	16.4
2009	77,767,738	12,897,001	64,870,738	16.6
2010	79,770,564	13,394,825	66,375,739	16.8
2011	81,827,521	13,911,865	67,915,656	17.0
2012	83,940,162	14,448,863	69,491,299	17.2
2013	86,110,087	15,006,589	71,103,498	17.4
2014	88,338,942	15,585,843	72,753,099	17.6
2015	90,628,428	16,187,457	74,440,971	17.9
2016	92,980,294	16,812,293	76,168,001	18.1
2017	95,396,346	17,461,247	77,935,099	18.3
2018	97,878,445	18,135,251	79,743,193	18.5
2019	100,428,507	18,835,272	81,593,235	18.8
2020	103,048,512	19,562,314	83,486,198	19.0
2021	105,740,497	20,317,419	85,423,078	19.2
2022	108,506,565	21,101,671	87,404,893	19.4
2023	111,348,883	21,916,196	89,432,687	19.7
2024	114,269,686	22,762,161	91,507,525	19.9
2025	117,271,280	23,640,780	93,630,500	20.2
2026	120,356,042	24,553,315	95,802,727	20.4
2027	123,526,423	25,501,073	98,025,351	20.6
2028	126,784,953	26,485,414	100,299,539	20.9
2029	130,134,239	27,507,751	102,626,488	21.1
2030	133,576,973	28,569,550	105,007,423	21.4

Source: CSA, Census 2007, First Draft

Energy demand in the agricultural, industrial and service sectors were projected based on energy consumption coefficients calculated as the quotient of energy consumption and value added by each sector. For the alternative scenarios, the rates of growth of sectoral value added were estimated on the basis of the elasticity of sectoral value added with respect to total GDP as shown in Table 10.3.

The elasticities were computed using time series data of sectoral value added with respect to total GDP at 1990 constant prices. The elasticities of agricultural, industrial and services value added with respect to total GDP were estimated at 0.8335, 1.0339, and 1.1876, respectively. The elasticity of non-agricultural income (industrial and service sectors) with respect to total GDP was estimated to be 1.0891. The urban household income growth rates under the alternative PASDEP growth scenarios were, therefore, arrived at 7.62 percent under the Base-case and 10.89 percent under the High-growth scenarios. Similarly, since the elasticity of transport and communications GDP with respect to total GDP was estimated at 1.2972, the annual growth rates were projected to be at 9.2 percent and 17 percent under the PASDEP Base-case and High-growth scenarios.

Table 10.3: GDP and sectoral value added assumptions for demand projection

Value Added	Elasticity Estimates	PASDEP Base-case, %	PASDEP High Case, %
GDP		7.0	10.0
Agriculture	0.8335	6.2	6.4
Industry	1.0339	12.0	18.0
Services	1.1876	7.1	13.1
Non-agricultural Income	1.0891	7.6	10.89
Transport and Communications	1.2972	9.2	17.0

10.3.3 Projected energy demand

Biomass energy demand

The energy demand projections indicate that biomass fuels will remain the dominant source of energy in Ethiopia. The demand for biomass fuels is expected to increase on average by 2.9 percent each year, from about 54 million TWE in 2009 to over 99 million TWE in 2030 (Table 4). Among the biomass fuels, the average annual growth rate for charcoal is relatively high; 3.7 percent per annum against 2.9 percent for biomass fuels. The proportion of the demand by households drops slightly, from 96 percent in 2009 to just 89 percent by 2030, while the demand from the Service sector increases from 4 percent to 9 percent.

Table 10.4: Projected biomass energy demand, 2009 – 2030

[TWE]

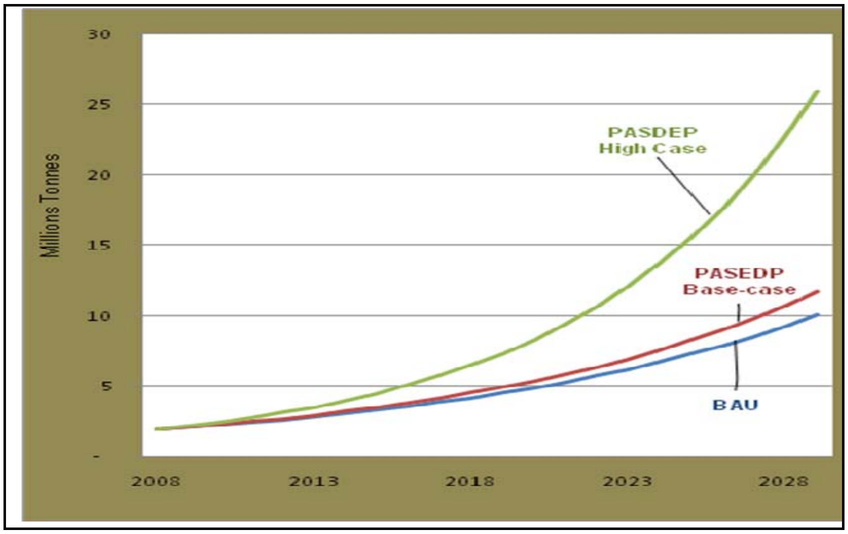
Fuel Type	2009	2010	2015	2020	2025	2030	AAGR %
Firewood	47,710	49,080	56,624	65,512	76,051	88,643	3.0
Crop Residue	2,441	2,503	2,835	3,210	3,636	4,117	2.5
Animal Dung	3,651	3,748	4,273	4,873	5,559	6,342	2.7
Charcoal	154	160	191	229	276	333	3.7
Total	**53,957**	**55,490**	**63,923**	**73,824**	**85,521**	**99,436**	**2.9**

Notes: AAGR = average annual growth rate.

Petroleum fuels demand

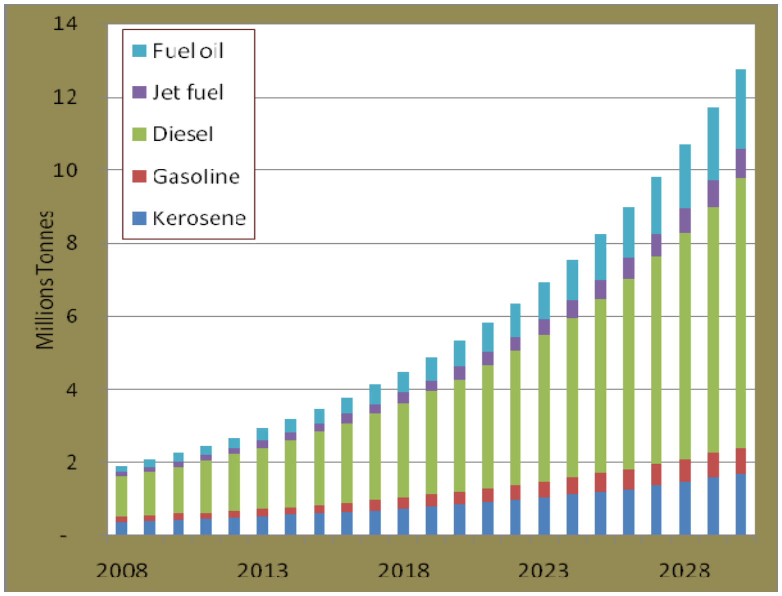
Petroleum fuels are the fastest-growing energy source under the reference and the alternative scenarios. Under the BAU, the demand increases by 8.3 percent annually from 1.91 million tons to about 11 million, in 2030. Under the PADSEP base-case the demand grows by 9.1 percent and will reach approximately 13 million tons by 2030 while under the PASDEP High-case scenario, the demand increases by 13.3 percent per year to about 29 million tons in 2030. The estimate under the PASDEP high-case is rather high while that of the PASDEP Base-case appears to be consistent with past trends and is taken as the most likely scenario (Figure 10.10).

Figure 10.10: Projected petroleum demand under alternative development scenarios



The demand for diesel oil increases by 13 percent per year and accounts for approximately 60 percent of the projected petroleum fuels demand in 2030. Kerosene demand increases by 15 percent per year and its share of total petroleum fuels grows from the current 19 percent to 28 percent in 2030 (Figure 10.11).

Figure 10.11: Projected petroleum demand by fuel type



Electricity demand

Under the BAU scenario, the demand for electricity grows by 11.5 percent per year, from 2,400 GWh in 2006 to 11,000 GWh in 2020 and to 33,000 GWh in 2030. Under the PASDEP Base-case, the demand grows by 9.5 percent while under the PASDEP High-case, it increases by 14.4 percent (Figure 10.12). The demand under the PASDEP High-case is high, almost 60,000 GWh in 2030. On the other hand, the PASDEP Base-case Projections seem to be low given the growth trends over the last five years. The demand under BAU appears to be the average of the three projections and is taken as the most likely scenario.

Under the BAU (the most likely scenario), electricity demand by households grows by 10 percent while the services and industrial sectors' demand increases by 12.3 percent and 12.1 percent, respectively. The relative share of the industrial sector increases to 46 percent while that of the households drops to 24 percent in 2030 (Figure 10.13).

Figure 10.12: Projected electricity demand under alternative scenarios

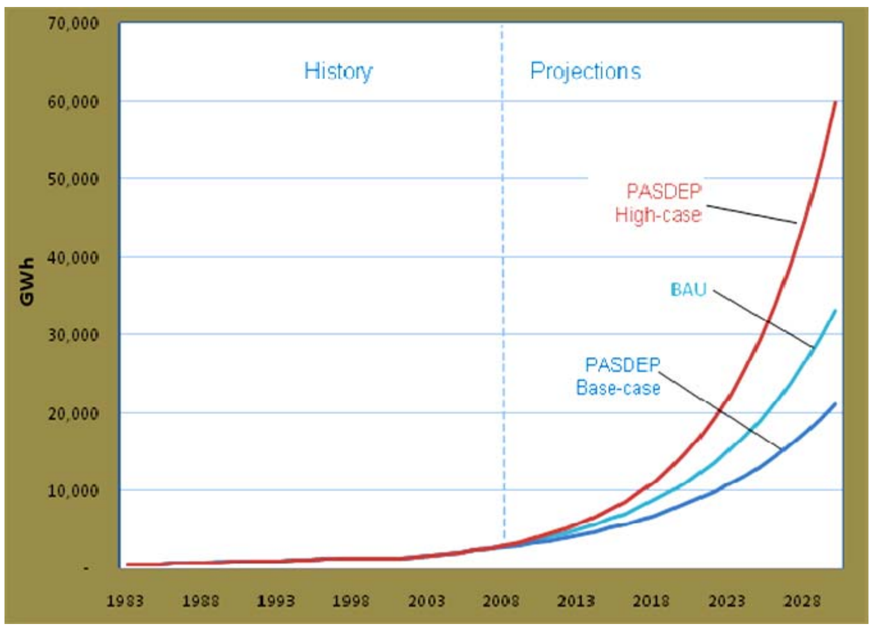
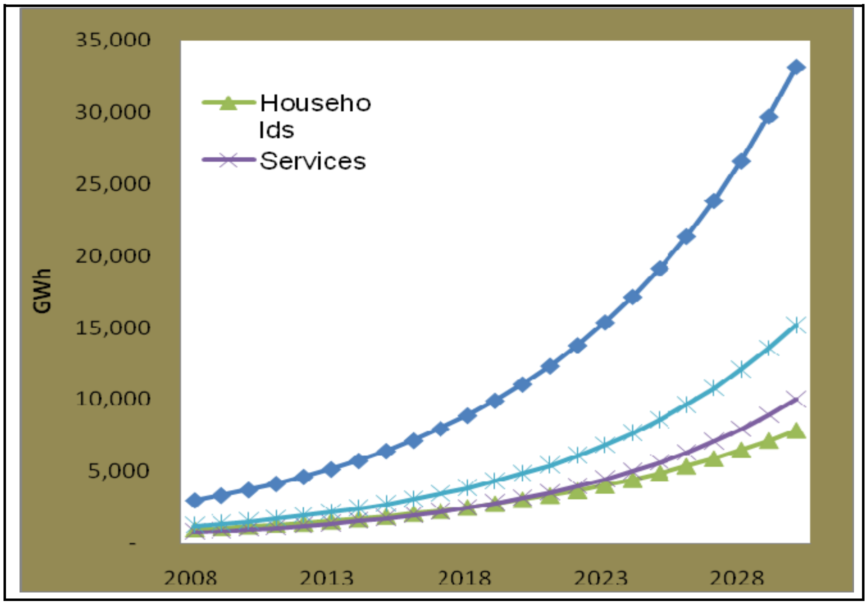


Figure 10.13: Projected electricity demand under alternative scenarios



Overall energy demand

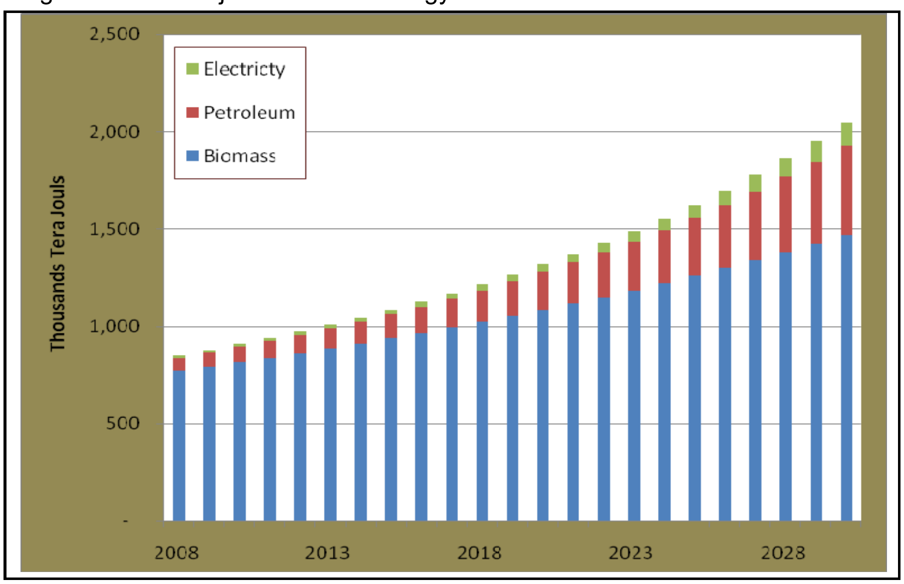
The overall energy demand is projected based on the most likely scenarios for the different sub-sectors, the BAU for biomass energy and electricity and the PASDEP Base-case scenario for petroleum fuels. Under these assumptions, the overall energy demand is expected to grow by approximately 5 percent per year and will reach over 2 million *Tera Joules* in 2030 (Table 10.5 and Figure 10.3). The estimated annual average growth rates for the different fuels are shown in the table below. The relative shares of petroleum fuels and electricity increase to 23 percent and 6 percent, respectively, with the corresponding drop in biomass fuels to 72 percent in 2030.

Table 10.5: Projected overall energy demand, BAU

[Thousand Tera Joules]

Energy Source	2008	2009	2010	2015	2020	2025	2030	AAGR, %
Biomass	766.8	788.8	811.4	936.1	1,083.0	1,257.1	1,465.1	3.1
Petroleum	68.6	74.8	81.4	124.8	192.3	297.5	462.5	9.3
Electricity	10.8	12.0	13.4	23.1	39.8	68.8	119.2	11.6
Total	**846.2**	**875.5**	**90642**	**1,084.0**	**1,315.1**	**1,623.4**	**2,046.7**	**4.9**
Percentage Share								
Biomass	90.6	90.1	89.5	86.4	82.4	77.4	71.6	
Petroleum	8.1	8.5	9.0	11.5	14.6	18.3	22.6	
Electricity	1.3	1.4	1.5	2.1	3.0	4.2	5.8	
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	

Figure 10.14: Projected overall energy demand



10.3.4 Energy demand forecast comparisons

Demand projections by EEPCO for electricity and by Ethiopian Petroleum Corporation (EPE) for petroleum products were reviewed and compared with the present demand projections. Petroleum fuels demand is projected by EPE for five years (2009 - 2012) and grows by 9 percent per year. It was assumed that the annual growth rates for all petroleum fuels would be the same. EEPCo's projections are for 35 years, from 2005 to 2030 and two scenarios are developed: target scenario and moderate scenario. The demand projections are disaggregated by ICS and SCS and also by sectors. Under the target scenario, the aggregate demand for electricity under the ICS grows at 13.86 percent per year during the projection period while under the moderate scenario the corresponding figure is 11.21 percent as shown in Table 10.6.

The present estimates are very close to those of EEPCO and EPE. However, EEPCo's projection under target scenario is rather high and seems to heavily depend on demand trends over the past few years which may not hold when one considers a period of three decades.

Table 10.6: Energy demand forecast comparisons

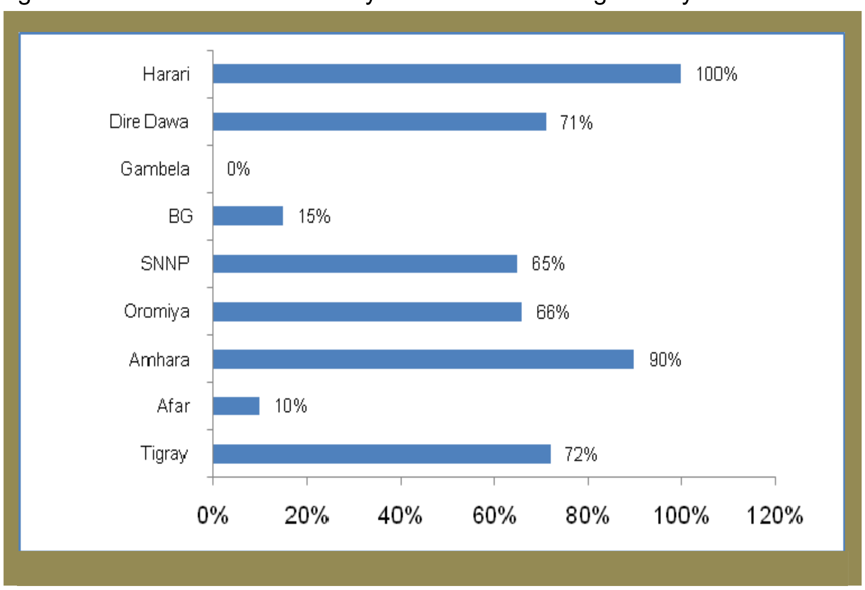
Demand Projection by:	Forecast period	Annual Average Growth Rates (%)		
		Electricity	Petroleum	Biomass
EEPCO				
1. Target scenario – ICS	2005-2030	13.86		
2. Moderate scenario – ICS	2005-2030	12.21		
Ethiopian Petroleum Enterprise (EPE)	2009-2013		9.0	
Present study	2009-2030	11.6	9.3	3.1

10.4 Broad implications of the energy demand growth

10.4.1 Biomass fuels

The demand for biomass fuels grows at 3.1 percent per year. In most areas of the Country, the overall forest stock is shrinking and the annual fuel-wood consumption exceeds annual forestry yields. Access to biomass fuels has declined significantly in almost all areas of the Country and even drastically in some parts (Figure 10.15). For example, as can be seen from the figure below, woody biomass consumption exceeds the forestry yield in 90% of the Woredas in Amhara and in over 70 percent of the Woredas in Tigray. Such unsustainable woody biomass harvesting will have serious economic, social, and environmental repercussions.

Figure 10.15: Biomass availability: woredas exceeding wood yield



> *"The burning of dung as fuel instead of using it as a soil conditioner is considered to cause a reduction in grain production by some 550,000 tons annually. In 1990, accelerated soil erosion caused a progressive annual loss in grain production estimated at about 40,000 tons, which unless arrested will reach about 170,000 tons by 2010."*
>
> *Federal Policy on the Environment,* Environmental Protection Authority and Ministry of Economic Development and Cooperation, Addis Ababa, Page 9, April 1997).

Inadequate and worsening access to cooking fuels will lead to increased use of agricultural residues and animal dung for fuel rather than as soil nutrient. The disappearance of trees will have adverse impacts on soil moisture, recycling of soil nutrients, and conservation of water, soil and wild life. Inaccessibility of biomass fuels for cooking also results in excessive expenditure of time and energy for fuel collection. This reduces availability of labour for agricultural activities. The depletion of biomass fuels also increases in household energy expenditure which otherwise could have been used to purchase farm inputs. The combined effects of the above factors are reduction in agricultural production, deforestation, and general environmental degradation.

Domestic cooking with biomass with inefficient and improperly ventilated stoves and kitchens results in high indoor air pollution. The burning of fuel-wood, crop residues and animal dung produces high emissions of carbon monoxide, hydrocarbons and particulate matter. Hydrocarbon emissions are highest from the burning of dung for fuel, while particulate emissions are highest from agricultural residues. Exposure to indoor air pollution from solid fuels has been linked to many different diseases, including acute and chronic respiratory diseases, tuberculosis, asthma, cardiovascular disease and prenatal health outcomes. It is estimated that in Ethiopia 56,460 people die each year (i.e., more than 150 deaths per day) that are directly attributable to indoor air pollution from the burning of solid fuels. Over 90% are children under five years of age (Table 10.6).

Table 10.6: Estimates of burden of disease attributable to solid fuel use in Ethiopia

Percentage of population using solid fuels	>95
ALRI deaths attributable to solid fuel use (<5 years)	50 320
COPD deaths attributable to solid fuel use (≥ 30 years)	6 140
Total deaths attributable to solid fuel use	56 460
Total DALYs attributable to solid fuel use	1 790 800
Percentage of national burden of disease attributable to solid fuel use	4.9

Notes:

ALRI = acute Lower respiratory infections

COPD = chronic obstructive pulmonary disease

DALY = disability-adjusted life year

Source: WHO (2007).

An additional outcome of disappearance of trees is increased greenhouse gas emissions. Less tree cover reduces the size of the carbon sink while burning wood emits greenhouse gases, a double negative impact resulting from the use of wood.

10.4.2 Petroleum fuels

The petroleum fuels demand growth coupled with the rising world crude oil prices could seriously worsen the country's balance of payment. A recent projection by the IMF (September 2009) shows that a growing share of export earnings will be spent on oil import (Table 10.7). Oil import bill is projected to grow from US$1.44 billion in 2009/10 to over US$2.43 billion in 2013/14, that is, at average annual growth rate of 14 percent. On the other hand, during the same period, export earnings are projected to increase from US$1.45 billion to US$2.45 billion or by about 11.3 percent per year. Petroleum fuel imports will absorb 99 percent of export earnings in 2013/14, compared to 89 percent in 2009/10. Thus, petroleum fuel imports will pose important constraints on the Country's development efforts by diverting meager foreign exchange earnings from other investment programs.

Table 10.7: Projected oil imports bill **(Millions of U.S. dollars)**

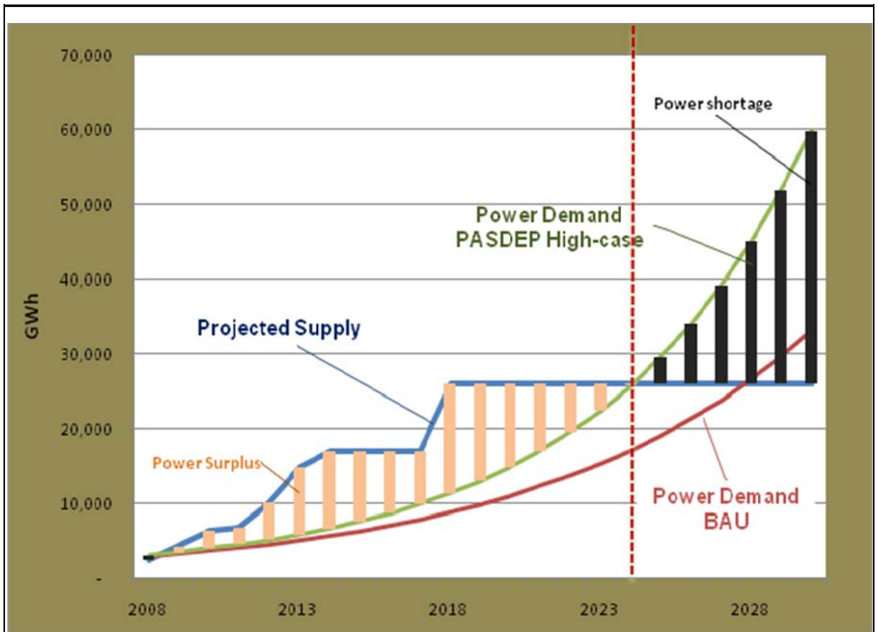
	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Trade balance	**-3,940**	**-5,348**	**-6,105**	**-7,015**	**-6,954**	**-7,183**	**-7,819**	**-8,444**
Exports of goods	1,188	1,462	1,446	1,616	1,795	1,987	2,211	2,467
Imports of goods	5,128	6,811	7,552	8,631	8,749	9,170	10,029	10,910
Oil	895	1,621	1,282	1,444	1,665	1,915	2,161	2,434
Capital goods	1,869	1,908	2,270	3,284	3,103	2,984	3,099	3,109
Oil as % of exports	75%	111%	89%	89%	93%	96%	98%	99%
Oil as % of Imports	17%	24%	17%	17%	19%	21%	22%	22%

Source: IMF (2009)

10.4.3 Electricity

Assuming EEPCOs planned power generation projects are implemented as scheduled, electricity supply will increase from the current levels of 2400 GWh to 26,000 GWh in 2018 (Figure 10.16). Under the PASDEP High-growth scenario (where GDP is projected to grow at 10 percent per annum), the demand for electricity will increase by 14 percent each year and will result in power supply deficit of about 3,500 GWh in 2025. However, under the BAU scenario, where the demand for electricity increases by 11.6 percent per year, power deficit will occur after 2025

Figure 10.16: Projected power supply and demand gaps



In the absence of additional investment in power supply and in demand management measures, the power deficit will result in power rationing. This will have severe economic and social impacts including decline in aggregate GDP and sectoral value added, employee lay-offs, reduced government revenues, and reduced exports, among others. Power shedding will also force businesses and households to switch to less efficient and inconvenient imported energy sources (such as diesel generators sets, candles, and dry battery cells). This again will pose important burden on the Country's balance of payments. It is, therefore, essential that the planned power generation projects be implemented as scheduled and that new power generation plants be initiated soon.

10.5 Current energy supply capacity, modality and access constraints

10.5.1 Electricity

In Ethiopia, hydro-based generation has assumed a predominant position as a consequence of consistent policies put in place since the early 1980s to exploit the large hydro potential and avoid the costly diesel generation. The policy direction was a response to the 1973 oil crisis, but it awakened Ethiopia to the use of an indigenous resource that may well underpin its entire development. Water regulated for hydropower generation can simultaneously be used for irrigation downstream, drinking water supply, fisheries, etc. Local consumers can benefit from the supply of relatively cheap hydropower. Cheap hydropower can also attract investment and promote the competitiveness of export commodities produced in Ethiopia. Hydropower itself can be exported and earn foreign currency.

The Ethiopian Electric Power Corporation (EEPCO) is currently responsible for almost all of the electricity supply in Ethiopia. EEPCO has been operating two systems: the interconnected system (ICS) forming the national grid, and the self- contained system (SCS) consisting of isolated, individual supply centers. With the recently commissioned Tekeze Hydropower Plant (300 MW) included, the ICS has an installed capacity of about 1070 MW, of which 963 MW is hydro, 7 MW geothermal, and the balance of 100 MW standby diesel generators. The SCS total installed capacity, on the other hand, is in the order of 25 MW consisting mainly of diesel plants. The SCS is a diminishing system continually losing ground to the hydro- based ICS grid supply. The capacity of existing hydro plants is indicated in Table 10.8.

There are a number of hydro plants currently under construction. These include Gilgel Gibe II (420 MW), Beles (420 MW) and Amarti-Neshe (100 MW).

Electricity tariffs are regulated by Government. The Ethiopian Electricity Agency is the Government arm set up to regulate electricity sector activities, including review of tariffs (FDRE, 1997 -proclamation no. 86/1997). Though electricity tariffs are in principle based on supply costs, current tariffs are uniform across the country. Thus, although EEPCO as a whole is making profit, there is cross subsidy between the ICS and SCS consumers. Due to the larger size of the ICS, however, this subsidy is negligible, and what is more, it carries an element of equity and practicality.

Table 10.8: EEPCO grid (ICS) hydropower generating capacity, 2009

Power plant	Commissioned date	Installed capacity (MW)	Average energy capability (GWh/year)
Koka	1960	43.2	110
Tis Abbay I	1964	11.4	85
Awash II	1966	32	182
Awash III	1971	32	182
Finchaa	1973	100	660
Melka Wakena	1988	153	543
Tis Abbay II	2001	73	359
Finchaa 4th unit	2002	34	137
Gilgel Gibe I	2004	184	720
Tekeze	2009	300	1070
Total		962.6	4048

Source: Based on EEPCO website information.

The separation of regulatory activities from operational activities contributes to the proper functioning of the power sector. EEPCO is now expected to go by the operational rules and technical standards set by the regulator. However, the power sector is growing rapidly (in terms of supply infrastructure, service area, customer numbers, workforce size, etc.) and there is an apparent need to review the appropriateness of having one utility to handle the power generation, transmission and distribution functions. The global trend has been to place these functions under different entities (i.e. to unbundle vertically integrated utilities). Under such a structure, management of the new and smaller utilities would be easier, consumers would benefit from closer attention, and weak links in the power supply chain would be more easily identified. The weak links now apparent or recurrent periodically, in the electricity supply chain include:

- Shortage of generation capacity in the ICS
- Paucity of transmission lines, often leaving large areas at the mercy of a single supply line
- Lack of prompt response to consumer complaints (in respect of metering, billing, supply voltage levels, emergency calls, etc)

These weaknesses hamper the exploitation of vast opportunities offered by the hydro resources. The weaknesses are not attributable to the nature of hydro-based generation. They can be planned for, prepared for and acted upon.

10.5.2 Petroleum

Since Ethiopia is not an oil producer, its entire demand is met through imports. Since the turn of the century, oil has been imported in the form of petroleum products. This alternative proved much more economical than the use of the oil refinery at Assab to process imported crude. Product imports are made through ICB advertisements extended to oil suppliers. Except for gasoline, which is imported from Sudan through a longer term supply agreement, other products are imported on a year's supply contract entered into with winning bidders. The imported fuel transport (except in the case of gasoline) involves sea routes, ports of entry, inland roads and rails as well as intermediate storage depots.

For liquid fuels, import is effected by the Ethiopian Petroleum Enterprise (EPE), a public enterprise which thereafter bulk-sells the imported fuels to distribution companies. In turn, distribution companies supply fuel to retailers across the country. Bulk-sale prices as well as distributors and retailers margins are set by Government. Butane gas (LPG) is imported and distributed by private companies.

Ethiopia currently imports about two million tons of petroleum products annually. The bulk of these products is gasoil, forming about 57% of total imports. Gasoline imports amount to about 7.5% of the total. Gasoline from Sudanese supply terminals, and the rest of the products received at seaports of entry are all transported to inland depots by fuel tankers. This operation currently involves a huge number of tankers. The total number of fuel tankers in the country is estimated at about 1200. Part of this fleet is used to transport fuel from distributors' depots to retail stations.

Part of the national strategic reserve depots capacity has been used to cushion against supply shortages and sudden oil price escalations. However, due to the limited capacity of these depots (about 375,000 cubic meters), they could only offer temporary relief.

Fuel supply capacity to the country primarily depends on the availability of foreign currency with which to import fuels. It is also dependent on the capacity of transport facilities in the supply chain. Fuel transfer facilities and customs processes at port of entry also matter for the speedy conveyance of the imported fuel. Even the bidding process and selection of suppliers can speed up or delay the import of fuel and is, therefore, critical in the supply chain. Thus, petroleum fuels supply is potentially prone to delays and sudden interruptions unless followed up with due attention. Nevertheless, fuel supply in Ethiopia has been largely smooth. However, increasing demand for fuel may give rise to or amplify weak links in the supply chain that would threaten sustained delivery. These include:

- Capacity of fuel handling facilities at ports of entry
- Capacity and mode of fuel transport from ports of entry to inland depots
- Capacity of inland depots, including strategic reserve depots
- Capacity to meet fuel import bills.

These issues are discussed further in section 10.6.

10.5.3 Biomass

Of the biomass fuels, charcoal is largely used in urban areas. Fuelwood and leaves are used in urban areas as well as rural areas. Agri-residues and dry dung are mostly used in rural areas.

Charcoal has higher energy content per unit weight. It is more easily transported (usually in sacks), and also fetches more money than fuelwood per unit weight. It burns in charcoal stoves which are less cumbersome than woodstoves and release little smoke. These are some of the features that made charcoal an urban fuel. Thus, charcoal is transported over long distances to be consumed in urban homes. Charcoal from acacia trees is most favoured by consumers, and is, therefore, priced higher. The rift valley lowlands used to be the major source of such charcoal, but the sources have been shrinking and receding. Therefore, other tree species, including eucalyptus, from private plantation plots and distant forests are used instead.

Charcoal is often transported in bulk, in the form of truckloads, into cities. However, other vehicles too can pick up small sacks from roadside vendors along most of the major highways.

Supply of fuelwood to urban areas also shares some of the modalities mentioned for charcoal, in terms of sources of supply and transportation to cities. Unlike charcoal which comes from distant places, however, some amount of fuelwood (especially of eucalyptus origin) can still be obtained from localities in the vicinity of most cities.

The legal and regulatory framework for the marketing of forest products is laid down within Proclamation 542/2007 (FDRE, 2007). Article 13, "Production and Movement of Forest Products", contains the following sub-articles:

1. No person shall harvest forest products from a state forest without having the necessary permit from the Ministry (of Agriculture and Rural Development) or the appropriate regional body.
2. A person who transports forest products from one place to another shall, when requested, have the obligation to show his forest product movement permit to a forest product movement inspector.

Article 10, sub-article 2 also states:

"The utilisation of a state forest -- shall be undertaken by government organisations or persons who are given concessions".

In addition, article 6, sub-article 4 states:

"Forest products trade license shall be issued in accordance with the management plan taking into account the utilization of the country's limited forest resources and in a manner that shall not disturb the natural resources balance of the areas".

There are a few governmental enterprises, like the Oromiya Forest Enterprise in Addis, that are engaged in the bulk sale of wood for fuel as well as construction works. The legal market makes use of these enterprises, while "encroachment" and "poaching" continue to feed the illegal market.

Prices for both charcoal and fuelwood are unregulated and driven by market demand. The general trend has been one of gradual rise through the years.

The weak link in the supply of both charcoal and fuel wood to urban areas appears to be the increasing unavailability of woody biomass resources discussed in the preceding sections. In the urban context, rises in the prices of charcoal and fuelwood, as well as switches to other fuels are possible outcomes of the increasing unavailability of woody biomass resources.

In the rural areas, fuelwood is 'collected' rather than traded for cash. Pruning of trees for branches and leaves, scavenging dead wood leaves and twigs sustains the supply of fuelwood/combustible woody biomass for cooking and lighting in the households. The stems of trees are normally left standing to re-grow branches.

The trees themselves are seldom grown in big patches on exclusive plots, but are rather scattered over peripheries of peasant land holdings, farms, roadsides, river banks, etc. Remnants of communal bushes as well as communal woodstands along steep and hard- to - access hillsides also provide fuelwood for the rural community. Communities in the vicinity of state forests would have the option of "collecting fallen woods" (and using these for fuel), per the provisions of article 10 of Proclamation 542/2007.

The weak link in the supply of fuelwood to rural households would be one of increasing unavailability of woody biomass from existing stocks, as a result of population pressures which lead to increasing competition for limited resources. This, in turn, may lead to cash purchase / trade of fuelwood and charcoal, as is the case in urban areas today. Only distant forests would be able to sustain such supply of fuelwood and charcoal. A further derivative of this outcome would then be faster deforestation.

10.5.4 Current energy access constraints

Access to electricity supply may be perceived as having the electricity supply infrastructure nearby for connection by consumers. For towns with a public supply of electricity, it is assumed that 100% of the population has access to electricity. 'Access' is thus different from 'connectivity' which is a measure of the percentage of population that is actually connected to the supply system.

In Ethiopia, the percentage of population with access to electricity was estimated at about 13% in 1999 (Mengistu, 2002). It rose to 17% by 2005, as a result of the Woreda Towns Electrification Program. In 2008 the access estimate stood at about 30%. With the current Universal Electricity Access Program (UEAP), electricity access is to rise to 50% by 2010, and to 100% by 2015.

Woreda towns' electrification, involving electrification of about 160 Woreda capitals, brought electricity closer to the rural areas, which had practically no access to electricity. It also prepared EEPCO for the more ambitious UEAP, in terms of implementation capacity. The UEAP runs deeper into the rural areas, ultimately bringing every household within reach of low voltage electricity supply line. In the process, all urban areas too are expected to be electrified. If the UEAP is completed as planned, there will be no access constraints to electricity supply. The only constraint would be that of actual connection of customers to the supply lines, which would largely depend on the capacity of customers to pay for electricity services, including connection fees. To-date the program is believed to have been implemented as planned, with the number of electrified villages and connected customers rising rapidly.

With respect to petroleum products, the filling stations (retail stations) are available only in major urban centers. Smaller towns may have shops retailing kerosene from barrels. Rural areas depend on small retailers selling kerosene from cans, on market days. In most rural areas kerosene is used for lighting small wick lamps. Current supply infrastructure would not support petroleum products demand for use in either kerosene stoves or transport vehicles, whose fuel requirements are significant.

The use of LPG is uncommon outside of the bigger cities. In part, this may be due to lack of supply infrastructure. Affordability of LPG and lack of promotional activities to encourage the use of LPG are also important factors. In the case of rural areas, transportation of LPG bottles would also be a challenge, as the bottles are cumbersome and unsafe to carry on donkey backs.

In the case of biomass fuels, there is a mismatch between the locations of the resources and the demand centers. Especially, the woody biomass resources in the west and southwest of the country are located far from the consumption centers in the central parts of the country. Apart from the distance, the absence of mass haulage systems like railways constrains the full exploitation of these resources. The same is true for coal resources. With better transport systems, coal briquettes could be transported cheaply to be used in households and industries.

In the rural areas, the absence of motorized transport infrastructure leaves little choice outside of using cooking fuels that are available in the immediate vicinity. Animal transport becomes impractical when the fuel load is voluminous, cumbersome, too heavy or volatile.

10.6 Current efforts and their adequacy for meeting energy demand and addressing problems associated with growing consumption

10.6.1 Electricity supply

The policy focus on hydropower development has rewarded the power sector in terms of cheaper costs of production, lower maintenance and reliable operation of plants. It has also meant that the country has been spared the import of a huge quantity of petroleum fuels that would otherwise have been needed. If the 2007 electricity generation of about 3200 GWh were totally based on diesel plants, it would have meant an import of 800 thousand tons of fuel for the power generation. This quantity of diesel fuel is about 50% of the total petroleum fuels actually imported in 2007. Although the advantages of hydropower are numerous, the recurrent shortage of generation capacity in the ICS has overshadowed its innate benefits and has given rise to doubts about reliance on hydropower.

Supply shortages and concomitant power shedding have largely been results of delays in the commissioning of new plants, with drought and sudden demand growth occasionally exacerbating the problem. Supply shortages were critical in 2003 and 2008 in recent years. These were the years preceding the commissioning of Gilgel Gibe I and Tekeze hydropower plants, both of which suffered delays in their commissioning dates. The problems of delays in commissioning new plants and the associated power shedding have to do with:

- Planning errors in respect of scheduling power plant study and design, construction and commissioning
- Inadequate standby hydropower capacity
- Inadequate generation mix
- Lengthy processes in arranging finance for the construction of hydropower plants
- Time overrun during the construction of power plants

Due to the disruptive nature of power shedding on the socio-economy of the country, it is worth taking a closer look at each of these causal and corroborative factors.

Because of the long gestation periods for the implementation of hydropower projects, typically over ten years, it is mandatory to have at hand a number of candidate power plant projects completed to feasibility study and design levels well ahead of foreseen construction periods. Choices can then be made among these candidate projects to go ahead with the actual construction. Until recently, the power sector suffered from lack of studies of such candidate projects and, therefore, had to make last minute scrambles to study, design and construct power plants. The construction of Melka Wakena power plant in the 1980s, for example, went hand in hand with the study and design of the plant. The feasibility and design of Gilgel Gibe I power plant in the 1990s was undertaken long after failed attempts to construct the power plant based on preliminary studies and scant designs. These factors contributed to delays in the starting and completion of the construction of the power plants. The chain of malpractices culminated in the power plants coming on line so late that costly supply shortages had to be endured.

The situation has improved substantially in recent years, with numerous hydro-plant schemes having been studied to feasibility and design levels for implementation in the next ten years (see Table 10.9). The studies have been undertaken by the Ministry of Water Resources, EEPCO, as well as private developers. However, close monitoring of the electricity demand has to be undertaken in order to be able to take up the construction of the power plants as early as possible and avoid the scourge of supply shortages.

Inadequate standby generation capacity in the supply system has also contributed to supply shortages. It would be a waste of resources to have unduly large standby capacity in a supply system. On the other hand, it is risky to have inadequate standby reserve capacity, since it would not be possible to cover supply shortages arising from breakdown of machinery and equipment, low water storage due to drought, unexpected demand growth (as witnessed in Ethiopia in the period 2004 - 2009), etc. It is, thus, customary to set aside about 20% of total forecast system peak demand as reserve. In the case of Ethiopia, this standby capacity too needs to be hydro or coal-based to minimize generation costs. The ICS hydro-plant total installed capacity in 2008 stood at 660 MW, while peak demand in the system stood at about 675 MW. Moreover, not all of the power stations were able to deliver their full (installed) capacities. So, the balance of demand had to be covered by costly diesel units and load shedding (i.e. supply cuts). The fuel costs for the diesel units amounted to about 100 million Birr per month in the first half of 2009. Future power system planning should, therefore, ensure that adequate standby capacity is built into the system.

Table 10.9: Power plants planned for commissioning by 2018

No.	Plant	Dependable Capacity (MW)	Average Energy (GWh/a)	Firm Energy (GWh/a)	Expected coming year	Status, 2009
1	Gilgel Gibe-II	420	1886	1345	2010	Under Construction
2	Beles	460	1364	2379	2010	"
3	Amerti Neshe	97	198	186	2010	"
4	Ashegoda WindTurbine	120	NA	400	2011	"
5	Gibe-III Phase1	935	3120	2825	2012	"
6	Gibe-III Phase2	935	3120	2825	2013	"
7	Chemoga Yeda 1	162	905	780	2012	MOU has been signed with SINOHYDRO and Consultants hiring underway
8	Chemoga Yeda 2	118	510	460	2012	
9	Aluto Langano Geothermal	30	NA	172	2012	Under Study
10	Halele	96	510	460	2013	Tender for construction floated on EEPCo's Web site; financing to be under Suppliers credit
11	Werabesa	326	1735	1570	2013	
12	Geba 1	215	935.1	911	2013	Prequalification evaluation is completed for 10 Companies
13	Geba 2	157	853	823	2014	
14	Genale Dawa III	254	1600	1640	2014	Prequalification evaluation is completed for 10 Companies'
15	Gibe-IV	1472	-	-	2015	Under Study
16	Mendaya	2000	12119	11194	2018	Pre Feasibility completed

Source: EEPCO

In view of climate change fallouts, the generation system mix in the national grid also needs to include sources other than hydro (which is susceptible to drought). These sources include geothermal, wind and coal, in the case of Ethiopia.

Wind-based electricity generation currently being introduced into the EEPCO grid would counter problems of water shortage, and the resulting power shortage, associated with droughts. The on-going advances in wind power technologies could be exploited further for strengthening the generation system in Ethiopia.

Regional grid interconnections among neighboring countries can also alleviate supply shortages through power imports. This can be costly, but still a better alternative to power shedding. At any rate, long duration power imports should be avoided. Grid interconnection projects with the Sudan and Djibouti are in the construction phase, and the Ethio-Kenya grid interconnection is in the study phase**.** When completed, the projects can play a significant role in reducing the incidence of power shedding in Ethiopia.

Financing arrangements from utility revenue, local and external banks also take up precious time prior to the start of the construction phase of hydropower projects. Whatever the mechanism of financing the projects, early start on negotiations with financers is mandatory to avoid the ultimate price in power interruptions.

Delays during the construction phase are ever-present, and, therefore, allowances need be made for eventualities. The causes of delays are numerous. They include:

- Unforeseen geological conditions at the project site
- Design changes during construction
- Unforeseen work components (variations)
- Shortage of construction materials

- Inadequate manpower and machinery capacity deployed by contractors
- Inadequate financial capacity of contractors
- Inadequate project management capacity on the part of the supervision consultant and the project owner
- Delays in effecting payments to contractors
- Disputes between consultants and contractors
- Dispute over claims
- Labour dispute and strikes
- Delays in port clearance for import items
- Inland transport problems for imported equipment and machinery.

Some of the problems have their roots in the study and design phase; others in the bidding phase (i. e. selection of consultants and contractors), and still others in the construction phase itself. At any rate, it would be appropriate to have contingency plans for meeting supply shortages in case of construction delays.

The problems of power supply are not limited to the generation end or to generation capacity. There are problems at the transmission and distribution levels that need to be addressed in order to realize the full advantages and benefits of hydropower.

At the local transmission grid level, the problem is one of paucity of transmission lines. By way of comparison, the transmission line density per 1000 km^2 of territorial area stands at about 5 km for Ethiopia. The corresponding figures for the Republic of South Africa, Ghana and Nigeria in sub-Saharan Africa are about 21 km, 12 km and 8 km , respectively (AFREPREN, 2002). The eastern regions around Harari and Dire Dawa, the southern regions around Kibre Mengist and Arba Minch, the western regions around Nekempte and Jimma rely on single transmission lines typically radiating from sub-stations or power stations in the central region. Transmission line rings connecting the radial lines would have to be constructed to provide alternative supply paths. There are also areas where the hydro-grid is entirely absent. Clearly, the resource endowment in hydropower should be exploited to benefit these areas too.

At the distribution level, the glaring problem has been one of failure to reach out to the rural areas. The on-going UEAP is a bold attempt to address this problem. It is largely based on the hydro-grid extension, and thus presents the rural population with an opportunity for sharing the benefits of the hydro resources of the country. Up to now, the identification of rural centers to be covered in the UEAP has been largely made by Regional Administrations. To ensure a 100% coverage of rural settlements, however, EEPCO has yet to devise its own means of mapping out electrified areas and see to it that every household has electricity access within a specified maximum distance.

The UEAP is also an instance of diversifying the benefits of hydropower development through the exploitation of forward and backward linkages: New power plants had to be planned and built to meet the UEAP customers' electricity demand; local materials and local labour have been extensively used in the implementation of the UEAP; small businesses are expected to follow in the trail of electricity access through the UEAP. In the final analysis, this translates into the sustainability of electricity supply to the population.

In the urban areas, whereas the electricity supply infrastructure exists, customer service in respect of metering, billing, maintaining the standard supply voltage, etc., is yet to be perfected. Admittedly, various alternatives are being tried out to improve customer service, but consumer complaints are still rampant.

As stated in a foregoing section, institutional restructuring at the power utility level, would also help tackle some of the outstanding shortcomings in the power sector. A serious review of this issue too appears timely.

10.6.2 Petroleum fuels

The transport sector in Ethiopia relies almost wholly on petroleum fuels, the exception being a five percent ethanol-blend on gasoline that was introduced recently. In the foreseeable future, petroleum fuels will continue to provide the bulk of the motive power for motorized transport in Ethiopia. Since petroleum fuels supply currently relies wholly on imports, prime focus needs to be made on the efficiency, cost effectiveness and sustainability of fuel imports. In parallel, of course, due emphasis needs to be accorded to the development of indigenous hydrocarbon resources, switch to substitute fuels, efficient use of transport fuels and better management of the transport sector.

Outside of the transport sector, households, power generation, agriculture and industry too use a limited amount of petroleum fuels. Measures taken to improve the supply of motive power for the transport sector would be expected to benefit all current users of petroleum fuels either directly or indirectly.

In section 10.5, it was pointed out that the increasing demand for petroleum fuels would require attention in respect of:

- Capacity of fuel handling facilities at ports of entry
- Capacity and mode of fuel transport from ports of entry to inland depots
- Capacity of inland depots, including strategic reserve depots
- Capacity to meet fuel import bills.

These issues ultimately affect the efficiency, cost effectiveness and sustainability of petroleum fuels supply and are, therefore, relevant and important. They are discussed further hereunder.

Fuel arriving at sea ports by oil tankers cannot be directly loaded onto road tankers. It is normally unloaded onto storage tanks for subsequent off-take in required amounts. Such storage tanks can be leased or built for own use if permit to do so is obtained from port authorities. The crucial point is to have adequate storage capacity and auxiliary facilities like pumps and fuel conveyance pipes in place. The storage capacity also needs to be kept abreast of the imported fuel volume.

Currently, fuel is transferred from storage tanks at sea ports onto fleets of road tankers for transportation to inland oil depots. This mode of oil transport is not necessarily the most efficient or cost-effective. Pipeline transport of the imported oil could be a better alternative, and its feasibility study and subsequent implementation need attention.

There should be sufficient inland depot capacity to receive the consignment of fuel delivered from storage tanks at the ports of entry. Such depots include central depots owned by fuel distribution companies, depots at retail stations and the national strategic reserve depots. Currently there is adequate capacity within these depots to take up fuel delivered from the ports. However, the capacity has to grow in tune with fuel import growth. With respect to the strategic reserve depots, in particular, the five year strategic plan of the Ministry of Mines and Energy aims at increasing the total storage capacity to over 500, 000 cubic meters by the end of 2010 (MME, 2007).

The local demand for oil grew at a rate of about 7% per year in the period 1996 -2006. Crude market prices too rose by about 14% per year between 1996 and 2006 (see Table 10.10 below). These factors resulted in a growing share of export earnings going to cover oil import bills. In fact, oil import expenses as a percentage of export earnings rose from about 38% in 1996 to about 86% in 2006, and actually attained a level well over 100% of export earnings in 2007 and 2008. Although the 'global financial crisis' has brought about a respite in oil price escalations, the current oil price regime cannot be taken for a permanent equilibrium. So, the imperative to sustain growth in export earnings, in tune with the growth of local demand and global price of oil, remains as critical as ever to stay in the oil import market.

Table 10.10: Oil consumption and import value as % of export earnings for Ethiopia

	1996	2003/04	2005/06
Global crude market prices -Brent spot prices (USD per barrel)	20.7	28.5	54.5
Domestic consumption ('000 tons)	857	1248	1475
Oil import value (million USD)	168	310	856
Export earnings (million USD)	437	600	1000
Oil import as % of export earnings	38*	52	86

Note on Table:

- There were ups and downs in crude price, but the general trend was one of increase
- High increase from 2004 on
- Price end of 2007 was 90 USD per barrel; Price July 2008 peaked to over 140 USD per barrel.

* - data for 1995

- Consumption grew by about 72%, whereas the ratio of oil bill to export earnings grew by 126%, in the period 1995- 2006.

Source: EPE, NBE, and MEDaC, 1999.

Discovery of oil within Ethiopia will, of course, fundamentally alter the local supply scene. Accordingly, progressive improvements have been made on incentives for investments in oil and gas explorations. As at early 2009, there were as many as 12 companies undertaking oil exploration and gas resources development in the country. Exploratory drilling has been undertaken in the Ogaden, and Gambella areas. Companies engaged in the Ogaden gas development are mainly focused at gas export options.

Short of discovery of indigenous oil reserves, there are a cocktail of measures that could be taken up to ease the oil import burden and also strengthen the transport energy supply base. These include:

- Use of biofuels as oil substitutes or oil extenders (ethanol production and usage falls under this category)
- Use of natural gas as a transport fuel

- Use of hydroelectricity for electric cars and trains
- Increasing the availability and efficiency of urban bus/ mass transport service
- Increasing the national oil depot storage capacity to cushion the vagaries of oil supply and price (fill up the reserve depots during low oil prices, and draw down during high oil prices)
- Exploiting oil shale resources (as the technology picks up).

The first three items in the list involve technologies that are up-coming at the global level. Biofuels are at the forefront of transport energy development notably in Brazil, China and India. Natural gas vehicles are already widely used in India, Pakistan, Iran and Russia. Cars powered by high energy batteries, especially lithium batteries, are already hitting the roads in the USA.

The success of the measures listed above would depend on the close collaboration and coordination between the Ministry of Mines and Energy, and the Ministry of Transport and Communications, among others.

10.6.3 Biomass fuels

The central issue with respect to biomass fuels is one of its impending unavailability to both rural and urban households. The causes of the impending shortage / unavailability, as pointed out in section 10.1, are not rooted in the energy sector alone, but have much to do with clearing of woodlands for agriculture and settlement, logging of wood for use as construction material, among others. In particular, population pressures drive both energy consumption growth and the quest for additional land for agriculture and settlement. Given this situation, the remedial measures may include:

- Reforestation
- Switch to substitute fuels (electricity, kerosene, LPG, coal briquettes, biofuels)

- Demand management (especially use of fuel-saving stoves)
- Population growth control.

With respect to reforestation, article 4, sub-article 1 of Proclamation 542/ 2007 states that "private individuals, associations, governmental and non-governmental organizations and business organizations who want to develop forest shall have the right to obtain rural land in areas designated for forest development in accordance with regional land administration and utilization laws". The premise appears to be that neither the MoARD nor regional governments would be undertaking direct afforestation activities. Rather, these institutions are expected to facilitate and control afforestation activities undertaken by private and governmental enterprises. In particular, no Treasury budget would be allocated for afforestation. In view of the special significance of woody biomass in the Ethiopian energy balance, the effectiveness of this legal provision in sustaining woody biomass energy supply to households needs to be monitored closely.

In the urban context, electricity, kerosene and LPG are already widely used as cooking fuels, especially in bigger cities. The supply infrastructure is well established for these fuels in big cities. As biomass fuels get scarcer, it is likely that more and more households would switch to these fuels. In the case of smaller towns, households may not afford to cook with electricity, but a gradual switch to kerosene and LPG is conceivable. LPG does not have the supply base in smaller towns, but it is likely to take hold as demand rises.

In the rural areas, due to affordability and infrastructure problems, it is unlikely that electricity, kerosene and LPG would make substantial presence as cooking fuels in the foreseeable future.

Coal briquettes and biofuels hold the potential as cooking fuels for both urban and rural households. However, these fuels have yet to pass through the study, demonstration and commercialization stages. The Chinese experience in the case of; coal briquettes, and Mauritian experience in the case of ethanol as cooking fuels may be emulated in Ethiopia too. A broader discussion of demand management will be presented in a later section.

With respect to cooking fuels, in particular, demand management pertains to the use of efficient stoves which use less fuel for the same task. Improved charcoal stoves have been used with some degree of success in urban households. Improved wood stoves, however, have had a less remarkable success.

Rural areas are yet to benefit from either of the improved stoves. Admittedly, the challenge in disseminating improved stoves is greater in rural areas, owing to the variety of diets, cooking habits, need for space heating in conjunction with cooking, need for lighting in conjunction with cooking and nature of homesteads in each region that have to be taken into account.

Limiting population growth to a sustainable level is a requirement not only from energy supply viewpoint but also for sustainable use of natural resources in general. Suffice it to say that enhanced implementation of the population policy would ease the household energy supply burden too.

10.6.4 Alternative energy supply

Alternative energy supply refers to the use of solar, wood, micro hydro, coal briquettes, bio-fuels, among others, particularly in the context of small -scale applications. Rural households and small -scale industries would be the main focus of alternative energy supply schemes. Such schemes would reduce dependence on grid electricity, petroleum fuels and woody biomass. In the past three decades some attempts were made to introduce the use of biogas, PV systems and briquette fuels, using public finance. However, success was limited. New beginnings could be made taking advantage of technological innovations in renewable energy areas.

10.6.5 Energy demand management

To meet the project energy demand, exerted efforts need to be made both in supply and demand management. In particular, despite the enormous benefits of demand-side management programs, little efforts have been made in these areas. Some of the demand-side management options are illustrated in case studies 1-3.

Interventions in the household sector should include demand management (improving energy efficiency, fuel switching - biogas, kerosene, etc), and supply enhancement (fuelwood plantation and protecting forest resources). Modern biomass technologies have the potential to provide improved energy services based on available biomass resources. There are several advantages of using more efficient cooking stoves (such as *Mirt* biomass injera stove and Lakech charcoal stove) in households and institutions. These include reduced fuel consumption and deforestation, reduced fuel collection time, reduced number of women and children who contract respiratory and eye problems due to prolonged exposure to poor indoor air quality, and reduced GHG emission[2]. The dissemination of the *Mirt* stove will also create employment and job opportunities for stove producers.

Case Study 1 (Box 1) illustrates the benefits of wide-scale dissemination of *Mirt* biomass injera stove in Ethiopia. Assuming that the penetration rate of *Mirt* stove will increase from 5 percent in 2010 to 44 percent in 2030, the biomass fuel saved will increase from 312 thousand TWE to nearly 5 million TWE in 2030. These constitute 0.6 percent and 5.2 percent of the projected biomass energy demand, respectively. Additionally, the dissemination of the

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[2] If biomass is harvested in a sustainable manner (i.e. with regeneration of harvested areas), it is a carbon neutral energy source, neither adding nor subtracting carbon from the natural carbon cycle. The same amount of carbon removed by harvesting will be needed for the growth of new biomass. However in reality biomass is often burnt with cooking stoves with poor combustion, which means CO, CH_4, and other products of incomplete combustion are released.

stove will result in a reduction of about 413 thousand tCO_2e in 2010 and 6.2 million tCO_2e in 2030.

Case Study 2 (Box 2) illustrates the benefits of using ethanol use for transport (as gasoline blend and for cooking as substitute for kerosene. Based on the Government plans to expand ethanol production capacity, ethanol will substitute about 60 million liters of gasoline (10 percent of the projected demand) and 40 million liters of kerosene (5 percent of the projected kerosene demand) in 2015. Similarly, phasing-out of incandescent light bulbs with energy saving compact florescent lamps (CFLs), will save 20 GWh during the first year and about 600 GWh in 2016 as illustrated in Case Study 3 (Box 3).

Box 1: Case Study 1- Dissemination of *Mirt* stove

One of the demand-side management interventions in the household sector has been the dissemination of efficient cooking appliances. In particular, the improved biomass *injera* stove - locally known as *Mirt* – has been disseminated by the private sector, governmental and non-governmental organizations.

At the end of 2008, an estimated 400,000 stoves have been disseminated throughout the Country. The fuel saving of Mirt stove is 48 percent. The wide-scale dissemination of this stove will decrease the demand for firewood, crop residues and animal dung. Assuming that the penetration rate increases from 2.3 percent in 2008 to 5 percent in 2010 and 44 percent in 2030, this will result in savings of 4.7 million TWE or 5.2 percent of the projected household biomass energy demand in 2030. The dissemination of the stove will also have the added benefits of reduced fuel collection time, indoor air pollution, and GHGs. The program will also create employment and job opportunities for stove producers. Assuming an emission factor of 1.6 tCO_2e per ton of wood, the potential GHG emission reduction would be 413 thousand tCO_2e in 2010 and 6.2 million tCO_2e in 2030.

Table 10.11: Biomass saving impact of dissemination of *Mirt* stove

	2010	2015	2020	2025	2030
1. Estimated No. of HHs, million	17.5	19.5	21.8	24.4	27.3
2. Penetration rate, % of HHs	5	16	27	37	44
3. Cumulative No. of Mirt Stoves, million	0.8	3.2	6.0	9.0	12.0
4. Biomass saving, Tons/year, '000					
Firewood	258	1,033	1,936	2,905	3,873
Crop Residue	22	89	167	251	334
Animal Dung	32	126	236	355	473
Total, TWE, '000	312	1,248	2,340	3,510	4,680
5. Percent of projected HH biomass demand	0.6	2.1	3.4	4.5	5.2
6. Potential GHG emission reduction# 000 t-CO_2e	413	1,653	3,098	4,648	6,197

\# Assumes emissions of 1.6 t-CO2e per ton of wood combusted; accounts for CO2, CH4, and N20 with GWP100.

Box 2: Case Study 2 - Ethanol use for transport and for cooking

Ethanol is used in cars as additive to gasoline, in flexible fuel (FF) cars or in dedicated ethanol engines. Currently, the Government has mandated a 5% gasoline blend starting in October 2008. Ethanol will also substitute for kerosene for cooking on a liter for liter basis. Ethanol is being used both for transport as well as for cooking.

Currently, Finchaa Sugar Factory is producing 8 million liters a year. The Government plans to expand capacity of existing sugar factories as well as develop a new factory at Tendaho. Ethanol production is expected to increase to about 62 million litters by 2015 (Table10.12). For the gasoline blend 7 to 19 million liters of ethanol will be required and the remaining will be for domestic and commercial cooking market. Ethanol for cooking will displace about 43 million liters of kerosene in 2015 or about 5 percent of the projected demand.

Table 10.12: Projected ethanol supply and use for transport and for cooking

	2009	2010	2011	2012	2013	2014	2015
Projected Ethanol Supply							
Fincha	8,000	10,000	15,000	15,000	15,000	15,000	15,000
Wonji	-	3,000	5,000	5,000	5,000	5,000	5,000
Metahara	-	4,000	8,000	8,000	12,000	12,000	12,000
Tendaho	-	-	20,000	30,000	30,000	30,000	30,000
Total Supply	8,000	17,000	48,000	58,000	62,000	62,000	62,000
Ethanol Demand							
Substitution of Gasoline							
Projected Gasoline Demand	144,505	151,129	158,057	165,302	172,879	180,803	189,091
Assumed blending rate	5%	10%	10%	10%	10%	10%	10%
Ethanol for Gasoline blending	7,225	15,113	15,806	16,530	17,288	18,080	18,909
Gasoline demand with blending	137,280	143,572	150,154	157,037	164,235	171,763	179,637
Ethanol available for cooking	775	1,887	32,194	41,470	44,712	43,920	43,091
Projected Kerosene demand	372,809	428,604	492,749	566,494	651,276	748,746	860,804
Percent of Kerosene substituted	0.2	0.4	6.5	7.3	6.9	5.9	5.0

The benefits of substituting gasoline and kerosene with ethanol include saving of scarce foreign exchange by reducing gasoline and kerosene imports, employment generation and new income streams for rural population from sugar-cane and ethanol production, reduced GHG emission.

Box 3: Case 3 – Switching to compact fluorescent lamps (CFLs)

One of the potential electricity efficiency measures in buildings is replacement of the incandescent light bulbs with energy saving compact florescent lamps (CFLs). Compared to incandescent lamps of the same luminosity, CFLs require less energy and last longer. CFLs use about 20 percent of the energy equivalent incandescent lamps.

Lighting accounts for 25 percent and 20 percent of the demand for electricity by households and the service sectors. Switching from incandescent lighting to CFLs should, therefore, result in significant reduction in peak-hour electricity demand. Assuming a complete phasing-out of incandescent light bulbs over the period 2011-2016 in the household and service sectors, about 20 GWh will be saved during the first year and nearly 600 GWh in 2016.

Figure 10.17: Household power demand with and without phasing-out of incandescent light bulbs

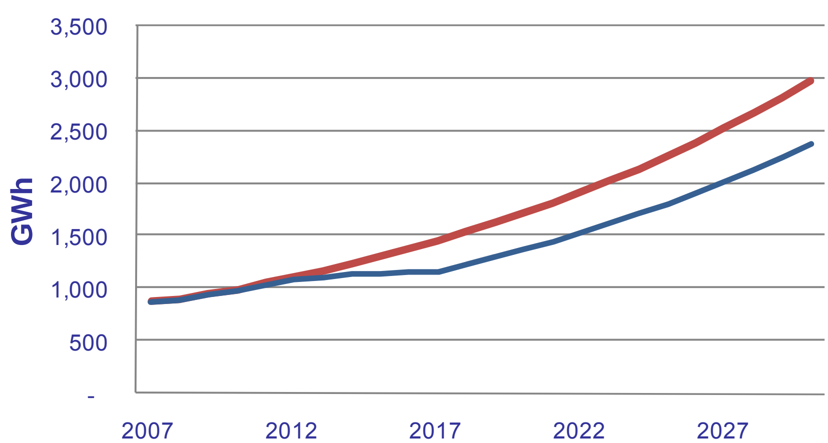
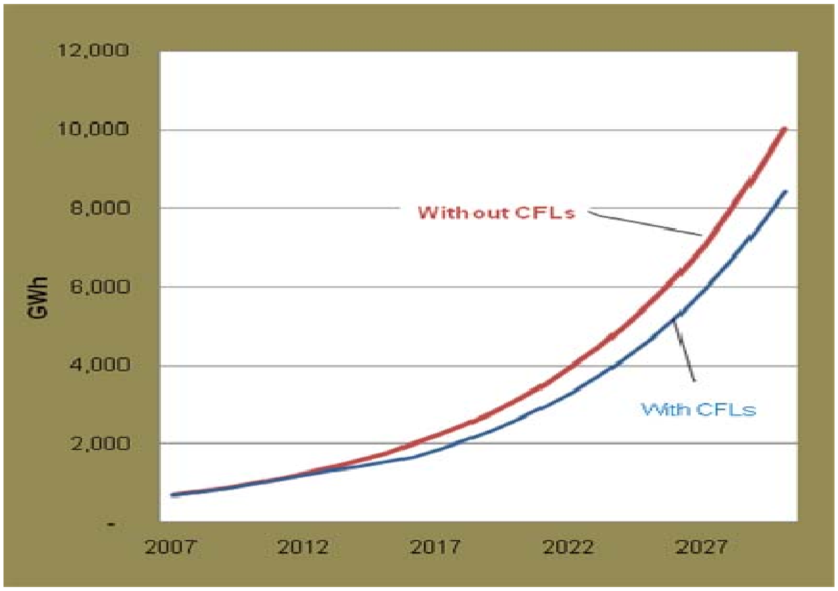


Figure 10.18: Services sector power demand with and without phasing-out of incandescent light bulbs



10.7 Summary

Ethiopia's energy resources in the area of hydropower, solar and wind are huge. Geothermal coal and natural gas resources are also significant. The level of development and exploitation of these resources is, however, insignificant. Access to modern energy is low even by developing countries' standards. So too is the level of consumption of modern energy. The national energy consumption is in fact hugely skewed towards the use of biomass energy - the bulk of the energy consumption in households for cooking and lighting. On the other hand, woody biomass resource is being depleted at an unsustainable rate due to increases in energy demand, population growth, settlement and agricultural expansion and a host of other reasons.

In practical terms, it would not be possible to make a shift from biomass energy use to electricity and petroleum fuels in the short to medium-term to any significant degree, due to problems of availing the supply of these energy sources, on the one hand, and the capacity of the population to purchase and use these fuels for cooking and lighting, on the other. So, it is likely that the performance of biomass energy in the Ethiopian energy scene would continue into the foreseeable future.

Industry, motorized transport and construction sectors rely to a large extent on the use of electricity and petroleum fuels. The demand for these fuels is forecast to grow in pace with economic and social development. The past few years have seen shortfalls in meeting the demand for electricity. There has also been a considerable strain on the economy in terms of bearing the burden of oil imports. Based on the challenges and opportunities outlined above, the way forward for the Ethiopian energy sector would be:

- Accelerated development of the electricity sub sector, using hydro, wind and geothermal resources, among others
- Strengthening of the capacity to continue to supply petroleum fuels or its substitution for socio-economic activities
- Review of the situation in the biomass sub sector with more seriousness with a view to sustain biomass supply

Chapter 11

The Imperative and Prospects for Environment-friendly Path of Energy Development

11.1 The linkage of energy sector to environment: conceptualization

The concept of sustainable development implies a pattern of development that "meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987, p. 43). Sustainable development thus requires accelerating economic growth to meet essential human needs and allocating and conserving resources overtime. This is important because any generation can maximize its consumption by degrading environmental resource base to the detriment of both current generations in subsequent years and of generations into indefinite future. In other words, as Solow summarizes it,

"There is a sort of dual connection … between environmental issues and sustainability issues. The environment needs protection … because … by burdening the environment, by damaging it, we can profit and have some of the costs, perhaps most of the cost, borne by others. Sustainability is a problem precisely because … we can profit at the expense of the future rather than at the expense of our contemporaries and the environment. We free-ride on each other and we free-ride on the future." (Solow, 1991, p.183).

The crux of the problem is that some environmental resources (e.g., air, water, wildlife) are non-marketed, free goods. As a result, their use is not entered into the calculation of current production costs of goods and services. Also, market prices of many environmental resources often do not reflect the full costs involved in their use due to existence of "externalities" and public-good character of environmental assets. These lead to inefficient use and over exploitation of environmental resources. Energy production and use have significant environmental impacts that are not reflected in energy prices (Mekonnen, 1995).

The 1992 UN Conference on Energy and Development in Rio de Janeiro, The Agenda 21, produced at the Rio de Janeiro, concluded that the present energy course is unsustainable (UNDP, 1997). Chapter 9 of Agenda 21, "Protection of the Atmosphere" states that:

Energy is essential for economic and social development and improved quality of life. Much of the world's energy, however, is currently produced and consumed in ways that could not be sustained if technology were to remain constant and if overall quantities were to increase substantially. The need to control the atmospheric emissions of greenhouses and other gases and substances will increasingly need to be based on efficiency in energy production, transmission, distribution and consumption, and on growing reliance on environmentally sound energy systems, particularly new and renewable sources of energy" (UNDP, 1997).

Agenda 21 recommends a series of concrete actions to promote sustainable energy. These include, among others, identifying and developing economically viable, environmentally sound energy sources; promoting the development, at national level, of appropriate methodologies for making integrated energy, environment and economic policy decisions for sustainable development; promote the research, development, transfer and use of improved energy-efficient technologies and practices for environmentally sound energy systems, including new and renewable energy systems; and review the current energy supply mixes to determine how the contribution of environmentally sound energy systems as a whole, particularly new and renewable energy systems, could be increased in an economically efficient manner.

Global warming is now recognized as a major threat to human existence on the planet. Extreme weather conditions, destructive storms, melting glaciers and rising sea levels that are being witnessed currently in various parts of the world, are believed to be manifestations of the effects of global warming. Global warming itself is the 'greenhouse effect' of 'greenhouse' gases including carbon dioxide, nitrogen oxides, methane, chlorofluorocarbons and carbon tetrachloride. At lower concentrations of these gases in the atmosphere, part of the solar heat that reaches the earth's surface is reflected back into space. At higher concentrations of the gases, however, the solar heat tends to be trapped within the atmosphere, thereby raising the surface temperature.

Burning fossil fuels (petroleum fuels and coal) is considered to be the major source of emissions of carbon dioxide and nitrogen oxides to the atmosphere. Plants, on the other hand, are considered to be carbon sinks (absorbing carbon dioxide through photosynthesis). Table 11.1 shows the global warming potential as well as emissions due to human activities for some of the green house gases. Global warming potential is a measure of the global warming effect of green house gases relative to carbon dioxide.

Table 11.1: Global warming potential, emission levels and major sources of some GH

Type of Gas	Global warming potential	Anthropogenic emission, (tons/year)	Major sources of emission
Carbon dioxide	1	25 billion	Burning fossil fuels (coal and petroleum fuels)
Methane	11	480 million	Rice fields, landfills, land clearing, fossil fuel processing
Nitrous oxide	270	16 million	Nylon production, nitric acid production, burning additives in automotive fuels

Source: IPCC, 1992.

Among greenhouse gases, anthropogenic (human generated /induced) emission of carbon dioxide stands out prominently. Although the ratio of emission of carbon dioxide to the natural emission is small (about 5%), it is believed to cause a net 0.4% increase per year in the global atmospheric concentration of carbon dioxide.

The use of renewable energy sources like solar energy, wind energy, hydropower and biofuels through PV systems, solar thermal convertors, wind turbines, etc., does not involve or result in the emission of greenhouse gases. Hence, the emerging global focus on renewable energy resources for countering global warming.

Fossil fuel resources are also subject to depletion and therefore carry the threat of increasing unavailability. Oil and coal currently constitute the backbone of world energy supply. Yet, at current consumption levels, proven reserves of oil cannot last beyond a few decades and discoveries of new reserves are hard to guarantee.

In short, the current reliance on fossil fuels leaves every country on the path of unsustainable development in general and unsustainable supply of energy in particular. Renewable energy resources on the other hand, pose lesser threat to the environment as well as being more abundant.

11.2 Environmental effects related to the current energy development and utilization policy, strategy and practices in Ethiopia

The major environmental problems associated with energy in Ethiopia are (i) energy-related deforestation, and (ii) energy-related air pollution. As discussed in earlier sections, fuelwood accounts for the bulk of the national energy consumption. The overall forest stock is shrinking and the annual fuelwood demand is already in excess of the sustainable yield. Such unsustainable harvesting of woody biomass resources will have serious environmental repercussions including deforestation. The consequences of deforestation include increased soil erosion by wind and water, reduced water retention in soil, disruption of the water cycle, loss of wildlife habitat, and dislocation of indigenous people. The long-term effects of soil erosion are desertification, increased flooding and droughts. This could lead to famine and force people to abandon their homes and lands. Some of these are already proceeding in some parts of the Country. The long-term decline in forest resource-base also leads to increased GHG emissions as emissions from the burning of fuelwood can no longer be absorbed and fixed in photosynthesis. The prevailing energy supply and consumption pattern in Ethiopia is, therefore, unsustainable and its socio-economic consequences can be disastrous.

11.2 Environmentally sustainable energy development

Renewable energy applications have the advantages of minimal environmental impacts, generally lower running costs, high labor intensities, and divisibility of investment arising from availability of small units. The wide-scale dissemination of Renewable Energy Technologies (RETs) is also in line with the Government's development policies and strategies (ADLI, Rural Development Strategy, decentralization, popular participation, and private sector-led economy). Their increased application can significantly contribute to poverty reduction, sustainable development and sustainable energy future. RETs could potentially be used in various sectors and applications: domestic, small business, agriculture, health and community services as shown in table 11.2.

Table 11.2: Potential applications of renewable energy system

Technology	Domestic	Small business	Agriculture	Health	Community services
Solar Energy				,	
Photovoltaic	●	●	●	●	●
Solar water heating	●	●		●	●
Solar cookers	●	●			●
Solar driers			●		●
Micro/small hydro	●	●			●
Wind	●	●	●	●	●
Wind turbines (electricity)	●	●		●	●
Water pumps	●		●	●	●
Biomass					
Improved stoves	●				
Briquettes	●	●			
Biogas	●	●			●

Source*:* Mekonnen (2002)

In Ethiopia, humble beginnings were made in the 1980s in the use of solar PVs, solar thermal convertors and wind turbines, in tune with the global move to develop alternative energy sources in the wake of the 1973 oil crisis. However, there was little progress in these areas until the turn of the century. On the other hand, hydropower development enjoyed full support in terms of policy and actual project implementation on the ground. Part of the reason for this skewed development in renewable energy may have been the conviction that, given the relative maturity of various energy technologies at the time, the base demand for electricity could be best met by hydropower, with other sources filling the supply gaps in various niches.

Currently, there is renewed effort to promote the use of solar PVs, solar thermal systems, wind turbines and biofuels. The effort in these areas is likely to be helped by the on-going global advances in the technology for these energy systems, as well as lower costs of energy production resulting from these technologies. In this respect, it is worth mentioning developments in the use of wind energy and biofuels.

Since 2004, wind parks for large scale power production have been studied notably at four sites: two sites each at Mekelle area, and one site each at Gonder and Nazareth areas. The wind park projects at Mekelle vicinity have in fact advanced to the construction phase for a total of 120 MW plants. The projects are being implemented by EEPCO.

A start has also been made in the use of ethanol as a gasoline blend. Currently, gasoline used at Addis Ababa is supplied as a 5% ethanol blend. There are plans to expand ethanol use to other regions in the country, as well as raising the blend level to 10% ethanol. At present the limiting factor is the capacity of sugar plants to produce ethanol. Sugar plants are, therefore, setting up ethanol production plants to meet the envisaged demand. The Ministry of Mines and Energy promotes and oversees the use of ethanol blend fuels in the country.

To-date, sugar plants in Ethiopia have been developed downstream of hydropower dams, using the regulated water supply to irrigate the sugar fields. With expansions in hydropower generation, there is more opportunity to open up new sugar plants. This would mean increased supply base for ethanol. This linkage of hydropower, sugar and ethanol development should be strengthened and exploited to benefit the power, industrial and transport sectors simultaneously. Such a strengthened linkage could set the scene for an ethanol (as well as biodiesel) program on the lines of Brazil, with all its positive implications for energy security, affordability and socio -economic development (Mathews, 2006).

The Ethiopian Rural Energy Development center (EREDPC) is the main governmental organization that has been engaged in the development, demonstration and dissemination of small scale renewable energy technologies. Other entities engaged in similar activities include Selam Vocational Training, GTZ AMES (Access to Modern Energy Services), SNV Ethiopia, Mekane Yesus Evangelical Church and World Vision Ethiopia.

The current programs of the EREDPC are framed within MME's five year strategic plan covering the period 2006- 2010 (MME, 2007). These programs focus on the following three areas of energy studies, development and utilization:

- Alternative/renewable energy technology studies and development
- Energy resources inventory
- Off-grid rural electrification

Some of the major outcomes of these programs expected by the end of 2010 include:

1. Dissemination of a large number of efficient biomass - fired stoves, solar cookers, biogas plants, wind-pumps, ethanol stoves, as well as introduction of fast growing tree species and biodiesel yielding plants
2. Construction of a number of micro-hydro power plants, pilot plants for small scale biodiesel fuel production, as well as local manufacture of PV panels
3. Drafting an integrated energy master plan for rural Ethiopia.

The outcomes of the programs would be important for identifying the effectiveness of various technologies for addressing the critical issue of sustained energy provision to rural households in the face of dwindling biomass resources. Ethanol stoves, in particular, combine the age-old technology of growing sugar cane in rural backyards with the current advances in stoves development. Thus, community -based ethanol plants can be set up in rural areas to provide fuel for the ethanol stoves in rural homes. Similarly, community based biodiesel plants can be set up in rural areas. Biodiesel so produced can be marketed to urban areas to supplement the supply of petroleum fuels for the transport sector.

The Centre has forged good working relations with the various Regional administrations and NGOs involved in the energy sector. This approach has significantly improved the dissemination rate of improved stoves and biogas technologies in rural areas.

EREDPC was established in 2002 by proclamation No. 269/2002, although it had already been functioning as EREDPC per a special directive issued previously. It evolved from earlier organizations, notably the Ethiopian National Energy Committee and Ethiopian Energy Authority, which were active from the early 1980s to the early 2000s. Between 2002 and 2005, EREDPC was attached to the Ministry of Rural Development (MORD), whereas currently it is under the MME.

Contrary to expectations, EREDPC's stay with MOARD did not help it to address the all-important issue of biomass energy in any significant way. True, the "National Strategic Plan for the Biomass Energy Sector" was drawn up during this period. However, EREDPC's participation in the strategic plan preparation is said to be minimal. Besides, the Centre was detached from other energy institutions like the EEA, EEPCO, etc., and had difficulties in coordinating its activities with these institutions. Overall, the Centre's current placement under the MME appears much more suited for carrying out its mandate. These experiences would no doubt help in future efforts at institutional structuring.

EREDPC is an institution with a rural focus. Its duties were structured and narrowly defined in order to enable it to achieve results in key areas. This measure has, however, created institutional gaps in addressing energy issues in certain areas. At present, there are no energy institutions outside the MME that are specifically mandated to address the following concerns:

- Urban household energy provision options (e.g., promotion/ facilitation of the usage of solar water heater in urban homes)
- Industrial energy efficiency improvement
- Transport energy efficiency improvement
- Alternative / modern energy provision for the transport sector
- Alternative / modern energy provision for the agriculture sector

Efficiency improvement measures and provision of alternatives to fossil fuels actually transcend beyond energy supply security and reducing energy costs. They have implications for the environment, in the sense that less energy or less-polluting energy is used for the same tasks. So, it would be essential to carry out research, innovation and adaptation in these and other energy technology areas, for the protection of the environment, energy security and affordability. Short of creating new institutions, it would be essential to set up departments within the MME to guide development in these areas.

The predecessors of EREDPC in the 1980s and early 1990s were involved in energy research, innovation and adaptation. However, the very fact that they were dealing with too many energy forms (biomass, biogas, wind, solar, etc) and too many aspects of research, innovation and adaptation (resource assessment, database development, demand-side management, efficiency improvement, technology demonstration, popularization and dissemination, etc) meant that, in general, their resources were overstretched and too thinly spread to yield substantive results. CESEN reports on the Ethiopian energy sector in the mid 1980s, energy sector data base development and the dissemination of fuel - efficient charcoal stoves could, however, be cited as success stories.

A useful lesson that we can draw from this experience is that it is difficult to conduct all energy research, innovation and adaptation within one organization. Given the market economy policy within which we operate currently, it is in fact more fitting for Government institutions to decentralize such activities and in particular, assist private firms to carry out their own research innovation and adaptation as far as possible.

11.3 Barriers to dissemination of renewable energy technologies

The potential constraints to the development and dissemination of renewable energy resources are often cited as follows (Karekezi, 2002; Fagbenle 2000; Karekezi and Ranja, 1997):

a) Lack of awareness of renewable energy technologies and benefits
b) High rate of renewable energy systems failure and need for frequent maintenance
c) Paucity of firms involved in renewable energy technology marketing and after-sales maintenance
d) High upfront investment costs (affordability problems)
e) Inappropriate pricing mechanisms for fossil fuels, which often hide cost components in respect of environmental degradation and pollution
f) Absence of long-term renewable energy policy, strategy and development programs
g) Absence of training and capacity building in renewable energy technology
h) Absence of flexible financing mechanisms for renewable energy technology development and dissemination.

These are, however, generic problems and, therefore, do not necessarily reflect the reasons behind the low level of dissemination of renewable energy technologies in every case in Ethiopia. The list can, nevertheless, serve as a starting point for an in-depth look into the opportunities and challenges of renewable energy technologies in Ethiopia.

11.4 Summary

It is now widely recognized that the current reliance on fossil fuels (coal and petroleum fuels) is unsustainable in terms of supply as well as averting calamities (i.e., global warming and its effects) resulting from the use of fossil fuels. Although Ethiopia is not a major user of fossil fuels, it would be affected by the depletion and unavailability of global petroleum resources. It would also be unable to sustain its transport system and mechanized agriculture, sub-sectors if it continues to rely on petroleum fuels, specially, when the rest of the world switches to alternative fuels. Last, but not least, Ethiopia cannot be immune to the fallouts of global warming and, therefore, has to contribute to global efforts at restoring and reversing the trend of global warming.

Global efforts for tackling global warming are now focused mainly on the move towards the development and use of renewable energy as well as improvement of efficiency of use of the energy being used.

Ethiopia has made humble beginnings in the development of renewable energy resources (solar and wind) and energy efficiency improvement in the 1980s. But the progress has been disappointingly slow. Currently, there is a renewed impetus to promote the use of solar, wind and bio-fuels.

In view of the compelling rationale, for the move towards alternative energy resources, it is essential that a long-term plan for the development of renewable energy for the Ethiopia be drafted and implemented.

Chapter 12

Opportunities for Innovative Modes of Financing Energy Development

12.1 Investment in various sources of energy by sub-sector and source of finance

The investment plans during the PASDEP period follow two major categories. A major focus in this respect is on the group of Poverty-Oriented sectors. These include agriculture, rural development and food security, irrigation, education, health, HIV/AIDs, clean water and sanitation, roads, rural electrification, urban housing development and others (MoFED, 2006). It is also emphasized in the PASDEP document that in the energy sector small and larger hydropower projects be identified as the least costly, as well as being environmentally sound. In some cases the sector development program also involves small-localized off-grid power sources (such as photovoltaic systems and mini-hydro). However, planned investment costs are not indicated separately for the different energy sources, except the explicit mention of the Rural Electrification Program that is designated as a poverty-oriented sector.

During the PASDEP period (2005/6-2009/10), total planned resource allocation for poverty-oriented sectors amounts to 175 billion Birr. This takes 75% of the total national budget for the period. Rural electrification will account for 5% of the poverty-oriented sector planned budget (i.e. Birr 9.1 billion, See Table 12.1). It is also indicated that the total costs required to implement the energy sector development program are estimated at Birr 10.5 billion, with 2 billion coming from EEPCO and the balance from the public sector, of which 70% is expected to be in the form of external and donor financing. According to this information, out of the 10.5 billion Birr, 8.5 billion Birr will be from public fund while 5.95 billion Birr is expected to be obtained from external sources including donations (MOFED, 2006).

Table 12.1: Indicative program costs (in Million Birr) within the Macro-economic Fiscal Framework for poverty-oriented sectors and program cost based on MDGs needs assessment

Expenditure Category	2005/6	2006/7	2007/8	2008/9	2009/10	Total
Total poverty-oriented sector cost	22924	32532	36049	39102	44319	174926
Projected total expenditure	36552	45066	47218	49797	53460	232093
Rural electrification (poverty-oriented)	1610	3027	2023	1426	1024	9110
Share of rural elec. in poverty	7%	9%	6%	4%	2%	5%
Total Estimated Cost *	51903	60168	68207	74385	77902	332565
Power Sector*	9728	11964	9941	11319	7670	50622
Share of power sector*	19%	20%	15%	15%	10%	15%

* Projected PASDEP Program Cost requirement based on the MDGS Need Assessment.
Source: PASDEP (MOFED, 2006)

On the other hand, the assessments of MDGs resources requirement estimate that a total of over 332 billion Birr would be required over the PASED period. It shows an annual allocation of the budget amount that ranges between 51.9 billion Birr in 2005/6 to 77.9 billion Birr in the year 2009/10. During the period, a total of 50.6 billion Birr is required for developments in the energy sector. This is 15% of the total budget required.

EEPCO has produced a 10-year power development plan covering the period 2006 to 2016. The plan indicates total investment cost disaggregated by local and foreign components, the financing plan in terms of the possible sources of finance, and the major activities (see Table 12.2). The investment plan shows that 47% to 81% of the project costs will be foreign costs while the remaining will be local. In total 63% of the investment cost will go to purchase the foreign components. The sources of the planned investment finance are EEPCo's own contributions, customer contributions, government, local loans, foreign loans and grants. During the plan period EEPCo's own contribution ranges from 11% in the year 2007 to 38% in the year 2015/16. As a whole EEPCo's share will be 28% of the total cost for the plan period. A significant share of the finance is expected to come from foreign loan and grants which will be 15% to 65% or average of about 51% of the total cost for the plan period. This grand investment plan, however, does not have any indication as to how the domestic private sector will engage as one of the sources of investment finance.

EEPCO's plan also indicates the different activities to which finance will be allocated. These are power generation, transmission, distribution, institutional strengthening, studies and universal electric access program (UEAP). Among these, generation will take the largest share of the total allocation in the range of 42% in the year 2008/9 and 94% in the year 2013/14. In total, generation takes close to three-quarters (75%) of the total planned investment allocation.

Next to generation, significant allocation is made to the UEAP which will take 14% of the total planned investment costs for the period. UEAP gets more than 25% of the annual total cost during its four plan years 2006/5 to 2008/9. It shows the emphasis to rural stratification program by the government as it is considered as one of the poverty-oriented sectors/ sub-sectors.

Table 12.2: Cost structure, sources of financing and allocation of EEPCO's investment plan for the period 2006-2016 (in Million Birr)

Cost category	2006	2007	2008	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	Total 2006 -16
Local Costs	2,506	1,236	3,709	4,302	7,437	6,005	6,536	6,694	4,694	4,258	2,023	49,400.74
Foreign Costs	2,246	5,318	8,110	11,552	12,816	9,752	9,196	8,660	6,959	6,054	3,089	83,752.11
Total Costs	**4,753**	**6,555**	**11,819**	**15,854**	**20,252**	**15,757**	**15,732**	**15,354**	**11,653**	**10,313**	**5,112**	**133,152.85**
% Foreign	47%	81%	69%	73%	63%	62%	58%	56%	60%	59%	60%	63%
Financing Plan												
Own Source	1,234.0	694.0	1,443.6	2,687.9	5,227.9	4,720.2	5,425.4	5,586.0	4,282.9	3,856.3	1,924.5	37,082.64
Customer Contribution	40.1	68.6	133.0	193.4	121.0	64.1	100.7	107.1	120.2	131.0	188.7	1,267.76
Government	1,245.2	473.8	2,132.6	1,250.0	1,189.9	675.1	1,005.1	1,006.3	300.7	281.9	0.0	9,560.65
Foreign Loan	724.9	1,396.2	3,150.2	7,739.9	7,466.9	7,952.5	8,826.7	8,654.5	6,948.9	6,043.5	2,998.6	61,902.79
Local Loan	1,508.3	3,922.1	4,959.8	2,987.8	4,279.9	28.6	1.0	0.0	0.0	0.0	0.0	17,687.52
Grant		0.0	0.0	995.3	1,966.6	2,316.2	373.3	0.0	0.0	0.0	0.0	5,651.49
Total	**4,752.54**	**6,554.62**	**11,819.15**	**15,854.37**	**20,252.28**	**15,756.66**	**15,732.17**	**15,353.86**	**11,652.74**	**10,312.65**	**5,111.80**	**133,152.84**

Table 12.2 contd…

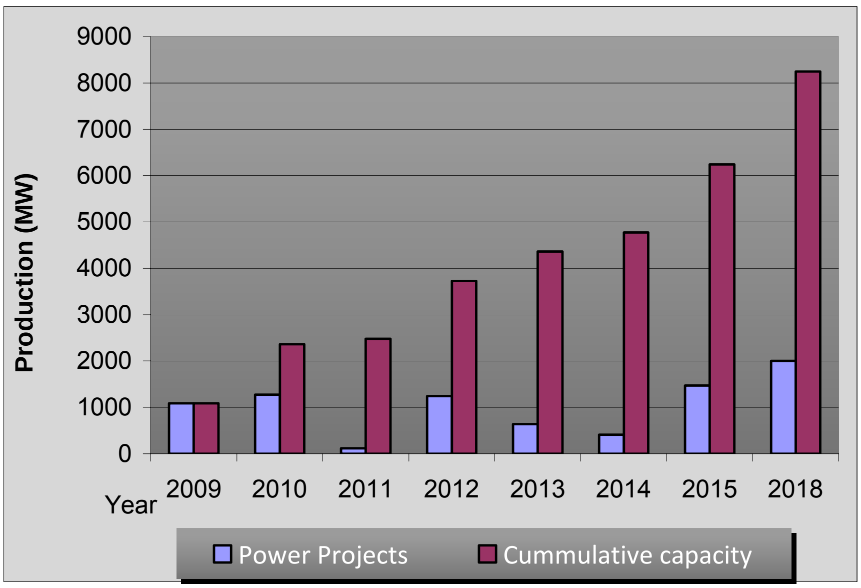
Cost category	2006	2007	2008	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	Total 2006 -16
% by EEPCO	26%	11%	12%	17%	26%	30%	34%	36%	37%	37%	38%	28%
% Foreign loan + grant	15%	21%	27%	55%	47%	65%	58%	56%	60%	59%	59%	51%
Allocation: for...												
Generation	2,541.30	4,063.05	7,013.03	6,635.90	14,453.08	11,358.96	12,840.03	13,130.19	10,958.76	9,426.79	4,506.73	96,927.81
Transmission	565.01	591.31	272.69	3,114.44	2,563.73	2,370.75	1,428.47	742.79	50.56	220.53	312.40	12,232.67
Distribution	107.54	184.39	204.61	1,263.03	182.91	201.84	221.15	237.83	267.49	289.40	292.67	3,452.85
Institutional Strengthening	69.50	65.11	567.68	646.64	84.37	66.09	60.00	0.00	0.00	0.00	0.00	1,559.39
Study	1.61	0.47	3.38	17.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22.97
UEAP	1,467.59	1,650.28	3,757.77	4,176.85	2,968.20	1,759.02	1,182.52	1,243.05	375.93	375.93	0.00	18,957.14
Total	**4,752.54**	**6,554.62**	**11,819.15**	**15,854.37**	**20,252.28**	**15,756.66**	**15,732.17**	**15,353.86**	**11,652.74**	**10,312.65**	**5,111.80**	**133,152.84**
% Generation	53%	62%	59%	42%	71%	72%	82%	86%	94%	91%	88%	73%

* Generation Addition Forecast-Target Forecast Plus Export (Scenario-2).

Source: EEPCO Investment plan.

EEPCO's electricity generation plan shows that about 10 years from now (by 2018), the country will have a capacity of generating 8000 MW of electricity (see Figure 12.1). The current capacity is about 1000 MW. This shows that other projects will be developed in the future in order to increase the capacity by eight-fold over the coming ten years period. This will include the large power plants that are expected to be commissioned in the years 2012, 2015 and 2018, with respective capacities of over 1000, about 1500 and 2000 MWs each.

Figure 12.1: Hydro and thermal power plant capacity and projection



Source: Based on EEPCO data.

12.2 Socio-economic benefits of investments in alternative energy sources

The development of alternative/ renewable energy sources like biogas, bio-fuels, solar, wind, geothermal and micro-hydro schemes allows the use of small scale technologies. This means that the investment for these sources of energy can be borne by user communities or individual households, thereby relieving the pressure on public infrastructure development entities.

In addition to alleviating the investment burden on public entities, for the provision of energy services, there are other socio-economic benefits that are expected from the development of various alternative/renewable energy sources. We consider these benefits briefly hereunder.

Small-scale biogas digesters in rural areas would provide households with biogas for cooking and lighting, thereby relieving households of expenses and time for the purchase of kerosene (for lighting) and collection of biomass fuels for cooking. Manure and water are the main inputs to the digester. Manure would be available freely from cattle kept by the households. Water would be available from the same sources that households use to meet their daily water needs. Once built, and properly maintained, the digesters could serve for as long as 10 years. The problem is the initial investment estimated at Birr 10,000, which is beyond the financial capacity of peasant farmers. The challenge is to reduce this cost to affordable levels.

Bio-fuels, especially ethanol and biodiesel, can be produced from plants and crops that can be grown by peasant farmers. Ethanol can generally be produced from sugar, starch and cellulosic biomass (Karekezi and Ranja, 1997). Sugar cane, which is a sugar biomass that is grown in many parts of Ethiopia, can be used for the production of ethanol at community levels in rural areas. Peasant farmers can provide the sugar cane feedstock needed for the ethanol plant, while at the same time benefiting from the supply of ethanol fuel for cooking, or share of proceeds from sales of ethanol.

Biodiesel can be produced from castor oil, palm oil, sunflower, soybeans and cotton seeds. The source plants and crops for biodiesel (especially sunflower and soybeans) can be grown by peasant farmers and the oil seeds can be marketed as factory feedstock, thereby generating revenue for the rural households. The biodiesel can supplement imported gasoil for use in automotive vehicles and stationary diesel motors and generators, thereby reducing the foreign currency burden on the country.

Solar energy convertor systems include PV systems (which produce electricity from solar light) and solar water heaters (which preheat water to about 70^{o}c, using direct solar heat). PV systems can provide electricity to homes, clinics, schools, telecommunications stations, and for street lighting and water pumping in remote areas that are not served from grid electricity. The major problem with this application is the high cost of electricity, estimated at US cents 25 - 125 per kWh (UNDP, 2000).

Solar water heaters can preheat water for use in homes, hotels, hospitals and other public facilities. Preheating water in these areas can save a large portion of electricity that would otherwise go for water heating. Customers would also save on their electricity bills. The major problems limiting the use of these systems appear to be lack of information on the technology and high upfront costs of installing the system.

Small scale wind turbine can be used for water lifting from depths of up to 100 meters. Wind pumps would be particularly helpful for lifting water in dry lowland areas of Ethiopia. Communities in such areas usually face water shortages for their own daily use, as well as meeting drinking water needs for their cattle. Small-scale irrigation water needs can also be met using wind pumps. Experiences from other African countries indicate that high upfront cost, which is in range of USD 10,000 (Karekezi, S., and Ranja, T., 1997), and the need for frequent maintenance (Harries, M., 2000) constitute the major drawbacks in the use of such wind pumps.

12.3 Public - private partnership in energy sector financing and service management

In Ethiopia, historically, as with other sectors and by virtue of the nature of the energy sector, the investment and development activities have been the duties and responsibilities of the government agencies. The fact that the generation of power and energy requires relatively huge investment resources and development projects that require longer time span, has made it a venture that needs heavy involvement of the public sector. The Ethiopian government's economic policy outlines the role and need for public private partnership (PPP) in the country's socio-economic development endeavors. In practice, however, the involvement of the private sector in energy development and utilization is still minimal. One example that testifies this assertion is EEPCO's ten year energy investment plan as shown in table 12.2. In the PASDEP's plan also there appear no targeted activities towards the involvement of private investment in the power sector.

Many factors hinder adequate involvement of the private sector in energy development in Ethiopia. A study by Mengistu Tefera (2002) examined whether the ongoing power sector reforms in Ethiopia can attract private investment in rural energy (RE) as an alternative to the sole reliance on EEPCO. Initial findings of the study indicated that private investment in RE could be enhanced with some improvement in the legal and regulatory provisions, along with extension of technical assistance from EEPCO to private investors.

Some institutional arrangements are known to have been made to promote the involvement of private sector in the energy sector development. However, the pace of the progress to date is low. For instance, as reported by the

Ministry (MME, 2007), the Ethiopian Electric Agency was established to oversee and facilitate the activities of ensuring quality in electrical services, certifying the capability of electrical service contractors, as well as provisions (and cancelation) of licenses for potential investors that would like to produce, transmit, distribute and sell electric energy. Accordingly, as of 2007, the Agency has granted 22 certificates of professional competence for electrical contractors.

From a discussion held with the senior expert at the Ministry of Mines and Energy it was learnt that the Ministry has thought of a Strategic Plan for the private sector. The recent institutional rearrangement following the BPR at the Ministry has given rise to two structures namely, technology development and technology dissemination sub-processes. Earlier there used to be two divisions related to the Rural Energy Promotion Center: i.e., (i) energy promotion /technology and (ii) socio-economic promotion. The new structure on technology dissemination relates to the private sector engagement for large scale multiplication of technologies. Here, NGOs, women and youth groups are expected to be the major partners. It is also reported that in this respect the regional governments have worked out (instituted) structures that will involve in this development. For instance, the TEVTs are said to have started offering training courses (skills) on energy sources like the bio-gas.

Given the fact that developments in some of the potential energy resources need high level skills and investment capital, facilitating opportunities for private sector (domestic as well as foreign) engagement could be one way out. A study by the Embassy of Japan in Ethiopia (2008) noted that the huge initial investment costs and the requirement of highly skilled workers have been, for instance, impeding the exploitation of the geothermal resources in the Ethiopian Rift Valley areas. The study further highlights that such may be the right areas for the Japanese private sector to consider investment. It further states that the Risk Mitigation Fund of ARGeo can also work as an incentive for the Japanese private sector to invest in this area in Ethiopia.

The possibility of mobilizing the Cool Earth Partnership Fund by the Japanese government was also given as one of the funding mechanisms.

Consultation with the experts at EREDPC shows that currently there are only 2 solar PV projects in the country. However, they believe that regional governments and the private sector could further promote this technology. One area of the energy development left for the private sector engagement is the fuelwood production. Experts also recommend that community forest development approach is one way out to address the serious problem of fuel wood shortage. This needs a collaborative work of the MOARD and the Rural Energy Promotion and Development Center. It is said that at the moment, there is no restriction as to who should do it, but both agencies have no budget for it. The center only promotes energy technologies but does not invest in development activities.

It was pointed out by staff of the MME that there is no room for the private sector investment in the electric transmission lines as this may result in higher cost electricity supply. Also it is generally felt that private sector engagement in rural electrification is difficult. With regard to imported energy technologies for household use, it was pointed out that the private sector fails to address the needs of the rural households. Rather the private sector targets rich urban households. Example, the imported solar water heaters are expensive[1]. Experts believe that the problem is partly due to lack of adequate information on energy needs, and demand assessment. It is advised that the private sector should seek solutions for energy technologies in collaboration with the MME.

[1] There is some information that 10 private enterprises involve in import and dissemination of solar water pumps

12.4 The role of the private sector in energy sector development: capacity and incentives

Review of the literature on experience of the private sector the participation in energy development reveals that until very recently energy sector investments remained to be largely the duties of the state. A study by Katharine and Eberhard (2007)[2] shows that at the beginning of the 1990s, virtually all major power generation throughout Africa was financed by public coffers, including via concessionary loans from development finance institutions. These publicly financed generation assets were considered one of the core elements in state-owned, vertically integrated power systems. The study further states that in the early 1990s a confluence of factors brought about a significant change in business. With the main drivers identified as insufficient public funds for new generation and decades of poor performance by state-run utilities, developing countries throughout Africa began to adopt a new 'standard' model for their power systems, influenced by pioneering reformers in the United States of America (USA), the United Kingdom (UK), Norway and Chile (a case study of which is shown in Box 4). It is also indicated that urged by multilateral and bilateral development institutions, which largely withdrew from funding state-owned projects, a number of countries adopted plans to unbundle their power systems and introduce private participation and competition. Independent power projects (IPP), namely privately-financed, Greenfield generation, supported by non-recourse or limited recourse loans, with long-term power purchase agreements (PPA) with the state utility or another off-taker, became a priority within overall power sector reform[3]. The same study shows that approximately two dozen such projects have taken root to date, concentrated in mainly eight countries

[2] The study concluded that IPP in Africa arose through the need to attract investment for new electricity generating capacity. They were also seen as a way to introduce the private sector into the electric generation sector and thereby improve technical and financial performance.
[3] Ibid.

in Africa. Outcomes have been varied with more balanced outcomes perceived in the North African region than across Sub-Saharan Africa.

IPPs were considered a quick and relatively easy fix to persistent supply constraints, and could also potentially serve to benchmark state-owned supply and gradually introduce competition. IPPs could be undertaken before sector unbundling. In 1994, Cote d'Ivoire became among the first African countries to attract a foreign-led IPP to sell power to the grid under long-term contracts with the state utility[4].

Many examples of countries that have initiated private sector programs in the energy sector are cited by Katharine and Eberhard (2007). Among these, Cote d'Ivoire is said to have kicked off its IPP development with a 210 megawatt (MW) combined cycle gas-fired plant undertaken by Saur International and Electricité de France. Five years later, the country would build West Africa's largest IPP, Azito, at 330 MW. Egypt also became a magnet for private sector investment, with InterGen and EDF winning tenders to build approximately 2000 MW of power. Ghana, Kenya, Morocco, Tanzania and Tunisia, among others, also opened their doors to foreign and local investors. The authors[5] quoted the World Bank that in 1997, there was a record US$1.8 billion in IPPs in Africa.

Although IPPs were considered part of a larger power sector reform programme, reforms were not far reaching. In most cases, state utilities remained vertically integrated and maintained a dominant share of the generation market, with private power invited only on the margin of the sector[6]. Policy frameworks and regulatory regimes, necessary to maintain a competitive environment, were limited.

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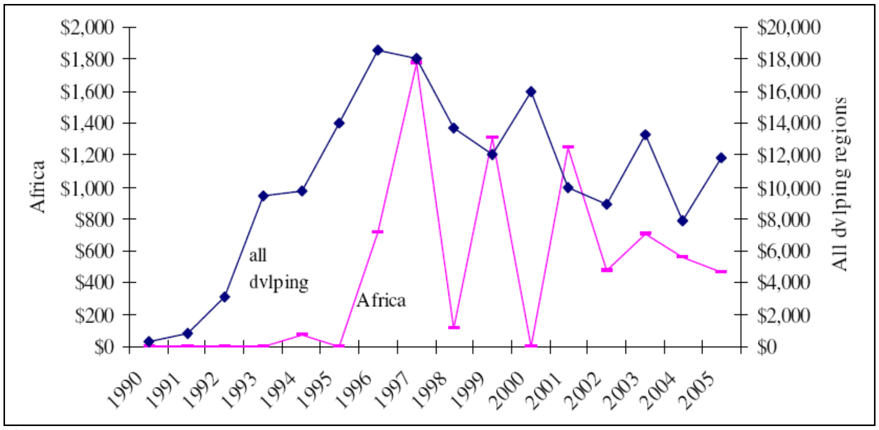
[4] Ibid.
[5] Ibid
[6] Ibid

Figure 12.2 shows that initiation of independent power projects in the developing world is a relatively recent phenomenon. Although the involvement of such projects in the power sector in many developing countries started about the same time in early 1990s, the magnitude of investment has been far lower in Africa compared to all developing countries. Not only the total amount of investment has been relatively lower, but has been significantly fluctuating from year to year and declined over time from the peak reached in 1997.

Figure 12.2: Greenfield IPPs in Africa vs other All Developing Regions (million $)



Source: Katharine and Eberhard (2007) based on the World Bank's database (World Bank 2006b).

According to Katharine and Eberhard (2007), although power sector reform is not very advanced in Africa (if measured by the extent of unbundling and the introduction of competition), there is nevertheless considerable evidence for private sector participation, prompted by the necessity of plugging the investment gap. Based on the World Bank database, private participation in energy (defined as electricity as well as natural gas, for which electricity represents 84 per cent of the actual total value of projects) has ranked second to telecommunications in terms of investment flows, followed by transportation and water.

Between 1990 and 2005, energy investments with private sector participation have occurred in 105 developing countries, through 1,307 projects, totaling US$298 billion. Latin America and the Caribbean account for the largest number of projects (460) and the largest chunk of investment (US$124 billion), and Sub-Saharan Africa the least (with 69 projects valuing US$7 billion)[7]. According to Victor et al. (2004) as quoted in Katharine and Eberhard (2007) in the 1990s, IPPs represented about one tenth of private foreign direct investment (FDI) in developing countries. The Authors referred to the International Energy Agency reports that installed energy capacity for Africa is approximately 112,000 MW as of 2004. With installed capacity roughly equal to 9,500 MW, IPPs are just less than 9 per cent of total installed capacity on the continent.

Over the last two decades, power sector reform has been propagated throughout the African continent, and there are signs of movement toward corporatization and commercialization (including via management contracts). Independent power project (IPPs) have been introduced in about 15 countries, and regulators have been established in approximately 22 countries, with efforts underway to set up such agencies in 12 more countries. However, no African energy sector institution has yet been fully unbundled (vertically and horizontally), and nowhere is there evidence of either wholesale or retail competition.

[7] Ibid.

Box 4: Promoting private investment in rural electrification: The case of Chile

In the 1980s Chile liberalized its markets, privatized state-owned electricity companies, and allowed the private sector the key role in investment. Before selling the electricity companies, the state split them into generation and transmission companies and distribution utilities. The distribution utilities were divided according to the areas in which they operated, but no exclusive distribution rights were granted. The National Energy Commission (Comisión Nacional de Energía, CNE) was created as the main policymaking and regulatory body. A new electricity law established free entry and competition in generation, a non-exclusive concession system for distribution, and a pricing scheme based on marginal costs, with generation charges reviewed every six months and distribution charges every four years. Rural electrification in Chile had traditionally been the domain of the state-owned power companies, which followed centrally developed plans and relied on subsidies from the central government or cross-subsidies from tariffs set above cost in urban areas. Lack of funding and pressure from other priorities made electrification slow. To increase rural access to electricity, Chile launched a rural electrification program in 1994. The design of the program is compatible with the overall electricity sector reforms—that is, based on competition, private investment and decentralized decision-making. The goal was, with the help of a subsidy, to turn rural electrification into an attractive business opportunity. The state, private investors and users would all contribute to funding. The state's contribution—the subsidies and the cost of managing the program—is delivered through a special fund set up to competitively allocate a one-time direct subsidy to private electricity distribution companies to cover part of their investment costs in rural electrification projects. Bids are conducted annually. To apply for a subsidy, companies present their projects to the regional governments, which allocate the funds to those scoring best on several objective criteria: cost-benefit analysis, amount of investment covered by the companies, and social impact. The central government allocates the subsidy funds to the regions on the basis of two criteria: how much progress a region made in rural electrification in the previous year and how many households still lack electricity.

Regional governments also allocate their own resources to the program. The state does not end up owning or operating any facility. If technically and economically feasible, the first choice is to provide service at the standards offered by the distribution grid (220 volts effective monophasic alternate voltage and 50 hertz frequency, with twenty-four-hour availability).

But where the costs of this solution are too high, alternative technologies are considered. These alternatives, mainly for self-generation in isolated communities, include:

- Photovoltaic solutions for isolated rural dwellings.
- Hybrid systems that reduce fossil fuel dependence and operating costs.
- Small hydroelectric power stations, independent or combined with other energy sources.
- Experimental solutions based on wind power and biomass systems, which would require a resource assessment program before being applied.

The short-term result: an increase in rural electrification of about 50 percent in the first five years of the program.

Source: Alejandro Jadresic (2000)

A study by Harris (2008) reports that energy and water sector investments in the South Asian region have been lagging. The report indicates that the region has had less success in attracting investment in the energy and water sectors. While investment commitments in energy accounted for 17 percent of the total in 2001–06, they have been falling recently despite the rapidly growing energy needs. This record reflects the political economy challenges of reforming these sectors, which have weak governance, high and poorly allocated subsidies, and distorted pricing. The study further elaborates that the region did see substantial investment in power generation in the 1990s, with a wave of investment in India and Pakistan and some notable procurements of independent power producers (IPPs) in Bangladesh. But the power sector's continued financial weakness in most countries and the poor governance, including in procurement of IPPs, have stymied further investments. All countries of the region are making renewed efforts to ramp up private investment in generation, with India pursuing a series of "ultra mega" (8,000-megawatt) generation projects. It is noted that both India and Pakistan have pursued private participation in power distribution. In India power distribution has been privatized in Delhi and the state of Orissa, and some states such as Maharashtra are developing "franchise" models akin to lease contracts to bring in the private sector. Pakistan privatized distribution in Karachi. But the results of these initiatives have been mixed, reflecting the difficulties in tackling long-standing power theft in the sector[8].

12.2. Summary

The ongoing rural electrification program is recognized as one of the investment areas in poverty-oriented sectors with 5% share (i.e. 9.1 billion Birr) of the total planned budget for these sectors. EEPCO's 10 years total investment plan in energy for the period 2006-2016 indicates a total amount of investment that reaches 133 billion Birr. A significant share of the finance

[8] Ibid.

is expected to come from foreign loans, 15% to 65% during the plan years or average of 51% of the total cost for the plan period. This grand investment plan, however, does not have any indication as to how the private sector will engage as one of the sources of investment finance.

The development of alternative/ renewable energy sources like biogas, biofuels, solar, wind, geothermal and micro-hydro schemes allows the use of small scale technologies. This means that the investment for these sources of energy can be borne by user communities or individual households, thereby relieving the pressure on public infrastructure development entities.

In Ethiopia, historically, the investment and development activities in the energy sector have been the duties and responsibilities of the government agencies. The fact that the generation of energy requires a relatively huge investment capital has made it a venture that needs heavy involvement of the public sector. The government's economic policies, in principle, mention about the role and need for public private partnership (PPP) in the socio-economic development endeavors. In practice, however, the involvement of the private sector in energy generation and distribution is still minimal, or absent. For instance, there is no indication and explicit mention about the involvement of the private sector in raising fund and investing in the energy sector over the ten years development plan of EEPCO.

Some studies concluded that private sector investment in rural energy in Ethiopia can be enhanced with improvement in the legal and regulatory provisions, along with extension of technical assistance to private investors from EEPCO. As developments in some of the potential energy resources need high level skills and investment capital, facilitating opportunities for private sector (domestic as well as foreign) engagement could be one way out.

A review of the experience of private sector investment in energy development elsewhere reveals that until very recently energy sector investments remained to be largely the duties of the state. However, in the early 1990s several factors brought about a significant change in business. With the main drivers identified as insufficient public funds for new generation and decades of poor performance by state-run utilities, developing countries throughout Africa began to adopt a new ‘standard’ model for their power systems, influenced by pioneering reformers including countries in the developed world. Following this, many African countries opened their doors to foreign and local private sector investors in energy sector development. Studies indicate that although the energy sector reform is not very advanced in Africa (measured by the extent of unbundling and the introduction of competition), there is nevertheless considerable evidence for private sector participation, prompted by the necessity of plugging the investment gap.

Chapter 13

Summary and Recommendations

13.1 Summary and conclusion

13.1.1 Highlights of the sector

Ethiopia's energy resources are vast and varied, but the level of development and exploitation of these resources is low. Hydropower, solar and wind are huge. Geothermal coal and natural gas resources are also significant. Despite the presence of huge energy resources, energy consumption and access to modern energy is low even by developing countries' standards. The national energy consumption is in fact hugely skewed towards the use of biomass energy. On the other hand, woody biomass resource is being depleted at an unsustainable rate due to increases in demand, population growth, settlement and agricultural expansion, among others.

Energy demand projections for the coming two decades indicate that while there is a gradual shift towards modern fuels (electricity and petroleum), biomass fuels will remain the dominant source of energy. The aggregate energy demand is projected to grow at 4.9 percent per year while the demand for biomass fuels will increase by 3.1 percent. The aggregate demand will increase from 876 thousand Tera Joules in 2009 to over 2 million Tera Joules in 2030. The demand for electricity and petroleum fuels will grow at 11.6 percent and 9.3 percent per year, respectively, and their relative shares in the aggregate national energy balance in 2030 will increase to 6 percent and 23 percent.

The demand growth will have serious economic, social and environmental repercussions. Access to biomass fuels has declined significantly. The depletion of forest resources will also have adverse impacts on soil moisture, recycling of soil nutrients, and conservation of water, soil and wild life. Also, there will be considerable strain on the economy in terms of bearing the burden of oil imports. Similarly, substantial investment will be required to meet the growing electricity demand.

The existing national energy policy was adopted in 1994 the main objectives of which include ensuring a reliable supply of energy at the right time and at affordable prices to support the country's socio-economic development and ensuring and encouraging a gradual shift from the use of traditional energy sources to modern energy sources, and providing the private sector the necessary support and incentives to participate in the development of the country's energy resources. However, nearly two decades after, the policy objectives, for the most part, have not materialized. Several factors such as lack of adequate capital, and weak planning, implementation and monitoring capacity might have led to the low achievement. The existing policy itself is inadequate to address the increasingly complex challenges. Hence, it has to be updated to reflect the current and emerging national and global realities.

13.1.2 Outstanding problems

Currently there are outstanding problems, constrains and shortcomings to meet the growing demand for electricity, petroleum and biomass fuels.

Electricity sub-sector

Generation capacity shortage has led to power rationing. Power rationing in turn is disrupting activities in all walks of life, including households, services, industry, transport and communications. The capacity shortage is largely a result of demand growth outstripping generation capacity increases. Drought and siltation of reservoirs have further exacerbated the problem by reducing the generation capacity of existing hydro plants. Inadequate generation reserve capacity in the system, as well as sole reliance on hydropower, have also been contributory factors.

At the centre of the problem is the perennial delay in commissioning of new power plants. Delays in the study and design of new power plants, securing requisite investment finance as well as late-hour start of construction and time-overrun during construction, result in power plant commissioning dates falling far behind schedule.

Electricity access in the rural areas has been among the lowest in the world. Although the UEAP is expected to address this problem, it remains undefined as to how close the electricity supply infrastructure would get to rural homes. Moreover, facilitation of actual connectivity of rural homes to the electricity supply infrastructure appears to have not been addressed. The paucity of transmission lines as well as the radial nature (as opposed to ring configuration) of the transmission system limits access to grid electricity as well as reliability of the supply.

Petroleum sub-sector

The major problems in the petroleum subsector are sole reliance on imports, sharply increasing demand and global oil price escalation. These have resulted in increasing burden of meeting fuel import bills. Other problems include:

- dependence on foreign ports of entry for fuel imports,
- the need to expand the capacity of fuel handling facilities at ports of entry in tune with increasing imports,
- limited capacity and mode of fuel transport (sole reliance on roads) from ports of entry to inland depots,
- limited number of retail stations (and their sole concentration in major towns),

- limited capacity of inland depots, including strategic reserve depots, and
- burden on government budget for construction of strategic depots and fuel reserve in pace with increasing demand.

Biomass sub-sector

The central problem in the biomass sub-sector is one of high rate of depletion of biomass standing stock. The main causes are land clearing for settlement and agriculture, demand growth for wood for energy and other uses, and low level of reforestation/afforestation, use of inefficient end-use devices, and wasteful charcoal production technologies. Associated problems in the sub-sector include:

- Except for ethanol, no program for development of substitute fuels to meet cooking fuel needs
- Ensuring supply of fuelwood does not lie directly within any public entity mandates.
- Forestry development is left for the private sector: no direct public sector investment in forestry development.
- Poorly organized marketing system
- Pouching (illegal harvesting) of natural forest resources
- Increased use of agricultural residues for fuel rather than soil amelioration

Renewable Energy

Renewable energy applications have the advantages of minimal environmental impacts, generally lower running costs, high labor intensities, and divisibility of investment arising from availability of small units. RETs could potentially be used in various sectors and applications: domestic, small business, agriculture, health and community services.

The wide-scale dissemination of RETs is in line with the Government's development policies and strategies (ADLI, Rural Development Strategy, decentralization, popular participation, and private sector-led economy). Their increased application can significantly contribute to poverty reduction, sustainable development, and sustainable energy future.

The penetration of RETs in Ethiopia is disappointingly low especially in comparison with the rapid application of these technologies worldwide. The major barriers for dissemination of these technologies include:

- lack of awareness about the positive environmental and economic (on the long-run) benefits of RETs,
- inadequate dissemination efforts and awareness about RETs with consumers,
- lack of successful pilot projects that can demonstrate the benefits of RETs to be replicated,
- lack of R&D to adapt/improve technology to suit local conditions and to reduce prices,
- lack of market infrastructure for RETs and after-sales maintenance,
- absence of direct and indirect national support programmes,
- high up-front cost of some RETs compared to conventional systems,
- financing difficulties due to the absence of RETs-targeted credit facilities for suppliers, end-users; and finally
- failure to strictly apply environmental and resource conservation laws and thus provide incentive to use environmental friendly systems.

13.2 Way forward

In terms of the way forward, the following measures need to be focused upon:

Electricity

- Policy focus on hydropower is a positive feature of the Ethiopian energy sector. The focus needs to be sustained with multipurpose use for regulated water downstream for power generation, sugar plantations, large scale farms, etc.
- The scourge of power rationing should be avoided through thorough planning and follow-up, putting aside adequate hydro capacity, as well as improving the generation mix by injecting wind turbines, geothermal and coal generation units into the system.
- Wind energy development holds promise for the power generation; possibilities for increased use of this resource need to be explored;
- The UEAP is an opportunity for electricity access to the rural population for domestic, social service and productive uses. Thus, supportive actions such as targeted financing mechanisms to encourage connectivity of rural homes to the supply system should be undertaken. The UEAP should be viewed in the framework of introducing modern technology into the rural areas, and as such a simultaneous policy focus on the construction of rural roads to facilitate the entry of technology would be in order.
- Alongside the power supply expansion, sufficient attention needs to be given to demand management/fuel substitution measures such as promotion of industrial energy efficiency, energy saving lamps, and solar water heaters. Equally important is minimization of power system losses.
- Despite the policy provisions, the involvement of the private sector in power sector investment remains almost non-existent. To share the anticipated heavy investment needs in the sector, the country should

draw lessons from other countries' experiences to enhance private sector investments in the power sector.

Petroleum fuels

- Enhance oil and gas exploration and use of natural gas as a transport fuel to reduce dependence on fuel imports
- Improve existing oil supply and storage infrastructure
- Improve the efficiency of use of petroleum fuels through demand-side management
- Enhance bio-fuels development as substitute for imported petroleum fuels

Biomass energy

Biomass is expected to remain the backbone of Ethiopia's energy supply, and, therefore, practical measures need be put in place to ensure its sustainability and efficient use. Specific measures include:

- Review of the current situation in the biomass sub sector with more seriousness with a view to sustain biomass fuel supply
- Strengthen reforestation/afforestation programs through incentive packages to encourage private sector tree farming and support for organized wood-fuel producers
- Promote the wide-scale dissemination of fuel-saving stoves in the household and other sectors
- Develop and enforce land-use planning
- Promote ethanol for domestic cooking
- Promote substitute fuels: electricity, kerosene, LPG, coal briquettes, etc

Renewable energy

There is a renewed impetus to promote the use of renewable energy sources. In view of the compelling rationale for the move towards alternative energy resources, it is essential that the following measures be taken:

- Formulate and implement a long-term plan for the development of renewable energy
- Enhance publicity campaigns and pilot demonstrations
- Mobilize finance for RETs and implement innovative financing mechanisms
- Integrate dissemination of RETs with sectoral development programmes and projects,
- Carry out market and technology assessments

Policy, institution and research

- The existing national energy policy was adopted in 1994 and thus fails to address current and emerging national and global energy challenges. Hence, it has to be updated.
- Development of energy information system to enable evidence-based energy sector planning and monitoring
- Energy sector-oriented research on technology generation and adaptation needs to be strengthened in both public and private sector institutions.

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Annexes

Annex Table 3.1: Regional distribution of non-farm enterprises

Type of non-farm enterprises	Regions and their percentage share				N
	Tigray	Amhara	Oromiya	SNNP	
Handicraft (weaving, pottery etc)	22%	12%	53%	13%	40
Fuel wood/charcoal/dung selling	17%	20%	26%	37%	47
Agricultural trade – grain	8%	7%	41%	44%	83
Agricultural trade – livestock	27%	9%	41%	23%	23
Petty trade – consumer goods	18%	23%	45%	14%	43
Petty trade – food and beverages	49%	9%	31%	11%	47
Others (traditional healers, renting pack animals, transport, milling)	37%	4%	38%	21%	53
N					333

Annex Table 4.1: Real gross value of production (at 1999/00 prices) by broad industrial group ('000 birr)

Industrial group	2004/05	2005/06	2006/07
Food Products and beverages	1951364	2035184	2088660
Tobacco	226788	259045	275187
Textiles	285639	236998	316243
Wearing apparel, except fur	26560	31793	93454
Tanning, leather dressing, prdn of footwear, luggage & hand bags	194250	251443	246140
Wood and products, and cork except furniture	28994	32131	32427
Paper, paper products and printing	298381	259549	265831
Chemicals and chemical products	218047	210389	263219
Rubber and plastic products	207251	349022	255344
Non-metallic products	322105	538863	794226
Basic iron and steel	280211	210458	185070
Fabricated metal products, except machinery and equip.	137072	146220	126346
Machinery and equipment	3312	6437	3453
Motor vehicles	42698	92000	111893
Furniture	130325	105566	101926
Total	4352996	4765097	5159419

Source: CSA, S.B. 431 and EEA data base for consumer price indexes

Annex Table 4.2: Real value added (at 1999/00 prices) by broad industrial group ('000 birr)

Industrial group	2004/05	2005/06	2006/07
Food Products and beverages	1951364	2035184	2088660
Tobacco	226788	259045	275187
Textiles	285639	236998	316243
Wearing apparel, except fur	26560.4	31793	93454.2
Tanning, leather dressing, prdn of footwear, luggage & hand bags	194250	251443	246140
Wood and products, and cork except furniture	28994.4	32130.7	32427.5
Paper, paper products and printing	298381	259549	265831
Chemicals and chemical products	218047	210389	263219
Rubber and plastic products	207251	349022	255344
Non-metallic products	322105	538863	794226
Basic iron and steel	280211	210458	185070
Fabricated metal products, except machinery and equip.	137072	146220	126346
Machinery and equipment	3312.16	6437.09	3452.84
Motor vehicles	42697.7	92000	111893
Furniture	130325	105566	101926
Total	4352996	4765097	5159419

Source: CSA, S.B. 431 and EEA data base for consumer price indexes.

Annex Table 5.1: Import by country of origin – CIF value in USD Thousands

	2002	2003	2004	2005	2006	2007	2008
Asia(E&S)	558894	1137210	1025062	1198802	1602929	2260219	3393085
EU (27)	485194	604562	616731	896744	1013666	1207805	1455472
Middle East	199089	240176	575509	781754	1100422	995621	2085205
North America	148625	203218	347580	449051	159817	241262	412898
Europe (other)	86148	142433	165429	263618	288495	300922	471505
Africa	71725	99697	141895	177876	274803	237574	384367
Latin America	35816	165791	116486	59378	124315	158342	55690
Oceania	16438	80019	52599	11960	32732	28410	15955
Total	1601929	2673107	3041290	3839184	4597180	5430155	8274177

Source: Ethiopian Customs Authority, 2009 (soft copy release)

Annex Table 5.2: Export by country of destination – FOB value in USD Thousands

Region	2002	2003	2004	2005	2006	2007	2008
Africa	46919	43203	55391	133247	154830	198999	230042
Asia(E&S)	84361	72971	108347	184322	196727	205920	214947
EU	214734	219930	290284	371057	418684	484049	640444
Other Europe	9257	13854	20638	20518	18495	34505	47665
Middle East	95562	100462	97350	139317	157086	187559	291657
North America	20194	25309	40504	53747	58420	75385	123594
Latin America	1012	1638	1261	1134	880	675	616
Oceania	1392	1659	1628	2241	4008	5065	7972
Total	473430	479026	615403	905583	1009130	1192159	1556936

Source: Ethiopian Customs Authority, 2009 (soft copy release)

Annex Table 5.3: Exchange Rate (Birr per US dollar)

EXR	2002	2003	2004	2005	2006	2007	2008
Birr/USD	8.5677	8.5999	8.6364	8.6664	8.6986	8.9660	9.5997

Source: National Bank of Ethiopia, Quarterly Bulletin, 4th Quarter, 2007/08.

Annex Table 5.4: Import by major product group – CIF value in USD millions

HS code	Product Type	2002	2003	2004	2005	2006	2007	2008
10	Cereals	115.339	366.216	196.998	257.744	96.541	146.614	587.467
27	Petroleum oil & products	201.843	334.138	452.739	638.469	1032.004	796.899	2059.631
84	Mechanical/electrical appliances	185.824	261.964	319.335	490.369	574.525	783.130	810.869
85	Electrical machinery & equipment	121.747	269.984	377.120	409.070	338.593	526.725	1009.450
87	Vehicles	197.037	261.964	304.170	285.312	583.842	543.015	438.531
	All others	780.139	1178.840	1390.927	1758.219	1971.676	2633.771	3368.229

Source: Ethiopian Customs Authority, 2009 (soft copy release)

Annex Table 5.5: Export by major commodity group – FOB value in USD millions

HS code	Commodity type	2002	2003	2004	2005	2006	2007	2008
6	Cut flower & ornamental foliage	0.000	0.000	0.000	0.000	0.000	88.241	125.022
7	Edible vegetables	42.838	25.181	41.050	38.306	59.550	106.510	225.444
9	Coffee & tea	172.062	191.755	255.102	367.667	439.259	429.143	574.508
12	Oil seeds	42.175	61.675	90.470	176.408	129.093	160.481	259.074
14	Vegetable products nes	42.601	158.800	0.000	68.190	87.609	106.868	0.000
41	Hides & skins, leather	64.281	56.569	68.376	71.632	81.755	93.017	92.793
71	Gold (precious metals)	38.010	13.809	79.577	44.645	51.677	59.703	80.338
	All others	71.381	72.409	80.869	138.735	160.382	150.093	199.755

Source: Ethiopian Customs Authority, 2009 (soft copy release)

Annex for Part II: Development, Prospects and Challenges of the Energy Sector in Ethiopia

Heating values and conversion factors

1. Biomass Fuels

Fuelwood	14.5 MJ/kg air-dry, 10-15% moisture content, wet basis (mcwb), about 600 kg/solid cubic meter
Crop Residues	15.5 MJ/kg
Animal Residues	13.8 MJ/kg (15% mcwb)
Charcoal	29.0 MJ/kg
Sawmill Residues	14.5 MJ/kg
Bagasse	10.0 MJ/kg
Biogas	18.9 MJ/cubic meter

2. Petroleum Products

Product	Specific Gravity	Lower Heating Value MJ/liter
Refinery Gas	46 MJ/kg	
LPG	0.57	25.8
Aviation Gasoline	0.70	31.0
Gasoline (MGR)	0.73	32.1
Jet Fuel (A-1)	0.80	34.6
Kerosene	0.82	35.3
Diesel (ADO)	0.85	36.3
Diesel (MDO)	0.87	36.8
Lubricants	0.89	37.6
Fuel oil	0.94	38.6
Asphalt	1.04	41.6
Crude oil	0.86	36.6

3. Electricity MJ/kWh ′

4. Energy Conversion Efficiencies

Electricity – hydro	85%
Electricity – Thermal	Varies by case
Charcoal	23%

5. Energy Conversion Factors

1 calorie = 4.2 Joules

1 Ton oil equivalent = 42 giga joules

1 Teracalorie = 98 Toe

6. Units of Measures

TJ	terajoule (10^{12} joules)
Tcak	teracalories (10^{12}calories)
GJ	gigajoule (10^{9} joules)
GW	gigawatt (10^{9} watts)
GWh	gigawatt hour (10^{9} watt hours)
Kg	kilogram (1000 grams)
kW	kilowatt (1000 watts)
kWh	kilowatt hour (1000 watt hours)
MJ	mega-joule (10^{6} joules)
MW	megawatt (1 million watts)
MWh	megawatt hour (1 million watt hours)
t	metric ton (1000 kilograms)

Annex Table 7.1. Organizations and individuals consulted

No	Name	Organization	Responsibility	Telephone
1	Alemu Muleta	EREDPC, Rural Electrification Fund	Coordinator	011-5530459
2	Amare Hadgu	EREDPC, Rural Electrification Fund	Consultant	0911-401588
3	Tesfaye Alemayehu	Rural Energy Development and Promotion Centre	Expert	0912-007250
4	Kiflu Sergu	Natural Resources, MOARD	Expert	011-5155517
5	Estifanos	Power system planning, EEPCO	Team Leader	011 1550811
6	Shiferaw Telila	UEAP, EEPCO	Deputy Manager	0911-506599
7	Mesfin H/Selassie	Natural Resources, MOARD	Expert	011-5155517
8	Alemayheu	Transport Authority	Planning Head	0115-155074
9	Banchialem Addis	Transport Authority	Database and dissemination	011-5527144
10	Shimelis	Ministry of Urban Works and Development	Planning Department	0911-448892
11	Gosaye Mengiste	Ministry of Mines and Energy	Process Owner, Energy	011-6463362
12	Dereje	Ministry of Mines and Energy	Energy Department	011-6463362
13	Ephrem Hassen	Ministry of Mines and Energy	Process Owner, Biofuels	011-6463361
14	Worku Gossaye	Ethiopian Petroleum Enterprise	Head, Marketing Department	011-5513288
15	Mekuria Lemma	EEPCO	Planning Department	011-1550811

Annex Tables for Chapter 10

Table A1. Petroleum imports and consumption, 2001/02 – 2005/06, Metric Tons

Item	1994	1995	1996	1997	1998
	2001/02	2002/03	2003/04	2004/05	2005/06
Imports (tons)					
1.1 Crude Oil	-	-			
1.2 Petroleum Products					
Gasoline	132808	134265	116935	129225.0	137232.0
Jet A-1	248711	260915	299834	316629.3	368670.0
LPG	111	-			-
Gas Oil	622094	635589	697783	720763.0	811013.0
Marine Diesel Oil	-	-			-
Inland Fuel Oil					
Light Fuel Oil	38412	41661	47141	46078.2	41385.0
Heavy Fuel Oil	80087	93389	85430	109755.0	116822.0
Export Residual Fuel Oil	-	-			-
Consumption (tons)					
Gasoline	179858	187187	180345	36286.0	147514.0
LPG	1327	1437	2171	77.0	-
Gas Oil	717268	753655	808532	110668.0	851381.0
Marine Diesel Oil	-	-			
Inland Fuel Oil	133781	140040	106557	38012.0	161942.0
Export Residual Fuel Oil	-	-			-
Kerosene	226120	231711	328627	50850.0	229898.0
Jet A-1	92671	87613	84576	284.0	145775.0
Aviation Gasoline	-	-			-
Bitumen					

Note: The 2004/05 Petroleum data not include the Mobil Company's April-May data.

The balance of consumption over imports is for the most part due to stock depletion/utilization from National Reserve Depots.

Source: EPE

Table A2. Electricity production and sales by type years, 2002-2006

	1994	1995	1996	1997	1998
	2001/2	2002/3	2003/04	2004/05	2005/06
I CS					
A) Generation (GWh)					
Hydro	1975.2	2007.1	2263.0	2521.2	2833
Diesel	0.1	21.1	16.1	18.4	12
Geothermal*	1.0	0.0	0.0	0.0	0
B) Sales (Consumption (GWh)					
Household	568.7	583.9	638.0	704.6	765
Commercial	381.9	391.3	445.0	507.7	582
LV Industry	301.0	369.7	347.0	401.5	476
HV Industry	330.9	314.0	364.4	386.8	464
Others	14.4	19.3	23.2	32.3	35
SCS					
A) Generation (GWh)					
Hydro	16.6	16..5	16.5	11	19
Diesel	16.5	19.0	22.7	28.1	33
B) Sales (Consumption (GWh)					
Household	10.8	13.0	14.0	17.1	18
Commercial	9.3	10.4	10.5	13.4	14
LV Industry	2.8	3.5	3.6	4.0	12
HV Industry	1.0	1.0	0.9	0.9	1
Others	0.6	0.7	0.6	0.9	1

* The geothermal plant is now in the rehabilitation process.

Source: EEPCo

Table A3. Percentage distribution of households by source of energy for lighting

Country level	**1996**	**1998**	**2000**	**2004**
Kerosene	67.8	73.6	67.9	71.1
Electricity (Private)	4.4	5.2	5.0	5.7
Electricity (Shared)	4.9	5.8	5.8	7.2
Fire Wood	_	_	20.8	15.7
Other	22.9	15.4	0.4	0.2
Rural				
Kerosene	73.0	81.3	74.6	80.1
Electricity (Private)	0.2	0.8	0.5	0.4
Electricity (Shared)	0.5	0.4	0.4	0.8
Firewood	_	_	24.1	18.5
Other	26.3	17.4	0.4	0.1
Urban				
Kerosene	38.6	26.9	28.6	23.2
Electricity (Private)	27.8	31.5	31.8	34.1
Electricity (Shared)	29.6	38.6	38.2	41.2
Firewood	_	_	1.1	0.3
Other	3.9	3.1	0.4	0.9

Source: CSA, *Welfare Monitoring Survey*, 2004

Table A4. Percentage distribution of households by source of energy for cooking

Country level	1996	1998	2000	2004
Collected fire wood	65.4	66.1	67.8	70.5
Purchased fire wood	8.0	9.9	8.0	10.9
Charcoal	0.7	0.8	1.2	1.3
Leaves/Dung cakes, etc.	17.4	18.0	15.6	11.5
Kerosene	3.0	2.6	3.3	2.4
Butane Gas	0.2	0.4	0.2	0.5
Electricity	0.4	0.5	0.4	0.4
Others	5.0	1.7	3.4	2.1
Rural				
Collected fire wood	74.1	74.7	76.4	80.7
Purchased fire wood	1.4	3.5	2.4	3.7
Charcoal	0.1	0.1	0.0	0.2
Leaves/Dung cakes, etc.	19.1	20.1	17.2	12.7
Kerosene	0.2	0.2	0.3	0.2
Butane Gas	0.0	0.1	0.1	0.1
Electricity	0.0	0.0	0.1	0.1
Others	5.2	1.4	3.6	2.3
Urban				
Collected fire wood	17.2	13.8	16.6	16.0
Purchased fire wood	44.5	49.1	41.3	49.4
Charcoal	4.3	5.0	8.3	7.7
Leaves/Dung cakes, etc.	7.6	5.3	6.3	5.3
Kerosene	18.9	17.2	21.5	13.8
Butane Gas	1.0	2.5	1.4	2.7
Electricity	2.7	3.8	2.2	2.4
Others	3.8	3.2	2.4	0.8

Source: CSA, *Welfare Monitoring Survey*, 2004

Table A5. Distance in kilometers to source of firewood, percent of households (2004)

	Under 1	1 - 4	5 - 9	10 - 14	15 - 19	20 and above	Not stated
Country	36.37	39.08	15.20	4.95	2.49	1.80	0.12
Tigray	30.02	35.62	18.19	7.39	5.81	2.83	0.13
Afar	51.86	33.95	9.85	1.63	0.58	2.13	-
Amhara	32.46	37.75	17.22	7.01	2.73	2.81	0.02
Oromiya	35.40	40.53	15.75	4.42	2.38	1.38	0.14
Somali	41.26	35.07	16.78	2.51	0.79	3.45	0.14
Benishangul Gumuz	23.01	52.82	16.70	3.83	1.66	1.49	0.48
SNNP	41.14	38.93	13.18	3.58	1.97	1.14	0.06
Harari	55.36	37.23	6.43	0.54	0.31	-	0.13
Addis Ababa	59.38	37.42	1.75	0.34	0.11	0.17	0.83
Dire Dawa	38.47	49.88	7.03	2.18	1.32	0.67	0.45

Source: CSA, Welfare Monitoring Survey, 2004

Table A6. National household energy balance for 2006 (1998 EC (preliminary results) [Tera Joules]

Sector/Fuel	Wood	Agricultural Residue	Animal Wastes	Charcoal	Kerosene	LPG	Electricity	Total
Urban households								
Water heating	4,537	0	0	81	57	0	58	4,733
Space heating	0	0	0	0	0	0	0	0
Refrigeration	0	0	0	0	0	0	92	92
Lighting	161	0	0	0	973	0	2095	3,229
Electric appliances	0	0	0	0	0	0	76	76
Cooking	48,072	0	3,837	1,593	1,854	326	193	55,874
Baking	50,339	0	2,952	0	0	0	318	53,609
Sub-total	103,109	0	6,789	1,674	2,884	326	2,832	117,613
Percent	87.7	-	5.8	1.4	2.5	0.3	2.4	100.0
Rural - Electrified								
Water heating	0	0	0	0	0	0	0	0
Space heating	0	0	0	0	0	0	0	0
Refrigeration	0	0	0	0	0	0	0	0
Lighting	0	0	0	0	72	0	30	103
Electric appliances	0	0	0	0	0	0	0	0
Cooking	5,510	424	424	4	2	0	0	6,365
Baking	4,354	326	326	0	0	0	0	5,007
Sub-total	9,864	750	750	4	74	0	30	11,475
Percent	86.0	6.5	6.5	0.0	0.6	-	0.3	100.0
Rural - Non Electrified								
Water heating	0	0	0	0	0	0	0	0
Space heating	0	0	0	0	0	0	0	0
Refrigeration	0	0	0	0	0	0	0	0
Lighting	14,136	0	0	0	5,687	0	0	19,822
Electric appliances	0	0	0	0	0	0	0	0
Cooking	270,010	20,795	20,795	183	116	0	0	311,898
Baking	213,370	15,996	15,996	0	0	0	0	245,362
Sub-total	497,516	36,791	36,791	183	5,803	0	0	577,082
Percent	86.2	6.4	6.4	0.0	1.0	-	-	100.0
Total Rural	507,380	37,541	37,541	187	5,877	0	30	588,557
Total	**610,489**	**37,541**	**44,330**	**1,861**	**8,761**	**326**	**2,862**	**706,170**
Percent	**86.5**	**5.3**	**6.3**	**0.3**	**1.2**	**0.0**	**0.4**	**100.0**

Source: Mekonnen K., Proposal for Biomass Energy Strategy for Ethiopia, prepared for GTZ February 2009.

Table A7. National energy balance for 1988 E.C (1996 GC)

Sector/Fuel	Total		Biomass		Petroleum		Electricity	
	'000 TJ[§]	%	'000 TJ[§]	%	'000 TJ[§]	%	'000 TJ[§]	%
Households	644.7	89.2	635.69	93.0	7.03	20.2	2.0	43.9
Urban	42.6	5.9	34.01	5.0	6.53	18.7	2.0	43.9
Rural	602.2	83.3	60.69	88.0	0.50	1.4		
Agriculture	0.8	0.1			0.82	2.3		
Industry	33.32	4.6	24.05	3.5	7.29	20.9	1.98	42.9
Medium and large	11.89	1.6	5.57	0.8	4.36	12.5	1.97	42.6
Small-scale	0.20	…	0.19	…	0.008	…	0.002	0.05
Cottage Industry	18.32	2.5	18.29	2.7	0.02	0.1	0.01	0.21
Mining	0.18	…			0.18	0.5		
Construction	1.97	0.3			1.97	5.7		
Grain milling	0.75	0.1			0.75	2.2		
Transport	17.92	2.5			17.92	51.4		
Road	16.18	2.2			16.18	4.6		
Rail	0.96	…			0.09	0.3		
Air	1.64	0.2			1.64	4.7		
Marine	-	-						
Services and other	26.07	3.6	23.65	3.5	1.80	5.2	0.61	13.2
Commercial	24.57	3.4	23.65	3.5	0.34	1.0	0.58	12.6
Government	1.28	0.2	-	-	1.27	3.6	0.004	0.08
Other	0.22	…	-	-	0.20	0.6	0.026	0.57
Total	**722.87**	**100**	**683.40**	**100**	**34.87**	**100**	**4.61**	**100**
Total mtwe[†]	49.9		47.1		2.5		0.3	
Total mtoe[‡]	16.9		16.0		0.8		0.1	
Percent	100.0		94.6		4.8		0.6	

Notes:

[§] Tera Joules
… negligible
[†] million tons of wood equivalent
[‡] million tons of oil equivalent

Source: Ethiopian Rural Energy Development and Promotion Center, National Energy Balance, 1996