ETHIOPIAN SCIENCE & TECHNOLOGY COMMISSION

NATIONAL INDUSTRIAL SCIENCE AND TECHNOLOGY POLICY

1. INTRODUCTION

In this policy document, the word "Industry" incorporates manufacturing, construction, transport and communication industries and handicrafts.

The contribution of the industrial sector to the overall economic development of a country is significant. One of the main indicators of socio-economic and technological development of a country is the level of the progress scored in this sector. In this respect, the present industrial development level of Ethiopia compared to other developing countries is low. Industry plays a leading role in the realization of the Agricultural Development Lead Industrialization Strategy of the country. This is because of its economic and technological contribution in supplying inputs such as raw materials, machinery, hand tools, spare parts, components, construction materials as well as in expanding infrastructure and providing material & technical services for agriculture, and other economic sectors. In addition, the sector has got a decisive role in the economic development process of the country in strengthening linkages, interdependence and in attaining a balanced regional development.

To this effect, it is indispensable to build scientific and technological capability to generate, select, transfer, assimilate and link transferred technologies with the traditional ones. Capability building includes research and development, development of traditional technologies, transfer and development of technology, engineering and consultancy services, modification of technology, S&T manpower development, S&T information collection, processing, dissemination and S&T popularization based on the need of the country.

However, at present, the industrial sector like other economic and service sectors is encountered with major scientific and technological problems. The general situation prevailing in the sector indicate that apart from importing technologies for production and services and trouble shooting technical activities, generation and utilization of suitable technologies as well as transfer and development of appropriate ones for reliable technological base leading to sustainable industrial development is not yet well established.

By and large, the current status of the manufacturing industry reveals that production is consumer goods oriented, its linkage with other sectors is loose; consumption of local inputs is low and its contribution in producing machinery necessary for various economic sectors including the sector is limited. In addition, efforts made to improve and utilize production techniques and inputs to enhance the development of handicrafts are at low level.
Efforts made to generate and use endogenous technologies as well as transfer and develop modern ones. In the transport and communication sector are also at a low level. This means that R&D activities undertaken to improve and promote traditional transport technologies and enhance their efficiency and effectiveness are limited. Moreover, the capacity to improve and promote endogenous technology enabling the substitution of imported ones as well as the generation of new technologies is not well established and the capability of institutions to manufacture and assemble transport and communication machinery is limited as well.

Similarly, in the construction sector, no significant activity is observed other than the limited research activities on construction materials. Generally, the major scientific and technological problems of this sector are low R&D capability, low capacity in designing and supervising large construction projects, less attention to improve and develop indigenous construction technology and the application of labour intensive construction technique, inadequate local production of hand tools with acceptable quality, lack of well developed design standard codes and unconducive system of collection, use and dissemination of information.

Generally, at present, R&D, engineering and consultancy, technology transfer and development capabilities that enable the reduction of dependence & the promotion of self reliance through time is not well established in the industrial sector at present.

Though limited, however, the current scientific and technological activities undertaken to substitute imported industrial inputs, manufacturing of spare parts, machinery and hand tools, training of technical personnel, design, engineering and consultancy services are believed to serve as a base for building the required capability. Due emphasis should be given to strengthen and promote these activities. Moreover, due to their internal linkages, technological interdependence and augmenting industrial branches and other economic sectors, there have to be priority accorded industrial areas.

This Industrial S&T policy is formulated to facilitate conditions to enhance scientific and technological developments of the sector and promote its contribution to other sectors by alleviating scientific and technological problems and strengthening ongoing activities and infant institutions.

It is based on the Agricultural Development - Led Industrialization Strategy and priority accorded areas in the national S&T policy for Industry, Construction, Transport and Communication sectors. Those policy directives and strategies stated in the national S&T policy that have a national content are not included in this document since they encompass all economic and service sectors and their implementation is nation-wide. The organizational system that would enable the implementation of the policy is also incorporated.

2. POLICY OBJECTIVES

The main objective of this policy is to build and promote industrial science and
technology capability for use to develop technological competence. The specific objectives emanating from this are the following.

2.1 To build capability that enables to identify, promote, develop and utilize indigenous technologies which are widely used by the society and proved to be useful.

2.2 To build capability that enables the generation and application of new technologies which have significant social and economic contribution and facilitate condition for their utilization.

2.3 To build capability to select, negotiate, transfer and develop appropriate technologies that are sustainable and environmentally sound.

2.4 To promote effective and sustainable research and development activities which have direct linkage and interaction with the production process and product development and utilize its results.

The following are the Priority accorded industrial science and technology directives indispensable for the implementation of the policy objectives.

3.1 Identify and disseminate those endogenous technologies viable to be promoted and developed.

3.2 Strengthen and promote existing research and development, design as well as other support institutions and units and establish new ones as required to enhance national and regional industrial technology development.

3.3 Create a system to facilitate the transfer, promotion and development of technologies.

3.4 Devise a method that enables to utilize useful research outputs.
way that is socially and economically sound.

3.10 Give priority to those scientific and technological activities that promote rural development particularly in the agricultural sector.

3.11 Develop a system to provide extension service, information exchange and popularization pertaining to new findings, technologies, S&T services and other related activities.

3.12 Facilitate conditions to effectively co-ordinate S&T activities undertaken in various institutions of the sector for their effectiveness.

4. STRATEGIES

Scientific and technological activities to mitigate techno-economic bottlenecks and enhance development should be undertaken. These activities have to be based on identifying and improving traditional technologies believed to be useful for selecting and transferring modern and appropriate technologies, building scientific and technological infrastructure, training adequate and capable manpower, utilizing R&D outputs and the like. To this effect, the following strategies are charted out.

4.1 Undertake assessment to identify those endogenous and modern technologies that contribute to development and support those programmes and projects that deserve priority.

4.2 Support scientific and technological activities that enable sustainable development, expand the utilization of those viable endogenous technologies.

4.3 Encourage and support scientific and technological activities that augment socio-economic development and generate resource-based new technologies.

4.4 Encourage and support capability building to select, negotiate, transfer and develop appropriate technologies.

4.5 Support scientific and technological activities that would promote the linkage between endogenous and modern technologies.

4.6 Strengthen the linkage and interdependence between industry and other sectors so that the industrial sector can contribute to the development of the national economy.

4.7 Support research on product development, process improvement and local sourcing of imported raw materials.

4.8 Encourage and support research and development activities that would enable local production of manufacturing machinery, spare parts & components, hand tools and
means of transport required by the sector and others as well.

4.9 Support workshops, symposia and conferences held to popularize research outputs and encourage the sharing of experiences including the participants & researchers abroad for similar objectives.

4.10 Encourage and support the strengthening and promotion of institutions undertaking effective and sustainable R&D activities and establish new ones as required.

4.11 Establish a system that encourages professionals engaged in research and creative activities and popularize their efforts.

4.12 Assist training activities to meet the manpower requirement of the sector quantitatively and qualitatively and support the strengthening and establishment of training institute.

4.13 Encourage and support the strengthening and establishment of support institutions assisting scientific and technological activities.

4.14 Support the establishment of information system indispensable to search for alternative sources of technologies and to undertake scientific and technological activities.

4.15 Encourage repair and maintenance, modification and innovative activities.

4.16 Encourage efforts to increase productivity, improve product quality, and quality control activities.

4.17 Support scientific and technological activities that would improve the quality, and competitiveness of export products.

4.18 Assist S&T professional association(s) in the sector.

4.19 Encourage & support activities that promote design, engineering and consultancy capacity, unpaaking of technologies and enhance local sourcing, project engineering and contracting.

4.20 Support scientific and technological activities that would enable the reduction, elimination, and recycling of industrial effluents that cause pollution such as dust, smoke, liquids & solid wastes and noise.

4.21 Support research on energy saving and its efficient utilization in the sector.

4.22 Facilitate conditions to provide the necessary support for the creation of linkages and interdependence among existing and forthcoming R&D institutions, higher learning institutions and the industrial sector so as to undertake R&D activities and utilize
its outputs as per the needs of the sector

4.23 Prepare and implement industrial S&T plans, programmes and projects.

5. PRIORITY PROGRAMMES

In order to build sectorial capability and utilize it effectively, it is essential to formulate priority programmes that would enhance and promote scientific and technological development. To implement these programmes sustainably and effectively, building S&T infrastructure and manpower development in each priority area will be carried out as required. The following are the priority programmes of the sector.

5.1 Manufacturing Industry

5.1.1 Basic metals and engineering

- create and promote the capacity to design and manufacture agricultural tools and machinery,
- build the capacity to design and manufacture machinery, spare parts, components, hand tools and equipment for the industrial sector,
- undertake activities to develop materials and equipment to assist health, education, and R&D activities,
- promote capability to design and manufacture electronics and electrical products including their manufacturing machinery domestically,
- undertake scientific and technological activities that would enable to modify, adapt and assimilate transferred technologies, and
- undertake activities that strengthen foundry, heat treatment, and machining which have special and all round services.

5.1.2 Food and Beverage

- improve and promote the production and preservation techniques of traditional foods and beverages,
- undertake research on traditional foods for better & nutritionally balanced content,
- undertake research that enables the preparation of nutritive and preferable food for babies and lactating mothers,
- generate, improve & promote the technology of handling, preparing and packaging of cereals, coffee and easily perishable food items like fruits and vegetables, fish, meat, milk and its products, and
- undertake research on by-products of food industry to suit them for better use.

5.1.3 Chemical
create capability to produce chemicals and chemical products used as inputs for the agricultural and other sectors both in quantity and quality,
undertake research on inputs such as mineral fillers, additives and chemicals from locally available natural products,
undertake research on local sourcing of imported inputs for food, beverage, leather, textile, pharmaceutical, plastic, paper and pulp production, and
undertake research on techniques that could eliminate or reduce pollution of industrial dust, liquid waste and residues.

5.1.4 Textile

strengthen efforts that would improve traditional cloth making technology,
promote competence to improve production process, product diversification, product quality, pattern development, design and dyeing techniques, and
undertake research and development on textile technology.

5.1.5 Leather

undertake research on the improvement of traditional handling and tanning techniques and production of chemical inputs from locally available natural products,
 improve and promote technical competence of handling, preparing and use of skins and hides,
 undertake research to improve the production process and the development of new products of hides, and skins, and
 promote the recycling methods of by-products and refuses.

5.2 Construction Industry

5.2.1 Building Construction

identify and upgrade those traditional construction techniques of housing, bunker and cillos that are used by the people in different regions, and also search for new techniques of construction;
undertake research that locally would help produce raw materials and other inputs for building construction;
upgrade and implement design and construction technology of low-cost housing that would enable to alleviate problems of shelter;
promote and utilize the application of low-cost and efficient construction techniques;
support efforts to improve and adapt foreign construction technologies to local conditions; and
formulate, improve and promote design and construction standard code.

5.2.2 Transport Construction
Promote the implementation of efficient low-cost dry weather roads, rail-way lines, air ports, and ports construction technologies to upgrade the sector's socio-economic contribution;
popularize the construction technology of small scale bridges made from locally available natural resources;
promote the technological capacity of developing, using, and repairing modern transport construction equipment; and
formulate standards for the construction and use of roads.

5.2.3 Water Works Construction

develop technologies for deep well construction, water pumps, transmission lines, reservoirs, water purifying method and sewage disposal;
support efforts to build designing and construction capacity of dams and irrigation works; and
promote the construction technologies of small and medium-scale dams that provide extensive services to the rural community.

5.3. Transport & Communication Industry

5.3.1 Land Transport

study, develop and strengthen low-cost transport technologies appropriate to the rural population; and
build technical capability to utilize, repair, maintain, improve, and modify land transport means.

5.3.2 Marine Transport

select, improve, and utilize appropriate traditional marine transport technology;
build capability to locally manufacture modern marine transport means;
strengthen technological capability to utilize, repair and maintain ships; and
upgrade capability to use, repair and maintain modern ship loading and unloading technology.

5.3.3 Air Transport
promote the transfer and development of modern aircraft technology and strengthen its absorbing capacity;
support efforts to build capability to repair & maintain equipment as well as manufacture and assembly of parts of small planes; and
develop and strengthen the information system and the manpower to keep up with the technological advancement.

5.3.4 Communication

strengthen capability to select, transfer and utilize modern communication technologies;
develop capability to repair and maintain communication equipment;
create and use capacity to manufacture and use parts and components of communication equipment; and
develop the capacity to use modern information technology.

6. ORGANIZATION STRUCTURE

In order to build Industrial S&T capability and to implement the policy effectively, a suitable organizational structure is required. The structure should help the elements of the system to be strengthened in order to make their contribution more effective & sustainable, and establish the necessary interdependence and co-operation. As stated in the national S&T policy document, sectoral organizations and representatives of R&D Institutes shall be part of the system. The sectoral S&T organisation shall be as follows:

1. Industrial S & T Council

2. National Industrial R & D Centres

3. Regional Industrial S & T Centres

4. Industrial S & T Operational Units

6.1. Industrial S&T Council

This council is composed of the following professionals drawn from development organizations, R&D Institutions, etc. in the sector as shown below.

a) Professional disciplines

The council shall be composed of the following professionals & their number may be extended as required.
1. Mechanical Engineer
2. Chemical Engineer
3. Electrical Engineer
4. Electronics Engineer
5. Civil Engineer
6. Transport Engineer
7. Material Technologist
8. Textile Technologist
9. Food Technologist
10. Leather Technologist
11. Town Planner
12. Economist
13. Architect
14. Safety Engineer
15. Information Expert

b) Institutions representing members of the council

Members of the council with the aforementioned disciplines are drawn from development organizations, R&D institutes and professional associations in the sector.

These are:

1. development organizations, R&D and training institutions in the Manufacturing, construction, transport & communications industry;

2. sectoral S&T operational units;

3. relevant higher learning institutions, and

4. the Department of Industry of the Ethiopian Science & Technology Commission (ESTC).
6.1.1 Organization of the council

- The Council is accountable to the ESTC.
- Members of the Council are nominated on the basis of the criteria that will be specified by the commission. The composition of the professional disciplines shall be extended as required.
- The working period of members of the council is three years.
- The Chairperson of the council is appointed from among the members of the council for a term of three years.
- The Head of Industry Department of the ESTC is the Secretary of the Council.
- Task forces whose responsibilities shall be determined by the Council shall be organized as required.
- The Council shall meet once every three months. Additional meetings can be held when necessary.

6.1.2 Duties & responsibilities of the Council

- advise the Commission on technical matters with regard to S&T activities of the sector,
- formulate the S&T policy of the sector, forward ideas to the Commission for decision and implement them when endorsed,
- evaluate and select sectoral S&T projects as per the policy and ensure their implementation,
- look for material, manpower & financial supports to undertake sectoral S&T Programs and projects and ensure their proper utilization through the secretariat of the council,
- ensure the establishment of a system for the popularization & implementation of useful research outputs,
- establish a system for the collection, processing and dissemination of information necessary for S&T activities in the sector,
- create a conducive environment for the encouragement and accreditation of researchers, inventors and institutions for outstanding achievements of S&T activities in the sector, and
- plan and initiate visits and conduct workshops and seminars to upgrade the knowledge and standard of researchers and inventors at all levels.

6.1.3. Duties and Responsibilities of the Secretariat

- Prepare agenda for the Council pertaining to sectoral S&T activities and implement its resolutions.
Compile sectoral research projects received and submit to the Council for decision.
Follow up the implementation of research projects selected by the Council and present evaluation reports.
Propose ideas for the establishment of research and other support institutions as required to promote the scientific and technological development of the sector and follow up their implementation when endorsed. Facilitate conditions for the dissemination of useful research outputs to end users.
Encourage the establishment of professional associations in the sector.
Prepare the Council's operational budget and implement when approved.

6.1.4. Duties and Responsibilities of the Chair Person

Chair the Council's meeting.
Ensure the realization of the decisions of the Council.
Summon members of the Council for regular and special meetings.
Guide the activities of the Council.

6.1.5 Duties & responsibilities of the secretary
Handle the correspondence of matters concerning activities of the Council,
compile the reports of the Council,
prepare and submits programs of action and annual budget to the council and follows up their execution, and
prepare agenda for meetings by consulting the chairperson; takes minutes of meetings and follows up decision implementation.

6.1.6. Working procedure of the Council

Regular meetings will be held once every three months; other meetings can be managed when necessary;
there will be a quorum when over half of members of the Council including the chairperson are present;
the Council makes decisions by voting; when the number of votes is equal on both sides, the chairperson will have a casting vote; and
discussions and decisions are recorded and minutes are distributed to each member of the council.
6.2. National Research Centres

R&D centres which are administered by the central government shall be set up as required to undertake industrial research activities to alleviate critical S&T problems of priority at national level. Their major objectives are the following:

- To undertake research on the generation of alternative technologies and to substitute imported inputs with local ones.
- To undertake research that enables to promote capability in technology transfer and development.
- To conduct research to promote capability to enhance the development of traditional technology and its utilization.
- To provide technical & material support to regional research centres.

6.3. Regional Industrial S&T Centres

These are S&T centres to be established in different administrative regions so as to promote research quantitatively and qualitatively and disseminate the output to end users mainly with the following specific objectives.

- To undertake research on upgrading and utilizing region-specific technologies.
- To undertake research on substituting scarce inputs with dependable and reliable ones that are available at regional level.
- To improve and strengthen information exchange and interrelations within the sector.
- To collaborate with counter-part research centres in searching solutions to problems of national character.
- To give technical & material supports to research units that will be established in administrative regions.

6.4. Science & Technology Units

These are S&T operational units to be established to alleviate fundamental S&T problems inherent in each production and service rendering institution of the sector. They could obtain material & technical support from national and regional research centres necessary for their activities.
7. WORKING RELATIONS AMONG NATIONAL & REGIONAL S&T CENTRES

- Exchange unrestricted information essential for research activities to be mutually undertaken;
- Collaborate in participating on workshops and seminars that are to be held at national and regional research centres level;
- Allow regional research centres to use research equipment which is available at the national research centres, but is for the time being beyond the reach of the regions; and
- When the regional research centres require the service of national research centres, it would be done in accordance to the agreement reached between them.