

## Sub-theme 3.5. Civil Infrastructure, Manufacturing, and Industrial Technology

### Rationale

The construction industry is one of the major sectors which involve huge capital and human resources. Design and construction play a vital role in the national economy including the development of residential housing, office, commercial and retail buildings, industrial plants, roads, dams, irrigation schemes and the replacement, maintenance and restoration of the nation's infrastructure and other public facilities. In countries like Ethiopia, about 60% of the annual capital budget is allocated to construction. Improved designs and construction of these facilities determines the development success of the nation.

However, the country's construction industry is characterized by delays in meeting project deadlines, increased total costs of projects, resulting in bankruptcy of companies, descent in construction quality, serious question on public safety, and overall project failures. Detail research on the design of civil infrastructure, efficient use of construction materials, improved construction methods and state of the art construction management alternatives will help to reduce the major problems associated with the Ethiopian construction industry. Noises, pollution and social problems still belie the priority accorded to sustainable development in Ethiopian urbanisation policy and strategy.

Ethiopia currently has a low level of urbanisation, with approximately 16% of its population living in urban areas. The rate of urbanisation is currently between 5-6% per year. This means doubling of the urban population every 12 years, a situation that could result in the urban population increasing from its current level of 11-12 million to over 40 million over the next 25 years.

Consumption of resources like water and energy in construction is high, while investment in research and development is much lower than in other sectors. New technologies and

approaches must be developed through research endeavours to help the construction industry to adopt concepts of sustainability.

In addition to infrastructural developments, the role of designing, manufacturing and industrial technology in the overall economic development of a country is enormous. At present, the manufacturing and industrial sectors face major scientific and technological problems.

Systems of agricultural production, which are primitive, have not kept pace with the population growth. The farming methods are poorly developed; breaking the ground is done with wooden ploughs, and planting is still mostly done by broadcasting. Cultivation and harvesting are done using old and poor farm tools. Threshing is done by pounding with sticks or by hooves of animals; winnowing makes use of wind and human labour. Tools, implements, equipment and powered machinery, are essential and major inputs in agriculture.

### **Aim**

The aims of this sub-theme is to analyse the current practice of designing and constructing of civil works and improving the design codes and standards in order to provide a cost effective and environmentally friendly structure as well as to examine and identify best practices to measure and monitor socially sustainable urban regeneration and provision of vital services.

### **Description**

The focus areas of the research will be construction and urban infrastructure which incorporate civil structures design and construction, geotechnical investigations, water supply and hydraulic structures, development and efficient and effective utilisation of construction materials, construction technologies and management, highway and transportation engineering, maintenance of civil structures, renovation and preservation of historical buildings and monuments, integrated urban planning and design, land use and waste management in urban areas, assessment and monitoring of civil infrastructures, and related issues.

One of the focus areas of the sub-theme is urban development and the construction industry

which incorporate urban planning and design, civil infrastructure monitoring, assessment, and maintenance systems, geotechnical investigations, development and efficient and effective utilisation of construction materials, construction management and technology, planning, and economics, and policy of transportation engineering and related issues.

The other focus area of the theme is design, manufacturing and industrial technology which includes automotive innovation, advanced materials, energy and power, design and development, thermal and systems engineering, designing and manufacturing, industrial automation and control system, quality control (an engineering approach), and motor vehicle engineering.

The focus area shall also include farm power, agricultural machinery engineering and mechanisation which will deal with possible areas of research like characterisation of soils of eastern Ethiopia in terms of their physical and mechanical properties, design, construction, performance evaluation and introduction of improved tillage, planting, harvesting, and processing machinery, investigation into physical and mechanical properties of plant and animal products, studies on potential, prospect and limitation of draft animal, human being, wind, solar and bio-energies and optimum utilisation of the same.

### **Potential Collaborators**

Ministry of Construction and Urban Development, Ministry of Transport, and Federal and Regional Road Authorities, Ministry of Agriculture, Ministry of Science and Technology, Ministry of Industry, Investment Bureaus at Federal and Regional levels, Ethiopian Academy of Science, private sector, non-governmental organisations, and international research institutes, domestic and overseas universities, infrastructure agencies, and private contractors and consulting firms

### **Expected Output**

- Proper designs and construction of civil works aligned with optimal use of locally available materials

- Improved technology and management of construction projects
- Proper and efficient procurement, contract administration and management of construction projects
- Integrated, cost effective, convenient, and environmentally friendly urban planning
- Improve urban infrastructure planning approaches for new cities and towns.

## **Research Areas**

### **3.5.1. Urbanisation, Urban development, and construction industry**

This research area addresses major problems related to urban development and construction industry such as urban planning and design, civil infrastructure monitoring, assessment, and maintenance systems, geotechnical investigations, construction materials, construction management and technology, and planning, economics, and transportation engineering.

### **3.5.2. Designing, manufacturing, and industrial technology**

This research area addresses major problems related to designing, manufacturing, and industrial technology such as automotive research and innovation, quality and productivity improvement, industrial control, processing machines and bulk material handling, and transport technologies.

### **3.5.3. Farm power, agricultural machinery engineering and mechanization**

This research area addresses major problems related to farm power, agricultural machinery engineering and mechanisation such as characterisation of soils, design, construction, and evaluation machinery and implements, introduction of improved tillage, planting, harvesting, and processing machinery, investigation into physical and mechanical properties of plant and animal products, draught animals, development of harness.

## **Beneficiary**

Agriculture, manufacturing industries, food processing industries, policy makers, and the wider public