Federal Democratic Republic of Ethiopia

Space Policy

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Contents

1. Preamble

The advancement of space science and technology contributes to the economic growth and development of any country. More importantly, the international space program has significantly improved human knowledge and led to major technological developments with universal benefits underpinning economic and social progress of the contemporary global society. Today, many developed and developing nations, including Ethiopia, recognize the development of a national space program as an important strategic choice for achieving national development agendas and improving the well-being of humankind. Given the geopolitics and socio-economic context of Ethiopia, space is a matter of high importance for existence in terms of national sovereignty and development.

Cognizant of this, the purpose of national space policy for Ethiopia is to give guidance on the contribution of a space program to the scientific, technological and economic development of the country; establish a national space affairs regulatory framework and define its role in protecting national interests and sovereignty.

The policy is formulated from the perspectives of both studying the earth from space and exploring space from the earth. More specifically, the first perspective includes acquiring satellite images applicable for different purposes and facilitating communication and broadcasting services using a mix of satellites. The policy also responds to national demands while fostering the development of a national space sector. Furthermore, the policy takes into account the evolution of a national space sector with time. This policy considers space activities to be conducted by two distinct but interdependent sectors namely: civilian and national defense and security. However, overall space affairs administrative governance in Ethiopia is a government undertaking led by the civilian sector.

This policy serves the space sector by providing inviolable directions, norms and principles of behavior to all actors of the sector in all space related activities.

2. Introduction

Globally, space programmes have created a strong space industry base, effectively exploiting space science and space technologies and their applications for socio-economic development, environmental resource conservation and management, disaster management, peace-keeping and security, space exploration and discovery as well as strengthening international cooperation in space sector. Now a space programme has become an essential sector in many developing nations including countries with emerging economic growth.

In Ethiopia space activities date back to 1950s with some initiatives in collaboration with international partners such as astronomical observations and photography, satellite tracking and deep space communication. However; until 2004 there had been little progress since its development in 1960s and early 1970s. The establishment of the Ethiopian Space Science Society (ESSS) in 2004 can be considered as a major step to revitalize the development of space sector in the country. By the joint effort of 32 public universities, one private university and the ESSS, in 2013, the first research institute, i.e., Entoto Observatory and Research Center (EORC), was established with the main aim to develop a space program, and in particular to build knowledge, skills and capability in space science, space technology and their applications. Likewise, a few universities are also developing space and space related education program, research and scientific infrastructure development projects.

In order to develop a national space program more effectively and in a well regulated manner, the Ethiopian government established the Ethiopian Space Science and Technology Council (ESSTC) and the Ethiopian Space Science and Technology Institute (ESSTI) in November 2016, by Council of Ministers Regulation No. 393/2016. The Council has powers and duties to provide direction and leadership in all aspects of space activities, approve national plans related to the space program, and provide necessary guidance and support for the development of space science and technology.

Ethiopia has the ambition to establish competent space program with an aspiration to re-align the sector to socio-economic development plans in order to effectively exploit the benefits that can be acquired from space science, space technology and their applications. To guarantee this, the ESSTI has been instructed by the Council to formulate space policy.

During the preparation of the policy national survey and situational analysis were conducted to identify the major challenges and critical demands. According to the findings of the survey, some of the major challenges are: the low scientific base, a lack of skilled human resources, almost non-existent space technological capability, weak space infrastructure, absence of a space affairs regulatory environment, non-alignment with national development programs; little utilization of the huge employment opportunity from the space sector, limited awareness and insufficient space popularization activity, lack of financing and incentive schemes, weak co-operation among local actors, and limited international collaborations and partnerships.

Accordingly, the Ethiopian space policy is formulated to overcome the challenges outlined above and serves as a tool to realize the development and effective utilization of a national space programme. On the basis of this, the policy is organized into three 'layers'. The first 'layer' is considered as the 'basis' of the space policy, and consists of space science, technology capability building, human resource and infrastructure development, and the development of a space affairs regulatory framework. The second 'layer' is devoted to aligning the space sector to national development programs and it contains strategic policy issues namely: space for economic and social development, space for resource management, space for infrastructure development and safety management, space for climate change and environmental disaster monitoring, and space commerce. The third 'layer' consists of policy issues that reinforce the first and second layers such as: local collaborations, regional and international cooperation, space awareness, finance and incentive scheme, and active engagement of civic societies and professional associations. Use of space for defence and security is also dealt with one component of this policy. Besides, the policy also deals with roles and responsibilities of different actors, institutional arrangements, continuous re-alignment of the space sector, and monitoring and evaluation system of the space programme.

3. Vision, Mission, and Principles of Space Policy

3.1. National Vision

According to the second growth and transformation plan (GTP-II) the national vision is "…To reach the level of lower middle-income countries where democracy, good governance and social justice are maintained through people's participation by 2025".

3.2. Vision of Space Policy

To ensure Ethiopia's home based competence in space science and technology that is capable of responding to national development demand.

3.3. Mission of Space Policy

To build national capabilities in space science and technology that maximizes effective utilization of the sector through human resources, institutional and infrastructural development and practice of a sound regulatory framework, thereby aligning with national development programs.

3.4. Policy Statement

The Ethiopian government realizes the crucial role space science and space technology plays to the socio-economic development, sustainable growth, national security and prestige in developed and rapidly developing countries. The government also recognizes that due to its special nature, development of the space sector needs high levels of competence, huge investment, comprehensible planning and special regulations in line with national and international laws and treaties. Cognizant of these realities, the government is also aware that the Ethiopian space program faces a number of challenges to which it is determined to take proper policy measures and strong strategic leadership to transcend and ensure accelerated growth of the space industry and significance of its contribution to the accelerated growth demand of the country.

Therefore, the Ethiopian government is committed to:

- Provide leadership and support including progressive investment budget for the growth of the space industry. Build robust space industry through research and launching of capital projects that enable realization of strong space science and technology infrastructures to speed up the development of the space industry.
- Build progressively advancing space industry and space commerce that will significantly contribute to creation of huge employment opportunity, entrepreneurship, Growth of SMEs, GDP growth, and innovation.
- Vigorously pursue the attainment of high level space science and space technology base.
- Attract, produce and retain competent professionals in the sector, build and strengthen infrastructure and systems to provide sustainable human capital thereby ensuring strong cooperation and coordination among actors of the space sector (universities, research institutions agencies and professional societies).
- Establish competent space affairs regulatory system that is capable of facilitating peaceful and responsible use of space, and capable of responding to local demands and global challenges of the space sector; ensure effective coordination and co-operation among local actors.
- Ensure alignment of space programs with national development agendas and priorities.
- Pursue to establish and strengthen bilateral and multilateral partnerships, capacity and infrastructure building projects along with experience sharing, and international cooperation of mutual benefit.
- Endeavour to actively participate and expedite maximum benefits from the global pursuit of international cooperation in the peaceful use of outer space.
- Popularize space awareness, education and promote the sector as area of opportunity to empower women, and attract the young and talented and inspire all citizens.
- Create and generate space revenue from space tourism and other services, attract funds, forge and provide various financing and incentive schemes.

3.5. General Objectives

The main objectives of the policy are to;

1. Develop capacity-building programs; that realize and maintain robust foundations in space science, technology and infrastructure.
2. Establish and implement a coordinated and integrated general governance framework, for effective implementation of space science, technology, and application programs.
3. Establish a strong regulatory environment that takes national and global norms and behaviour into account.
4. Enhance the alignment and use of space driven products and services to address the demands of national development programs.
5. Create the necessary skilled human resource and promote space awareness at all levels of Ethiopian society.
6. Promote improved co-operation with other nations in the mutually beneficial peaceful uses of outer space.
7. Implement adequate financing and incentive schemes while concurrently promoting the space sector as a business.

3.6. Implementation Strategies

1. Develop and implement roadmaps and strategic plans for space science research, infrastructure and technology capability building;
2. Develop and implement demand based human resource development programs in space science and technology;
3. Develop and implement sector based joint programs and projects for multidimensional applications of space solutions;
4. Enact necessary legislative tools /directives, guidelines for the establishment of strong institutional frameworks, space related business entities, and a regulatory environment;
5. Provide financial support and incentive schemes that encourages private sector engagement and joint projects involving different local actors;

6. Mobilize civic and professional societies to actively engage in jointly planned space promotion programs.
7. Establish bilateral and multilateral co-operations and ratify international treaties and resolutions that are in line with national policies.

3.7. Principles

The implementation of Ethiopian space policy will be guided by the following principles:

1. Ethiopia is determined to utilize outer space for peaceful purposes and for the benefit of all humankind.
2. Exploit space application solutions in consistent with the strategic demands of the nation's medium- and long-term development plans.
3. Encourage women and youth to participate in the space sector and maximize benefit that arises from it.
4. Ensure that all public and private space related activities are conducted in accordance with national legislation, relevant international laws and best practices.
5. Promote research and development activities in space science and technology, and inspire the general public by making the results transparent and accessible.
6. Government will take the leading role in the development and maintenance of robust and appropriate set of space capabilities in terms of scientific research, technology acquisition, human resource development, basic infrastructure, and legal and institutional frameworks.
7. Promote co-operation with other nations in mutually beneficial and peaceful uses of outer space, and take active part in the implementation of the African space program.
8. Encourage public and private sector participation in the development of space industry and commercial activities related to the space program.

4. Foundations of Ethiopian Space Policy

4.1. Space science

4.1.1. Overview

Most research and development studies in space science aim to explore earth systems, the solar system, stars, galaxies, extra-galactic phenomena, cosmology including navigation, positioning communication, earth observation, astronomical research, etc. Specially, recent development in space science focuses on astronomy, space physics, geodesy, remote sensing, satellites, planetary sciences, geophysics, aeronautics, and astronautics.

Space science contributes significantly to the solution of economic, social, environmental and climate change related challenges that are confronting the sustainable development goals of every country. However, in Ethiopia, space science is currently not well developed and its applications are underutilized. The country has made insufficient efforts to comprehensively advance research in space science and technology and there has been little effort made to establish national centres.

Nevertheless, presently a few research and higher learning institutions are working in space science with a focus on education and research. Other government agencies are also involved in the utilization of space science. Yet, the development of space science in Ethiopia is facing challenges such as: lack of highly skilled human resources in the field, absence of priority setting in research and alignment with national demand, inadequate scientific infrastructure, and weak collaboration between institutions working in the space science domain. It has therefore become necessary to overcome these limitations through implementing appropriate policy instruments. Focus will be given to most prioritized space science disciplines that are oriented to bring significant impact on socio-economic and environmental developments.

4.1.2. Desired outcomes

Create the knowledge base in space science that enhances the use of space application through conducting theoretical and applied research in Earth systems, the Earth-sun environment, the Solar system and the universe.

4.1.3. Objectives

- To strengthen and develop basic research infrastructure so as to address fundamental scientific questions in various space science fields that can add value to the knowledge domain.
- To set priorities in space research and exploit space applications to address socio-economic and environmental challenges.
- To design and conduct research projects, on a priority basis, that will spur rapid growth of space science and technology

4.1.4. Strategies

1. Develop centres of excellences and strengthen existing programmes to sustain long-term advancement in space science as well as to enhance multidisciplinary research.
2. Promote research projects that aim to downstream space science applications to tackle socio-economic and environmental challenges, while also maintaining balance for other researches that foster development in science and technology.
3. Develop laboratories, observatories, and earth stations equipped with the latest state-of-the-art scientific equipment that support research in space science disciplines.
4. Secure ownership, develop and protect space research sites and astronomical observatories.
5. Exploit the best astronomic and space geodetic sites of Ethiopia to attract the international space research community so as to mobilize resources and develop research capability.
6. Encourage the community identified as the source of indigenous astronomical knowledge through codifying the knowledge, recognizing and promoting the community.
7. Support youth and women to participate and hold leading positions in space related research projects.

4.2. Space Technology Capability Building

4.2.1. Overview

Ethiopia is investing considerable resources, purchasing satellite products and services to meet its national demands for earth observation, communication and broadcasting services. The cost of these services will become ever more expensive to meet the demands of rapid economic development, urban expansion and population growth. Therefore, there is a definite need to create a robust space technology base that is able to meet national needs and generate income by providing services for end users, locally and abroad. By its nature, the development of capability in space technology requires high level of technical capacity such as proper knowledge and skills as well as huge investment.

In Ethiopia, except for some practice in operating optical telescopes and radar stations, the capability in space technology is almost non-existent. The Ethiopian space program is also characterized by lack of skills and experience required to operate telescopes, satellites, ground-based satellite data receiving stations, radar stations, Satellite Laser Ranging, Lunar Laser Ranging, and Very Long Base Line Interferometry. Further challenges include: lack of technical capability in designing and critical design review, manufacturing, assembling, integration, testing and verification of satellites; data processing, archiving and software development; and maintenance and servicing of telescopes. Given all these challenges, Ethiopia is committed to accumulate technological capability in the field that ranges from simple operation to complex manufacturing of satellites of different sizes and purposes, and ground-based space infrastructure, earth stations, and astronomical telescopes.

4.2.2. **Outcomes**

To ensure the development of a robust space technology base in satellites, astronomical telescopes and ground-based space infrastructure.

4.2.3. Objectives

- To build technological capability in operating, maintaining, producing parts and components of small to medium sized satellites, observational telescopes and ground-based space infrastructure.
- To accumulate technological capability in designing, critically reviewing the design, manufacturing, testing and verification of satellites of different sizes and purposes, and ground-based space infrastructure.

4.2.4. Strategies

1. Establish a long-term framework that enables proper transfer of technology, knowledge and skills from technology suppliers during implementation of national space projects.
2. Develop end-to-end satellite technological capability through enabling research and higher learning institutions to excel at least in one of the capabilities such as maintaining, designing, manufacturing, assembling, integration and testing, calibration, and verification of satellites.
3. Identify demand based core aerospace technologies and develop an aerospace technology roadmap to build a stage by stage national capability.
4. Encourage continuous learning of the state of the art technology by exploiting the 'late comer advantage'.

4.3. Human Capital Development

4.3.1. Overview

Sustainable development of space science and technology requires the availability of adequate human capital with the right sort of knowledge and skills. Cultivating renowned scientists and engineers in the space sector is a serious challenge not only for the beginners but also for most space leading nations. Maintaining competence in a space program is unthinkable without having sustainable development of human capital. In this regard, new entrants, like Ethiopia are facing critical challenges in finding an initial workforce whilst also creating new ones.

In recent years a few institutions in Ethiopia have launched postgraduate education programmes in core space science and technology related fields (e.g. astronomy, space physics, remote sensing, geodesy, geo-information and earth observation, geometrics, and aeronautical engineering) in order to produce a new generation that helps to realize the country's ambitions in its space program. Still it remains challenging to launch educational programs in space engineering, satellite engineering, and satellite communication engineering.

Currently, appropriate human resource in space sector is at an infant stage in Ethiopia. There are very few professionals in the field. Similarly, the number of young scientists that are pursuing studies in space education is limited as of 2016. Retention of the existing staff is another challenge. Apart from the scarcity of human resources in the technical aspects; the country needs to have qualified experts in space diplomacy and international space law and space related businesses. Therefore, Ethiopia has to invest in long term comprehensive human resource development programs and also give due attention to attract young talented scientists and engineers.

4.3.2. Desired outcomes

Create highly qualified and competent scientists, engineers and technicians in a sustainable way that lays a foundation for the development of space science and technology and ensure effective utilization of space driven products and services.

4.3.3. Objectives

- To strengthen existing research and educational programmes so as to supply adequate and qualified human resources.
- To establish demand driven educational and training programmes.
- To attract and retain talented scientists and engineers, and encourage youth and women.

4.3.4. Strategies

1. Design and implement demand based curricula in space science, engineering and technology thereby enhancing collaboration between space research institutes and universities.
2. Build and strengthen collaborations with renowned international educational and research institutes to ensure the transfer of knowledge and skills through initiating exchange of staff, on job training and student internship.
3. Mainstream space science and technology into curricula of primary, secondary; and in relevant tertiary level education system.
4. Ensure sustainable balance of demand and supply of space science and technology human resource development through implementing long term planning.
5. Encourage and attract Ethiopian diaspora in the field, to build local skills and expertise, and in so doing accumulate capacity that will minimize over reliance on foreign technical support.
6. Enhance youth and women participation in the space sector through arranging special talent scholarship programs.
7. Devise incentive schemes to attract and retain best brains in space science and technology fields.
8. Create national and international research networks and promote participation in short term and long term research projects

4.4. Space Infrastructure

4.4.1. Overview

The development of a space program requires huge investment to establish key infrastructures that support research and development in space science and technology. Such infrastructure includes the development of astronomical observatories (radio and optical telescopes), space telescopes, atmospheric and space weather laboratories, space radar laboratories, Assembly, Integration and Testing (AIT) facilities, clean room, satellite mission control centre, facilities for manufacturing of satellite as well as establishment of scientific observatories and laboratories ,

earth receiving stations, geostationary ground stations, space segments, high computing facilities, laboratories, and workshops and launching and flight centres.

In Ethiopia, these facilities are not yet developed and it is necessary to establish a centrally planned common space infrastructure that can support the national space program and strengthen competency of the country in space industry. The construction cost of these facilities is very expensive and they also have high maintenance costs. Therefore, it is essential to ensure effective and efficient use of public money while developing space infrastructure.

4.4.2. Desired outcomes

To realize robust national space infrastructure that ensures effective implementation of space program.

4.4.3. Objectives

- To build robust space science and space technology infrastructure.
- To mobilize resources through joint research projects, programs and partnerships.
- To ensure planned and well-coordinated procurement and administration of space infrastructure.
- To build human and technical capability that enables use of the signals and data supplied by these space assets, satellites, to develop value-added applications for effective management and data exploitation.
- To build infrastructural capability to launch, own and operate satellites and receive, store, process and analyse satellite data.

4.4.4. Strategies

1. Identify and build state of the art space science and space technology infrastructure, on priority basis.
2. Establish demand based laboratories and workshops for enhancing technological learning, research and development.
3. Establish centrally planned framework dealing with the procurement and development of space infrastructure that requires huge investment.

4. Engage in direct grant and competition based international projects to secure resources from various funding agencies for further enhancement of space infrastructure.
5. Establish and Set up national satellite data receiving, storage and processing facilities.
6. Develop Communication satellites, earth observation satellites and their respective ground station facilities.

4.5. Space Affairs Regulation

4.5.1. Overview

Space affairs regulation ensures fair participation of various stakeholders; and maximizes the benefits of the sector thereby protecting the public from undesired effects and impacts emanating from using the technology. A regulatory scheme provides various services such as registration of institutions engaged in space activities, issuing licences, renewal of licences, amendment, suspension and revocation of licences**,** inspection, registering space objects, regulating the development, launching and operation of civilian satellites as well as access to satellite data and signals, and ensure the peaceful use of space matters relating to international obligations.

In 2016, the government established and mandated the Ethiopian Space Science and Technology Institute to "issue permits to persons desiring to engage in space activities, control their operations, register space objects, and regulate in collaboration with other relevant organs overall aerospace activities that emanates within and outside the country and operated in the country's jurisdiction". In this regard, the main challenges are lack of implementation practice due to the absence of detailed directives, standards and codes of conduct. Therefore, the Ethiopian space policy will address these challenges and put in place a space affairs regulatory environment.

4.5.2. Desired outcomes

To ensure public interest thereby optimizing the benefit while minimizing the undesired effect emanating from space sector.

4.5.3. Objectives

To establish well-functioning regulatory environment for notification, registration, licensing, renewal, inspection and controlling of space and space related affairs.

4.5.4. Strategies

1. Develop directives that clarify regulatory requirements on space objects and related affairs, in line with international practices.
2. Ensure implementation of a directive that deals with regulation of the development, launching and operation of any type of civilian satellites.
3. Establish standards and codes of conduct for access to satellite data and signals from satellites owned by foreign agencies and companies.
4. Establish the necessary infrastructures to verify compliance with regulatory requirements in co-operation with relevant stakeholders.
5. Establish an independent regulatory authority at a time when the national space sector development becomes momentous and demanding.
6. Create awareness on space regulation to the concerned parties.

5. Strategic Pillars for Space Applications and Development

5.1. Space Science and Space Technology for Socio-Economic Development

5.1.1. Overview

Ethiopia is facing various socio-economic challenges. The most pressing ones are food insecurity, nutrition deficiency, low level of mineral exploitation; lack of good land governance and well established land information system as well as inadequate access to quality of health, education and clean water provisions. Space solutions such as ground-based, air-borne and space-borne technologies would contribute a lot to address these challenges. More specifically, space technology and applications are important to inform wise decision making processes for: yield forecasting and risk assessment of crop and livestock farming practices; expand basic geological surveying and mapping to enhance the mining sectors; enable the realization of dynamic rural and urban land administration and the provision of smart healthcare and educational services. In this regard, the ability to utilize space technology and applications to tackle these challenges is not well realized. The following goals and strategies are set to address such gaps.

5.1.2. Goals

- Enhance agricultural productivity through space technology and applications.
- Enhance mineral exploitation activities and ensure productivity, safety as well as monitor the environmental and social impacts of mining activities.
- Strengthen the rural and urban land administration, land use planning and cadastre information system using space technology and its applications.
- Enhance human health care and access to and quality of education using satellite applications.

5.1.3. Objectives

- To create a platform among key stakeholders for joint development, implementation, monitoring and evaluation of modernized agricultural practices;
- To contribute to surveying and exploration of mineral site mapping;
- To support monitoring of ground movement, and assessment of environmental and social impacts of mining activities;
- To enhance the realization of urban and rural land use planning and cadastre information system using space applications;
- To standardize end-to-end spatial data acquisition, processing and interpretation for urban and rural land information and administration systems based on proven scientific methods.
- To create reliable, real time, and cost-effective platforms to facilitate the utilization of space science and space technology for education, medicine, culture, tourism and utilities;

5.1.4. Strategies

1. Acquire weather monitoring and earth observation satellite images to monitor near real time based farm practices.
2. Develop crop growth status, crop area estimation, production forecast and cropping analysis using atmospheric science, space science and space technology tools and services;
3. Design and implement agricultural drought and natural hazards protection, monitoring and assessment system using space science and technology applications;
4. Enhance large scale irrigation schemes using space science and space technology, knowledge and leadership for managing and utilizing water resources;
5. Develop soil classification, characterization, mapping, and soil quality monitoring systems using space science and space technology and applications;
6. Design space and ground based technologies and applications strategy to monitor crop pests and disease detection and incident forecasting system;
7. Increase livestock productivity through properly managing rangelands, forage production and water point location using space science and technology, knowledge and expertise;

8. Support the decision making processes of crop and livestock insurance using space science and space technology driven products and services;
9. Assist the mining sector to utilize space science and space technology data and applications for improving mining activities, safety and reduction of social and environmental impacts;
10. Support acquisition and installation of space science and space technologies to monitor land deformation process in mining sites;
11. Ensure regular updating of rural and urban land records using space science and space technology driven products.
12. Support spatial based land survey organizations and institutes through training and provision of facilities;
13. Develop standards and guide lines for spatial data acquisitions and processing so as to realize accurate and reliable land information management system using space science and space technology applications;
14. Enhance the use of satellite-medicine, satellite-education services and other space technologies for cultural heritage and tourism for improving social services;
15. Establish collaborative frameworks among stakeholders to enhance the contribution of space science and space technology applications for precision farming, mining, rural and urban land administration, health and education;
16. Identify and nurture space tourism, potential and existing space science and space technology sites and establish international laboratories and observatories.

5.2. Space Science and Space Technology for Resource Management

5.2.1. Overview

Land, soil, water, solar energy, forests, minerals, range lands, different forms of agro-diversity and biodiversity resources with diverse varieties of wild animals are the most common natural resources in Ethiopia. Space science and space technology applications play an important role for managing different natural resources**.** Over the past couple of decades the advance of space instruments from space and new platforms of earth observation technologies have been proven the applicability of space science and space technology in natural resources management.

Currently, earth observation data provides services that require synoptic or periodic observations for a natural resource inventory, surveying studies and management programmes.

However; in Ethiopia space science and space technology based natural resource management systems are not well established yet. This policy maximizes the use of space science and space technology application to effectively manage natural resources.

5.2.2. Goal

Enhance capability for integrated and space knowledge-based natural resource utilization and establish a resource management system at national and regional level.

5.2.3. Objectives

- To quantify and map environmental resources using space science and space technology and its applications.
- To investigate the implication of natural resource dynamics on atmosphere, ionosphere, climate, water, carbon cycle, ecosystems and societal domains using space science and space technology.
- To create a platform among key actors for s space science and space technology based joint research and development, implementation, and evaluation of natural resources.

5.2.4. Strategies

1. Create a space science and space technology based platform to strengthen environmental resources quantity determination, and digital mapping services.
2. Establish a centre for acquisition, processing, archiving and dissemination of satellite and in-situ data in support of a natural resource management system.
3. Formulate a joint research program among key stakeholders to better understand the status and dynamics of natural resources as well as to verify space science and space technology application tools and services.
4. Provide up-to-date space science and space technology driven value added information and

services for decision makers in charge of natural resource planning, conservation and development.

5. Enhance space science and space technology based applications for the management of trans-boundary water resources.
6. Device and implement skill development and knowledge transfer schemes for users of space science and space technology based natural resource management system.

5.3. Space Science and Space Technology for Infrastructure Building and Safety Management

5.3.1. Overview

Dependable key economic infrastructure such as energy and water supply networks, reservoirs, dams and transportation facilities (i.e., roads, railways, tunnels, bridges, irrigation cannels, airport facilities and telecommunication networks) are crucial for the efficient economic growth and development. Space science and space technology and applications can significantly contribute to the planning, surveying and design of the different economic infrastructures in a cost-effective way. In addition, space science and space technology and its products are proven to be utilized for monitoring compliance to safety requirements of dams and reservoirs, tunnels, bridges, highways, and cannels. Furthermore navigation, positioning, and communication system are essential for safe landing, takeoff and inflight operation of aircraft. However, the current practices of planning, surveying and designing activities of these infrastructures are not effectively utilizing space science and space technologies and applications in Ethiopia. A number of Strategies are designed to enhance the use of space science and space technology applications in building economic infrastructure.

5.3.2. Goal

Increase the use of space science and space technology and application for planning, surveying, and designing economic infrastructures whilst complying with necessary safety requirements.

5.3.3. Objectives

- To modernize the planning, surveying and designing techniques of infrastructure projects using space science and space technology driven products and services.
- To enable reliable, cost-effective and near-real-time monitoring of key infrastructures and the operation thereof.

5.3.4. Strategies

1. Develop and implement reliable and cost-effective space science and space technology solutions and services that complement the classical planning, surveying, design and alignment selection techniques.
2. Provide accurate and high resolution three dimensional topographic information for planning, designing and selecting various infrastructural developments such as water, energy and telecommunication utilities, dams and reservoirs.
3. Provide accurate and high resolution three dimensional topographic information for planning, designing and selecting transportation infrastructures such as: roads and high-ways, bridges, airports, tunnels, and railways.
4. Integrate Satellite Based Augmentation Systems with existing airport facilities in order to support flight operations.
5. Create a platform among key stakeholders for joint research and compliance monitoring to safety requirements of mega infrastructures using space science and space technology and applications.
6. Design and implement skill development programs for end users to effectively implement space science and space technology and applications for infrastructure development and monitoring.

5.4. Space Science and Space technology for Climate Change and Environmental Disaster Monitoring

5.4.1. Overview

Climate change is one of the critical environmental issues in Ethiopia. Besides recurrent drought, landslide, earthquake, volcanic eruption, frequent flooding, land deformation and desertification are commonly occurring environmental disasters in the country, and the frequency, scale, and intensity of such disasters have been increasing over time. Space science and space technology based climate change and environmental disasters monitoring systems are not well-established in the country however; space science, space technology and applications can provide reliable climate change and environmental disasters monitoring systems. In particular, satellite products are widely used to provide near-real-time terrestrial and space weather data and information; establish stable weather and climate monitoring systems; create continuous terrestrial and space weather forecasts and prediction; develop early warning and prediction systems and improve integration of weather and climate data into other economic sectors. Thus, it is imperative to improve the existing climate change and environmental disasters monitoring systems through effective utilization of space science and space technology and applications as a means to build a climate and environmental disaster resilient society as well as economic development.

5.4.2. Goal

- Build capability with regard to monitoring of atmospheric, space weather and climate variability and change using space science and space technology and applications.
- Enhance the contribution of space science and space technology applications and services for effective forecasting, prediction, early warning and monitoring of environmental disasters.

5.4.3. Objectives

- To develop robust forecast and prediction models to characterise the trends and patterns of climate change and its mechanisms ;

- To strengthen research and development in sectors responding to atmospheric, space weather, and climate change such as agriculture, forestry, soil, water, and livestock;
- Strengthen and develop disaster management systems that provide information before and after the event, including early warning, monitoring, response, recovery, and mitigation activities;
- To create decision support systems to understand the impact of atmospheric, space weather, climate change, atmospheric variability and environmental disasters.

5.4.4. Strategies

1. Avail up-to-date space science and space technology driven inputs for climate change forecasts and prediction models to support informed decision making processes.
2. Support climate change and environmental disaster monitoring and information service providers to maximize the use of space science and space technology driven products and services;
3. Create a platform among key stakeholders for space science and space technology based research and development for monitoring of climate change and environmental disasters.
4. Strengthen centres dealing with space and atmospheric sciences to exploit near-real-time atmospheric and space weather data and services that can be used by various sectors.
5. Establish space radar, atmospheric and space weather research and prediction centers.
6. Enhance the provision of near-real-time geo-hazard information using space science and space technology driven data and existing geophysical observatory facilities.
7. Enhance monitoring of climate change and environmental disaster through deploying automatic weather and geo-hazard stations with adequate spatial coverage.
8. Provide space science and space technology driven near-real-time information to support the functioning of responsible bodies for disaster management.

5.5. Space Commerce

5.5.1. Overview

Though space sector is recognised globally as an area of investment that demands huge fixed cost at the beginning but it can generate high economic return in the long term. Space leading nations have a good track record in demonstrating the sector's contribution to their GDP growth, employment opportunity creation, and stimulating other manufacturing and service sectors. In particular, with the growth of communication and broadcasting services, communication satellites are becoming an attractive and profitable business area.

In Ethiopia the space sector is not well recognized as an industry. Given the low level of the manufacturing sector industries pertinent to space sector such as optics, electronics, satellite operation and space related commercialisation activities are almost non-existent. Local communication and broadcasting companies rely on expensive rental service of foreign owned communication satellites. Different government agencies and private entities spend significant amounts of money to purchase satellite images for different purposes. This policy designs strategies that realize the space sector's contribution to create job opportunities and generate revenue while being developed as an integral part of Ethiopia's structural economic transformation.

5.5.2. Goal

- Ensure reliable and secured communication satellites services, earth observation satellite services, in Ethiopia that satisfy local demand at one hand and generate commercial benefit on the other.
- Create progressive space manufacturing industries in line with the realization of the national structural economic transformation agenda.
- Generate revenue from space science and space technology products and services.
- Establish space business entity in due course of development of the space industry in the country.

5.5.3. **Objectives**

- To build sustainable self-reliant Ethiopian communication satellite services;
- To provide satisfactory communication satellite services for local communication and broadcasting companies and government institutes;
- To generate foreign currency through commercialization of services acquired from communication, other types of satellites, and other space science and space technology services;
- To foster small and medium sized enterprises to engage in the supply-chain of space science and space technology products and services as a new window of business opportunities; and
- To create enabling environment for nurturing space tourism and manufacturing industries.

5.5.4. **Strategies**

1. Deploy Ethiopia's transponder using the next satellite mission up until Ethiopia launches its own communication satellite.
2. Develop, launch and make operational communication satellites.
3. Generate income (foreign currency) by renting transponders for communication and broadcasting companies based in neighbouring countries.
4. Enhance Satellite-education, Satellite-medicine, television and radio broadcasting and broadband internet provision that utilize an Ethiopian communication satellites services.
5. Ensure wise use of limited public resources by establishing centrally planned frameworks dealing with the procurement, development and use of communication satellite;
6. Develop, add value to and commercialize space products and services to generate revenue and attract foreign currency
7. Build space science and space technology observatories, manufacturing centres, museums and planetarium centres for space science promotion and to contribute to the development of tourism industry.

8. Introduce preferential approach to encourage potential manufacturing enterprises pertinent to the space sector.
9. Establish a business enterprise responsible for commercialization aspects of space science and space technology activities.
10. Build satellite tracking and data receiving stations to provide reliable, demand based, and affordable value added satellite imagery services;
11. Provide continuous technical trainings and encourage private sector participation in space science and space technology based outsourced projects;
12. Use space science and space technology and applications as a tool to create employment opportunities, in particular for youth and women.

6. Supportive Mechanisms for Space Sector Development

6.1. Coordination and Partnerships

6.1.1. Overview

Coordinated efforts among the major actors of space sector will ensure that limited resources are used effectively, to integrate various initiatives by different stakeholders, to minimize duplication of effort, to focus on priority areas, and to strive for the same goal thereby sharing the same vision and values. In Ethiopia there are existing nodes of space science and space technology expertise and in-situ capabilities that could be used as a basis to grow the space sector. Different public universities have already started human resource development and various initiatives to develop space technology infrastructure. Despite individual efforts the sector is characterized by lack of coordination amongst research and higher learning institutions. Failure to coordinate initiatives by different local institutes is leading to inefficient utilization of limited resources. Ethiopia's space policy, therefore, gives due attention towards creating strong partnerships and coordination among the local actors though implementing the following policy direction and strategies.

6.1.2. Policy Direction

One of the determinant factors for the success of a national space program is coordinating partnerships among different actors of the sector. Hence, a conducive environment that enables all the actors to form strategic partnerships through time will be made in place with the aim of achieving the same national goal.

6.1.3. Goal

To strengthen the coordination and networks between different players related with the space sector so as to avoid duplications, and maximize the efficiency and benefits.

6.1.4. Strategies

1. Strengthen collaboration and partnerships within all local institutions, including research centres, universities and their corresponding departments, governmental agencies, and private stakeholders;
2. Develop a centralized portal whereby all levels of government institutions can access, and share space related data;
3. Develop and implement a guideline to harmonize and standardize all infrastructure, as well as for common use of core facilities;
4. Promote space projects that engage two or more actors that are aimed at commercializing the output thereof.

6.2. Regional and International Cooperation

6.2.1. Overview

Regional and international co-operation provides an opportunity to supplement the local capability. Compared to the available resources that can be exploited through mutually beneficial international cooperation current engagement of Ethiopia in joint research, human resource development, and data and information exchange is insignificant. In addition, the involvement of the country in various regional and international platforms at different level is very low or non-existent. Ethiopia needs to pursue mutually beneficial and appropriate international co-operation opportunities in space science and technology consistent with its foreign policy objectives and international obligations. In addition there is a need to increase membership and participation in space related international associations, take an active role in joint projects related with research, space infrastructure, data collection and use, participation in commissions and divisions, scientific and local organizing committees, and other activities of international bodies. Therefore, the government is committed to build strong regional, continental, and international co-operation in accordance with its foreign affairs and national security strategy, that devote the prime focus to activities at home;

6.2.2. Policy Direction

The Ethiopian Space program is not solely limited to activities performed locally. It extends beyond the geographic territory and at the same time is bounded to international norms and regulations. Creating strategic partnerships provides an opportunity to maximize the benefit that can be acquired from space. Therefore, various measures will be taken to establish strong bilateral and multilateral co-operations in order to use space program as a tool for economic and social development.

6.2.3. Goal

To strengthen regional and international co-operations to fulfil mutual interest and to make Ethiopia one of attractive sites for mega space science and technology projects.

6.2.4. Strategies

1. Promote regional and continental co-operations and partnerships for human resource development, space research development, knowledge transfer, making accessible space science and space technology driven technologies and products, and build space infrastructure and industry development;
2. Increase Ethiopian participation in global space science and space technology activities through memberships, committee's involvement, decision-making roles, treaties and signing of appropriate conventions.
3. Strengthen collaboration with leading institutions and build strong partnerships with international organizations engaged in space related activities;
4. Leverage Ethiopia's strategic location to attract mega-science projects in space science studies that will enhance the scientific profile of the nation and support the building of critical scientific infrastructure;

5. Promote an African-led space agenda through mutually beneficial partnerships, by taking an active role in African Space Agency which aims to adopt collaborative plans to protect and maximize the allocation of frequencies, to take similar positions on future treaties and polices on space debris, geostationary satellite orbit (GEO) slots, and fibre optic network rollouts.

6.3. Space Program Popularization

6.3.1. Overview

Contrary to the opinion by several agencies and governments that countries with low income economies have more pressing priorities, space programs play a vital role in kick starting innovation programs in developing countries to address many of economic, socio-cultural, and environmental and technological challenges. In Ethiopia, the establishment of the space science society along with Entoto observatory research centre has contributed a lot in popularizing the relevance of a space program to the national development agenda. For the space programme to be meaningful to the broader public there is a need to create public awareness relating to the benefits that space technology and its manifold application products and services can deliver. Broad public support for a publicly-funded Ethiopian Space Programme relies on an appreciation and understanding of the benefits of space science and space technology at all levels. In this respect, Ethiopia's space policy is dedicated to promote space awareness and provide appropriate information to all levels of society, including the manner in which public resources are being used by the space sector for the public good.

6.3.2. Policy Direction

In order to create a society consciousness about the manifold application a space program can deliver various space popularization strategies to be implemented.

6.3.3. Goal

- To increase the awareness of the general public regarding space science, space technology and their applications.

- To create a society that fully exploits the variety of applications that space science and space technology can provide.

6.3.4. Strategies

1. Ensure a strong public awareness program that targets and solicits the support of all sectors of society, including politicians and decision makers, about the manifold benefits of space science and space technology;
2. Nurture and develop the large body of indigenous knowledge of astronomy that is passed down from generation to generation;
3. Improve accessibility to information related to national, regional and global space activities through different communication channels;
4. Establish space popularization centres in all regional states and city administrations to undertake continues awareness campaign so as to establish local communities of practice;

6.4. Professional Associations

6.4.1. Overview

Professional associations in the field of space science and space technology play an indispensable role in the development of the sector. The role of civil societies is also significant to inform the policy-making process by making relevant contributions. The participation of the public in space related activity is increasing over time. For instance members of Ethiopian space science society have reached to 50,000 with 20 branch offices in different regional states. The following policy measures will be taken in order to improve their contribution while strengthen their structure.

6.4.2. Policy Direction

Strategies to capacitate civil societies and professional associations will be implemented in order to enhance their contribution to space sector development.

6.4.3. Goal

- To enhance the contribution of professional associations and civil societies in the development of the space sector.

6.4.4. Strategies

1. Jointly develop and implement action programs that relies on the mutual interest of the government and professional associations;
2. Support space related professional associations through providing various training opportunities and consultation projects;
3. Create a platform to promote space sector development and engage professional associations and civil societies on a regular basis;
4. Encourage space science and space technology professional societies to work together and recognise renowned professionals in the field.

6.5. Finance and Incentive Scheme

6.5.1. Overview

Space science and space technology development requires huge and intensive initial investment, and needs a lengthy time frame to recover the cost of investment. The private sector is not in a position to take the leading role in the development of this sector. For this reason, the development of the sector accordingly shall be supported by the government, given the broad societal benefit offered by the sector, which is in the interests of the public. In Ethiopia, investment in the space sector is not undertaken in a planned and coordinated manner. Ethiopia seeks to use its limited investment budget wisely and in an optimized way. The commitment the government is taking to invest in purchasing satellite data needs to be used effectively through provision of a centralized data exchange portal. Similarly, since the space program in Ethiopia is in its infant stage, the realization of the extensive societal benefits envisaged in this Policy will require an increase in overall expenditure, in particular in the area of infrastructure and human resource development. Apart from financial support various incentive mechanisms must be in place to promote the participation of the private sector in the field.

6.5.2. Policy direction

In order to exploit the variety of economical and societal benefits arising from the development of a space program huge initial investment is required, in particular at the early stage of its development. Along with allocation of finance a strong system will be established to effectively utilize the limited resources. Different incentive mechanisms will be introduced to encourage research and higher learning institutes, individual researchers and the private sector.

6.5.3. Goal

- To progressively increase the budget allocated to space sector along with the growth of the national economy;
- To establish a strong system to regulate the effective use of the resource allocated for space program;
- To establish incentive mechanisms that support and encourage demand driven research, and private sector participation.

6.5.4. Strategies

1. Allocate adequate resources to establish the basic infrastructures needed to make use of space science and space technology applications.
2. Implement an effective capital budget allocation system related to space science and space technology activities for optimal utilization of limited public money;
3. Develop and implement a long-term plan to diversify alternative financing sources through commercialization of space science and space technology driven products and services, engage in information exchange and international research projects.
4. Encourage research and higher learning institutions, individual researchers, and private enterprise engaged in demand driven space science and space technology related research activities by designing various incentive schemes;

7. Space Science and Space technology for Defense & Security

7.1. Overview

Space science and space technology is used in boundary surveillance & conflict resolution, crisis prevention and management, conducting rescue operations, and monitoring of peace keeping missions through space-based intelligence Surveillance and Reconnaissance Systems. All developed and the majority of developing countries have made the use of space as a crucial part of national security and integrity. These countries believe that their internal and external stability depends increasingly on their space-based infrastructures and they are concerned about the entire issue pertaining to cyber security of these infrastructures. Consequently, these countries have advanced towards formulating space policies for defense and security stating that space systems will be used to deter treats to national stability, terrorist treats warn the military and defend the national sovereignty and integrity.

Ethiopia is a signatory to the Outer Space Treaty of 1967 and to the Limited Test Ban Treaty of 1963 that deals with peaceful use of outer space and banning nuclear testing above ground, underwater and in outer space respectively. The country has set plans to bring accelerated socio-economic development and wants the peaceful application of space science and space technology to make a significant contribution while ensuring the wellbeing of its people and protecting its integrity & sovereignty. To this effect, it becomes important to apply space science and space technology based applications and protect its national interests under the international framework of the peaceful use of space. The Federal institutions for defense and security will develop and use space science and space technology services for military and security purposes only & use space science and space technology assets and administer their own space activities without interference while being under the supervision of the space science and technology council. These institutions can collaborate with the ESSTI on any space issues including: joint research, information exchange and capacity building efforts, and some other related activities.

7.2. Goal

Ensure space science and space technology and assets contribute to national and global security and stability

7.3. Objectives

1. To build national capability in information gathering, monitoring and analysis using space science and space technology.
2. To strengthen partnerships and international cooperation on joint efforts to secure domestic and international security and stability

7.4. Strategies:

1. Foster joint research on space science and space technology related issues that will promote the country's capability on information gathering, maintaining security and stability.
2. Build up a national competence for space situational awareness through the use of space science and space technology resources.
3. Build capability and space assets that will enhance information gathering to provide security-related analysis to support decision making.
4. Strengthen international cooperation on space science and space technology related issues to combat national & transnational security threats
5. Engage in the development of multi-stakeholder collaborations that focus on cyber security in space.
6. Develop strong international co-operations and partnerships for building capability to safeguard national security and integrity under the umbrella of the international treaty on peaceful use of space.

8. Policy Implementation Framework

This national space policy is crucial for multifaceted development and it requires active involvement of relevant stakeholders. In this regard, the Government creates and maintains the necessary legal and institutional framework to enhance synergies among different actors, to mobilize and optimize the use of public and private sector resources, and provide strategic leadership for effective implementation of the policy.

8.1. Institutional arrangement

The Ethiopian Government has undertaken a strong commitment to promote space science and space technology development by enacting regulation No. 393/2016 that declared the official establishment of Ethiopian Space Science and Technology Council, at the apex of ESSTI. The ESSTI is mandated by the said regulation to lead and coordinate the national space related agendas in this regard, regulate, and solve such and other developmental challenges through utilization of space technology. The Council, which is led by top government official, is mandated to provide strategic leadership for the successful implementation of national space science and space technology programs.

All stake holders of the sector shall accomplish the roles assigned to them in the policy implementation framework; contribute to the execution of the policy by regular participation in the evaluation of policy implementation and enforcing the improvements made thereof in their respective institutions. The roles and responsibilities of the key stake holders in the execution of the space policy are stated as follows.

A. **The National Space Science and Technology Council (NSSTC**)

Provides timely and relevant strategic direction for the successful implementation of the space policy. Approves special research grant for every three years period

B. National Space Science and Technology Secretariat

The institution assigned to oversee the space sector is responsible to create an environment for effective coordination of stakeholders of the sector; raise and allocate funds to execute its

responsibility; supervise implementation of directions of the council; provide necessary support when needed.

C. The Ethiopian Space Science and Technology Institute

As a leading institution and front runner of the sector It executes its responsibilities according to the powers and duties assigned to it by law. Among these: the Institute implements directions given by the space council; actively monitors implementation of issues related to the policy and under its jurisdiction; develops and issues appropriate methods and strategies. The Institute serves as a national hub for national coordination and also serves as the bridge to international cooperation and partnerships in the space sector. ESSTI regulates all activities in the space sector and issues permit and revokes based on the regulatory inspection it conducts; Monitors and regulates proper alignment of space related projects and programmes with the national development needs. Issues directives and framework for the coordination and mutual support among actors and stakeholders of the space sector; issues different other guidelines, systems and working mechanisms for the sector and implements.

The institute regularly follows-up and evaluates the implementation of the policy, strategies, frameworks and systems. Prepares and conducts stakeholder discussion fora on the implementation, evaluation of outcomes of the policy and strategies and for raising awareness. It Conducts policy impact studies and collects inputs and analyses same to make recommendations on needed improvement measures, provides support to high impact existing and new space related projects, provides space products and services and makes them accessible to users in the policy implementation framework.

D. National Defence and Security Institutions

These institutions execute policy issues related to defence and security including cyber security on the one hand and provide support to civil space activities on the other; exchange data and information with the leading institution of the space sector regularly; provide support for space regulation activities and compliance to legal requirements; implement sector specific and joint

projects taking the institution specific issues and the international principle of peaceful use of space into account.

E. Institutions that use space products and services

Such institutions identify, notify or communicate the types and quality of space products and services to the leading institution of the space sector; make use of the space products and services they have acquired for free or on payment; conduct impact assessment; actively participate in joint research, technology development and human resource development; provide support for implementation of space affairs regulatory requirements; contribute in the preparation of policy related and legal frameworks that are instrumental for the development of the sector; revise their own respective institutional strategies and plans in view of the benefits of space science and space technology applications; conduct promotion and awareness creation activities regarding the role space would play to the success of their respective institutional missions; evaluate the role space has played on sector specific areas and at national level to forward recommendations. Space products and services user institutions of the tourism sector take part in developing space related indigenous knowledge, protection of national heritage, promotion of space tourism, ensure societal benefits, and work closely with the leading institution of the sector and other stakeholders.

F. Communication and broadcasting institutions

Provide television, radio, internet, and different cyber related and broadcasting services, and various telecommunication services making use of information obtained from the communication and broadcasting satellite information provider institution; cooperate with the responsible space regulatory body to assist effectiveness and success of its regulatory practices; participate on training and awareness creation efforts of the sector; cooperate with all stakeholders so that the satellite information service is accessible, equitable and meets international standards.

G. Space Business entities and the private sector

Preferential support will be provided to entities that conduct market analysis to use job creation opportunities; and to those striving for profitability in the sector and for global competitiveness. They carry their business activities based on existing and forthcoming national and international laws.

H. Civic organizations, professional societies and media

These bodies, in good coordination with the leading institution of the sector, conduct: research, training, awareness creation and promotion activities to facilitate implementation of the policy.

I. Research and higher education institutions

Such institutions undertake need based human resource development, research and technology development activities through sound collaborative system with the leading institution of the sector,

J. Institutions leading the education sector at all levels

Such institutions levels have indispensable role of addressing one of special space policy issues in developing and providing competitive human resource.

Apart from incorporating space science and technology in the curricula of primary and secondary education as well as raising awareness of students, the institutions are responsible to play their part in motivating and inspiring the new generation to science and technology.

Similarly, the institutions monitor delivery of need based academic programs in the sector and evaluate higher education institutions in the development of skilful competent professionals.

8.2. Continuous re-alignment of the Sector with national development programs

Given the cross-sectorial nature of space science, space technology and their application, the government will make sure proper re-alignment of the sector is created, continuously monitored and implementation of the following:

A. Platforms for consultative meetings and other joint programs will be used to ensure continuous alignment of actors of the sector.

B. Develop and use monitoring and evaluation mechanisms for the implementation of the policy and use programmes for joint evaluation.

C. The different government ministries, commissions, agencies, universities, research institutes will integrate plans on similar projects, freely exchange information on their space science and space technology related programs to mobilize resources, synergize their efforts and to align with the national development agendas.

8.3. Monitoring and evaluation

It is essential to put in place mechanisms to ensure that the development and implementation of the national space policy, as well as plans and programs are well coordinated. In order to realize good progress towards the accomplishment of its mission and achievement of its vision the institute will provide the institutional framework for designing mechanisms to ensure that implementation of the policy is on track, and that it is regularly monitored and evaluated.

The mechanisms include the following:

- Leading and coordinating the implementation of the space policy, strategies, roadmap plans, projects, programs and initiatives;
- Setting and executing a joint plan and agenda for regular stakeholder meetings for monitoring & evaluation of the implementation of the strategy and to carry out any required modifications. The institute will ensure optimized use of resources, including research project funds and synergized approach with related projects through centralized and joint planning arrangements and verify the implementation of such in the monitoring and evaluation of projects.
- Establish performance indicators and targets to measure effectiveness.
- Setting standards to ensure effective project management and accountability for national and sector specific programs and projects.
- Continuously assess global trends and review policy performances.
- Revise this policy as deemed necessary.

9. Conclusions and the way forward

This policy identified challenges that have been faced by the Ethiopian space sector and designed policy issues and directions together with their respective goals, objectives and strategies. The critical policy issues are grouped under three layers based on their purpose and level of importance. The policy also addresses the use of space for national security and defense. With a long term vision for achieving home based competence in space science and technology the policy is expected to transform the sector to a level where it can respond to national demands. It also emphasises the vitality and importance to allocate sufficient resources in particular, at the initial stage of development and to provide incentive schemes to encourage private sector participation.

For effective implementation of space policy the government is committed to design policy implementation tools such as: a space science and space technology roadmap, detailed strategies and action programs, implementation framework, legislative tools including regulations, directives and guidelines. The policy is believed to speed-up development of the space program, expedite effective use of resources and all opportunities locally and in the global arena. It serves to effectively coordinate and regulate all actors of the sector by providing inviolable directions, norms and principles of behaviour in all space related activities.