

# Opportunities and Challenges of Geospatial (Geomatics/Surveying) Education in Nepal

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**Key words:** Geospatial, Surveying, Education, Opportunities, Challenges

## ABSTRACT:

As a history of surveying education in Nepal, the formal surveying training education started from survey training center since 1968. The school of Geomatics (SOG), established in 1999 and it started in Diploma in Survey Engineering from 2001. The Himalayan College of Geomatic Engineering and Land Resource Management (GIT), established in 2004 and it started Bachelor of Geomatic Engineering from 2005 affiliated with Purbanchal University. Kathmandu University and Land Management Training Center (LMTC) jointly started BE in Geomatics Engineering from 2007 and Tribhuvan University (TU), Institute of Engineering (IOE), Western Regional Campus (WRC), Pokhara started of BE in Geomatics Engineering from 2012. Kathmandu Forestry College (KAFCOL) started MSc in GIS course affiliated with University of Salzburg, Austria from 2012 and Kathmandu University and LMTC jointly started Master in Land Administration Course from 2013.

Geospatial/Geomatics education is fast growing discipline education which integrates acquiring, storing, modeling, analysis, retrieving, transforming, displaying and management of spatially data from different sources of airborne and satellite based spatial data. The courses of Geomatics education are Computer Science, Cartography, Topography, Astronomy, Geodesy, Photogrammetry, Remote Sensing, Global Positioning System (GPS), and Geographical Information System (GIS) etc. Geomatics education is the most technological education in surveying and mapping field. In recent year Global Navigation Satellite System (GNSS) widely used in monitoring the earth surface like as tectonic plate as an earthquake purpose, control point monitoring as a mapping and surveying purpose. After Gorkha earthquake 2015, Global Positioning System (GPS) is the continue observation for monitoring the earth surface as a shifted of earth surface. So, Geomatics education is highly demanded in the Nepal as well as in world.

At the starting time, surveying education as a training course, when colleges and universities are established then Geospatial education is started as an academic course. The main objectives of this courses are to produce the qualified academic manpower in Geomatic engineering field; to phase-out the training manpower replace from academic manpower; to production the competent professionals in the field of surveying and mapping; and to conduction and promotion of skill, knowledge, research and development activities in the field of Geomatics engineering. This education has a broad range of employment opportunities as well as offering challenging research, innovation and technical problems in a vast range of Geomatics engineering.

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## **1. INTRODUCTION**

Geospatial education is fast growing discipline education which integrates acquiring, storing, modeling, analysis, retrieving, transforming, displaying and management of spatially data from different sources of airborne and satellite based spatial data. The courses of geospatial education are Computer Science, Cartography, Topography, Astronomy, Geodesy, Photogrammetry, Remote Sensing, Global Positioning System (GPS), and Geographical Information System (GIS) etc.

During initial phase, surveying education was just a training course, when colleges and universities are established then Geospatial education was started as an academic course. The main objectives of this course are to produce the qualified academic manpower in Geomatic engineering field; to phase-out the training manpower and replace with academic manpower; to produce the competent professionals in the field of surveying and mapping; and to conduct and promote the skill, knowledge, research and development activities in the field of Geomatics engineering. This education has a broad range of employment opportunities as well as offering challenging research, innovation and technical problems in a vast range of Geomatics engineering.

## **2. GEOSPATIAL (GEOMATICS/SURVEYING) EDUCATION IN NEPAL**

As a history of Geomatics education in Nepal, the formal surveying education started from survey training center from 1968. The school of Geomatics (SOG), Kathmandu was established in 1999 and it started in Diploma in Survey Engineering from 2001. The Himalayan College of Geomatic Engineering and Land Resource Management (GIT), Kathmandu was established in 2004 and it started Bachelor of Geomatic Engineering from 2005 affiliated with Purbanchal University, Biratnagar, Nepal. Kathmandu University and Land Management Training Center (LMTC) jointly started BE in Geomatics Engineering from 2007 and Tribhuvan University (TU), Institute of Engineering (IOE), Western Regional Campus (WRC), Pokhara started of BE in Geomatics Engineering from 2012. Master of Science (Geographic Information Science & Systems – MSc (GIS) course started in Kathmandu Forestry College (KAFCOL) affiliated with University of Salzburg, Austria from 2012 and Master in Land Administration Course started of Kathmandu University from 2013.

### **2.1 Government of Nepal, Land Management Training Center (LMTC), 1968**

Land Management Training Centre (LMTC) is located in Bakhundol, Dhulikhel Municipality of Kavrepalanchok district at about 30 kilometers east of Kathmandu. Its longitude and latitude are respectively 85020'11" E and 27042'59"N. The total area of the LMTC is about 2.9 Hectare. LMTC under the Ministry of Land Reform and Management, is the only governmental institution which has been continually and significantly contributing for production of human resource and

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conduction of research activities in the field of geo-information science since its establishments in 1968 AD.

LMTC has been conducting long-term training programmes which are senior survey training, junior survey training and Basic Survey Training. Since 2007 AD, the centre has launched academic course Geomatics Engineering in collaboration with Kathmandu University (K.U.). Moreover, the centre has been running short term flexible professional courses in GIS/LIS, Remote Sensing, Land Administration and many more as per governmental needs.

The centre has already trained more than 5000 survey technicians at different levels through various types of training programmes in Surveying and Mapping, Land Administration and various digital mapping technologies. The technology used to train up the center is very modern.

## **2.2 Council for Technical Education and Vocational Training (CTEVT), School of Geomatics (SOG), 2001**

Bhusuchana Prabidhi Adyayan Pratisthan popularly known as School of Geomatics (SOG) was established in 1999 and it started Diploma in Survey (Geomatics) Engineering from 2001. The courses SOG currently imparts are mainly affiliated with Council for Technical Education and Vocational Training (CTEVT). Since the establishment, SOG has been focusing only on developing human resource in Geomatics engineering at Diploma and TSLC levels.

The main moto for SOG is as “A Pioneer Institute of Surveying and Geo-information in Nepal”. Qualified and skilled human resource in the field of surveying, mapping and land resource management collectively referred as Geomatics is an ever-growing need in Nepal.

## **2.3 Purbanchal University, Himalayan College of Geomatic Engineering and Land Resource Management (GIT)**

Himalayan College of Geomatic Engineering and Land Resource Management was established in 2004. In respect of this need of quality higher education institutions in the country, Himalayan College of Geomatic Engineering and Land Resource Management has been running its Bachelor in Geomatics Engineering since 2005. At the same time, the institute is planning to start Master Level of Geomatic Engineering in the near future.

Engineering is regarded as one of the core inputs of overall development and prosperity of every society worldwide. It is also a proven fact that only the conventional education may not be enough in the context of fast dynamic and highly innovative global environment.

It envisions delivering the best available engineering and technical education and all round opportunities to its entire student, often the best in the country, as they aspire to realize their personal talents and to expand their abilities. This leading academic institution sees to it as its responsibility to equip its students with an education relevant to their society and to their time - the 21st century.

## **2.4 Kathmandu University, Department of Civil and Geomatics Engineering**

Kathmandu University, School of Engineering, Department of Civil and Geomatics Engineering and Land Management Training Center (LMTC), is jointly offering Bachelor of Geomatics Engineering from 2007 and Master in Land Administration from 2013.

The Geomatics Engineering program emphasizes the use of new technology for data collection, including electronic equipment for measuring, earth circling satellites for positioning, and computers for processing data and generating planning that can be used in a wide variety of professional disciplines. Geomatic engineering is fast growing discipline. The speed of development in the field is same as of Information Technology.

Geomatics Engineers apply engineering principles to spatial information and implement relational data structures involving measurement sciences, thus using Geomatics as Spatial Engineers. Geomatics engineers manage local, regional and global spatial data for infrastructure development.

Based on the scientific framework of geodesy, it uses terrestrial, marine, airborne, and satellite-based sensors to acquire spatial and other data. Prior to mid-90's, this program was known as "Surveying Technology". "Geomatics" is a term that is currently used by educational institutions, governments and private industry. "Geomatics Engineering is the field of activity that integrates the acquisition, processing, analysis, display and management of spatial information.

## **2.5 Tribhuban University, Institute of Engineering, Pashchimanchal Campus (WRC), 2012**

The Pashchimanchal campus, formerly also known as Western Region Campus (WRC), founded in 2038 BS as constituent campus of institute of engineering under Tribhuban University is located at northern part of gorgeous city Pokhara. Committed for development of highly skilled engineering manpower in various disciplines are offering six Bachelor level engineering programs (Civil, Electronics and communication, Electrical, Mechanical, Computer and Geomatics engineering) and are planning to run master level program in near future.

Pashchimanchal campus envisioned to become a premier engineering educational institution with global standards and becoming the center of excellence in Geomatics engineering which can be achieved only on background mission of quality engineering education, professionalism and research works in relevant engineering fields. Paschimanchal Campus is one of the pioneering and very few educational institutions in Nepal offering Bachelor of Geomatics Engineering from 2012.

## **2.6 Kathmandu Forestry College (KAFCOL)**

Kathmandu Forestry College (KAFCOL) was established in 2005 by the Nepal Agroforestry Foundation and a group of like-minded professionals and academicians deeply committed to the cause of promoting quality education and research in the fields of Forestry and Natural Resource Management in Nepal. KAFCOL has been steadily growing over the years. Currently, it runs three academic programs: (i) B.Sc. Forestry in affiliation with the Tribhuban University, Nepal, (ii) Diploma in Forestry in affiliation with the Council for Technical Education and Vocational

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Training (CTEVT), and (iii) M.Sc. in Geographical Information Science and Systems (GIS) in collaboration with the University of Salzburg, Austria from 2012. This programme has been authorized by the Ministry of Education, Government of Nepal.

## **2.7 Council for Technical Education and Vocational Training (CTEVT) affiliated to Technical School Leaving Certificate (TSLC) College**

The total 28 Technical School Leaving Certificate (TSLC) Geomatics (Basic Surveying) college affiliated with CTEVT. The each of the TSLC college name listed as below;

- White Park College, Amargadhi, Dadeldhura
- Kailali Polytechnical Institute, Dhangadi, Kailali
- S. K. Institute of Technology, Mahendranagar-18, Kanchanpur
- College of Allied Technical Science, Nepalgunj-17, Banke
- Nepalgunj Technical Institute, Nepalgunj, Banke
- Image Engineering College, Ghorahi-11, Dang
- Rapti Engineering College, Ghorahi-1, Dang
- Deuti Engineering College Pvt. Ltd. Birendranagar-5, Chisapani, Surkhet
- Shree Birendranagar Technical Institute, Birendranagar-6, Surkhet
- Surkhet Technical School Pvt. Ltd. Birendranagar-6, Surkhet
- Palpa Engineering College, Tansen-8, Palpa
- Kapilbastu Technical Institute, Bana Ganga, Pipra, Kapilbastu, Rupandehi
- Lumbini Technical Institute, Butwal-11, Rupandehi
- National College of Technical Science, Bharatpur-10, Chitwan
- Yati Technical Education and Multiple College, Laxmi Bazar, Gorkha
- School of Geomatics, MidBaneshwor-10, Kathmandu
- Milestone College of Science and Technology, Balkumari, Lalitpur
- Iceland Multi Academy Center, Charikot, Dolkha
- Nepal Technical Institute Pvt. Ltd. Ramanda Chowk, Janakpur, Dhanusha
- Shankar Technical Health Training Center, Janakpur, Dhanusha
- Institute of Technical Education, Rautahat, Gaur-5, Rautahat
- Chhinnamasta Institute of Technology, Bisanpur, Rajbiraj, Saptari
- Everest Technical Institute, Rajbiraj-9, Saptari
- Bangalamukhi Multiple Technical Institute, Ithari, Sunsari
- Horizon Engineering College, Itahari-1, Sunsari
- Purbanchal Bahu Prabidhik Talim Kendra, Dharan, Sunsari
- Triveni Technical Academy, Itahari-4, Sunsari
- Pathibhara School of Engineering and Technology Pvt. Ltd. Mechinagar-2, Jhapa

## **3. OBJECTIVES OF GEOMATICS EDUCATION**

Geomatics education and training programs appears under the Geomatics field of study. The main objectives of Geomatics education as listed below;

- To significantly contribute to institutionalize Geomatics Engineering Education.
- To develop mid-level professionals in Surveying/Geomatics with adequate knowledge and skills also in social and human sciences that is necessary to deal with issues related to land-

man relation such as Land Reform and Management, Hydropower, Irrigation, Road, Building Construction, Aviation, Land Resource Planning and Mapping, GIS/LIS, Cadastral Mapping and Land Development Planning.

- To impart need based training on the latest technologies in the field of Surveying, Mapping, Geo-information and Space-tech Applications.
- To produce high level competent manpower in Geomatics Engineering.
- To provide consultancy and other technical services to the local government bodies, business community, private enterprises, NGOs, INGOs etc. on demand.
- To conduct academic and applied research studies, surveys, conferences and seminars in the issues of national and international interests.
- To expand necessary infrastructure as per the demand of the time and growing technology to provide the quality education required for the overall development of its students.
- To design awareness, appraisal, operational and professional level and make available for decision makers, technicians, and discipline specialists.

#### **4. GEOMATICS EDUCATION APPLICATIONS**

Nepal has limited work on the Geospatial (Global Navigation Satellite System). The following area need the precise location of primary data.

- Military
- Search and rescue
- Surveying and mapping
- Tourism
- Forestry
- Satellite positioning and tracking
- Geographic Information System (GIS) and Remote Sensing (RS)
- Recreation etc.

#### **5. EMPLOYMENT OPPORTUNITIES OF GEOMATICS EDUCATION**

The employment opportunity of Geomatics education in Nepal are as listed below. It includes,

- Government of Nepal
- Survey Department
- Department of Mines and Geology
- Road Construction
- Forest Department
- Aviation Department
- Land Reform and Administration
- Nepal Electricity Authority (NEA)
- Nepal Army
- Nepal Police
- Armed Police Force (APF)
- Hydro Power Sector
- Engineering Consultancy
- Construction Company

- Urban Planners
- NGO's/INGO's
- Highly possibilities to migrate in the developed countries like USA, Canada and Australia etc.

## 6. CHALLENGES OF GEOMATICS EDUCATION

Geomatics education is the invariably considered as part of civil engineering in context of Nepal. Most of the survey works are undertaken by civil engineer and overseer instead of qualified geomatic engineer in Nepal. It is one of the big challenges in Nepal for fostering geomatics engineering education and field. Lack of facility, unavailability of qualified teacher remains another burden in this aspect. Expenses for buying surveying equipment, goods and software are highly expensive. And thus, fund for those expenses are not readily available which is yet another huge hurdle in developing geospatial engineering in Nepal.

## 7. CONCLUSION

Geomatics education is the most technological education in surveying and mapping field. In recent year Global Navigation Satellite System (GNSS) widely used in monitoring the earth surface like as tectonic plate as an earthquake purpose, control point monitoring as a mapping and surveying purpose. After Gorkha earthquake 2015, Global Positioning System (GPS) is the continue observation for monitoring of the earth surface as a sifted of earth surface. So, Geomatics education is highly demanded in the Nepal as well as world.

## 8. RECOMMENDATION

Capacity building is one of the weakest components in the development and adjustment of GNSS technology in Nepal in GPS data processing and network adjustment. University level focus on research, seminars and workshop related to geospatial education. Geomatics topics should be introduced to student thesis and projects. Data capturing as well as data processing also required for academic and training institute should survey camps which is required for students.

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## **10. BIOGRAPHICAL NOTES**

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