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ELECTION COMMISSION, NEPAL

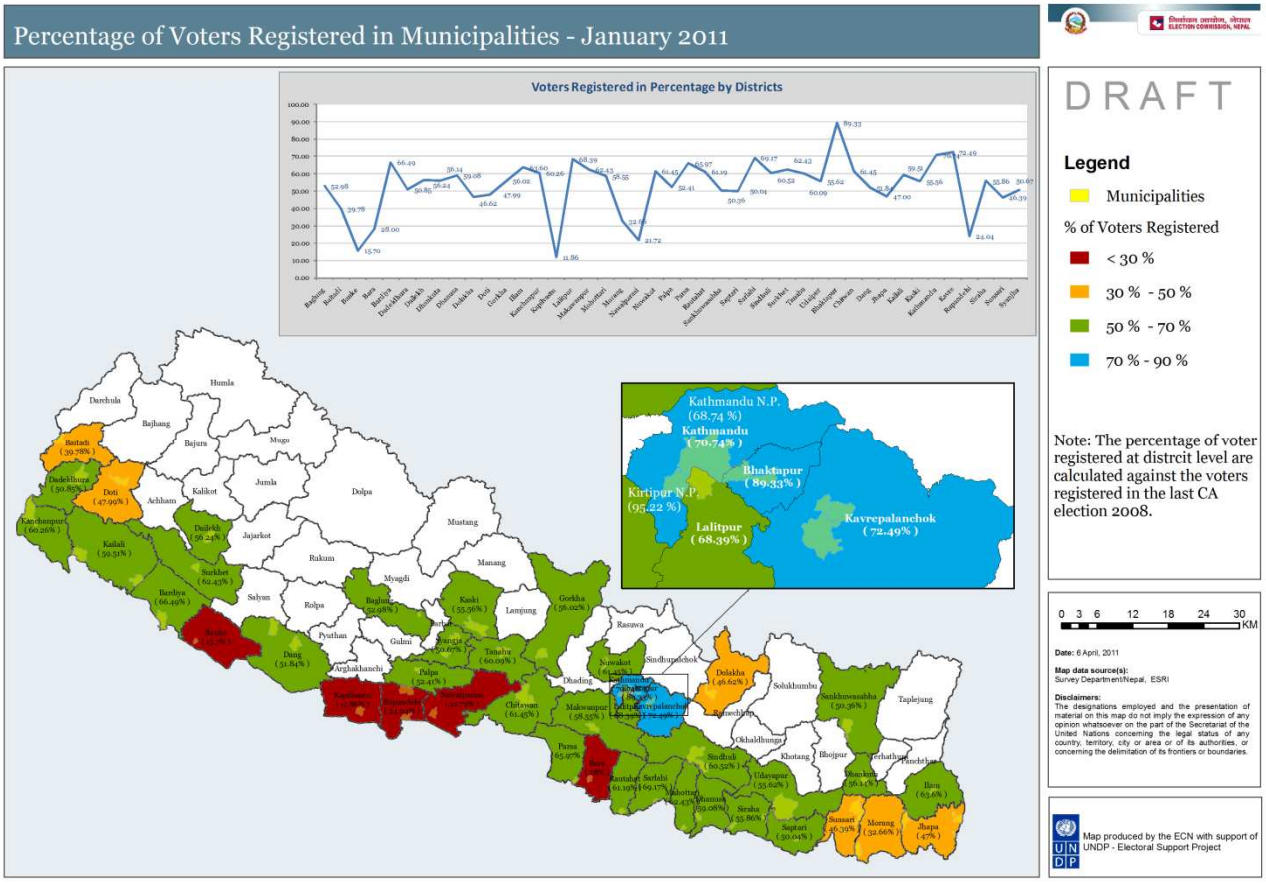
Electoral Support Project (ESP)

UNDP Nepal

Concept Paper

Establishment of Geographic Information System (GIS) within Election Commission of Nepal

February 2010



The purpose of this paper is to put forward an approach how to develop a GIS-based electoral mapping system for the Election Commission of Nepal. This paper begins with a general background, the need to adopt an analytical and decision making tool to manage the whole electoral cycle and how Geospatial technologies namely Geographic Information System (GIS) and Global Positioning System (GPS) can play a significant role in the planning and execution of the elections in Nepal.

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Project Activity's Objective

The broader objective is to establish an operational GIS unit within ECN that is well equipped with essential hardware, software, datasets and technical staff. The in-house GIS facilities will develop digital mapping of the country including all administrative and electoral boundaries with population and voting statistics. Each voter will be linked to a geographic unit such as ward, Polling Location, and/or settlement.

Background

The Election commission of Nepal (ECN) has the constitutionally mandated responsibility for the preparation, administration and supervision of the Constituent Assembly (CA) election in a free and fair atmosphere. The functional responsibilities of ECN are to conduct, supervise, direct and control the election to the constituent assembly, referendum and local elections and as well as prepare electoral rolls (Voter Registry). There are 9,821 polling locations and 20,888 polling centers within nearly 100,000 settlements in 3,915 Village Development Committees (VDC) and 58 municipalities in 240 constituencies in 75 districts across the country, with a 17.6 million registered voters. ECN maintains a District Election Office in each district.

Much of the election planning and decision making requires spatial data i.e. location of the polling stations, constituency's geographic details and voter demographics. In order to conduct the election, it is important to know the voter statistics, electoral boundaries and geographic details. This basic information is fundamental for providing relevant, authentic and interpretable information in a time and cost effective manner. Most of this information exists, but is not readily available in a usable form during the execution and planning of election related activities. To date much of the activities has been carried out in a traditional system of record keeping in the form of tables.

Recognizing that spatial information supports strategic and operational decisions and provides a basis for the overall electoral management process, ECN in its strategic plan envisioned the adaptation of GIS[1] based on ECN's needs and environment. The International Foundation for Electoral Systems (IFES) Voter Registration Assessment in Nepal indicated a need to create a government-wide GIS to allocate every voter with a Geographical Code that locates the person geographically in order to allocate and in the future re-allocate them to polling centres. In the last few years, Election management bodies in developing countries moved from a conventional approach to modern information technologies based approaches in the overall electoral management process. Modern electoral mapping systems based on the "Geographic Information System" (GIS) technology are increasingly used by electoral management bodies across the world to support a wide number of functions that they are mandated to perform throughout the electoral cycle.

ECN has successfully introduced computer technology and developed an electronic voter list back in the late 1980s. A GIS-based electoral mapping could meaningfully contribute to the administration, planning, execution and monitoring of the electoral process throughout the electoral cycle. A GIS can provide logical and effective solutions for managing several Elections related tasks such as setting up polling stations, allocating and deploying staff, managing the logistics of holding the election, and supplying information to voters both before and after the election. More specifically, GIS technology

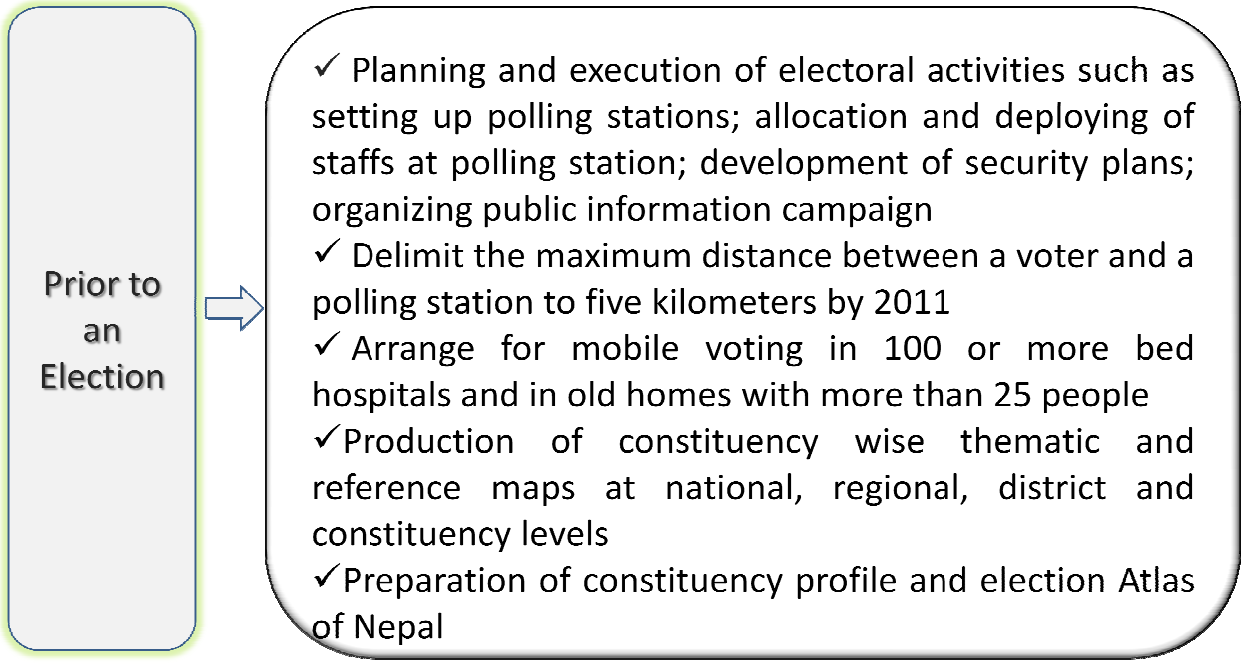
[1] A GIS is a computerised system (software package) that can be used to capture, store, retrieve, manipulate, analyse, and display spatially-referenced data. It presents information in form of maps, charts, animation, simulation; and provides a spatial framework to help and assist in decision making process for the management

can help ECN in the delimitation of electoral boundaries, placement of Polling Centers, qualitative comparison of voter and map production. It helps in spatial data development of polling locations and constituencies and as well as in the creation of hardcopy and online maps (Internet GIS), election statistics, tables, charts and reports of electoral constituencies including multiple socio-economical, demographic and ecological variables for electoral activities, for interpretation and analysis of results and for forecasting.

Role of GIS in Electoral Management

GIS tools can provide basic information products and custom-made maps during the planning and execution process of elections based on various factors and criteria spelt out by the ECN for smooth conduct of the elections. The various scenarios generated using GIS maps guide ECN in the decision making and scheduling of elections by choosing the best scenario. In view of a new federal structure in the future, ECN may use GIS in a more scientific delineation of constituencies based on population, natural resources and terrain.

A wide variety of reference and thematic maps can be generated using GIS based on the commission's needs and requirements. Constituency-wise maps, showing administrative/constituency boundary, VDC/Ward, Polling stations, airstrip/airfield, Schools, Hospitals and voter statistics etc., can be prepared. A GIS helps in building seamless spatial data for the entire country in support of the Elections by developing an accurate, up-to-date centralised spatial database repository that contains voters demographics including 'Geocoding' Voters' addresses. Thus, potential application for GIS in the electoral process throughout the election cycle includes the following:



Prior to an Election

✓Conduct a feasibility study on pre-voting and absentee voting

✓In view of new federal structure in future, GIS can be applied in more scientific delineation of constituencies based on population, natural resources and terrain

✓ Election risk and vulnerability analysis mapping

✓ Development of Internet-based Online Election website that allows registered voter to access information such as their assigned district, polling location and election results 24 hours a day

✓ Building an accurate, up-to-date centralised spatial database repository that contains voters demographics including 'Geocoding' Voters' addresses

During and After the Election

✓Announcement of Election results

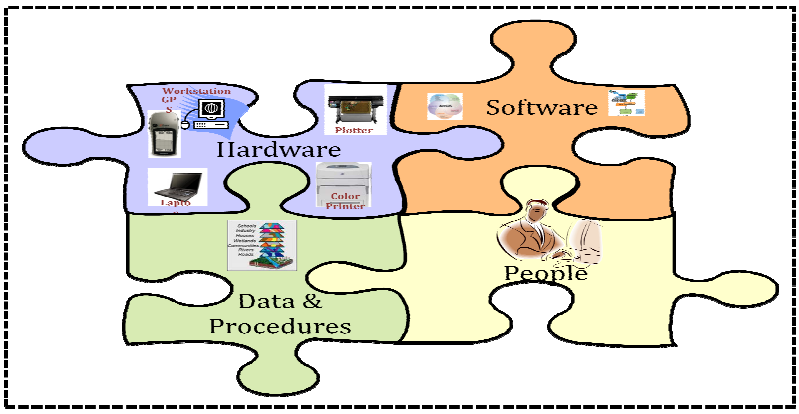
✓can be used to track voter turnout and voting patterns by analyzing election results from the data collected at polling places

- Preparation of map based on voter turnout, voting patterns and trends and election results
- Analysis of election results as district, regional and country level by Gender, political parties, age etc.

✓ can be applied to redefine poling stations based on important lessons earned through the conduct of the election.

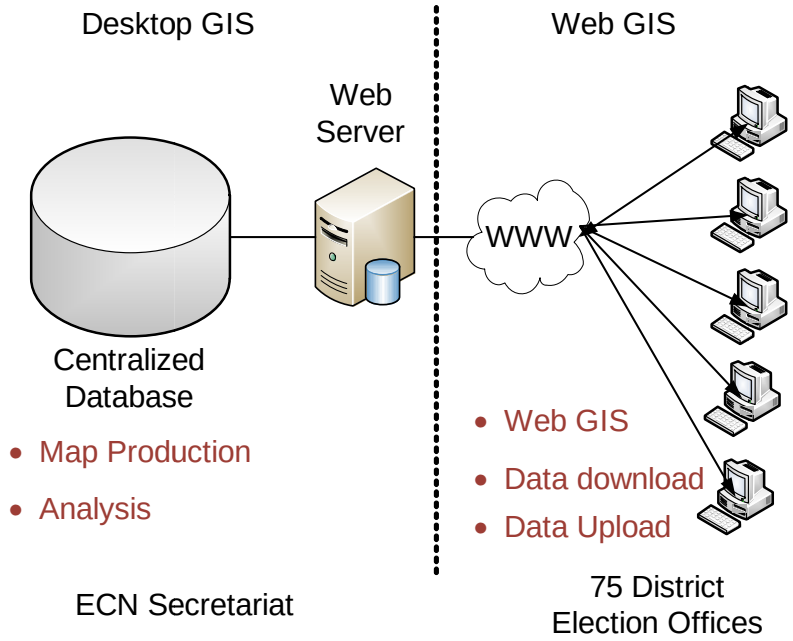
Components of a GIS

There are four components in any GIS as shown in the figure below. These are: (1) GIS Hardware (2) GIS Software (3) Data & Procedures (4) People. These components are building blocks of any GIS establishment. The list of hardware, software and datasets needed to establish GIS is available in Annex 1.



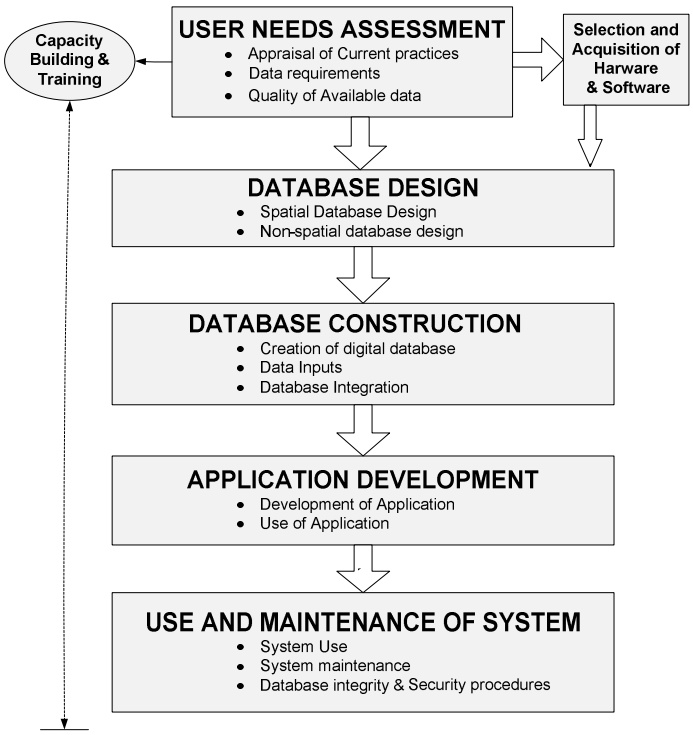
Implementation Approach

The ECN wishes to develop nation wide GIS system that can link its district election offices, voters and other stakeholders. It would be better to adopt a two phase approach in the implementation of GIS as shown in the figure below. In the first phase, Desktop GIS may be established in the ECN secretariat where map productions, analysis and visualization of electoral information can be performed. GIS applications in the second phase can be made ”Online” or “live”. This can be achieved by extending the centralized database by using a Web Server and combination of ArcSDE and ArcIMS software packages. The objective of deploying Web GIS is to provide ECN district offices, voter and other stakeholders with the ability to quickly and easily display, query, locate, and generate output information stored in the ECN centralized GIS database repository.



Key Steps in developing GIS

Development of successful GIS requires completion of all the steps illustrated in the figure below, approximately in the sequence as indicated.



Key Factors for a successful implementation of a GIS

A number of GIS initiatives in Nepal are operational and expanding day by day as more and more actors are realizing its value in development and humanitarian support during crisis. Government agencies are the major users of GIS technology. The Survey department has successfully piloted a concept of national spatial data infrastructure and operationalised a national platform to facilitate the sharing of geographic and related data. A brief review of existing GIS activities in Nepal is briefly summarized in Annex 2.

The development of a GIS database and applications shall proceed incrementally and gradually build up skills of ECN staff through a combination of professional training and learning by doing approaches. In order to build the long-term sustainability of the GIS project, there is a need to involve the end users in the design and development process. This would be helpful in order to develop a commitment to and participation in the implementation of system at all levels of the organization. Some of the key factors that form the building blocks for the development of a successful GIS within ECN.

Data Availability and Access

The base GIS data is already available with several government line agencies, the additional information that ECN requires is updated voter list and locations of polling centers across the country. The issues related to data up-to-dateness, availability and access are central to the successful implementation of the GIS. A successful approach shall be based on (a) building on existing information and updating it (b) Exploring the use of Remote Sensing and Global Positing

System for Data collection; and (c) considering data acquisition and database creation as a long-term process that require adequate on-going resources and continuity

Annex 3 provides a list of readily available essential datasets that are urgently needed to start up GIS activities in ECN.

Capacity Building and Training

The introduction of a GIS in an organization requires a pool of computer literate staff. This should be done by providing existing staff of ECN with appropriate training opportunities. This will include on-the-job training (learning by doing) for the ECN Staff, which is essential to provide a clear understanding of the different stages of GIS processes. The training programme shall be organized for general training for all relevant officials (end users) and specialized training for full-time users (Engineers/Operators) of ECN. Annex 4 provides details of capacity building and training programme.

Human Resources

With the establishment of a GIS unit within the IT section of ECN, staff selection and availability for training and implementation, sustainability of the system can be highly critical issues. The availability of appropriately qualified staff within ECN for GIS training and to support the GIS installation on ongoing basis is another important issue. Consideration must be given to how to retain staff trained in GIS to stay with ECN for long-term support.

At a minimum, the GIS unit necessitates the creation of three new positions in the existing ECN organization structure so as to provide a foundation for future development and long-term operational management of an integrated GIS system. ECN may either choose appropriate staff from civil services or hire new staff from outside. Additional technical staff may be needed depending on the workload and skills of the above. Despite training of ECN staff, ECN would still require constant technical assistance and support from IT professionals (GIS Experts, Programmers, Database and Network Administrator), at least during the first few years of operation. The proposed three positions are:

1. GIS Coordinator
2. GIS Assistant/Cartographer
3. Database Assistant

Electoral Management Information System (EMIS) and GIS Integration

Experience everywhere demonstrates that unless GIS is fully integrated with the Management Information System (MIS) and MIS is fully integrated into the organizational functions and procedures of the organization, both are likely to ultimately fail. It is therefore proposed that the planned GIS systems shall be fully integrated into EMIS such that the GIS applications will reflect the actual situation at that particular point of time. The changes in the database shall be immediately incorporated /reflected in the GIS database and application.

GIS Technical Committee

The ECN may consider forming a GIS technical committee to provide general oversight and guidance of GIS activities within ECN. This committee may be formed under chairmanship of joint secretary. Other members of the committee may include chief of IT section/ECN and representatives from ECN

strategic partners, HLCIT, NID, MoH, Survey Department and CBS. Ideally, membership of the committee should also include technical staff from IT section and Election Section of ECN.

GIS Sustainable Strategy

To ensure successful and sustainable in-house GIS facilities within ECN that support the overall electoral management cycle, the implementation strategy will build upon four main areas: 1) Organizational setup – recruitment of proposed three new positions 2) Provision of training and awareness programmes for election management professionals. 3) Networking of Election GIS users globally to facilitate the exchange of ideas, mutual support and technology transfer. 4) Securing financial and technical support from government, donors and electoral partners for essential hardware, software and application developments.

Expected Outputs

The GIS will assist in

- Development of a system for polling location at district level
- The spatial data development for constituencies
- Development of Internet-based Online Election website
- Map production and other information products and services
    - **Poster-size constituencies maps/profiles** – 240 Nos. (Showing constituency boundary, VDC/Ward, Polling stations, airstrip/airfield, Schools, Hospitals and voter statistics etc.)
    - **Other value added products** –3d Visualization, animation, simulation and thematic Maps such as Historical Election Maps, Elections Security, Logistic Management/Flow/Transportation, Voter Education, Election Campaign, Staff Deployment

The system will perform the following tasks related to election management:

b) Clear demarcation of all administrative boundaries (districts, VDCs, Wards, Settlements) and electoral boundaries (constituencies)

c) Clear demarcation of all voter areas. Demarcation of the voter area/constituencies can be marked with precision within the District/VDC/villages. It can be clearly seen which constituency spans multiple villages/unions or which area falls within a particular voter area. Unions that span multiple voter areas can also be clearly marked and adjusted.

d) The system will report the location of all polling locations/centers. Location of all polling centers and their density can be graphically mapped with the GIS along with all administrative details such as VDC office, schools, colleges, hospitals etc.

e) During election logistical management and air operations in the remote areas, the system will provide accurate latitude, longitude and elevation details of polling locations.

f) The system will generate statistic reports on population or voter density based on each constituency or polling location/centers. When demographic data like population density are stored in the GIS system, statistics such as number of voters in each constituency or the number of voter allocated for each polling location/center can be found easily.

g) The system will report statistics on the effect of changes of demarcation for constituencies. It can be found out immediately what the effect of changing borders or demarcations of the constituencies will have on the population or number of voters.

h) The system will report statistics on the effect of adding or removing or reallocating constituencies. It can be found out immediately what effect adding or removing a constituency will have on the voting system. Furthermore it can be experimented how relocating constituencies can harmonize the voter density of each constituency.

i) The system will calculate and generate average number of voters on each polling center and their effect if location is changed. Using demographics data and statistics it can find out how many voters are allocated for a particular polling center and any effect if their location is changed.

j) During the voter registration process, the GIS will provide a bigger picture of the whole registration process by showing the areas where registration is ongoing or completed. The Voter Registration with Photograph Project may use GIS based visual reporting system to track registration trends and patterns across the country, as the project is planned to rolled out in phase wise across Himalayan districts, municipalities and remaining districts . The GIS system will show registration status (ongoing, completed, not yet started) by districts and regions and as well as by constituency. The system will also be able to drill down within district and into constituencies.

In the long-run, in-house GIS facilities will help in building a national GIS to exchange, organize, store, retrieve and make available data and maps, information and expertise across district election offices and other government line agencies.

Development of a system for polling location at district level in GIS

In line with ECN's five year strategic plan implementation schedule regarding work activity "development of a system for polling location at district level in Geographic Information System (GIS)", the aim of a system is to create spatial database of polling location at district level by mapping of 9,824 polling locations spread across Nepal with aid of Global Positioning System (GPS) device. Each polling location will be surveyed and its latitude, longitude, and height will be captured using GPS. The specific objective of this activity is to collect geographic coordinates of polling locations in all 75 districts.

During CA Election 2008, the Election Commission of Nepal (ECN) has compiled Polling Centre Master List (PCML). The list has been created mainly to prepare a database of polling locations spread across Nepal. It includes constituency geographic details (Zone, District, Constituency Number, VDC/Municipality), Number of Voters, polling locations' detailed information such as it's name, physical status, accessibility, type of building, number of polling centers, provision for electricity, water supply and telephone etc. However, PCML currently lacks spatial information (latitude, longitude, height) of each polling location. The incorporation of location information in PCML will give the knowledge of where polling locations are, what is the distance between polling location and district headquarters or near by village/settlements, how they can be reached by means of roads or other transport means, and what things are adjacent and near by. Therefore, the spatial data development of polling location will assist in the streamlining a wide variety of important tasks

such as the management of polling locations, setting/relocating up poling locations/centers and allocating and deploying the staff during the elections.

Implementation Plan Activities

- Preparation of Polling Location Mapping Survey Questionnaire
- Master Training of Trainer (MTOT) Programme at Central Level
- Regional Level Training Programme
- Field Operations, Supervision and Monitoring
- Publication of Survey Report

Outputs

- A training manual on operation of GPS devices and baseline data collection of polling location
- Master Training of Trainers (MTOT) will be developed in Polling Location Mapping Survey in central and regional level
- Geo-database of polling locations by district consisting of spatial location of polling location, administrative and electoral boundaries with population and voting statistics
- Constituency wise maps in hardcopy and in CD format

Summary

The adaptation of a GIS based electoral mapping system is a step forward in fulfilling one of the objectives of reforms in management as envisioned in ECN's strategic plan. The system will have a significant impact on the commission's ability to perform qualitative analysis of voter information. The system will also enhance the commission's ability to perform geographic analysis of voter and constituency data as is required for boundary delimitation and polling center placement.

Indicative Budget

The proposed Implementation plan requires investment for essential hardware and software, training and field deployment. The table below provides preliminary budget

Expenditure Category	Estimated Cost in US $	Status
1. Procurement of Hardware, Software and Datasets	**130,000**	
i. Procurement of computer workstations (2 Sets) and GPS (73 Units)	37,799	Procured through UNDP/ESP
ii. Procurement of Plotter and color printer, GPS (7 units), ink cartridges and consumables	30,201	Procured through UNDP/ESP
iii. Procurement of Software (a)Desktop GIS - ArcView 9.3 Software – 2 licenses (b)Web GIS – ArcSDE and ArcIMS – 1 license	50,000	GIS Software - 1 License only procured through UNDP/ESP
iv. Baseline Datasets (Administrative Boundary, Settlement, Contour, Roads and Rivers)	12,000	Procured through UNDP/ESP
2. GIS Training to ECN Technical Staff	**20,000**	
3. Development of a system for polling location at district level in GIS	**115,000**	
i. Preparation and finalization of baseline-survey questionnaire and training manual	1,000	
ii. Conduct Training programme at central and regional level	12,000	
iii. Field operations for data collection (polling location and settlements) through DEO - 75 districts	100,000	
iv. Field visits from central and regional level staff to facilitate and supervise the survey	2,000	
4. Staff Cost based on Government pay scale for three positions (GIS coordinator, GIS Assistant and Database Assistant for three years)	**22,060**	
5. Furniture (Map table, chairs, Map cabinet and map display stand)	**6,000**	
6. Plotter and printer ink, consumables and papers	**10,000**	
Total **(including 5% Miscellaneous expenses)**	**328,713**	

Implementation Plan - 2010

Tasks	**Q1**				**Q2**			**Q3**			**Q4**	
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Establishment of GIS unit												
Procurement of Hardware and Software	**x**	**x**	**x**	**x**								
Data			**x**	**x**								
Concept Paper		**x**	**x**									
Training												
GPS			**x**									
Basic GIS			**x**									
Data collection of polling station using GPS			**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**
Field Visits			**x**	**x**		**x**		**x**		**x**		**x**
Voter Registeration Pilot Project												
Geocoded Voter information					**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**
Map Production							**x**	**x**	**x**	**x**	**x**	**x**

Annex 1: List of Hardware, Software and Datasets

IT Hardware		**Unit**
Plotter		1
	HP DesignJet Z6100ps 42-inch	
Colour Printer		1
	HP Laserjet 5550dn (Q3715A) A3 Colour Laserjet Printer	
Computer Workstations – 2 Sets		2
Other Equipments		
GPS receivers		80
Consumables, paper, ink cartridges		
Software Licenses		
	Desktop GIS Suite	
	ArcGIS 9.3 Floating Licenses with required Extensions	2
	ArcSDE	1
	Web GIS	**1**
	ArcIMS	
	Other Softwares	**1**
	Google Earth Professional	
	ERDAs Imagine 9.2	
GIS Datasets		
Department of Survey Base Maps/ Digital Data for Whole Country		
	Administrative Area (Boundaries)	
	Transportation	
	Building and Settlement	
	Landcover	
	Hydrography	
	Topography	
	Utilities	
	Designated Area	

Plotter

A3 Color Printer

GPS Sets

Annex 2 – Existing GIS Activities in Nepal

Department/Projects	GIS Activities
Ministry of Industries - Department of Mines and Geology	Landslide, Geological and Environmental mapping. Geological maps of entire country at 1:50,000 scale, Engineering geological maps at 1:10,000 scale for several cities, a network of 21short period seismic stations capable for monitoring uniformly any Magnitude 2 Richter earthquake,
Department of land records and Mangement	Creation of database of Land parcels/cadasteral mapping
Department of Roads - Highway Management Information System (HMIS)	GIS - based Highway management Inforamtionn System
Nepal Toursim Board (Tourism for Rural Poverty Alleviation Program)	GIS mapping for tourism related activities and tourism potentails
National Planning Commission - GIS facility	GIS mapping for planning, poverty alleviation, service accessibility mapping
National Landuse Project - Ministery of Land Reform	Ccreation of databse for land use planning
Ministery of Agriculture/Department of Agriculture	GIS mapping for pllanning and management and crop sutability mapping
Department of Forest	Creation of databse for forest area change mapping
Ministery of Land Reform and Management - Department of Survey (National Geographic Information Infrastructure Project)	National topographic of Nepal at different scale. Mapping of the country at 1:25,000 and 1:50,000 scales, digital maps of VDCs, municipalities, aerial photographs at various scale, , real-time operation of continuous GPS stations, access to latest satellite mapping and interpretation capacity
Central Bureau of Statistics (CBS)	Generates timely and reliable socio-economic statistics mainly through the operation of censuses and surveys. National statistical organization for the collection, consolidation, processing, analysis, publication and dissemination of statistics
Ministry of Environment, Science and Technology - Department of Hydrology and meteorology	Countrywide hydro-meteorological stations, weather monitoring tracking, analysis, forecast, and dissemination of information for public use.
Ministry of Water Resources - Department of Water-Induced Disaster Prevention (DWIDP)	Capacities of research and river/hydraulic modeling, field-research stations for landslide/erosion studies, flood control researches and implementation of mitigation measures for floods and landslide/erosion
Ministry of Physical Planning and Works - Department of Urban development and Building Construction (DUDBC)	Prepared Digital Base Maps of Kathmandu Valley and Municipalities of Nepal, Building research, design of disaster-resistant construction, training directorate, curricula and training centers, training programs for engineers, architects and masons,
Ministry of Home Affairs - Disaster Management Department	Coordinate the activities relating to disaster preparedness, mitigation and reconstruction as well as rehabilitation with other disaster management related agencies. Data collection and dissemination, collection and distribution of funds and resources are also the vital functions of the Ministry
Ministry of Local Development and District Development Offices (DDC)	Focal points on DRM in each DDC, information management system networked with 75 districts, District periodic plans for several districts integrating disaster reduction concerns,
Kathmandu Metropilitian City	Maintain Muncipal level Geodatabase covering all the wards of Metropilitian
Ministry of Local Development/ UNDP/ Norway Embassy - Decentralised Local Governance Support Programme (DLGSP)	Supports the Ministry of Local Development (MLD), National Planning Commission (NPC) and District Development Committees (DDCs) to upgrade their Geographical Information System (GIS) facility. Spporting the DDCs in collecting, compiling and disseminating the socio-economic and bio-physical database of all 66 programme districts

Department/Projects	GIS Activities
ICIMOD	GIS mapping and mountain specific GIS application Developments
UN Organizations	GIS for refrence and thematic mapping of Nepal
Department of Wildlife and national Parks	GIS mapping for planning and management of national parks
Ministry of Local Development - Department of Local Infrastructure Development and District Agriculture Road (DoLIDAR)	Undertake infrastructure development programmes in accordance with decentralization policies. Working with IP, IRAP, DTMP for reproducing maps. Dolidar with suport from HELVETAS is developing DTMP in 57 Districts

Annex 3 - List of Essential Readily Available Datasets

Title		Source
National Data Sets		
Administrative Boundaries	International	**Survey Department**
	1st Administrative Level - Regional	
	2nd Administrative Level - Zonal	
	3rd Administrative Level - District	
	4th Administrative Level - VDC	
Transportation	Roads	
	Airfields	
	Ports	
	Railroads	
Building		
Landcover		
Hydrography	Major Rivers	
	Water Course	
Contour		
Designated Areas		
Utilities Lines		
Place Names	Geographic Names	
Population	Census 2001 and Household surveys	**CBS**
Place Codes	P_codes and National Standard Codes	**HLCIT**
Voter List, Constituencies details, Polling locations etc		**ECN**
Schools	Location of Schools	**MoE**
Health Post	Location of Health Posts	**MoH**

Annex 4: Capacity Building and Training Programme

The primarily objective of capacity building and the training programme is to provide the managerial and technical staff with the knowledge of the usefulness of GIS technology in addressing election planning and execution issues through Electoral Support Project to use Geographic Information System (GIS) in Electoral Mapping System. This is achieved by:

a. Introductory training on GIS for implementing Electoral Mapping System

b. Advance trainings on GIS for electoral planning, resource mobilization, voter's registration management, setting up of polling stations, human resources and security deployment planning, logistical and operational planning, dissemination of electoral results and other advanced applications.

In examining the people to be involved with GIS technologies, one needs to consider both technical and managerial staff. Appropriate training needs to be provided for both. In order to achieve this objective three types of training programmes may be undertaken

I. Awareness workshop on GIS and its applications for policy/decision makers
II. Training course for Engineers, and
III. Training course for GIS technicians / operators

Objectives: After the training, the participants will have knowledge on:

1. Fundamental concept of GIS and related technologies (Global Positioning System GPS)

2. Development, updating and maintenance processes of GIS to support electoral Processes for example constituency mapping, polling station mapping, mapping of administrative services, infrastructure services, security services and management of demographic information

3. Application of GPS for locating and mapping polling stations and other supporting Infrastructures

4. Applications of GIS for electoral data management, analysis of voters turnout, Analysis of voting patterns, election results dissemination.

1. Awareness workshop on GIS and its applications for policy / decision makers

Objectives: To create an awareness of wide array of GIS applications amongst decision makers

Scope of Workshop / Training: The principal focus of this workshop will be on the introduction of GIS and usefulness of GIS technology in addressing election operation and management issues.

Awareness workshop on GIS and its applications for policy / decision makers

Duration	Topics to be covered
½ Day	**GIS introduction**
	What is GIS How can a GIS assist in operations of the ECN What are the important building blocks for a successful implementation of a GIS
	GIS Applications
	Application cases: Presentation and demonstration of GIS capabilities

2. Training course for Computer Engineers/Officers

Objective: To train engineers in the design and implementation of GIS applications for Election management. He/She should be responsible for identifying user needs, interacting with the management, assisting in developing GIS applications and coordinating with other departments/sections of ECN

Scope of Training: The principal focus of this training will be on the introduction of GIS and usefulness of GIS technology to be followed by "hands-on-training" in applications to a number of key areas of Election management. The training programme will also focus on:

- Database Management
- Spatial Analysis
- Application Development

What will be achieved?

On completion of these courses, participants working in election management will be able to:

- Identify the data and information requirements for election management tasks
- Effectively apply GIS techniques in election management; and
- Assess the usefulness of GIS in addressing election operation and management

Training course for Computer Engineers/Officers

Duration	Topics to be covered
Week 1	**Basics of GIS**
	Representation of geographic features, spatial data and attribute data, organizing spatial information, data structure and thematic layers
	Data automation
	Data sources, methods of data entry: scanning (screen digitizing)
Week 2	**Data processing and Database Management**
	Spatial data handling, database management
	Attribute Data Handling
	Table operation, Updating, data coversion, data integration
Week 3	**Spatial Analysis and Application Development**
	Spatial Relationships
	Spatial Analysis (proximity, overlays, networks etc)
	Output preparation
Week 4 -5	Project work (includes all stages of GIS development such as planning, design and implementation and prepare project work mostly mini pilot study type of work

Includes Hands-on exercise for all the contents

3. Training Course for GIS technician / Computer Operators

Objective: To train GIS technicians / operators in scanning, registration of maps and drawings, digitization of maps, attribute data entry, database integration and generation of thematic maps

Scope of training: This training programme will focus on:

- Basic concept and functions of GIS
- Spatial database processing and management
- Application of GIS

Training Course for GIS technician / Operators

Duration	Topics to be covered
Week 1	**Basics of GIS**
	Representation of geographic features, spatial data and attribute data, organizing spatial information, feature type and data structure and thematic layers
	Data automation
	Data sources, methods of data entry, scanning (screen digitizing), manual digitizing
Week 2	**Data processing and Database Management**
	Spatial data editing, error correction, building final database
	Attribute Data Handling
	Table operation, Updating, data integration
Week 3	**Simple Applications and Output preparation**
	Spatial Relationships
	Simple GIS Applications
	Output preparation and presentation

Includes Hands-on exercises for all the contents