

SCITECH Nepal

July 2009 Vol. 11 No. 2

Chief Editor:

Prof. Deepak Bhattarai

Managing Editor:

Rajiv K. Chaudhary

Editor:

Yug Maya Rai

Shailendra K. Jha

Rajjan Man Chitrakar

Published By:

Nepal Engineering College
Changunarayan, Bhaktapur, Nepal.

G.P.O. Box 10210

Phone: 6611744

Fax: 977-1-6611681

Email: info@nec.edu.np

Circulation:

Pramila Karki

© nec 2009

Printed at:

Lusha Press

Jawalakhel, Lalitpur

Tel: 01- 5532822

The publication Committee does not vouch for the originality and the correctness of information in the articles of the authors published in this journal.

From the Editor

The advancement in science and technology has really made the lives of the people comfortable, effective and efficient. Globalization and the discoveries in different areas are day by day adding value to the social and economic state of the people. Technology greatly has bridged the gap between the invention and the needs of the society.

However it is not easy to bridge this gap. For this to occur, research and development at the university and college level seems to be essential. This is both opportunity as well as challenge. Globally the MNC'S are eager to tap the achievements of the academics.

In the recent past, Nepal has made significant achievements in the areas such as infrastructure developments, Alternative energy, banking etc. but this gain does not look sustainable. It is because of the inability of these technologies to be accessible to the remote area and underprivileged people. Inappropriate planning and lack of expertise probably is the reason for this. One way to address this problem is to foster closer collaboration between academics and all other stakeholders.

Thus it is a challenge for engineer and architects to maintain the balance between need and supply by using the underutilized resources through their knowledge and expertise. Optimum use of technology is still a challenge for the practitioners. Inappropriate use of technology always incurs cost rather than profit. This it is right time for us to lead from the front for the well being of the society and the nation.

CONTENTS

CONSTRUCTION OF MATSAPHA INTERNATIONAL AIRPORT IN SWAZILAND, SOUTHERN AFRICA AND ITS EFFECT ON ENVIRONMENTAL AND SOCIAL ECOLOGY - <i>S.K. Dev</i>	3
URBAN HERITAGE CONSERVATION AND SUSTAINABLE COMMUNITY DEVELOPMENT: A CASE STUDY OF HISTORIC TOWN THIMI, NEPAL - <i>Bhatta, Kishan Datta</i>	7
CHALLENGES FOR MANAGEMENT TO IMPLEMENT E-GOVERNANCE IN NEPAL - <i>Dhiraj K. Das, Deepak B. Dhami</i>	24
NATURAL DISASTERS AND PROTECTION OF WORLD HERITAGE SITES IN NEPAL - <i>Bharat Sharma</i>	29
TEACHING AND LEARNING ENGINEERING EDUCATION IN INDIA - <i>Deba Prayagan Chaudhary</i>	33
GIS BASED COVERAGE PREDICTION MODEL FOR GSM - <i>Subash K.C., Ashish Sharma, Bikrant Koirala, Bipin Timilsina, and Krishna Regmi</i>	37
DEPLETING WATER QUANTITY AND CHANGE IN WATER MANAGEMENT PERSPECTIVES: A CASE STUDY OF PANCHAKANYA IRRIGATION PROJECT - <i>Rupak Bastola, Sunil Parajuli</i>	42
MODELING AND SIMULATION OF SOFT SWITCHING SNUBBER BASED BOOST CONVERTER - <i>Rajendra Mahat</i>	48

CONSTRUCTION OF MATSAPHA INTERNATIONAL AIRPORT IN SWAZILAND, SOUTHERN AFRICA AND ITS EFFECT ON ENVIRONMENTAL AND SOCIAL ECOLOGY

S.K. Dev*

Introduction

This is the case study of the after effects of Matsapha International Airport construction, Swaziland, Southern Africa. The location of the centre part of Swaziland is at 26°30' south latitude and 32°00' east longitude. It is a beautiful mountainous land locked country bordering Mozambique in the east and Republic of South Africa in the north, south & west. Seventy five percent of the population are of African origin and the rest are of European and Indian origin. Most of the African population speak and understand English and the native African language.

Up to 1985 Swaziland had a small runway to fly STOL aircrafts like Twin Otter. The only connection with the outside world was up to Johannesburg, South Africa by aircraft. Later with the assistance of International Civil Aviation Organization (ICAO), (UNDP) and Swaziland Government, the country's only international airport, Matsapha International Airport was constructed.

Consultants

International Civil Aviation Organization (ICAO) was hired as consulting engineers which comprised of international team of experts in the fields of civil, electromechanical, transportation & survey engineering. The experts were hired by U.N. from Netherlands, Britain, Sweden, Poland, Ghana, Ethiopia, India, Nepal and Pakistan apart from local experts.

*Mr. Dev is the Associate Professor in the Department of Civil Engineering, Nepal Engineering College and former UN Expert for the Survey, Design and Construction of Swaziland International Airport.

Methodology:

After the government identified the site for the airport construction, the whole area of about 4 Km by 0.8 Km was surveyed and a topographical map was prepared. Control points were provided by traversing and triangulation using Electronic Distance Measurement (EDM) and precision theodolites. These points were linked to national control point series. A detailed topographical map of the whole area was prepared at a scale of 1:500, however a master plan covering the entire area was produced at 1:5000 scale. After desk study of the topographical map of the area and national topographical map and also after several site visits by concerned authorities and airport experts, the proposed runway alignment and its location was ascertained. Location of taxiway, apron, operations building, control tower, security fence, main entrance, emergency exit etc. were planned by airport and aviation experts at ICAO head quarter, Montreal. Construction design for runway, taxiway, control tower and other components were completed at ICAO head quarters.

Construction

During the construction of the runway, through crossings of small streams were avoided. Specially, at the two ends of the runway threshold, where landing and take-off took place, stream crossings were not accepted since the impact of load (landing) was very high. The land required for airport facility were acquired before any construction could proceed. Peripheral access road was built and the whole of the airport premises were fenced for security before the construction started.

Construction of the 3.6 Km long runway and other components started with site clearance and erection of security fence. Since human life was involved and with more than 300 tonnes of load impacts at the two ends (thresholds) of the runway, strict compliance with design was adopted during construction of the runway.

Security fence of 2.5m height was erected. There was one main entrance having cattle trap at this entrance to prevent cattle from entering the airport premises. There were 3 other emergency exits. A 45 m × 3600m

runway was constructed. Longitudinal and cross slopes were designed in such a way to prevent stagnant water on the runway. Rain water was made to slip away from the runway. Likewise, side drains along the runway were constructed so that no pounding of water at airport premises would take place. Since the level difference between operations building floor level and apron level was about 1.2 m., ramp between operations building and apron was constructed for smooth movement of passengers and their luggage between apron and operations building.

Six storey hexagonal shaped control tower was built at such a locations that Air Traffic Controller (A.T.C.) could see the entire runway from the control tower. It was hardly 150 m away from the operations buildings.

Earthwork

Massive filling (up to 22 m) was required at one end of the proposed runway. Filling was done in layers. After filling every 250 mm thick layer, the soil was compacted and it was tested for 95% compaction and then only the following layers of filling were placed and this was quite a big haul of earth work. The required material was obtained from nearby terrain slopes. During construction, the elevations, slopes, alignment, thickness of different layers of runway (according to design) were checked at every chainages of runway alignment. Longitudinal and cross-slopes were verified to determine whether they matched the desired slopes. After the construction of the runway, taxiway was constructed.

The apron, ramp, side drains, operations building, control tower, cargo building, and vehicle parking were constructed. At every phase of this massive construction, construction survey was done to confirm the actual conformity with design parameters. Verticality of 6 storey control tower, slopes of spoon drain and other side drains were verified as per design. When the facilities were constructed, test landing was done. The hills, horizontal distances and elevations along the alignment of runway were ascertained. This was necessary to determine the angle of slopes while, approaching and taking off from either ends of the runway.

Construction Controls

For the construction of this multi-million dollar project work weekly site meetings were held between Engineer's Representative (Consulting engineers) and contractor's representative. Construction was guided, quality controlled, verified as per the design. Every small change in the design to meet local conditions was discussed, design amended and ordered in black and white and passed on to the contractor. Every week the progress of work was monitored. Any defective works by the contractor was not accepted by the Engineer's Representative. As an example, while constructing a temporary taxiway, the contractor did not comply fully with the design criteria as his argument was based on the compliance of a temporary taxiway. But the Engineer's Representative determined that "though it was a temporary taxiway, the contractor needed to comply with design specifications completely". Thus every bit of construction by the then international contractor, Sterling International, registered in U.K and South Africa were given hard time by the Consulting Engineer's Representative and thus the whole project was constructed on time and met the design specifications set by ICAO.

Quantity Survey and Bill of Quantity

Every month the contractor had to submit running bills of the works executed. The quantity surveyor had to verify all the details of the bill. The contractor used the escalation factors as agreed in the contract as per the index of cost of materials published by the government authorities of Republic of South Africa. After verifications and satisfaction to the Engineer's Representative, the bill was forwarded for payment.

As built drawing

Each and every element of the project was constructed as per the design. During construction, horizontal and vertical positions (x,y,h) were thoroughly checked to comply with design specification. Locations of runway, taxiway, operations building, control tower etc. were shown on drawings true to the scale. Longitudinal and cross slopes on constructed runway was shown on as-built drawing. Location of landing information system and other components were also shown on

as-built drawing. The altitude and distance of two highest points along the alignment of the runway, on either end of the runway was verified. Thus a complete as-built drawing was prepared and sent to ICAO, Montreal for verification and landing license.

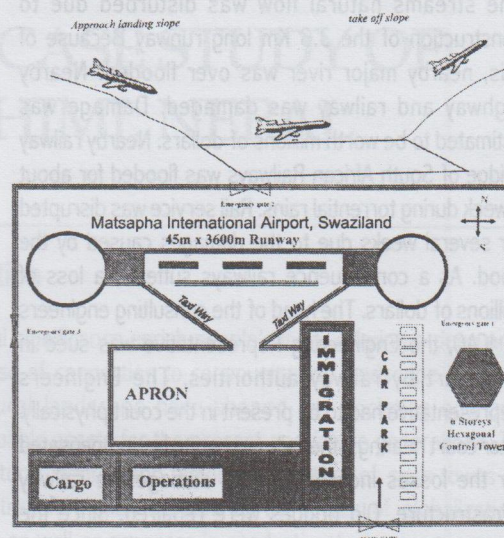


Fig.1 Test Flight

Fig.2 Location Map (not to scale)

Test Flights

Civil aviation authorities from the Republic of South Africa carried out test flights on the request of The Government of Swaziland. During this time approach angle for landing and take off were ascertained for safe navigation of aircrafts. Also, side visibility conditions were met. After successive test flights all the details were sent to ICAO for verifications and issuance of landing license.

Change of Topography and after effects

After the construction of 45m x 3600 m runway, (25m x 800m) two taxiways, (200m x 250m) apron, operations building, instrument landing system, control tower, access road around the periphery and security fence, topography of the nearby terrain was changed to a great extent. On the steep slopes of cuttings and fillings a lot of erosion took place during the following rainy season. Because of the 3.6 Km long runway construction, the natural flow of surface water in small

nearby streams changed drastically. To protect steep slopes from erosion hydro seeding was done. Special kind of grass was grown, watered and laid for erosion controlled.

The streams natural flow was disturbed due to construction of the 3.6 Km long runway. Because of this, nearby major river was over flooded. Nearby highway and railway was damaged. Damage was estimated to be worth millions of dollars. Nearby railway bridge of South African Railways was flooded for about a week during torrential rains. Rail service was disrupted for several weeks due to the damages caused by the flood. As a consequence railways suffered a loss of millions of dollars. The head of the consulting engineers of ICAO, the Engineering Representative was sued in the court by railway authorities. The Engineers Representative had to be present in the court physically. After court hearings, the railways had to be compensated for the losses incurred by the damages to railway infrastructure. Old bridges were repaired. Since the volume of water was beyond the capacity of the existing bridge, additional new culvert was constructed to prevent flooding during peak rainy season.

Conclusion:

Any construction in large area changes the surrounding environment. In a construction of this kind the whole natural topography is changed. Surface water drainage system, erosion, damage to infrastructure like roads, railways, etc also takes place. It also damages the fragile ecology of soils by weakening the micro organism in it. Any construction of this scale must take care of after effects of the project such as social, environmental, transportation and many more.

Bibliography

1. Age, P.H. (1975) 'Air Terminal Planning – An Airline Industry View in Transportation Facilities Workshop: Passenger, Flight and Parking ASCE PP 335-357.
2. Airborne Instruments Laboratory (1962) Airport Terminal Plan Study, RDS- 136, US, FAA, Washington, DC.
3. Air Transport Association (Annual) Air Transport Facts and Figures, Washington. D.C.
4. Bron, P. and Henring, D. (1974) "The Passenger Terminal- A System Analysis Approach", Airport Forum, 4 No 2, PP. -69-82.
5. Block, J. (1975) "Planning the Airport Environs – A European View Point", Proceedings, ASCE Conference on International Air Transportation, San Francisco, March, PP- 191 to 204.
6. Clowson, M. and Hall, P. (1973), Planning and Urban Growth- an Angle – American Comparison, Johns Hopkins University Press, Baltimore.
7. Crowley, R.W. (1973). a Case Study of the Effects of an Airport on Land Values, JTEP, 7, No. 2, May, P P 144-152.
8. De Neuf ville, R. and Marks, D.H. (1974). Systems Planning and Design : Case Studies in Modelin, Englewood Cliffs, NJ and London.
9. Haward, G.P. (1974), ed. , Airport Economic Planning, MIT Press, Cambridge, M A and London.
10. IATA, Airports Terminal Advisory Committee (1975), Capacity Evaluation Studies Airport Terminal Facilities, Montreal.
11. ICAO (1969) Airport Master Planning, DOC 8769-An 891, Montreal HMSO.
12. Knusen, T. (1976) Uncertainties in Airport Cost Analysis and Their Effect on Site Selections, Doctoral Dissertation, ITTE.
13. Manheim, M.L. (1974) 'Reaching Decisions About-Technological Projects with Social Consequences: A Normative model reprinted in de Neufville and Marks (1974).
14. Mayerson, M. and Bafield E.C. (1955) Politics, Planning and the Public Interest, Free Press, Glencoe, I.L.
15. U K, Ministry of Transport (1970) Report of a Study of Rail Links with Heathrow Airport, HMSO.

URBAN HERITAGE CONSERVATION AND SUSTAINABLE COMMUNITY DEVELOPMENT: A CASE STUDY OF HISTORIC TOWN THIMI, NEPAL

*Bhatta, Kishan Datta**

1.0 Introduction

Places of cultural significance enrich people's lives, offering a deep and inspirational sense of connection to community and landscape. Historic towns and cultural landscape have shaped our societies and are considered invaluable assets for the present and future generations. To preserve the cultural identity and historic characters of such towns in the light of the transformation brought by the forces of globalization and urbanization as well as progress in production technology present severe challenges to relevant stakeholders.

This paper identifies that the absence of integrated policies, weak public participation, lukewarm tourism promotion and weak institutional capacity are the factors underpinning the demise of Thimi as a sustainable-cum-culture community. It is argued that the rehabilitation strategy for Thimi should be geared to preserve heritage resources, retain identity, improve the quality of life of local people and protect cultural continuity and sense of place. This paper identifies heritage conservation, public participation, efficient institutions and heritage-led sustainable tourism as prerequisites to promote sustainable community development. An integrated conservation plan and policy will address development needs of the local people that conservation is necessary for sustainable development of Thimi. Urban conservation through area revitalization will enhance local economy, improve built environment, maintain sense of community and regenerate local arts and crafts, which will eventually promote sustainable community development.

* Assistant Professor, Department of Architecture, Nepal Engineering College

2.0 Theoretical Analysis

2.1 Concept of Urban Heritage Conservation

The concept of urban conservation has its roots in the conservation movements in the late nineteenth century when awareness of the value of historic urban centres developed in reaction to the loss of the defence structures of many fortified medieval cities in Europe due to their expansion. During this period, a city was considered as a monument or as an object of art (Jokilehto, 2003). After the First World War in the early twentieth century, the reconstruction of historic centres was started and the conservation movement gained momentum only after the Second World War. Its importance was further emphasized after the foundation of international organizations, charters, conventions and many other efforts on conservation.

John Ruskin, a prominent advocate of conservation, in his work entitled "The Seven Lamps of Architecture" identifies the values of conservation. His seven lamps were considered as guiding principles and they were: sacrifice, truth, power, beauty, life, memory and obedience. It is in the lamp of memory that he has discussed the significance of history of society (Jokilehto, 1999). Townsend (2003) argued critical conservation (i.e. critical process and then creative act) is most appropriate in urban conservation practices because a historic urban centre can not be treated as work of art or as a static object, rather it embodies multidimensional cultural values that must be considered on a par with its contemporary role.

The broader definition of conservation refers more widely to a complex, diverse, and even divergent social practice. It has now shifted from protecting the single built form to the wider context such as area-based conservation or district regeneration. The intangible heritages such as traditional skills and techniques of making craft are also considered significant in the urban conservation.

Hence, urban conservation deals with cultural heritage within urban areas and in particular historic urban centres. It is a process of managing change in historic urban areas in which urban conservation works within

the greater context of the urban system. Moreover, it is more than conservation of physical fabric; ensuring continuity of the socio-cultural system and contribution to sustainable development are very much at the core of urban conservation. Integrated conservation with active community participation is considered a key approach to achieve sustainable development in the historic towns.

2.2 Historic Towns: Rationale for Conservation

According to UNESCO World Heritage Centre (2005, Article 7) historic urban centres are the *"ensembles of any group of buildings, structures and open spaces, in their natural and ecological context, including archaeological and palaeontological sites, constituting human settlements in an urban environment over a relevant period of time, the cohesion and value of which are recognized from the archaeological, architectural, prehistoric, historic, scientific, aesthetic, socio-cultural or ecological point of view. This landscape has shaped modern society and has great value for our understanding of how we live today"*.

Cohen (1999, p.11) defined: *"historic city centres are made up of a web of buildings and streets from different periods that create various cultural and urban strata. Over the centuries, they have finely honed their urban character and now offer quality urban culture. New cities and suburbs however lack any feeling of history and are devoid of any sense of cultural continuity"*. He further elaborated that proper urban conservation transforms historic cities into hubs of cultural activity, making them much more than merely residential. Hence, conservation on an urban scale is concerned with the urban fabric as a whole and not with architecture alone (Cohen, 1999, p.13).

The approach of conservation varies from culture to culture. Conservation of a place should identify and take into consideration all aspects of cultural and natural significance without unwarranted emphasis on any one value at the expense of others. Cohen (2001) suggested the aim of conservation to promote life characterized by the strong sense of continuity and aesthetic qualities are not sufficient to achieve this aim. The focus should not be only on the monuments;

everyday urban activities should also be rediscovered. Larkham (1996) argued that the reason for conservation is much more complex than mere aesthetics. It also involves factors such as psychology, finance and fashion. Hence, the ultimate aim of conservation is not to conserve material for its own sake but rather to maintain (and shape) the values embodied by the heritage. More exactly, urban heritage constitutes social, economic, aesthetic, cultural and historical values and these are considered as selection criteria for heritage conservation,

The intangible heritage such as traditional skills and knowledge can be selected for their cultural and economic values. They could significantly contribute to revitalize the local economy if planned and managed properly. Hence, conservation is now considered as an important part of urban regeneration. Particularly in historic towns, where the entire urban setting is a strong cultural heritage resource, urban regeneration with the dominance of heritage conservation is inevitable.

2.3 Process of Urban Conservation

Each of the historic towns or urban districts is unique in terms of its socio-cultural, demographic, economic and urban system. The legal, administrative and institutional mechanism also differs for different countries. However, the procedural aspects require some common steps that need to be followed for conservation.

ICOMOS Australia (1999) states: *"conservation may, according to circumstances, include the processes of: retention or reintroduction of a use; retention of associations and meanings; maintenance, preservation, restoration, reconstruction, adaptation and interpretation; and will commonly include a combination of more than one of these"*. Urban heritage conservation is a continuous and value based process and it involves a wide range of activities.

The conservation activities are usually carried out with regard to the existing physical conditions, values of the urban heritage, and needs of the society. In most

cases, tangible and intangible heritage together create a symbiotic relationship and the protection of which requires a holistic approach. The main goal of urban heritage conservation is to protect the heritage significance of a place expressed through the physical embodiments. The protection process of urban heritage has three basic components (Australian Heritage Commission, 2000):

- Understanding heritage significance;
- Developing objectives to retain significant values; and
- Manage to achieve objectives.

In each step, qualitative judgments are most important and inputs from the community are essential.

2.4 Integrated Heritage Conservation: New Approach to Urban Conservation

Feilden and Jokilehto (1998, p.80) argued: *"integrated conservation implies reconciling conservation requirements and town planning objectives, i.e. considering the values and interests of the existing historic fabric as equal in status to other factors in the general planning process"*. Lichfield (1988) also explains planners saw the need to embrace conservation as one of the series of sectoral concerns to be absorbed within the comprehensive planning and conservationists realized the need to prepare the conservation strategy within the wider context.

The European Charter of Architectural Heritage defined integrated conservation as the integration of architectural heritage into the context of people's lives and making it part of regional and town planning and development scheme. The Article 7 of the Charter states:

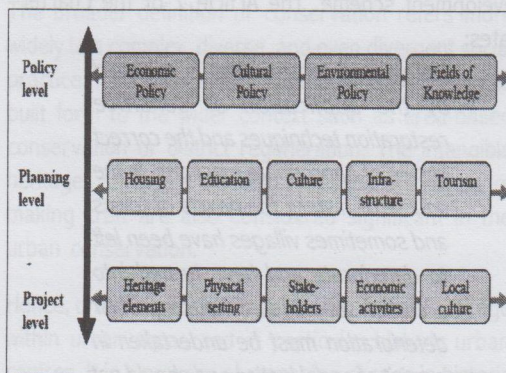
"Integrated conservation is achieved by the application of sensitive restoration techniques and the correct choice of appropriate functions. In the course of history, the hearts of towns and sometimes villages have been left to deteriorate and have turned into areas of substandard housing. Their deterioration must be undertaken in a spirit of social justice and should not

cause the departure of the poorer inhabitants. Because of this, conservation must be one of the first considerations in all urban and regional planning”.

The Declaration of Amsterdam Charter also highlighted the importance of social justice in urban conservation and explained the principles of integrated conservation as follows:

- The conservation of architectural heritage should be an integral part of urban and regional planning;
- Integrated conservation involves the responsibility of local authorities and calls for public participation;
- The success of any policy of integrated conservation depends on taking social factors into consideration;
- Integrated conservation necessitates the adaptation of legislative and administrative measures; and
- Integration methods require the promotion of methods, techniques and skills for restoration and rehabilitation.

In the historic towns, the dilapidated built forms need to be revitalized to cope with new demands. In such areas, integrated conservation is needed which includes the conservation conscious development plans and the laws that are able to control the harmful changes. The integration process need to include in three levels of public decision making: (i) policy level; (ii) planning level; and (iii) project level. In each level, there may be more than one sector involved. Hence, integration is also necessary in all sectors of each level, as shown in Figure1 below.



Source: Imon (2006)

At the policy level, conservation concerns need to be incorporated in development strategies by promoting conservation as one of the means to achieve economic and socio-cultural development. It needs support from many governmental departments to achieve the integration. At the planning level, the coordination between departments, adequate development control and public participation is needed. Finally, at the project level, the essential elements such as local culture, economic activities, environmental quality, and physical setting need to be included in the project for effective integration.

2.5 Defining Sustainable Community Development

The concept of sustainable community has similar idea as that of three components of sustainable development which explains sustainable community involves an integration of three basic aspects: economic, social and environmental. Cook and Ng (2001) argued that people need to feel sense of belonging and commitment to the well-being of their communities so that these are sustainable in the long term. They further defined: *“a sustainable community could be described as one which has an enduring integration of the social, economic and physical characteristics of our total environment”*. According to Hope (1996) sustainable community is a community that puts sustainable development in practice and defined as: *“sustainable community development can encompass actions which ensure the meeting of the needs of the existing inhabitants of a given community without jeopardizing the ability of future generations of inhabitants in that community to meet their own needs”* (Hope, 1996, p.195).

Cook and Hyslop (2004) argued sustainable communities embrace two key interrelated dimensions: one related to the concept of governance, namely, having the *authority* and *ability* to take action; the other to the way the community cares for the long term well-being of its total environments, namely, what actions it takes. Both these dimensions require a high degree of self-reliance and social capital within the community (ibid).

Certainly, the sustainable community represents a direction or goal rather than an end state and is a continuous process which minimizes the consumption of natural resources, ensures long term economic prosperity, social equity, efficient use of urban space, maintains diversity, conserves heritages, encourages community participation in decision making and works in a team through partnership between government, private sectors and community itself. Cook and Ng (2001) emphasized that for long-term sustainability, communities need to take responsibility for themselves, to have access to expertise and knowledge, and to have the capacity to make a real contribution to decisions which affect their members. They further suggested two basic principles for building sustainable communities. They are: (i) the ethical utilization of natural resources; and (ii) intra and inter-generational equity.

2.6 Urban Conservation and Sustainable Community Development

To promote sustainable community development in the historic towns, urban conservation plays a significant role. Integrated conservation, sustainable tourism and participation are the major factors that head the community towards sustainable development.

2.6.1 Integrated Conservation and Sustainable Development

The approach of integrated heritage conservation has strengthened the view that urban conservation should be dealt within the broad urban context. It bridges conservation activities within different actions of urban and regional planning. Integration of conservation concerns in policy level, planning level and project level activities is a key to achieve sustainable development in the historic towns.

Conservation seeks to preserve heritage, maintain continuity of socio-cultural system and benefit community economically by attracting tourist and foreign currency to the local area. In addition, in the historic towns, urban conservation as a part of regeneration revitalizes the local economy by conserving the built heritage and traditional skills and

techniques of making craft. The local skills and products such as arts and crafts, pottery, and weavings could significantly benefit the community if their advancement and proper marketing are performed. Therefore, the conservation of tangible and intangible heritage with strong integration of development and planning activities is essential for the sustainable development.

On the other hand, urban heritages should be fully respected by sustainable community. By conserving urban heritage, it enriches the community by providing a deep sense of connection to the past and to live experiences, also reflects the diversity of the communities, sustains urban values and allows future generations to connect to the collective history we share as a society (Kwan, 2004). Thus, urban heritage conservation is a key component to maintain the social capital which significantly contributes to promote sustainable community development. Integrated Conservation promotes sustainable community as it contributes to maintain Quality of life, Sense of Community, Genius Loci (it refers to the distinctive atmosphere or pervading spirit of a place) and Collective Memory.

Rossi (1982, p.130) mentioned: *"the urban artifacts are the soul of the city and the city itself is the collective memory of the people"*. Historic urban fabrics express spirit and sense of place and thereby act as spaces for collective memory. Kevin Lynch (1972, p.124) also emphasized *"memory is the basis of self identity"*. In this context, heritage conservation sustains the spirit and identity of place and builds confidence and civic pride in the society and strengthens social cohesion which is essential for sustainable community development.

2.6.2 Public Participation and Urban Conservation for Sustainable Development

The public participation in the urban conservation provides local community opportunities to identify their problems, plan, implement and monitor the conservation projects and management of the entire historic towns. This process provides the community a feeling of ownership, more inclusive approach and

maximum satisfaction and thus contributes significantly towards sustainability. In the historic towns of developing countries like Nepal where most of the built heritages and land plots are privately owned, attempts at conservation may raise conflicts due to willingness to return maximum benefits from their development. In this situation, community participation may provide opportunity to raise public views and solve the conflicts through consensus, thereby achieving best solutions. Hence, the participation in policy level, planning level and project level of urban conservation and partnership among community sector, public sector and private sector could promote sustainable community development in historic towns.

3.0 Case Study of Historic Town Thimi

3.1 Geographical Setting

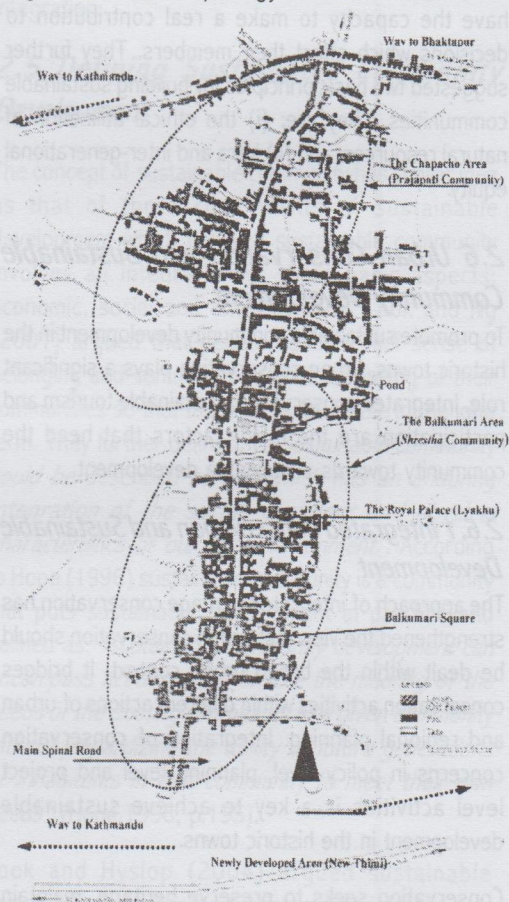
The historic town Thimi, also known as a 'Pottery Town', is one of the 31 settlements of Kathmandu valley with their history going back to medieval times, and periods further back (Pant; 2002). Located to the east of river Manohara, a tributary of *Bagmati*, Thimi is at a distance of 8 km east from the present capital city—Kathmandu and 4 km west from Bhaktapur, the medieval capital city of Nepal. It is traditionally known as *Madhyapura*, probably because of its central location in the Kathmandu valley. The historic town Thimi with its neighboring small traditional towns; *Bode* and *Nagadesa* were incorporated in Madhyapur Thimi Municipality (MTM) in 1996. Thimi is known as a medieval settlement, a satellite town of Bhaktapur; however, some of the inscriptions push its history at least back to Lichchavi period. One of the recently discovered inscriptions dated 484 AD in a *shivalinga* mentions the place *Themmrang gram* which is now believed to be Thimi (Pant, 2002, p.15) (Figure 2).

3.2 Demographic Context

The historic town Thimi had a population of 16524 in 1991 which increased to 18,485 in 2001, comprising 38.7% of the total population of MTM (CBS, 2001). The population density of historic core has increased from 68.56 pph in 1991 to 80.98 pph in 2001 and the average family size was 5.25 in 2001. From the above data, it is concluded that the population of

historic town Thimi is growing rapidly and consequently there is an increasing demand for development and construction. There is an increasing number of building permits in the northern and southern parts of the traditional settlement and expansion of the existing historic towns has occurred rapidly in the past few years. Moreover, because of the increasing family size, property divisions and other socio-economic factors, internal migration has been noticed from the historic core to the surrounding vacant land (Jayana, 2007).

Figure 2: Urban Morphology of Historic Town Thimi



Source: Pant (2002)

3.3 The Community and Settlement

Most of the town settlements of Kathmandu valley are inhabited by diverse communities that may be identified by their traditional occupation (Pant, 2002, p.23). Thimi is predominantly a *Newar* town. One of the

important features of the *Newar* community is that each inhabitant of the town becomes the member of a number of community associations such as *Guthis*. Thimi is made up of 14 different maximal communities (Pant, 2002). The distribution pattern of these communities in Thimi has provided the distinctive urban space. The distinct urban characters and urban form are the result of their socio-cultural and religious practices prevailing in each community. The communal activities, religious and cultural functions have taken the unique pattern of urban built form with artistically decorated monuments, temples, stupa, rest houses, and other structures. Pant (2002) argued that there is overwhelming majority of two communities – *Shrestha* and *Prajapatis*, representing more than 85% of the total population in the area between Bahakha and Tachhutole. *Shresthas* occupy 53.71% of the dwellings units while *Prajapatis* occupy 32.65% of the dwelling units.

3.4 Urban Characteristics, Identity and Heritage of Thimi

The sophisticated urban forms developed in the principal cities of Kathmandu valley essentially during the Malla period is the high point in urban development and planning in Nepal. They demonstrate great refinement in the handling of land-use, quality of urban space, infrastructure provisions, monumental architecture, arts and craft coming together to support a culturally advanced urban society (Shah, 1997). The historic town Thimi represents the legacy of the *Newar* people; the farmers, the renowned artisans and craftsman who shaped it to give the town a unique identity. It is characterized by its compact urban form, traditional planning concept, rich built heritage, beautiful arts and crafts and socio-cultural activities. The traditional *Newar* towns of Kathmandu valley are socially, culturally and environmentally acceptable and their preservation is inevitable for the long term sustainability.

3.4.1 Urban Form

The urban fabric of the historic towns of Kathmandu valley can be considered a wise assemblage of beautifully carved streets and squares and their boundary is always marked by entry gates and various

temples. These towns would never have straight orthogonal streets rather they are filled with curvilinear streets to offer passerby the continuously changing views and vistas.

The historic settlement Thimi is situated on a high plateau stretched north-south on a tongue shaped linear form. A spinal road runs through the middle of the settlement and transverse streets radiates from the spinal road at intervals leading to residential squares, alleys and quarters. Open spaces in the form of public squares are found at major junctions of these streets. The prime squares existing in the spinal road are *Balkumari Square*, *Layakhu* (Palace Square), *Negu Pokhari*, *Chapacho*, *Songapukhu* and *Gungachiba*. There are mainly three types of built forms: (i) linear (street house); (ii) central courtyard type; and (iii) detached built form. The residential buildings have extensively decorated doors and windows and beautifully tiled overhanging roofs and brick facades.

3.4.2 Religious Attributes in Planning of Thimi

The traditional towns of Kathmandu valley are based on the *Astramatika* Planning which locate power goddesses at the eight different locations. The historic town Thimi is also protected by a circle of *Astramatika*; the eight power goddesses known as: *Brahmayani*, *Varahi*, *Balkumari*, *Vaisnavi*, *Indrayani*, *Siddhikali*, *Maheswori* and *Mahaluxmi*, which are arranged in eight directions from east to north east. *Balkumari* is dominant over the rest of the *Astramatikas* and has been worshipped as the town goddess.

The religious built forms such as temples and stupas, regular celebration of religious festivals and cultural programmes and the supporting urban spaces give the sense of a culturally vibrant town. Hence, the cultural practice and religious beliefs of *Newars* has evolved a distinct physical built form that has provided a unique identity to Thimi and is considered strong heritage resource.

3.4.3 Cultural Attributes in Planning of Thimi

The tangible and intangible heritages are interrelated and sometimes inseparable. The intangibles such as festivals and socio-cultural activities of the *Newar* community have also shaped a distinct spatial pattern

of Thimi. Cultural attributes are considered as the major elements for determining the urban form and planning of traditional towns of Kathmandu valley. Some of the important cultural attributes of Thimi that have shaped its town planning and territorial expansions are:

- a) *Bisket Jatra*. Thimi is well known for *Bisket Jatra* (festival) of 32 chariots. It is the most spectacular festival of Thimi, celebrated for 4 days from the Nepalese new year. Balkumari square is the major focus of the event. The chariots are grouped into three circles with focus on three major goddesses such as: *Balkumari*, *Vaishnavi* and *Siddhikali*. Each chariot follows a distinct processional route, which defines cultural norms for planning of traditional towns in Kathmandu valley.
- b) *De-Bahu Route*: *De-bahu* is ritual which is particularly done prior to *Bisket Jatra* in order to keep the evil spirits away from the town. The processional route was confined to *Deguli* at the north and *Balkumari* and *Pithu Ganesh* at the south (Jayana, 2007).
- c) *Funeral Route*. The settlement pattern of Thimi also demonstrates the routes for the funeral activities. There are two distinct routes for the ritual which show the relative sequence of the development of areas and the process of incorporation of social activities into urban planning (Jayana, 2007).
- d) *Town gates*. Thimi is believed to be a fortified town with town gates as rudimentary form of fortification. Out of the eight town gates at the major entrances to the town, two still exist. The town gates are not only meant for security purpose but also mark the territory of the time. These gates have added to the heritage significance of the Thimi.

Hence, the historic town Thimi is a remarkable example of the advanced cultural society of Kathmandu valley and its urban morphology is guided by socio-cultural norms of the *Newar* community. The extension of such towns in the past incorporates cultural and religious attributes as a major factor for planning. Thus, the socio-cultural activities and urban development of

Thimi are inter-related and based on such norms. Thimi developed extensively over a period of time.

3.5 Historic Objects: Heritage of Thimi

The historical and built heritage such as temples, buildings, and monuments and intangibles such as festivals, arts and crafts have familiarized historic town Thimi as a 'Living Museum of Newars'. There are many tangible and intangible heritage resources in Thimi. Layakhu, a traditional palace, is still existent and used for community purpose. Other important places with significant heritage values are: *Balkumari Square*, *Hembarna Mahabihar*, *Bakachhen Mahadev*, *Taha Degah*, *Digu Square*, *Gunakriti Mahabihar*, *Siddhi Kali*, *Chapacho* (Potters area), *Gungah Cheebhah*, *Pati Bihar*, *Jeeswan Baha*, *Dathu Baha*, and other Buddhist monasteries (Prajapati, 2005).

According to a survey conducted by Madhyapur Thimi Municipality, besides residential built heritage, there are 246 historic objects in the historic core of the town which includes temples, shrines, *stupa*, town gates and other monuments. Moreover, there are altogether 10 Buddhist courtyards for monks and number of temples and shrines are found at almost every thresholds, backyard, streets and crossroads.

3.6 Arts and Crafts

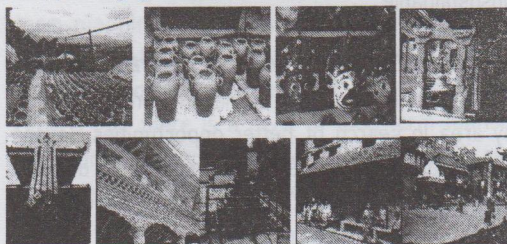
Newar craftsmanship is highly advanced and artistic in nature. The *Newars* were famous not only for artistic crafts but also for the manufacture of everyday articles and the products from their spinning mills, weaving and pottery workshops and also from their forges which catered not only for local demands but were also exported (Muller, 1981). Pottery, masks, puppets, traditional hand woven clothes and other handicrafts are manufactured in Thimi. Clay mask and paper mask are popular handicraft of Thimi. The *Prajapatis* are potters by caste who make clay products of various sizes for different uses. Pottery had supra-regional importance and in 1981 there were roughly about 500 to 600 pottery workshops in Chapacho area of Thimi (ibid). The workshops are purely family enterprises. Almost all family members usually involve in the pottery works and the trade is handed down from father to son. Besides pottery, the potters are also involved in agriculture.

The various pottery items produced by Prajapatis are Buddhist and Hindu religious statuary, architectural terracotta, roof tiles, space heaters, pottery wares such as containers for water storage and cooking, flower pots and many other decorated and functional wares. The streets and courtyards everywhere are lined with the pottery wares. The centuries old traditional occupation of making of arts and crafts has the significant economic and heritage value.

3.7 Festivals, Music and Dances

These constitute the intangible heritage resources of Thimi. The Newar community celebrates many festivals and cultural programmes and performs religious dances. They are famous for the saying: '*Newars celebrate more than 365 festivals in a year*'. Besides *Bisket Jatra*, other important festivals of Thimi are: Tongue piercing festival, *Gathan Mugah*, *Gunla Dharma*, *Gunhu Punhi*, *Pancha Dan*, *Yanya Punhi*, *Mohani*, *Swanti*, *Sakimila Punhi*, *Bala Chahre*, *Yomari Punhi*, *Ghayh Chaku Sanhlhu*, *Swasthani Bakhan Kanegu*, *Pulikisi Jatra*, *Shree Panchami*, *Sila Chahre* and *Holi Punhi*, *Swanya Punhi*, *Sithi Nakhah* (Prajapati, 2005).

It is also popular for traditional, classical and folk music and dances. On the occasion of different festivals, various music, dances and cultural events take place. The cultural programs are associated with the religious, social and cultural life of the people. Mask dances are popular in Thimi. Some of the important dances are: Mahakali Dance, Bhairab Dance, Nil Barahi Dance, Astamatrika Dance, Lakhey Dance, Indra Apsara Dance, Monkey Dance, Jyapu Dance, Lusi Dance and Charya Dance etc. These intangible heritages are the important asset for Thimi, however, since past few years, the festivals, music and dances are not being practiced regularly by the community and are disappearing gradually.



Photographs of Heritage Resources of Thimi (Source: Author, 2007)

4.0 Major Issues of Heritage Deterioration of Thimi

It is well known that Thimi has significant cultural heritage resources both tangible and intangible, which are not only cultural and economic capital but also a social capital of Thimi. However, the historic identity and urban character of Thimi are deteriorating day by day due to many reasons. The major issues of heritage deterioration in Thimi as identified during site visit and household survey are as follows:

4.1 Rapid Urban Expansion

With the rapid increase in population, the surrounding agricultural land of the historic core is converting into built up area. The pattern of such urban growth neither follows historic urban character nor is developed in a planned way. The urban expansion seems haphazard and the new development at the southern and northern part shows mixed land uses such as commercial, institutional, industrial, residential etc. With the increasing land and rental value, the fragmentation of land is also going on rapidly (Jayana, 2007).

The trend of converting vacant land into small commercial plots and the unplanned development has broken down the continuity of the spirit of historic character and caused many impacts in the traditional identity of Thimi. As a result, the historic environment of Thimi, particularly the urban heritages, is disappearing with the new development.

4.2 Conversion of Use of Heritage Buildings

With the rapid urban growth and development, many changes in the historic buildings and urban character of Thimi are apparent. The major spinal road is getting more commercialized. Large numbers of shops have now emerged along the roads in historic core which were very few some years ago. The change in use of buildings from residential to commercial and institutional has also brought changes in their traditional appearance. Moreover, there is an increasing trend of alteration on façade and reconstruction of buildings.

Not only the dilapidated buildings but some structurally and historically sound buildings are found to be rebuilt in new style. The household survey of 78 houses conducted in the historic core reveals that 34% of the buildings are modified and newly designed. Out of that, 23 % new buildings are constructed by demolishing traditional buildings, 6 % are constructed in vacant land and 4 % buildings have changed their facades. Hence, the conversion of use of heritage buildings from residential to new uses, changes in appearance of buildings, skyline and streetscapes have caused loss of historic urban identity and heritage values.

4.3 Change in Modes of Movements

The earlier pedestrianised town is now encroached by vehicular movements. The open spaces and community spaces which are traditionally an interacting and social space for community activities are now frequently used by vehicles. Wide lanes and squares of *Chapacho* area which are used as a pottery workshop and socio-cultural activities space are now disturbed by vehicular movements. In fact, the vehicular movement has also brought congestion in urban space, loss in socio-cultural activities and deterioration of cultural heritage and environment of Thimi.

4.4 Lack of Heritage Inventory and Regular Maintenance

There are many historic buildings, temples and monuments in Thimi, however, their record and up to date inventory has still not been prepared effectively by the municipality. The inventory of monuments once carried out by UDLE/GTZ in cooperation with the municipality in 2001 has mentioned that out of 246 monuments of Thimi, 118 are in need of urgent repair and maintenance.

The inventory neither includes residential buildings nor mentions their heritage values. Moreover, the identified historic objects are not conserved properly, and local people criticized the work saying that the conservation activities are limited to certain monuments and did not benefit the community in a broader sense. The private *Guthis* and community organizations are also inactive in maintaining up-to-date inventory and to

carry out conservation works, due to lack of financial support and organizational weakness. Thus, with lack of proper inventory and regular maintenance, many invaluable heritages of Thimi are disappearing, which is a great loss for the Newar community.

4.5 Change in Community Life Style

The change in lifestyle has also been noticed in the *Newar* community of Thimi resulting from the introduction of modern facilities, and change in traditional occupation and socio-cultural activities. There is an increasing tendency of changing traditional occupation to trade, commerce and services. Remarkably, even the *Prajapatis* who are traditionally potters are now competing with the traders such as *Shresthas* and others in transportation sector, trade and commerce. Out of the 50 households of *Prajapatis*, 42% replied that they are not satisfied with their traditional occupation of pottery and majority of people are interested to change their profession because of the lack of proper market, return and scarcity of clay. It is surprising that not one respondent is interested in adopting pottery as a profession for their children. Similarly, other works such as production of mask and other handicrafts are also disappearing gradually; even though the people have excellent skills and knowledge in craft production. Moreover, it is also very difficult to enter into new profession because of the high competition and lack of knowledge in new field. With the change in life style, the traditional socio-cultural activities and celebrations are also limited to certain festivals. Hence, the unique identity of the pottery town which once had a supra- regional importance in Nepal is losing its character gradually, which is not only destroying the urban heritage and historic environments, but also making the community unsustainable.

4.6 Migration and its Impacts on Historic Core

People are migrating from the historic core to the nearby area in search of better opportunities. Jayana (2007) argued that the migration is due to different push factors in historic core such as inadequacy of space, property division, uncomfortable old houses, lack of financial source to renovate the buildings etc, and pull factor such as better economic opportunities

and more infrastructure facilities at the new area. Ninety One percent of the community at Shankhadhar Chowk i.e. at the southern part of Thimi is people who migrated from the historic core (ibid). Hence, the migration pattern shows that the heritage buildings i.e. the traditional residential buildings in Thimi are being abandoned by people instead of being reused and renovated. This has also led to the heritage deterioration in Thimi.

4.7 Lack of Public Participation

Public participation though considered an important factor for urban heritage conservation and sustainable development, is not encouraged significantly in Thimi nor given any priority by the municipality. The policy, planning and implementation of conservation works are prepared directly by the top level, even though the Local Self Governance Act 1999 has the main aim of decentralization strategy to encourage local public participation. Out of the 78 respondent, 93 % replied that they are not satisfied with the policies and programs of the Madhyapur Thimi Municipality. In the underdeveloped countries like Nepal, the policies and their objectives are often quite good, however their implementation always face problems and often fail.

4.8 Lack of Tourism Development

The exceptional art and architecture, unique urban identity, festivals and lifestyles are the major tourism resources of Thimi and their promotion is essential for its development. In spite of being such an incomparable tourist destination and being so close to the capital city and between two tourist destination, Kathmandu and Bhaktapur, Thimi remained unnoticed for decades. The lack of comprehensive tourism-led conservation policy, awareness, education and long term planning has caused the deterioration of heritage, loss of pottery, handicraft production and economic benefits. Moreover, most of the respondent replied that there is a need of long term tourism development policy to improve their quality of life and enhance economic development of Thimi.

4.9 Lack of Funding for Conservation

Urban renewal of traditional towns demands large amount of money. The Madhyapur Thimi Municipality

and other community organizations often fail to implement the projects in the absence of financial resources. Moreover, the conservation and renewal of private property also faced similar problems. Out of the 78 respondents, 69% replied that the municipality is responsible for the conservation of historic heritage and 63 % replied that the funding for conservation should be managed by the central government, the municipality and the community itself. Hence, due to lack of funding, the heritage conservation and development projects have remained dormant in Thimi.

4.10 Institutional Inefficiency and Weak Policy

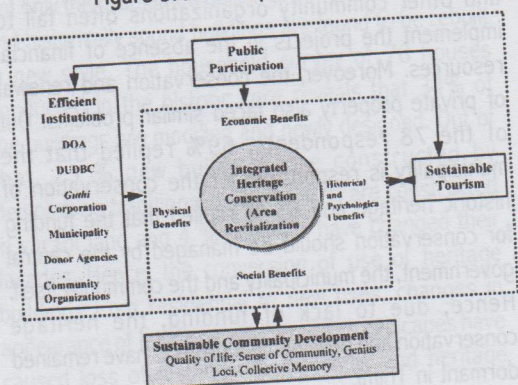
The institutions responsible for conservation are inefficient in terms of technical capacity, legal backing and policy matters. The prevailing policies of conservation are individual-monument based; it does not include integration and area based conservation.

In conclusion, heritage resources and identity of Thimi are disappearing day by day due to many factors. With the increase in population, rapid urbanization and globalization, the community of Thimi has been facing many problems in terms of social, cultural and economic development. The production of traditional handicrafts is also disappearing because of the lack of proper market, return on investment and other deficiency factors. Moreover, the urban heritage of Thimi i.e. the entire historic environment is deteriorating and losing its importance and identity, which has pushed the traditionally stable community towards unsustainability.

5.0 Towards a Framework of Integrated Heritage Conservation

A conceptual framework to examine the context of Thimi has been formulated. It assumes integrated heritage conservation as an essential means to promote sustainable community development in the historic town of Thimi. Moreover public participation, heritage-led tourism, and efficient institutions are identified as the key components to ensure sustainability through heritage conservation in Thimi.

Figure 3: A Conceptual Framework



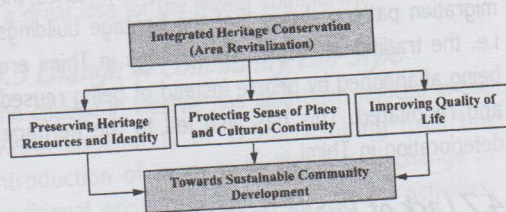
Source: Author

An attempt has been made to analyze the case of historic town Thimi in relation to the need of integrated heritage conservation in order to promote sustainable community development. In the heritage sphere elsewhere, concerns of cultural heritage conservation have been strongly highlighted and often been viewed as a necessary activity to promote sustainability in the historic towns. It plays a prominent role in urban policies by offering several new opportunities for socio-economic development. Bizzaro and Nijkamp (1996) mentioned that the heritage, in fact, allows us to recognize the identity, the peculiarity and plurality of a society, identifying and satisfying basic ethical needs of a community, local distinctiveness and tradition. At the same time it allows us to link the past to the present and future.

Thimi encompasses significant heritage resources that have fashioned its unique urban characters and identity. The entire urban fabric had supported a cohesive community with strong social networks having strong community feeling, functional neighborhoods and a unique socio-spatial hierarchy (Jayana, 2007). However, its historic character and identity, since past few decades, are constantly destructing. The socio-economic conditions and quality of life of local people are also degrading. This situation suggests immediate need of comprehensive plan which would address the needs of the local people and conserve heritage resources. Integrated conservation is an appropriate approach which revitalizes the town and benefits local people in terms of economic, social, physical, historical and psychological aspects. Moreover, it aims to foster the preservation of heritage and identity, protects cultural continuity and sense of place and

improves quality of life, which is vital to promote sustainable community

Figure 4: Significance of Integrated Heritage Conservation in Thimi



Source: Author

6.0 Achieving Sustainable Community Development

Urban conservation should not be the end process rather it should be continuous process that would preserve heritage resources and provide quality environment for present and future generations of Thimi. Built heritage such as monuments, temples, residential buildings, water spouts and intangibles such as arts and crafts, pottery, masks, feasts and festivals and cultural programmes of Thimi should be strongly integrated within the broader framework of comprehensive conservation and development plan.

The genuine significances of cultural heritage of Thimi have to be retained and historic identity should be maintained. For this, the responsible institutions should be effective and efficient in technical, financial and legal aspects and adopt integrated conservation approach through broader public participation. Conservation should not be taken only for the sake of preserving buildings, but it should provide quality environment to the neighborhoods. In fact, conservation in the context of underdeveloped countries like Nepal should promote tourism activities so that local people will get more opportunities and economic benefits. Hence, integrated conservation should promote sustainable tourism that will eventually help to promote sustainable community development in Thimi.

Thus, the strategic approach of urban conservation in Thimi should include the following features:

- Integrated conservation rather than piecemeal ones;

- Flexible and adaptive policies rather than rigid policies;
- Efficient institutions technically, financially and legally;
- Proactive, collaborative and participatory approach;
- Strong public participation and partnerships to build civic consensus rather than the passive form of public information;
- Sustainable tourism through heritage conservation and vice-versa;
- Strong political commitment and willingness to carry conservation and development through a holistic manner; and
- Public awareness and education programmes about the importance of heritage conservation.

6.1 Need of Comprehensive Conservation Plan

Conservation emphasis should be changed from monuments and individual buildings to living historic towns. A comprehensive conservation plan should be implemented to conserve and revitalize the historic town Thimi. The plan should include a detailed inventory of heritage, comprehensive objectives to retain heritage values and a good management plan to achieve the objectives.

6.2 Comprehensive Legislations and Development Control

It is observed that the prevailing legislations on cultural heritage conservation have created contradictions in the responsibilities of different institutions. It is necessary to review and revise the legislations for their effective implementation by the institutions. The legislations of each institution should be clear and comprehensive and should not overlap with the responsibilities and legal provision of other institutions.

Thus, the institutions should have comprehensive conservation legislations that would provide them more with power for enforcement and simultaneously encourage the public to get involved in conservation activities. The legislations and development control regarding conservation of Thimi should include the following features:

- They should be area -based revitalization rather than solely focusing on the conservation of individual monuments;
- Include public as well as private built heritage for conservation;
- Include conservation of intangible heritage such as arts and crafts, feasts and festivals, rituals, folk dances, music etc;
- Provide sufficient subsidies and incentives to encourage conservation by people;
- Encourage genuine public participation in urban conservation; and
- Be adaptive and flexible with the need of community and time.

Hence, the role of different institutions should be clearly mentioned in the legislations. The DOA would have vital role and should act as a facilitator for the urban conservation in Thimi, while the municipality being a local government, should play a proactive role in planning, designing and implementing the conservation policies and plans. Moreover, the LSGA 1999 should clearly mention the forms and framework required for public participation in the planning process. It should also provide statutory provision to ensure public participation in the municipal planning process.

6.3 Need of Efficient Institutions

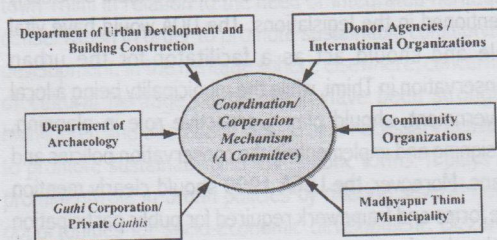
A conservation plan would be effective only when it is effectively implemented and monitored through efficient institutions

6.3.1 Strong Cooperation and Coordination Mechanism

Different institutions, including central to local government, are responsible for the conservation and development works in Thimi. It is essential to have a good cooperation and coordination mechanism among these institutions to successfully carry out conservation process. DOA should go beyond the preservation of single monuments. It should also include traditional built structures, arts and crafts and other intangible heritages. Moreover, DOA should cooperate and coordinate with the Madhyapur Thimi Municipality in preparing inventory, legislations, policies and plans. Guthi Corporation should also be more active in the conservation of cultural heritages and actively coordinate with the DOA and Madhyapur Thimi Municipality.

Similar to Bhaktapur Municipality, the Madhyapur Thimi Municipality should play a proactive role to cooperate and collaborate with the governmental and non-governmental organizations to carry out conservation works in Thimi. The donor agencies and local community organizations should work in collaboration with the municipality. Although, DUDBC is not directly involved in the conservation works, its cooperation is also necessary to formulate urban planning and development policies for Thimi. Hence, there should be a strong coordination mechanism that should promote better implementation of the conservation projects and enhance sustainable community development in Thimi.

A Framework to Coordination among Different Institutions



Source: Author

6.3.2 Provision of Sufficient Technical and Financial Resources

Conservation of cultural heritage often become unsuccessful because of the lack of sufficient technical and financial resources. As stated earlier, the responsible institutions for heritage conservation in Nepal are deficient in technical and financial resources. Moreover, some are found deficient in leadership and proper legal support. Hence, it is necessary for the institutions to be competent and efficient to carry out urban conservation successfully. The Government should empower the institutions by recruiting professional staffs and developing proper funding mechanism.

The role of donor agencies and local community organizations is considered vital to support the projects financially and technically. They can provide technical support in terms of expertise in the conservation works and necessary trainings. Moreover,

their intentions should always aim to strengthen the institutional capacity of the responsible institutions such as DOA, *Guthi* Corporation and Municipality.

Revitalization of historic town Thimi will need large amounts of financial and technical resources. The institutions including donor agencies and local community organizations should contribute significantly to manage the resources for the heritage conservation in Thimi. As in the case of Bhaktapur Municipality, after the establishment of conservation project, the conservation and development activities should be fully managed by Madhyapur Thimi Municipality with support from the local people. Further dependence on external resources may hinder the development needs of local people. Hence, The Municipality should start to collect entry fee from tourists and taxes from local business activities. The revenue should be fully utilized for conservation and development purpose. Moreover, similar to Bhaktapur Municipality, there should be a separate Heritage Section that should work in cooperation with other institutions to prepare and implement conservation policies and plans. Competent professional expertise such as urban planners, conservationists should be recruited by Madhyapur Thimi Municipality for effective planning and implementation of conservation works.

6.4 Political Commitment, Education and Awareness

Lack of strong political commitment, education and awareness has been identified as the major hindrance for the successful implementation of the conservation and development plans in Thimi and Kathmandu valley. As witnessed in the case of Bhaktapur Municipality, when there is a strong political commitment, conservation becomes easier and successful. The issues of conservation should be the major objectives of the local government's development agenda. Since, most of the members of the Municipal Council are political representative of the different wards of the town, and they are capable of reaching out to a large section of the community; they should be first educated about the heritage importance and then should be motivated to make local people aware in their

respective areas. There should be common consensus among the leaders and local community and heritage conservation should be given top priority.

Moreover, education and awareness programmes about the importance of cultural heritage resources and their conservation should be launched by responsible institutions such as DOA, *Guthi* Corporation and the municipality. Regular organization of cultural programs, community meetings, distribution of pamphlets, school education, publishing in newspapers, broadcasting from radios and televisions should be encouraged significantly. Similarly, the local community organizations could provide information about the legislations and development control, so that people can stop violating the rules. Besides, local people should be educated and convinced about the economic benefits of heritage conservation. For example the potters should be educated on improved techniques and methods of pottery production and marketing so that they will gain more profits and continue their traditional occupation. Hence, financial justification would be one of the major public awareness campaigns. DOA, *Guthi* Corporation, local government and local community organizations should demonstrate strong political commitment and launch educational and awareness programmes to conserve urban identity and heritage of Thimi.

6.5 Need to Promote Sustainable Tourism

Madhyapur Thimi Municipality neither has a comprehensive tourism policy nor up-to-date tourism statistics. It is essential to have a long term tourism plan that would promote sustainable cultural tourism and enhance conservation of built heritages, local culture, arts and crafts and other intangibles. Moreover, comprehensive conservation plan should integrate tourism concerns so that many historic building could be used for tourism purpose such as restaurants, hotels, museums, shopping centers, entertainment houses etc. Marketing of local arts and crafts and tangible and intangible heritages as a tourism product through promotional programs and activities should be conducted. In fact, there should be a sustainable tourism plan that should promote cultural tourism and enhance heritage conservation

together for their mutual benefits. It should have the following major objectives:

- Conserve cultural, historical, religious and architectural heritages and maintain uniqueness;
- Conserve and promote local arts and crafts such as pottery, mask-making, weaving, wood carving and other intangible heritages;
- Adopt balanced approach between the supply side and demand side of tourism;
- Improve social and economic benefits to the local people;
- Attract more tourists and provide best experience to the tourists;
- Encourage participation of local people in tourism activities and implementation and management of tourism plan;
- Provide continuity to heritage conservation for the future generations;
- Minimize negative impacts of tourism on local resources and community; and
- Achieve goals of sustainability and promote sustainable community development

Hence, the plan should be compatible with the local heritage resources and character and should strengthen the identity of local community and sense of place. Since, tourism activities would provide jobs that encourage use of the local knowledge, skills and traditions and offer sense of fulfillment and satisfaction to the local people, the local government and tourism organizations should strongly adopt the heritage-led sustainable tourism. It should encourage the use of locally manufactured products (such as pottery products, ceramics etc.) through tour operators and hotels and should avoid the imports of foreign goods. However, the local products should also have good quality and satisfy tourist needs. The revenue collected from tourism should directly be spent for heritage conservation and socio-economic development of Thimi. Since, the historic town Thimi lies between tourist hubs; Bhaktapur and Kathmandu, efforts should be always made to develop Thimi as a major tourism destination and a part of Kathmandu –Bhaktapur heritage trail. It will help to improve the quality of life of local people, preserve the heritage resources and

prolong sense of community. Thus, Madhyapur Thimi Municipality should adopt sustainable heritage-led tourism to promote sustainable community development.

6.6 Fostering Public Participation

Heritage conservation in historic town Thimi follows a top down process and civic engagement is hardly seen in such works. Community participation plays a crucial role to preserve cultural identity, promote social inclusion, quality of life, conservation and sustainability. Hence, effective heritage conservation for promoting sustainable tourism and sustainable community development should be realized through public participation. The DOA, Madhyapur Thimi Municipality, *Guthi* Corporation and other organizations should realize the importance of public participation in the promotion of sustainable community development. They should actively involve in fostering participation in heritage conservation and tourism promotion. Moreover, the communities also need to be aware about the heritage conservation and development works and should actively participate and raise voices to conserve their heritage resources. Planners and conservationists should play proactive role to educate public about the importance of heritage conservation and should convince people that their participation is crucial to improve their quality of life and in promoting sustainability. Genuine participation should be encouraged so that it will provide people a feeling of ownership as well as motivate the municipality to protect social capital, sense of place and promote community well-being. The institutions should develop an effective participation mechanism which should promote active participation of stakeholders in (i) understanding the heritage significance and preparing heritage inventory; (ii) developing objectives to retain significant values; and (iii) implementing, monitoring and reviewing the conservation plan.

Similar to the case of Bhaktapur Development Project (BDP), the formation of the Local Development Committees (LDCs) and Community Development Units (CDUs) could foster participation effectively in heritage conservation. Moreover, the traditional organizations such as *Guthis* should be revived and should play a

leading role in organizing community discussions and interactions. Different means of participation such as community forums, street exhibitions, workshops and door to door consultations should be approached to maximize the participation of stakeholders. There should be statutory mechanism for participation which will encourage institutions to ensure local people's voices and their development needs in the plans. Moreover there is a need of promotion of civic duties and communal responsibilities so that people will correctly judge their needs and conservation works in Thimi. Urban planners, conservationists, social workers, community planners should play proactive role to encourage local people to participate in the conservation process. Thus, the change in the institutional structure and people's behavior towards heritage conservation and tourism development will help to promote long term sustainability in Thimi.

7.0 Concluding Remarks

Historic town Thimi is known for its remarkable cultural heritage resources and unique historic identity. However, continuous decay and destruction of cultural heritages, since past few decades, have threatened to end its unique identity. Moreover, the traditionally well-sustained community is now degrading and heading towards unsustainability. Nevertheless, Thimi is so close to the capital city and between two major tourism destinations of Nepal (i.e. Katmandu and Bhaktapur), yet tourism development has remained in the shadows. The current plans, policies, legislations and institutions regarding heritage conservation are inefficient and ineffective to carry out conservation works for overall development of Thimi.

In this context, urban conservation i.e. integrated conservation through public participation is essential to promote sustainable tourism and sustainable community in Thimi. Efficient institutions, integrated conservation plan, effective legislations, genuine public participation and sustainable tourism practice would be the appropriate approach to achieve sustainability in the historic towns like Thimi. Moreover, provision of technical and financial resources, strong political commitment, awareness and education about the importance of the heritage conservation are the most

essential components to foster sustainable development. Hence, both the central and local government should be proactively involved in the conservation of Thimi by preparing comprehensive policies, plans and legislations and their effective implementation through genuine community participation

8.0 References

1. Australian Heritage Commission (2000), *Protecting Local Heritage Places: A Guide for Communities*, Australian Heritage Commission.
2. Bizzaro, F. and Nijkamp, P. (1996), "Integrated Conservation of Cultural Built Heritage", *Serie Research Memoranda*, No.12, Amsterdam: Free University.
3. Central Bureau of Statistics (CBS) (2002), *Population Census 2001*, National Report, Kathmandu: Central Bureau of Statistics.
4. Cohen, N. (1999), *Urban Conservation*, Cambridge, Mass: MIT Press.
5. Cohen, N. (2001), *Urban Planning Conservation and Preservation*, US: McGraw-Hill.
6. Fielden, B. (1982), *Conservation of Historic Buildings*, London: Butterworth.
7. Feilden, B. M. and Jokilehto, J. (1998), *Management Guidelines for World Cultural Heritage Sites*, Italy: ICCROM.
8. Imon, S. S. (2006), *Sustainable Urban Conservation: Role of Public Participation in the Conservation of Urban Heritage in Old Dhaka*, PhD. Dissertation, The University of Hong Kong.
9. Jayana, D. B (2007), *Spatial Transformation of Thimi*, unpublished MSc. Urban Planning Dissertation, Pulchowk Campus, Tribhuvan University.
10. Jokilehto, J. (1999), *A History of Architectural Conservation*, Oxford, England: Butterworth Heinemann.
11. Jokilehto, J. (2003), *Conservation Concepts and Ideas*: Centro de Estudos Avançados da Conservação Integrada (CECI), Recife, Brazil.
12. Kerr, A. (2000), "Public Participation in Cultural Resource Management: A Canadian Perspective", In *ICOMOS General Assembly entitled "Patrimony of Conservation, Arqueologia. XII Asamblea General del ICOMOS"*, Mexico City: INAH.
13. Pant, M. (2002), *A Study on the Spatial Formation of Kathmandu Valley Towns: The Case of Thimi*, unpublished Doctoral Dissertation, Kyoto University.
14. Larkham, P.J. (1996), *Conservation and the City*, London: Routledge.
15. Lichfield, N. (1988), *Economics in Urban Conservation*, Cambridge: Cambridge University Press in association with Jerusalem Institute for Israel Studies.
16. Madhyapur Thimi Municipality (2000), *Development Guidelines and Regulations*, Bhaktapur: Madhyapur Thimi Municipality.
17. Muller, U. (1981), *Thimi-Social and Economic Studies on Newar Settlements of Kathmandu Valley*, Leibig Universität Giessen.
18. Prajapati, S. R. (2005), *Destination Thimi*, Thimi: Chapacho Information Centre.
19. Shah, B. (1997), "Conserving Katmandu's Urban Form", *The Kathmandu Post review of Books*, Vol.1, No.12.
20. Shah, B. (2003), "Heritage Conservation and Planning, New Development in Bhaktapur, Nepal", *Paper presented at the 6th US/ICOMOS International Symposium "Managing Conflict & Conservation in Historic Cities*, held on April 24-27, 2003 in Annapolis, Maryland.
21. The ICOMOS International Committee on Cultural Tourism (1993), *Tourism at World Heritage Cultural Sites: The Sites Manager's Hand Book*, Spain: World Tourism Organization.
22. Townsend, S. S. (2003), *Development Rights and Conservation Constraints: Urban Conservation-Oriented Controls in the City Centre of Cape Town*, PhD Dissertation, University of Cape Town.
23. UNESCO World Heritage Centre (2005b), *Vienna Memorandum on "World Heritage and Contemporary Architecture- Managing the Historic Urban Landscapes"*, Paris: UNESCO.

Internet sources:

- International Council on Monuments and Arts (1987), *Charter for Conservation of Historic Towns and Urban Areas-Washington Charter*, Documentation Centre UNESCO-ICOMOS
- Website: http://www.international.icomos.org/charters/towns_e.htm, retrieved on 5 September, 2007.
- ICOMOS, Australia (1999), *Burra Charter*. Website: <http://www.icomos.org/australia/burracharter.html>, retrieved on 25 January, 2007. <http://www.unescobkk.org/index.php?id=2113>

CHALLENGES FOR MANAGEMENT TO IMPLEMENT E-GOVERNANCE IN NEPAL

Dhiraj K. Das*

Deepak B. Dhimi*

Abstract

e-Governance is designed to support and simplify governance for all stakeholders - government, citizens and businesses. In e-Governance, information and communication technologies support and stimulate good governance through better public service delivery to individual citizens and businesses, transparency in information, and easier citizen access to authorities. The term "e-Government" applies to the use of Information and Communication Technology (ICT) as a tool to achieve better government. Thus, e-Government is not about business as usual, but should instead focus on using ICT to transform the structures, operations and, most importantly, the culture of government. This paper focuses on the external and internal challenges to e-Government implementation.

Keywords: e-Governance, stakeholders, good governance, public service, transparency, ICT.

1. Introduction

Many economists, management experts and futurists agree that the world has entered the new age of information. The new era is being increasingly referred to as the *Information Age*. The primary drivers of this information age are technology, market, enterprise and marketing entrepreneurship. The emergence of the Internet and developments in processing capacity and data storage during the 1990s has significantly altered the environment for ICT use across society and in government.

Keeping up with the 21st century developments, governments around the world are embracing Information Technology (IT). In every region of the globe, from developing countries to industrialized ones, central and local governments are putting critical information online, automating bulky processes and interacting electronically with their citizens.

* Assistant Professor, Department of Computer Science and Engineering, Nepal Engineering College

International organizations such as the World Bank and the ADB, as well as countries such as Korea and India, who are leaders in e-governance, have been supporting Nepal in this regard.

The Nepal e-Government Master Plan (e-GMP) has also provided a framework for moving forward. This Master Plan, undertaken by the Nepal High Level Commission for Information Technology with the support of the Korea IT Industry Promotion Agency, has sought to establish the vision, lead applications and management framework including legislation necessary to proceed further. India has provided substantial assistance, particularly by way of infrastructure and connectivity.

In order for the government to function as e-Government, it must adhere to the following principles: government services should be citizen-focused, accessible and inclusive, adept at managing information.

In order to make e-Government more accessible, cost effective and responsive, local public services should be:

- Integrated so that they make sense to the citizen.
- Accessible so that the citizen has more choice in how to contact and receive public services at times convenient to the citizen.
- Delivered electronically for faster and better value services.
- Delivered by local and regional partnerships.

There are many definitions of electronic government due to the different perspectives of experts, especially since the term itself is new. As a result, there is no one definition enjoying broad acceptance. Our starting point is that the concept of governance refers to a process whereby elements in society wield power and authority, and influence and perform policies whereas the term government refers to the organizations in the public sector.

2. Scopes for e-Governance in Nepal

The rationale for establishing e-Government needs to relate directly to the common needs and goals of the

community if it is to form a vision for an e-Government program in Nepal. The vision needs to be shared by the stakeholders including communities, businesses, special interest groups and others. Such goals commonly include:

- Rural poverty alleviation and improved service delivery to the community.
- Enhanced productivity (and efficiency) of government agencies.
- More effective rule-of-law with a stronger legal system and law enforcement.
- Economic development and strengthening implementation of good governance.

3. Expected Effects

- Minimization of investment cost by using GIDC based facilities.
- Improved stability and efficiency through concentrated central management.
- Offering of basic environment for government co-location and secured email service.
- Minimization of operation cost through centralized installation.

4. Challenges for Management

e-Governance on the internet faces several challenges. The following are the major challenges for management which need to be addressed for efficiently implementing the e-Government.

4.1. Social and Cultural Aspects

Nepal is rich in social attachment and culture which are reflected in different aspects of social life. In addition, cultural issues manifest clearly in the workplace and in the street. As a result, it can be said that the government takes cognizance of these facts in providing services to the citizens. For example, the adoption of new technology enables more Nepalese to work and enhance their access to government services.

As Nepal is a country whose economy is based on tourism and agriculture, more than two million tourists come to Nepal every year from different parts of the

world requiring various government agencies to collaborate in providing services to them effectively.

4.1.1. Ensuring a Common Vision

A common vision is essential to e-Government as a means to engage and co-ordinate agencies. It also serves to engage political leaders and to impress upon them the importance of e-Government. A common vision is not a goal in itself, but a means to achieve policy priorities.

A government-wide vision helps to tie e-Government initiatives with broader strategic and reform objectives. It can help promote inter-ministerial co-ordination, ensure balance and fairness and help to stay the course over a number of years. Having a clear vision of reform helps to maintain consistency and a sense of purpose. Towards this end, political leaders are key supporters of an e-Government vision.

4.1.2. Strengthening Coordination

Decentralization has been a key component of public management reforms in most developing countries. Agencies cannot operate in isolation, especially with regard to ICT. The nature of e-Government requires a level of co-operative action to ensure interoperability, avoid duplication, ensure coherent action in a range of crucial areas such as security and privacy protection, and to provide the framework and capacity for seamless services.

4.1.3. Meeting Regularly for Changing Skill Needs

ICT-related skills are important not just for ICT production and service industries, but for the economy as a whole. ICT skills have become a new general skill, like literacy, and governments have implemented a range of policies to promote the acquisition of basic and advanced ICT skills across the economy.

The skills required for e-Government are not simply technical but also managerial for decision making. Necessary skills include basic technical understanding (IT literacy), understanding of information management and the information society. Like all employees, managers need basic IT skills to use ICT

effectively. But managers also need to understand the possibilities of ICT, to manage the information strategy for the organization and to deal with the impact of e-government on the organization. They need to understand how new technology works, how it can be incorporated into existing government functions, and how e-government applications can build new government services and products or open new channels of communication.

4.2. Technical Aspects

The adoption of e-Government in the public sector can lead to widespread improvement in ICT architecture and improve skills for employment. This empirical study reflects this motivation in terms of interest to utilize ICT and to learn new skills in dealing with this technology.

4.2.1. Rapid Technological Change

Governments face the challenge of promoting the development of e-Government while there is still great uncertainty regarding fast moving technological change, and it is difficult to anticipate future policy impacts in detail.

Risk of failure can be reduced by using well-proven approaches or even better, standard software. Broad approaches to dealing with emerging technologies include:

- Technology neutrality in legislation and regulation to avoid adaptation of current laws to a digital world.
- Performance requirements when procuring new technologies.
- Involvement of all stakeholders in regulatory processes.

4.2.2. Internet Infrastructure and Bandwidth

The Internet as the medium of e-Governance cannot be trusted for guaranteed and secured delivery of transactions or for mission critical application since no one takes responsibility for its 100 percent uptime. Robustness, reliability, bandwidth and security of the Internet continue to be major concerns for the growth of e-Governance.

4.2.3. Privacy and Security Concerns

Citizens are unlikely to use e-Government services without a guarantee of privacy and security. Governments also have a strong interest in maintaining citizens' trust. The challenge facing e-Government coordinators and implementers is to respect accepted privacy principles while allowing the benefits of the Internet and other technologies to flow to citizens.

Government has a responsibility to provide leadership in developing a culture of privacy protection and security. It should provide this leadership through its roles in the development of public policy, as owner and operator of systems and networks, and as a user of such systems and networks.

4.2.4. Digital Divide

The digital divide is an important barrier to e-Government in that people who do not have access to the Internet will be unable to benefit from online services. In developing countries, a growing number of people have access to the Internet, but there are still large numbers of people who do not. Such disadvantaged groups are often the targets of government interventions and higher level of ongoing interaction with government.

The digital divide is a particular challenge in some countries because some studies seem to indicate that Internet and pc penetration may be reaching a limit that is defined by the perceived value for citizens to be online.

4.3. Economical Aspects

Meeting economic goals is an important issue for any government endeavor as every country places a premium on attracting good investment, which in-turn provides jobs for its people and helps the economy to grow. In terms of funding, certain ICT project spending as capital rather than recurrent expenditure can be a challenge. Not all ICT expenditure is of a capital or investment nature, but involves maintenance, associated recurrent staffing costs, or small-scale projects.

Many e-Government projects will be multi-year in nature, and thus require commitments to spend

resources over a long period. Such projects represent a commitment to spend future revenues. Finally, the difficulty of measuring costs and potential benefits for e-Government projects makes it hard to develop funding cases for projects and compare alternatives in a budget-setting context.

4.4. Legal Aspects and Regulation

The success of e-Government initiatives and processes are highly dependent on government's role in ensuring a proper legal framework for their operation. The introduction and uptake of e-Government services and processes will remain minimal without a legal equivalence between digital and paper processes. Governments are aware of the need for a framework to provide for enforceable electronic transactions, both in the e-Government sphere and for electronic commerce, and have taken action. In addition, privacy and security concerns need to be addressed through appropriate legislation and regulations before e-Government initiatives can advance.

Combining existing requirements with clear regulatory guidance is a major challenge to e-Government coordinators. Government should address how existing regulations should be clarified and explained to e-Government implementers for its implementation.

5. Conclusions

Basically the e-Governance challenges for management are to understand how e-Government fits with other government offices, with citizens and the business community. This larger governance issue is what many mean by the term "e-Governance", but in fact it is not unique to electronic services and consultation; it is simply made more complex and pressing by a host of new ICT tools.

In e-Governance implementation, individual agencies have tended to respond to e-Government bodies by putting existing information online. All information flows from the administration to the user since this stage primarily involves the digitizing of existing information and placing it online, requiring the least investment in process reengineering with a minimal amount of planning.

References

1. www.egovernancenepal.blogspot.com, September 2008
2. www.hlcit.gov.np/workshop/development, september 2008
3. www.egovernance.wordpress.com/2006/10/11/niit-singapore-joint-hands-for-e-Governance, September 2008
4. *A Handbook for Citizen-centric e-Government Version 2.1* December 2007, October 2008
5. *UN e-Government survey 2008 from e-Government to connected Governance*, October 2008
6. *A fact book on ICT by HLCIT*
7. *e-Government Master Plan Consulting Report by KIPA*, October 2008
8. Kim Viborg Andersen "e-Government: Five Key Challenges for Management"
9. Edwin Lau, "CHALLENGES FOR E-GOVERNMENT DEVELOPMENT"

NATURAL DISASTERS AND PROTECTION OF WORLD HERITAGE SITES IN NEPAL

*Bharat Sharma**

Though this paper will basically focus on protection of World Heritage Sites, nonetheless it is strongly felt that there exists a very strong interlinkage between earthquake, landslide, flood, soil erosion pre and past management and protection of world heritage sites in Nepal.

In the Nepalese scenario, there are numerous aggravating factors which are likely to impact and trigger risk to our priceless sites.

Disaster Context and Eco-Geo Setting of Nepal

Nepal is an extremely vulnerable and disaster prone country. Though small, it is not only very rich in bio-diversity but simultaneously its ecological and geological setting is very fragile and unique. Apart from natural agents such as earthquake, landslide, flood, soil-erosion, GLOF, climate change, human induced actions are contributing factors in the Nepalese context.

A very wide array of geological, ecological, meteorological and above all physiographical factors contribute to Nepalese disaster. The presence of seismic faults traversing the country and the tectonic movement in the region are responsible for earthquakes. Obviously, earthquakes of even moderate intensity can deliver devastating impacts.

The Nepalese Himalayas are subject to soil erosion, landslide, flash flood, glacial lake outburst and avalanche. Though the high Himalayas are subject to avalanche and GLOF, the midland is prone to land slides due to very steep slopes. The Monsoon plays a key role to aggravate the situation further.

Nepal lies in a very high seismic zone, consequently, earthquakes of magnitude 5 and above up to 8 in Richter scale have been experienced frequently in the past. High seismicity is directly related to the presence of active faults between tectonic plates along the Himalayas.

* Professor, Department of Architecture, Nepal Engineering College

Settlement System and Pattern

The most obvious direct impacts of hazards are glaringly our settlements with locations of cultural heritages within them. Heritage sites are spread over a mosaic of settlements. Hence the interrelationship of hazard zone and heritage points has to be seriously considered. Heritage site are our national identity, that too when some of the sites are enlisted in the world heritage list, our national responsibility tremendously increases to safeguard them. Out of seven locations enlisted in the world heritage list only two namely, Changu and Swayambhu, are on hillocks with interesting terrain while the rest namely, Boudha, Pashupati Nath and three Durbar Squares of the valley are all located within dense settlements and are almost flat in topography.

Both hillocks of Changu Narayan and Swayambhu Nath are fragile and sensitive though very intrinsic in aesthetics. Both of them have painful history in the past with regard to landslide and erosion. But more than natural process and causes, the negative environmental impacts on these two hillocks were due to man made cause. Both heritage sites were menacingly threatened for survival.

Basically it is cause and effect relation which is a product of human induced aggravations. The angle of repose in both cases was badly impacted. To add insult to injury, it is the flood of chaotic unbridled urbanization in close vicinity of the hillock itself that poses threat to our heritage sites.

In Nepal a very significant number of landslides occur annually. Available data indicate that nearly 13% of the total area of "Churia" and Mid Hilly Region of the country suffers from landslides. Natural as well as man made factor contribute to the cause.

Natural factors include young geology, steep slope undercutting by rivers, high rainfall, weather and fractured rocks and frequent seismic activity.

Induced factors responsible for landslide are deforestation, unplanned settlements, improper practices in agriculture, quarrying of materials and non-conductive infrastructural developments.

Risk Assessment

Risk assessment which is a very effective tool has hardly been resorted to in a systematic way. Though hazard mapping and vulnerability analysis with donor's assistance has made its way into the Nepalese scene in recent years, Hazard Mapping of the country, basically geological, is slowly getting available. However, its inference and effective use has yet to be made.

Though some endeavor has been made by the Department of Mines and Geology, Tribhuvan University, Department of Geology, ICIMOD, Water and Energy Commission, NSET in context of hazard evaluation, it has hardly gone into institutionalisation process which is a must. It is the call of the hour that hazard mapping coverage and vulnerability analysis and appropriate response should be carried out so that proper mitigation measure could be taken to avoid loss of life and property. It is very essential to have hazard location map indicating projected severity, frequency and duration.

Institutionalized vulnerability analysis has yet to be carried out in a systematic way in Nepal. The spectrum of vulnerability broadly covering physical, social and economic has to be given due weightage and consideration.

In the context of protection of World Heritage Sites in Katmandu valley, perhaps it is very pertinent to mention about the tremendous contribution made by renowned professor of Harvard University, Professor E.F. Sekler whose team prepared the Master Plan for conservation of heritage sites and his praiseworthy contribution to establish "Katmandu Valley Preservation Trust"

In his very emotional expression Prof. Sekler has said, "The protection of monuments and heritage is never an impediment to development, rather it helps to earn"

Heritage protection is definitely not a single action plan. Caring for the monument is not restricted to the outward face lift and some structural repair. In fact the sites and monuments are dovetailed and one can not separate them. Protection of monuments can not materialize until and unless the sites are protected.

Measures of Protection

Most likely, site protection will require the followings:

- i) Status-quo of the site should be maintained strictly in physical terms.
- ii) Human intervention within and around the site should be almost nil.
- iii) Chaotic and unplanned growth around the site should be restricted.
- iv) Carrying capacity of the site should not be breached.
- v) Hydrological balance in and around the site should not be disturbed.
- vi) Soil or sand mining around the site should not be allowed.

In the distant past the slope stability of both Swoyambhu Nath and Changu Narayan was under stress and in fact threatened. The land-use of Swoyambhu with mushrooming of so called religious buildings was a contributing factor apart from other physical disturbances. If likely natural disaster was to be added to it, the consequence and destruction could be unthinkable and heritage site was liable to be ruined.

So is the precarious situation of Changu Narayan. Here the slopes around are much steeper with dissected terrain. Gully erosion and eventual landslide is a factor to be taken seriously to protect the hillock. Any destruction of forest and green ground-cover and reckless tendency of building houses in very close proximity of the temple site could trigger very negative impacts on soil stability.

In recent years NSET has been deeply involved in retrofitting school buildings in particular in Katmandu Valley. To date no effort has been made to retrofit our heritage sites by any government agency perhaps because of their complex and sensitive nature.

Particularly in the case of Boudha Nath Temple and the three Durbar Squares, it is the aesthetics and visual quality of the skyline which have negative impacts. It is the ruthless on-slaught of unplanned

urbanization which is ruining those heritage sites. Basically it is the surrounding built-environment which is creating a very unhealthy physical setting. In case of Pashupati Nath the physical setting is slightly different. To some extent Pashupati is insulated in almost all the cardinal directions other than the west by green canopy. However, it is worth mentioning that perhaps Pashupati has suffered to some extent because of some reckless planning exercise recently, which is rather sad.

Protection of heritage is just not by cosmetic measure; it is deeper than that. In the name of conservation, an exercise in brinkmanship does more harm than good. Heritage protection is not simple one time affair, it is a process in continuum.

Mitigation Practice

An established mitigation approach has not taken root in Nepal. This is perhaps a somewhat ignored area and has to be taken up in all seriousness. Only prevailing conventional wisdom will not cope with the disaster situation.

We should get reminded by the devastating 1934 earthquake when lots of monuments were levelled to the ground. This should serve as a reminder to our community that structural as well as non-structural mitigational measures have to be taken on time to protect our heritage.

It is not only our national responsibility and obligation but global as well to protect world heritage sites. Hence it is very essential that strict planning bylaws and construction bylaws be effectively used. Preventive measure is always better than a curative one.

Though, the National Building Code backed up by Act has now been enforced, its efficacy has yet to be tested and verified. To date no Government or Department including Department of Archaeology has given serious thought about likely serious impact of earthquake hazard on our world heritage sites. As in any fatalist society we assume that nothing will go

wrong which is so false. Hence, without affecting the architectural quality and fragility of the site some appropriate retrofitting measure has to be taken so that the structure will be able to withstand future eventuality. Perhaps a team of multidisciplinary experts will be needed to apply the right retrofit.

Disaster Management

Pre or post disaster management has not taken institutionalized system in Nepal. Pre disaster management which is so vital in the context of minimizing loss to life and property is never high on the agenda. Some government organizations and prominent NGOs like Red Cross are mostly involved in post disaster period.

Though the Natural Calamity Relief Act (1982) did establish a central Disaster Relief Committee as the body for disaster management, its role has not been effective enough.

In fact disaster preparedness and relief aspect has not fully caught the imagination of the society. National Disaster Preparedness Plan which could link preparedness and relief action with wide developmental linkage and effective mitigation measure is the call of the hour to protect our heritage as well as others.

Concluding Remarks

Our heritage and monument sites are invaluable assets and remarkable identity of our society. That too, our world Heritage sites are on global cultural web, putting duty and obligation on our part to be very careful about their protection. Hence, it is extremely important that our society comes out of all fatalistic attitudes towards protectional measures. It is for sure that we can not prevent disaster all together but definitely our preparedness with awareness will help to alleviate the situation. Hence all aggravating factors, man-made or natural, should be minimized and simultaneously protective mitigation measures should be initiated anticipating the natural hazard which is so real yet does not tell the time and date of strike. It is only our preparedness which counts.

The crux of the matter is that the symbiotic relationship between the built environment of heritage sites should be established and the natural setting should be harmoniously maintained. This is a Herculean task but definitely not impossible. A further safeguarding response and measure would be "Structural Retrofit" with conservational compatibility to be soundly decided by a panel of concerned experts. This applies to all the heritage sites because "a stitch on time saves nine"

TEACHING AND LEARNING ENGINEERING EDUCATION IN INDIA

Deba Prayagan Chaudhary*

Abstract:

This paper describes a study to investigate action learning and evaluation in improving teaching quality on the basis of analysis of NAAC. The study also focuses on the contribution of evaluative practices to the building of staff and organizational capability and the improvement to program performance.

Teaching/Learning and Evaluation:

It deals with the efforts of the institution in proving appropriate teaching/learning experiences to learners and also looks at the adequacy and competency of the faculty who handle the various programmes of studies, as well as the efficiency of the evaluation methodology of the institution.

Criteria

Criteria for evaluation of a teaching institute may include the following:

- Judging students' knowledge and offering bridge/remedial courses if needed.
- Teaching/learning process.
- Use of new technology in teaching and co-curricular activities.
- Examination process.
- Innovative evaluation methods.
- Recruitment of faculty and faculty development programmes.
- Evaluation of teaching, research and work satisfaction of faculty.
- Monitoring and rewarding successful teaching innovation.

*Mr. Chaudhary is the Research Scholar at Center for Quality Management System, Jadavpur University, Kolkotta, India. His e-mail id is debaprayaga@yahoo.com.in>

Present Scenario of India

Calculating Weightages (1)

Criteria	University	Affiliated/constituent colleges	Autonomous colleges
Teaching/learning and evaluation	250/1000 (25%)	350/1000 (35%)	450/1000 (45%)

Criteria	Key aspects	University	Autonomous college	Affiliated /constituent college
Teaching Learning and Evaluation	1. Admission process & student profile	20	30	30
	2. Catering to diverse needs	20	35	45
	3. Teaching-Learning process	90	170	270
	4. Teacher Quality	60	65	65
	5. Evaluation process & reforms	50	40	30
	6. Best practices in teaching learning and evaluation	10	10	10
	Total	250	350	450

Improvement in teaching-learning strategies

The attention of the institutions became focused on priorities and responsibilities, especially with reference to teaching/learning as their primary mission. In the scheme of assessment of NAAC, the criterion teaching learning and evaluation carries the maximum weightage. It gave a positive stimulus to institutional attention and oriented institutions so as to improve their quality of teaching/learning by going beyond the routine examination-oriented outcome. The fact that teaching/learning has to be equal to or more important than research became well understood in universities as well. Improved teaching methods using educational technology, projects and student seminars, providing computer skills, encouraging co-curricular activities, and incorporating community orientation were observed.

Campus Concept

The campus integrates the tools for effective teaching, learning, evaluation and communication. Main components used are the campus wide technological facilities, global access, digital class rooms, class

facility, library facility, hostel etc. Community of the campus locality offers another important component for community based teaching learning.

The Modern Classroom

The technology has entered the classroom. An innovative way the class room teaching has morphed, with the blackboard being replaced by e-board and papers and pens replaced by laptops and the limited knowledge of the books.

Features of a classroom where modern technology has entered including E-board are:

- ❖ Supported by Webster Software
- ❖ For interactive chalkless writing
- ❖ Wireless lapel microphone to pickup audio
- ❖ Ceiling mounted camera to capture video
- ❖ Multimedia projector for display

The Modern Teachers

The modern teachers should have quality and qualification to understand and practice modern tools, with it modern teacher will be benefited as follows:

- Innovative way of teaching with technology enabled education system.
- Burden of spending lot of time in drawing complicated figures can be reduced to a greater extent.
- Traditional class rooms were place and time bound and source of knowledge and learning
- Professor + supplementary tools = learner centric, open and flexible education that is opportunity for focused learning.
- To listen, remember, synthesize and interpret knowledge is drudgery but with digital tools teaching will be effective because there is a chance to repeat any number of time and practice till it is perfected.
- The lectures sessions can be interactive and digitized.
- The teachers can access the performance of the students online uniformly and with transparency.
- Information beyond the syllabus can be shared in small duration.
- Most important of all, make best teachers which is measured in terms of money.

Students Get Benefit

With the enhanced quality and qualification of modern teacher to deliver in the classroom, modern students get benefited a lot. Direct benefit can be derived by the students as below:

- Need to take class notes are avoided thus enabling the students to focus on the topic being taught.
- Efficiency increases since student's attention is 100% on teacher's lecture rather than on his writing notes and spellings.
- Students at various colleges or centers or even countries can swap their notes in no time
- Instant availability of any material in the classroom.
- Programming subjects can be learnt 'by doing' in the class room rather than in the laboratory.

Re-engineering Examination

There is a demand of more transparent and reliable system of examination, evaluation and reporting. It is also noticed that the examinations primarily test the memory of the students. In fact examinations must be of the type that promotes creativity among the teachers in setting questions and to evaluate the creative ability of the students, which is the need of the hour in this highly competitive and globalized world.

Therefore the traditional system of taking 3 hours examination in each subject at the end of semester or year should be changed to continuous evaluation and student centered evaluation. The traditional evaluation system should be re-engineered to test the real ability of a student.

The examining bodies should have a reliable evaluation system and timely declaration of results. After the initial evaluation of the answer paper a centralized core group can draw random sample from each batch and carry out independent evaluation.

E-Examination

Technology has revolutionized education and every aspect of it in a big way. The computer assisted automated marking is one of the attractions of putting assessment online. Whole examination procedure can be made online.

The two primary benefits of administering examination online are:

- a) The large cost savings by the substitution of machines for labor in grading and
- b) The potential for enhanced student learning due to more frequent assessment.

Another significant benefit is immediate feedback to students on home assignments and other examinations.

Conclusion

In this knowledge era the facilities provided to the students would help them to become globally competitive. Quality students are generated who can meet the challenging requirements of the emerging

knowledge economy. The standard and exposure of the students to information increases and the quality of students coming out of the portal is comparable to any other reputed established university in the world.

Reference:

1. Agarwal Pawan, "Higher Education in India: The need for change", Indian Council for Research on International Economic Relations (ICRIER), June' 2006
2. Bhattarai Deepak, "Prospects and Challenges of Engineering Education in Nepal", Nepal Engineers Association (NEA), September 2008
3. Government of India Planning Commission, New Delhi, India, "Draft Report of Working Group on Higher Education, 11th Five Year Plan"
4. Gunter Heitmann, "Quality Assurance in German Engineering Education against the Background of European Development", International Journal of Engineering Education, Vol.16 no.2, pp. 117-126, 2000
5. Maureen Brookes, Nina Becket, "Quality Management in Higher Education: A Review of International Issues and Practice", The International Journal for Quality and Standards. www.bsieducation.org/ijqs
6. National Assessment and Accreditation Council, "External Quality Assurance in Indian Higher Education : Case Study of the National Assessment and Accreditation Council (NAAC)", International Institute for Educational Planning, www.unesco.org/iiep
7. Report of National Assessment and Accreditation Council, India, Published by the Director, NAAC, P.B.No.1075, Nagarbhavi, Bangalore-560 072, March 2007

GIS BASED COVERAGE PREDICTION MODEL FOR GSM

Subash K.C., Ashish Sharma, Bikrant Koirala, Bipin Timilsina, and Krishna Regmi

Abstract

The aim of this study is to propose an applicable GIS based coverage prediction model for GSM. The model makes use of the received signal strength by MS from different BTSs while MS is in traffic from GSM system, GSM system databases, digital GIS map of interest area and propagation path model. The MS transmits the received signal strength by MS from serving cell and up to six neighboring BTSs to the GSM network during mobile is under traffic. This model uses data from MS without the knowledge of the mobile user and additional hardware. Additionally, the paper gives GSM system intrinsic positioning information and proposed intrinsic positioning technique used in the model. The rms accuracy of positioning technique used in this model is approximately 108 m. An erroneous accuracy jump can be made using averaging technique over a long period.

Index Terms- BTS, Coverage, GIS, GSM

Introduction

The tremendous increase in number of mobile users around the country has placed the challenge to the *Global System for Mobile Communication* (GSM) operators to support the growing number of users and maintain the quality of service, with an increasing number of operators and users opting for quality services. The service providers have to be conscious in providing the superior services to the customers while competing with other operators. Providing quality service is not only the demand these days but also an ethics of providing the service in return for the price paid by the customers. In order to ensure the quality of service, the proper network coverage plan plays a great role.

This project was funded by Department of Computer and Electronics Engineering, Kantipur Engineering College.

Subash K.C is Head of Computer and Electronics Department, Kantipur Engineering College and Ashish Sharma is working as research assistant in the same department.

In Nepal, the signal strength prediction of different locations in the coverage area is usually carried out through "Drive Test" by the GSM service providers. The drive test is carried out by keeping the measuring equipment in a vehicle and driving the vehicle where the signal prediction is required. Due to improper urban planning of Kathmandu valley, this method lacks the accessibility to various core city areas. Besides this, other factors like time, cost, accuracy, feasibility and requirement of trained manpower are the issues that need to be considered. Therefore, new approach is proposed that does not require expert manpower, recurring cost and extra time as in the case of drive test and the proposed approach helps to monitor the coverage of the GSM system centrally from Operation Support Subsystem (OSS).

Geographical Information System (GIS) captures, stores, analyzes, manages, and presents data that refers to or is linked with location. In a more generic sense, GIS applications are tools that allow users to create interactive queries, analyze spatial information, edit data, maps, and present the results of all these operations [1]. GIS maps are one of the frequently used information sources in different departments of GSM service providers.

This research project aims to provide an alternative way of coverage prediction of GSM network that makes use of received signal strength by Mobile Station (MS) from different Base Transceiver Stations (BTS) while MS is in active communication (traffic), digital GIS map, databases of GSM networks and professional analysis tools and aids to solve the various coverage problems of network and planning of GSM system. This project requires knowledge of three highly complex technologies: mobile telephony, GIS, and application development. In addition, the model can be used to increase subscriber safety, to enhance network performance, to perform location sensitive billing and other location specific information of users from system.

This paper is organized as follows: second section includes the literature review of related work. In section III, the methodology is proposed and section IV

provides results of the proposed model. Section V describes conclusion and future direction of the project. Finally, section VI provides information related with limitation of the approach.

Literature Review

One viewpoint of classification of positioning system is to consider where the position measurements are made and where the position information is used. Three broad classifications are: *self-positioning*, *remote positioning* and *indirect positioning* [2]. In self positioning system, the positioning receiver makes the appropriate signal measurements from geographically distributed transmitter and uses these measurements to determine its position. The most widely used self positioning system is (Global Positioning System) GPS. In remote positioning system, receivers at one or more locations measure a signal originating from, or reflecting off, the object to be positioned. These measurements are communicated to a central site where they are combined to give an estimate of the position of the object. In indirect positioning system, it sends position measurement from self positioning receiver to a remote site or vice versa. In this proposed work indirect positioning system has been used.

There are a variety of ways in which position can be derived from the measurement of signals in GSM. The most important measurements are propagation time, signal attenuation, Time of Arrival (TOA), Time Difference of Arrival (TDOA), Angle of Arrival (AOA), carrier phase, Cell Global Identity (CGI), Handover/ Location Area Update, Signal Strength Matching and hybrid methods (AOA and TOA) [2, 3, 4]. The overview about methods of mobile positioning, their geodetic analogy and restrictions that limit the spread of the respective methods can be found at [3]. Timing Advance (TA) is a measure of the propagation time which is proportional to the distance from the BTS to the MS and thus location of the MS can be constrained to a circular locus centered on the BTS. If the MS could be artificially forced to hand over to two more BTSs, it is possible to find MS position. This method uses forced hand over that can degrade call quality and reduce system capacity. Beside this, TA is reported in units of a bit period, which equates to a locus of 554 m. The

rms accuracy of such a system is likely to be even worse due to Dilution of Precision (DOP) [2]. Observed Time Difference (OTD) is made by the mobile without forcing a handover, they are of potentially greater utility for positioning than TAs. However, the resolution of an OTD measurement is 554 m and its rms accuracy is even worse due to multipath and DOP consideration [2]. The localization methods used in cellular system can be compared in terms of hardware requirements and accuracy. CGI and signal attenuation are the worst methods in terms of accuracy despite the advantage that they do not require any additional hardware other than the existing network. Best accuracies are provided by GPS methods that needs GPS receiver. Comparative chart of localization methods with required hardware and accuracy is found at [4]. Review of the different types of self-positioning techniques using GSM signal can be found at [5].

Methodology

The project needs different information from service provider including digital GIS with information of GSM system database, received signal level by MS from different BTS. Initially, the required information is acquired from the concerned department of Nepal Telecom, a leading GSM service provider of Nepal. In the following stage, coverage prediction model is developed using following algorithm consisting of four steps:

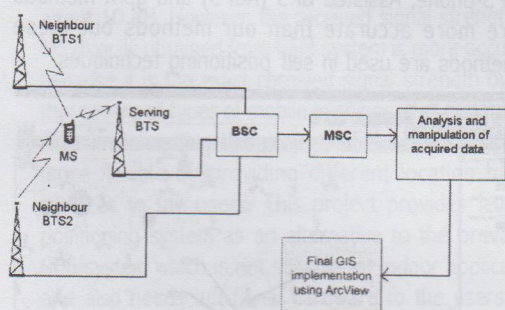


Figure 1: Basic block diagram of the proposed system

- a) First the different parameters such as operating frequency of BTS, height of

transmitting antenna, transmitting power by BTS, received power by MS while it is in traffic, location of BTS, are acquired from the GSM system. The height of the receiver (MS) antenna can be taken as the average height of MS.

- b) Using the suitable path loss model such as Hata model, Okumura model, Log-normal shadowing, Log distance model, etc., the separation between BTS and MS can be calculated. In this project, Hata model and Extended Hata model (according to GSM spectrum usage) are used for at least three BTSs (one serving base station and other two neighbouring base stations) to calculate the distance of a MS from each using the parameters obtained from step (a).
- c) Using the calculated distance in step (b) as radius and base station as the center, three circles are created. The common intersection point of the three circles is the probable location of the MS position. If three circles do not intersect at the same common point a common region is obtained. In this case, the probable location is approximated by using the centroid of the common region.
- d) After finding approximate MS position from step (c), it is possible to plot the signal strength with different colors (according to the signal strength) at this position of MS in the coverage area of the serving BTS.

Steps from (a) to (d) are repeated for a specific observation period, so that the movement of the MS in the coverage area helps to identify the signal level in different locations. In addition, this increases the accuracy due to small scale fading characteristic of the signal that varies (positive or negative) within short interval of time.

Initially, the prototype is developed using MATLAB for understanding the concept. Later, the developed

algorithm is implemented in GIS using ArcView, that provides tools for the real time implementation for depicting coverage of the GSM system.

The major requirements to run this software are categorized into three parts. First requirement is, different parameters of GSM system such as height of transmitting antenna, operating frequency, location of BTS including latitude-longitude, transmitting power by BTS, height of receiving antenna and received power by MS. All these data are known at the GSM system except the height of the receiving antenna. The height of the receiving antenna can be taken as the average height of MS antenna. The required data can be acquired by directly interfacing this software with GSM system or by using the data bases obtained from GSM system separately. Second requirement is the GIS data base along with the map of the particular cell site under test. In addition, third requirement is the sophisticated GIS software (ArcView) and appropriate hardware to run this software.

Results

The required parameters including GIS map for the GSM system and drive test data are obtained from Nepal Telecom. The sample drive test data obtained from Nepal Telecom is shown in Table 1. During the simulation, average receiving MS antenna height is taken as 1 meter. Output obtained from MATLAB is shown in Figure 2, where three different neighbouring BTSs are shown with black dots. The actual and predicted MS locations are also shown with green and red dots respectively.

Table 1: Sample drive test data obtained from Nepal Telecom

Cell	Frequency (MHz)	Tx Power (Watt)	Rx Signal level (dBm)	Longitude	Latitude	Antenna height (m)	Antenna Gain (dBi)
Kuleshwar 1800M-2*	1800	40	-79	85.2989	27.6874	30	18
Balkhu 1800M-1	1800	40	-70	85.3015	27.6809	25	18
Balkhu-1	900	40	-72	85.3015	27.6809	25	18
Kumari club-2	900	40	-75	85.2963	27.6831	15	17

MS position: 85.2995 (Longitude) and 27.694969 (Latitude)
Remarks: Inside vehicle there is signal loss of 10 dB and * denote serving cell

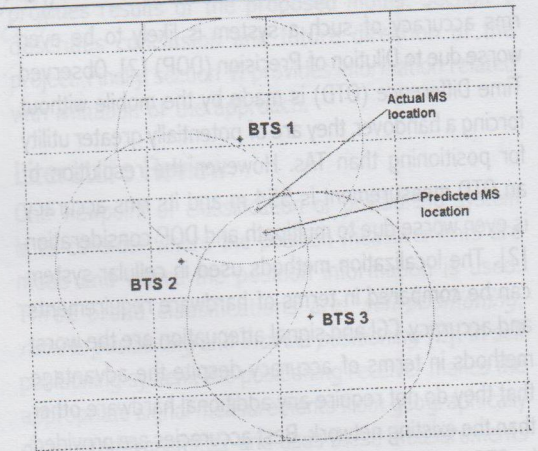


Figure 2: Prototype output obtained from MATLAB

The sample output obtained using sample drive test data (shown in Table 1) is presented in Figure 3 in GIS map. In this case, the distance between predicted MS position and actual MS position that is error in positioning is 78 m. The error in positioning ranges from 78 m to 152 m while using various samples of drive test data. The obtained rms accuracy in two dimensions using this model is 108 m. The observed error in this model is far better than CGI and signal attenuation that do not require additional hardware, same as our proposed model. The accuracy of this model is a bit less accurate than TOA, TDOA, AOA and hybrid methods [4]. However, these methods need additional hardware whereas the proposed model does not need any additional hardware. The accuracy of GPS-phone, Assisted GPS (AGPS) and gprX methods are more accurate than our methods but these methods are used in self positioning techniques.

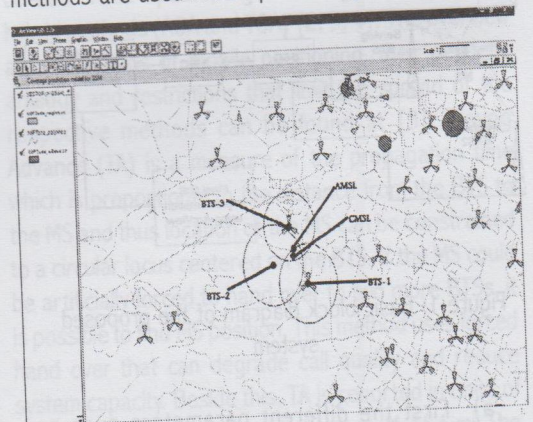


Figure 3: Output in GIS map for Balkhu Region

Conclusion and Future Direction

In this project, a prototype has been developed of the coverage prediction model and positioning system utilizing the already available data such as received signal strength by MS from GSM system and BTS parameters from the system databases. Using stated algorithm that was obtained the probable MS location and then received signal strength at that location was depicted in a GIS platform with different colors (according to the signal strength) for a real time pictorial visualization.

This coverage prediction model will dramatically reduce cost, time and requirement of experts for coverage prediction process if implemented in the GSM system. In addition, this feature can be used for signal strength prediction of whole coverage area irrespective of small roads and other ad-hoc infrastructure of the city that is impossible with the traditional method. The added system will assist network upgradation and modification of the GSM system.

The path loss model used in this project is Hata model and Extended Hata model without any modification for the terrain under the test. The used path loss model can be modified in accordance with terrain of the interest so that the deviation of the result can be minimized and the accuracy of the system can be improved. If the service provider has already developed the suitable path loss model for the terrain of interest, it can be directly implemented. The data obtained from the drive test is less accurate because the received signal strength is measured from the vehicle that may introduce loss of about 10 dB. However, the received signal strength by MS directly obtained from GSM system is more accurate because it is the exact received signal strength by MS that covers all types of mobile positions in all geography. After implementing this project, GSM system becomes more flexible by providing different location based services to the users. This project provides feature positioning system as an alternative to the prevalent GPS system which is not suitable for indoor application and also needs additional hardware to the users. In addition this project can be upgraded to deal with the 3D visualization of the signal strength in the coverage area of GSM system.

Limitation of The Approach

There are two major limitations of this research project. One is related with use of received signal strength by

MS and another is related with GIS map. The objective of this project is to provide alternative way to the traditional drive test for the coverage prediction of GSM system. The received signal strength by MS that is reported to the GSM system (serving BTS) while MS is in traffic was supposed to be used. However due to the lack of the data, the received signal strength of MS was used that was obtained from the drive test. Due to some factors such as privacy and authority of the system the study had use drive test data. Another limitation is the low definition GIS map that does not provide better accuracy. High definition map with different data bases are necessary to plot and visualize the position of the predicted MS location along with signal strength in the coverage area of the GSM system with high accuracy.

Acknowledgment

Authors are grateful to Birendra Thapa of Mobile Service Directorate, Nepal Telecom, and Rajan Kadel, NTA for providing the necessary GSM system data and for technical support respectively. Furthermore, our special thanks go to Surendra Lal Hada, Deputy Director of Nepal Telecommunications Authority for his constructive comments.

References

1. K. Chang, *Introduction to Geographic Information System*, 4th. ed., New York: McGraw Hill, 2007.
2. C. Drane, M. Macnaughtan and C. Scott, "Positioning GSM Telephones," *IEEE Communications Magazine*, April 1998, pp. 46–59.
3. V. Schwieger, "Positioning within the GSM Network," in *sixth Coastal Areas and Land Administration- Building the Capacity FIG Regional Conference*, San Jose, Costa Rica, 2007, pp. 1-14..
4. S. Al-Sahli, A. Amro, M. M. Kassir and D. Noamani, "Direction Finding Application for GSM Networks" Master dissertation, Dept. Electrical and Computer Engineering, American University of Beirut, Beirut, Lebanon, 2006.
5. G. P. Chai, "Alternative Positioning Method using GSM Signals," *Journal of Global Positioning System*, 2004, pp. 101–105.

DEPLETING WATER QUANTITY AND CHANGE IN WATER MANAGEMENT PERSPECTIVES: A CASE STUDY OF PANCHAKANYA IRRIGATION PROJECT

Rupak Bastola*
Sunil Parajuli**

Abstract

Depleting water quantity in the wetlands is a distinct manifestation of the global and local climate change and also over exploitation of the wetland resource. This paper is mainly focused in the general introduction of the Panchakanya Irrigation Project (PIP), the institutional aspect, socio-economic aspect, technical aspect, the problem scenario and the management strategy to cope with the problems.

Keywords: *Wetland, Climate change, Resource exploitation, Management, Tariff, Conflict, Productivity.*

1. Background

Panchakanya Irrigation Project (PIP) is a Farmer Managed Irrigation System (FMIS), with a long history of success in irrigating the land of Chitwan. It covers mainly two areas, namely Sissai and Bhaujad. Chitwan district is renowned for rice and poultry products, which has been possible only due to the service of hundreds of small and medium scale irrigation projects. PIP is one of those projects which have been serving that part of the district since 1853 BS. Rajkulos (Earthen Canal) were built and water was provided through them till 2034 B.S. From B.S 2034-2037 this system was under Chitwan Sinchai Ayojana. In 2037 this system was rehabilitated and expanded to cover an area of 900 bighas with aid from the Asian Development Bank (ADB). Subsequently it was managed by Sinchai Bewastha till 2047. Water User Association (WUA) was fully under the control of the government. In 2051 this system was registered

* Assistant Professor, Department of Civil Engineering, Nepal Engineering College
** Junior Professor, Department of Electrical and Electronics Engineering, Nepal Engineering College

as a legal institution. Till B.S 2052 it was under the joint management of the government and WUA. In the same year an agreement was signed with the government to transfer the management to WUA after rehabilitating and expanding most essential system components. Later in BS 2054 Ashad, its management was informally transferred to the WUA and formally handed over in BS 2054, Mangshir. The participation of the users for the system operation, maintenance, decision making, policy formulation, conflict resolution and financial management of the system commenced from 2054 B.S.

2. Present Situation

For any such system to carry such a long history with less complications and a good example of success, many factors play an important role which broadly includes technical as well as social context. The present situation of the PIP from different perspectives is presented below.

2.1 Institutional Aspects

PIP is a FMIS, so the whole responsibility of operation maintenance and management is done by WUA. The WUA consists of 17 Main Committee Members. The selection of members for WUA is done on the basis of election or understanding. The members contesting for election are selected on the recommendation of branch committees. Each branch committee selects and recommends its candidate for WUA election. Hundred and ninety eight-General Assembly Members cast their votes for final selection of WUA members. The management structure is shown below

➤ Management Structure

- 198-General Assembly Members
- 17-Main Committee Members
- 9-Executive Members
- 8-Ex-officio Members

2.1.1 Responsibility of WUA

Success doesn't come in a day. It needs a long effort of different people. These people are the members of WUA who make strategies for the good functioning of the system, addressing equity issues and reducing their

inadequacies in management level and functioning level. Everyone bears some responsibility and a discussion on different responsibilities of the WUA on as a whole is presented below. Following is the major responsibilities of WUA:

i. O/M of Scheme

Allocating the water to each user as per requirement & periodic maintenance of main & branch canals is one of its major functions. Equitable distribution is to be maintained among the users and maintenance is done by users as per the service provided. The cost sharing for maintenance is done on the basis of land holding: bigger the land holding, more the responsibilities for maintenance. WUA determines the number of days to be worked in maintenance for each branch committee and branch committee determines the number of working days for each user. The user contributes for maintenance or pays compensation in cash for each day of work if presence is not possible as per the rule of WUA. However female members from each household involve in cleaning the canal and male members involve in renovating the canal. This work division is done based on the physical strength and skills of individuals. The general guideline for O/M cost paid by users is as follows:

● Main

- Rs 10 /katha
- Rs 200 /bigha
- Rs 300 /hectare

● Branch

- Rs 20 /katha
- Rs 400 /bigha
- Rs 600 /hectare

ii. Tariff Collection:

WUA is also responsible for collecting tariff from users. The collected tariff is used for improvement of service quality, for maintenance and paying salary to gate operators and other staffs involved in the system management. The tariff is collected on the basis of water provided to the user. The general guideline for tariff collection is as follows

- 1 Bali
Rs 5 /katha
Rs 100 /bigha

- 2 Bali
Rs 10 /katha
Rs 200 /bigha

iii. Institutional Strengthening

WUA is also responsible for institutional strengthening, skill enhancement, forming WUA each year, financial strengthening, capacity building, skills enhancement making new policies according to new situation, making new relation with funding agencies and Government of Nepal (GoN).

iv. Conflict Resolution

WUA is also responsible for resolving the conflict among users. It is the major responsibility of WUA to maintain the harmony in society. Major conflict arises among the tail users and head users as the water reaching the tail is very less in amount which is not sufficient for cropping activities. WUA takes care of this conflict by distributing water equitably to all the users.

2.2 Socio-Economic Aspect

The population in the command area of PIP consists of indigenous Tharus, Brahmins, Chettris and migrants from different parts of the country. Initially Tharus were in the majority but at present after the eradication of malaria in the Terai, huge immigration has taken place so other ethnic groups dominate the area. Population growth rate of this area is about 3%.

The major occupation of the people is agriculture and poultry. With the change of time, people have diversified into import/export businesses and left for foreign countries for work .

The education status of the area is above the national average as there are a number of colleges around the district, including Rampur Agricultural and Animal Science Institute and Bharatpur Medical College. About 60-65% people of this area have completed secondary level education.

2.3 Technical Aspect

The PIP initially had natural drains and earthen canals for water conveyance and temporary headworks. Afterward with aid from Asian Development Bank and Government of Nepal to the users, permanent headworks and lined canals were constructed. Presently it consists of 10 branch canals and 10 outlets.

For systematic and regular service it has permanent headworks with weirs and regulating gates. Along its main and branch canals there are well gated cross and head regulators. For controlling seepage almost all the main and branch canals are lined with concrete masonry and stone rip rap along the length and sides of the canal. Most of the sub-branch canals are earthen canals. Outlets have been designed systematically to provide water to all the users within the command area. The canal alignment follows the contours alignment and most of the cross-sections have trapezoidal geometry.

Moreover, technically the scheme is sound with well maintained canal, regulating structures and headworks. Users are satisfied with its functioning and it seems to have been well designed from the perspective of hydraulics as well as structure for its functioning.

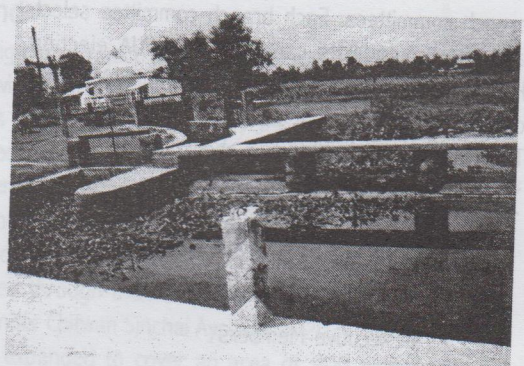


Photo 1: Headworks of PIP

2.4 Water issues

The main source of water for PIP is the wetland close to the headworks. It draws the water from the wetland throughout the year. The wetland is charged by a

number of tributaries from the Mahabharat region, Panchaknaya River being the major source. The wet land covers nearly 5ha of land.

Initially the scheme was able to fulfill the demand of the users throughout the year. The command area was small and enough water was available. Later, the command area was extended up to 900 bighas and in the last decade due to the drastic climate change, ground water availability has lessened leading to inadequacy of water during the dry season. This has been the main issue since the past few years. Moreover areas around the wetland have been encroached for building construction. Significant rise in water hyacinth shows the increase in eutrophication led by degradation in water quality. However there are no records of decrease in yield due to degraded water quality.



Photo 2: Wetland area at the headworks

3. Problem Scenario

It has been well known that problems come with solution and right identification of solution for particular problem leads to management enhancement and credit for success too. This applies to PIP also.

3.1 Problem Identification

Inadequate water during the dry season for irrigating the dry season paddy crop is its one of the major problems. In Chitwan district, paddy is cultivated twice during the dry and monsoon season. The productivity of the dry-season paddy field has been found to be more than that of the monsoon season, and it is also the main source of additional income for the users. People have started growing the cash crop for

additional income during the dry period so demand of water is high. Consequently, the scheme has not been able to supply sufficient water as per area demand on a regular basis.

3.2 Impact of the Problem

As stated before, the major impact of the problem is on the agricultural productivity and the emerging trend of cash crop production. Indirectly, this will impact the socio-economic condition of the users. Water inadequacy will cause conflict in sharing of water which will thus affect the social relations of users and cause problems for WUA in maintaining equity. Eventually, the impact is transferred to WUA.

3.3 Causes of Problem

The main problem is the inadequacy of water during dry season and the main cause of the problem is the depleting water source i.e. water quantity in the wetlands.

From a global perspective, the climate is changing gradually with change in global temperature; the pattern, intensity and duration of rainfall; the land use pattern and other related factors. During the last decade, the effect of climate change has also shown its effect on reduction of wetland. Considering this fact, it is inevitable and unavoidable that we are also loosing our wetlands that support a large biodiversity and terrestrial life and act as a source of water for different human needs.

There are also a number of other local factors that have caused the reduction in wetland area like: excessive extraction of water from wetland, settlement nearby wetland which extracts water for household use by using deep tube wells and industries nearby the wetland area that consume a huge amount of water.

Regarding to the PIP, the local factors seem to be the main cause for the reduction in wetland water. After the demarcation of Chitwan National Park, thousands of people dislocated from the national park area along with flood victims and other migrants from different parts of country were settled near by the wetland area by clearing the forest. About 5 ha of area were deforested during that time. With

increased settlement adjacent to the wetland area, the encroachment and reduction of wetland area have become distinct within the past few years. Most of the households use the shallow tube wells and wells for their water requirement. According to the local people nearly 1000 tube wells were installed in a year. This has caused the lowering of water table and in turn gradually reduced water quantity in the wetland.

Concurrently, the settlers started farming the deforested area by withdrawing water from the wetland by constructing their own canals, thereby causing reduction of water available in the wetlands that is mainly used by the Panchakanya Irrigation Project.

The emerging small scale industries and poultry farms are drawing excessive amount of water by using deep tube wells, thereby lowering the ground water table which directly affects the wetland water quantity as well as the wetland environment.

3.4 Problem Situation and Challenges

Prior to the last decade PIP was able to supply adequate water to users both during the dry and wet seasons. Now with the reduction of quantity of water available for supply, WUA is compelled to manage the available water among the users. Initially the scheme at dry season used to supply 1500 lps of discharge which was sufficient for both dry and wet season cropping. At the present situation, at the beginning of the dry season only 900 lps of water is available which reduces to 250 lps at the end of the season. Thus managing this meagre amount of water among the users equitably and in a productive way is the WUA's main challenge.

4 Management Strategy

In wet season, the quantity of water available is sufficient so there is no problem in distributing water. In case of dry season the amount of water is insufficient. Thus it is impossible to supply water on a regular demand basis and has to be supplied on rational judgment to meet the demand exactly at the right moment. The paddy field in dry season requires water three times, once for cropping, once during the

growing period and lastly before harvesting. The water quantity required is also less, not for pounding but only for saturating up to the root zone depth. Regarding all these factors WUA has formed a rule for managing the scarce resource as per the availability of water.

The water distribution strategy of the available water has been formed by WUA which is presently being used. It has been summarized as below:

- **Case 1:** If discharge remains between 900 - 1200lps: In this case the water available is sufficient for irrigating the whole command area so water is distributed to users continuously. On demand, PIP also supports the Khagari Irrigation Project when the amount of available water is more than the demand of PIP.
- **Case 2:** If discharge remains between 700-900lps: In this condition the water is less than the requirement of the whole command area so whole command area is divided into two parts and each part is then supplied with the full discharge available for three days a week routinely.
- **Case 3:** If discharge remains between 500-700lps: In this condition the water available is not sufficient for irrigating the two parts of the command area as stated in the previous case, so whole command area is divided into three parts and each part gets full discharge available for three days and successively other two parts get full discharge available for three days. This cycle continues till this range of water is available.
- **Case 4:** If discharge is less than 500lps: In this condition water demand form is collected and water requirement according to the cropping pattern is decided. Water is then supplied routinely on the basis of information supplied in the forms collected in such a way that repetition of supply for a single part of command area is avoided.
- **Case 5:** If discharge is less than 250lps: In this condition distribution is done on the basis of the coupon and timing allotted in the coupon. The

amount of water required and the date of requirement is to be determined by the farmer and WUA determines the routine for the supply as per the coupon collected.

- iii) Deforestation should be stopped nearby the wetland as the forest plays a vital role in preserving the wetland.
- iv) Wetland recharging tributaries should not be interrupted.

5. Lessons to Be Learned

The study of PIP produces different lessons for all who are involved in this field. For sustainable management of such projects it is necessary to take lessons of all other projects which had success as well as failure. This case also has set a good example of sustainable management. So the presented case of PIP provides the following lessons:

- i. The possible danger to the wetland based irrigation projects in dry season.
- ii. The effect of settlement near the wetland area.
- iii. The institutional strategy reforms to cope with the adverse situation.
- iv. Resilience of irrigation system for different types of impacts in terms of social change, national level policy change and environment change.

6. Conclusion

The global and local climate change and encroachment of the wetland is affecting the water quantity in the wetlands and wetland based irrigation projects. Thus preserving the wetlands and rational use of wetlands should be highly considered for long term effective use of the resources, thereby saving the huge investment on the wetland based schemes and in securing our agricultural productivity.

7. Recommendations

Depletion of water quantity from the wetland can be mitigated by preserving the global and local environment and by adopting rational use of water from the wetland. The following steps are recommended:

- i) Over extraction of groundwater from nearby settlements should be reduced to maintain the natural water table which supports the wetland water quantity.
- ii) Ground water recharge should be adopted after thorough investigation of recharge well locations.

References:

- i) *Field visit and the interviews with the PIP Water Users Association (WUA) members*

MODELING AND SIMULATION OF SOFT SWITCHING SNUBBER BASED BOOST CONVERTER

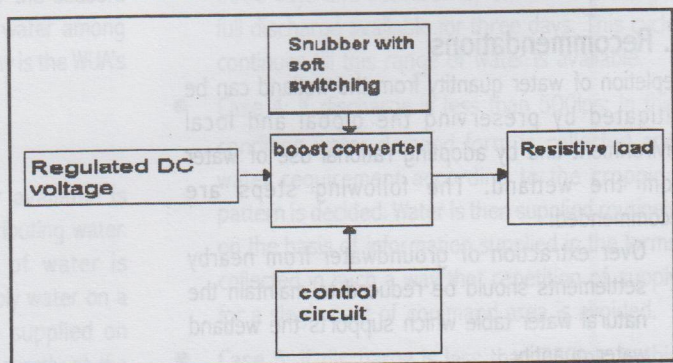
Rajendra Mahat*

Abstract

Traditional DC to DC converters utilizing hard switching techniques usually operate at low efficiencies. With the advent of newer technologies, more efficient converters are becoming an expectation. One such technology is the soft switching snubber designed converter.

Here in this paper the auxiliary switch takes part in energy transfer from source to output and both the switch (boost and auxiliary) operate in parallel during most of the time they are turned on. Zero-voltage turn off and zero current turn on for both switches, and reduced reverse-recovery related losses in the boost switch and diode are achieved. The focus of the present work is on introducing the power electronics community to the modeling and simulation of soft switching snubber based boost converter but also to evaluate performance of converter topologies.

1.1 Introduction of converters



*Assistant Professor, Department of Electrical and Electronics, Nepal Engineering College

DC to DC converters are very efficient for converting DC voltages of different voltage level. By using IGBT and soft switching techniques, it becomes possible to reduce or boost voltage with hardly any losses. DC to DC converters are used in many power applications including UPS (Uninterruptible Power Supply) systems, wind energy, electric vehicle etc. There are different ways to implement a DC to DC converter, but this project focuses on the converter based on snubber switch which operate in parallel with main switch so that very simple control circuit can be employed because gate drive signals are same for both switches (main and auxiliary). The DC to DC converter has 4 main stages to its operation. These include DC voltage regulator, control circuit, driver circuit and power circuit. A block diagram of the DC to DC converter is shown in figure 1.

1.2. Design Consideration

Snubber proposed in this paper is applicable within a wide range of switching frequencies and easy to design. Still there are few things that should be taken into account.

1. Snubber capacitor C_{s2} has to be at least 50% larger than snubber capacitor C_{s1} .
2. Snubber inductors L_{s1} and L_{s2} should have nearly the same values to assure proper operation of the snubber.
3. Snubber inductor L_{s1} should be large so as to
 - a) Decrease boost diode reverse-recovery related losses.
 - b) Reduce di/dt rate of the main switch during turn-on.

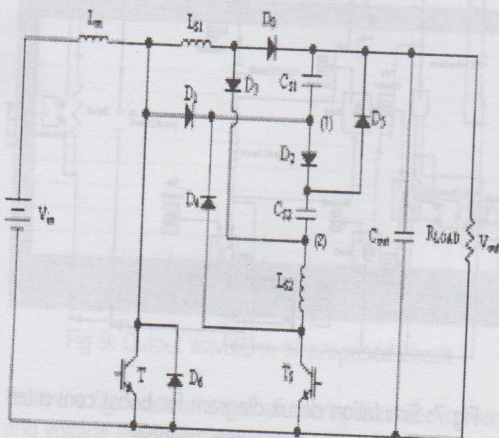


Fig 2

Figure 2 shows the boost converter with active snubber. The circuit diagram work in continuous conduction and both (auxiliary and snubber) switches are turned on and off simultaneously. And figure 3 shows the key waveform during operation.

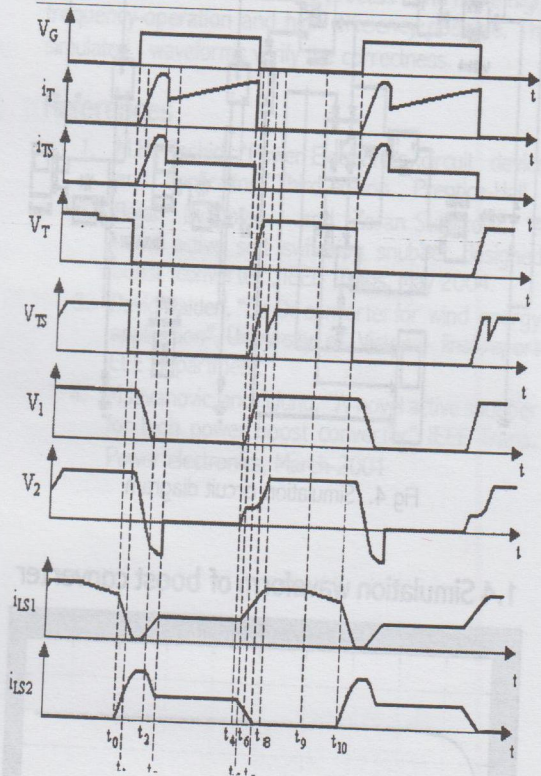


Fig 3. Key waveforms

Components data:

L_m	100uH
L_{s1}	20uH
L_{s2}	20uH
C_{s1}	30nF
C_{s2}	60nF
C_{out}	400uF

1.3 Simulation circuit of boost converter without using active snubber

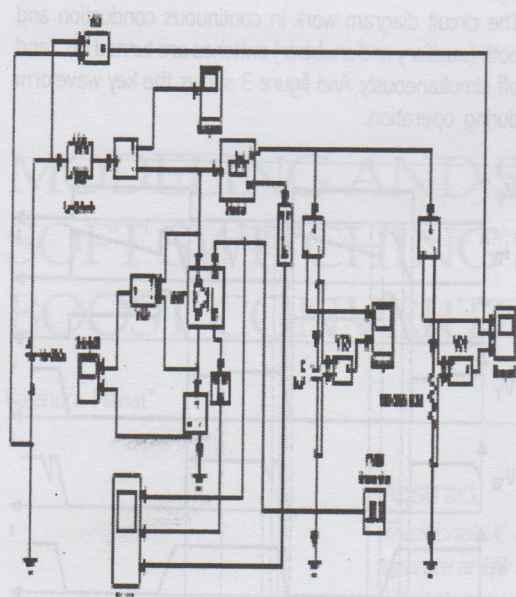


Fig 4. Simulation circuit diagram

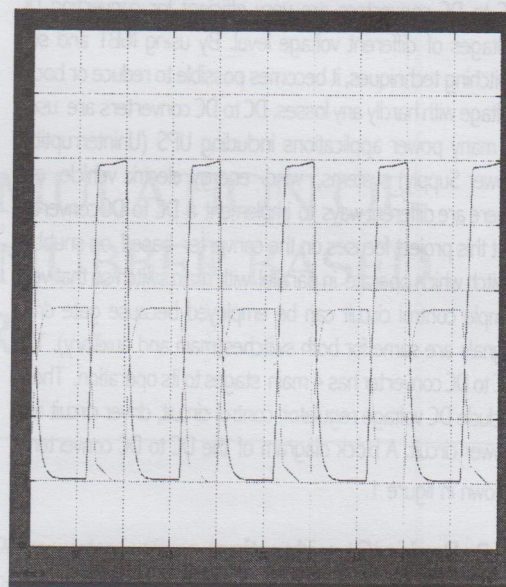


Fig 6: Voltage and current waveform of IGBT switch

1.4 Simulation waveform of boost converter

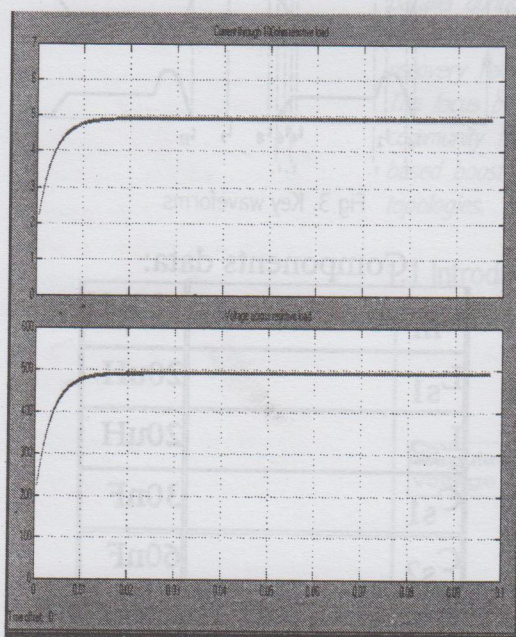


Fig 5: Voltage and current waveforms across resistive load.

1.5 Simulation circuit of boost converter with using active snubber

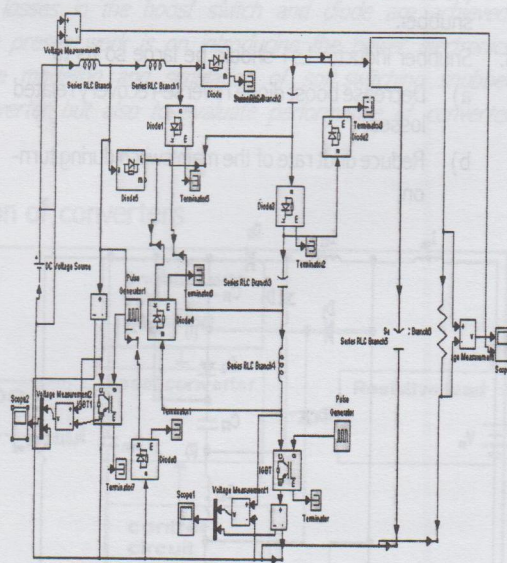


Fig 7: Simulation circuit diagram for boost converter with using active snubber

1.6 Simulation waveform of boost converter with using snubber

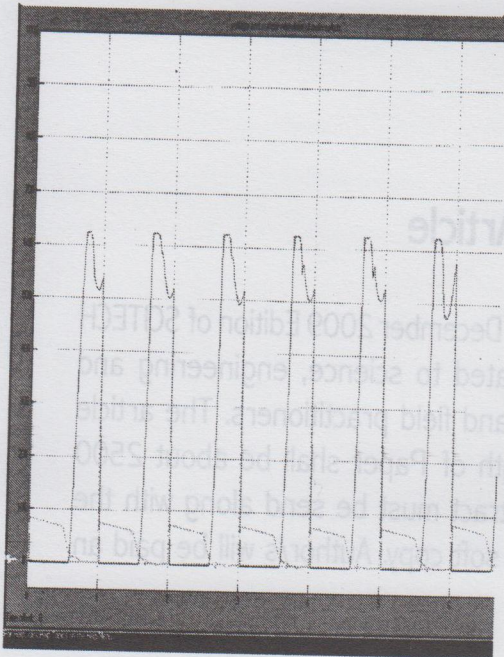


Fig 8: Voltage and current of main IGBT switch

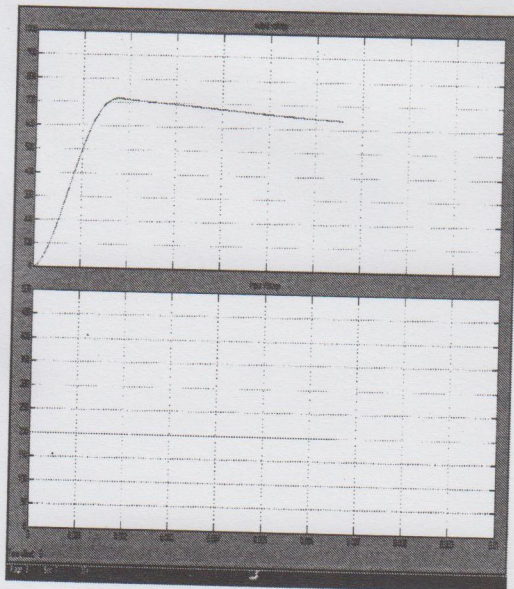


Fig 9: Output waveform of proposed circuit

From the fig.8 we can see that overlap between current and voltage is reduced compared to fig. 6 without using active snubber. Hence loss is reduced considerably.

1.7 Conclusion

In this paper a novel active snubber circuit is proposed, which is formed by introducing an active switch to the traditional snubber circuit. The active switch shares the control signal of the main power switch. The snubber circuit can soften the switching process and make high-frequency-operation and high efficiency possible. The simulated waveforms verify the correctness.

References

1. M.H. Rashid. "Power Electronics :circuit device and application",Third edition., Prentice-Hall
2. Bojan Evanovic and Zoran Stojiljkovic "A novel active soft switching snubber designed boost converter", IEEE Trans, May 2004.
3. David walden, "Dc-Dc converter for wind energy application", University of Victoria, final report EEE department.
4. M.Javanovic and Y.Jung, "A novel active snubber for high power boost converter" IEEE Trans. Power electronics, March 2001