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From the Editor

In this era of information technology and supercomputers the mantra for development among today's planners has been the ability to harness the potential of this vast and growing technology. For the younger generation, who has been accustomed to the comforts and efficiency provided by modern technology, anything not hi-tech is not worth knowing or promoting. In any kind of debate regarding trade-off between hi-tech and traditional technology, invariably hi-tech is the winner.

Although the great advantage of today's globalization phenomenon has been the ease with which technology can be transferred to an underdeveloped country like Nepal, the multiplier effects of this technology can only be obtained if the supporting infrastructure is in place. Sadly much of Nepal does not have the minimum infrastructure to make the most of this technology. In the absence of infrastructure are we then to remain mute onlookers while modern development bypasses entire regions of the country? When the country today is undergoing turmoil mainly because of unbalanced development and inequitable distribution of resources, can we afford to further widen this development and technological divide between the urban and rural areas?

One of the ways to address this problem of cumulative causation is the concept of appropriate technology. When traditional technology is inefficient or insufficient, and modern technology is not economically sustainable, introducing a technology which improves upon the traditional, is easily adaptable, and yet is not too capital intensive or knowledge based helps to significantly improve the lifestyle of the community. In a resource poor country like Nepal, it may be more realistic and beneficial to promote this kind of technology rather than taking a do-nothing attitude. Actually a lot of appropriate technology has already been successfully implemented in Nepal like micro-hydel plants, solar heaters, improved chulos, back boilers, sulab sauchalayas etc. and more recently solar panels to generate electricity. NGOs involved in community development works are already quite familiar with this technology; however, the academia has not as yet given it enough priority. Given the fact that the IT revolution is not going to affect the lives of the majority of Nepalis in the near future, it may be worthwhile to give engineering students adequate knowledge about appropriate technology so that they could go out and make a difference in the lives of their countrymen. Offering them some courses on appropriate technology could be a good start.

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TO WHOM IT MAY CONCERN - PRIVATISATION OF PUBLIC SPACES: A CASE OF 'DHARAHARA - SUNDHARA' SQUARE, KATHMANDU-

Bijaya K. Shrestha*, Ph. D., Sushmita Shrestha**

Abstract

If the literature review of successful public space design of the past forty-five years is the base, then the present ongoing redevelopment work on the historical site of 'Dharahara-Sundhara' square under public-private partnership between the Kathmandu Metropolitan City (KMC) and the Side Walkers Traders (SWT) Private Limited best illustrates the 'privatisation of public spaces' with numerous weaknesses: lack of contextual study analysis, poor planning and design features and controversy during implementation. In the transformation process, the private party is successful to commodify (and commercialise) the public spaces in different ways: developing a greenery park and then charging an entry fee, constructing retail outlets and temporary stalls and annexing business uses whereas the public sector fails even to retain the earlier privilege of free entry and freedom of using the spaces let alone forget to add new amenities. Such uneven development remains unchecked at present due to absence of urban design guidelines, existence of ineffective building bylaws, and above all because of poor technical and managerial capability of the Metropolitan City. As a result, not only lost is the opportunity to transform the area as a true 'public square' but it has also an adverse impact on public education and image of Kathmandu Metropolitan City. The key strategy to reverse this trend includes the designation of the square as a 'comprehensive redevelopment area' and development of a mechanism in public private partnership program in fulfilling the community needs as well as ensuring the investor's rate of return through private money. Formulation of urban design concept with detail planning and design guidelines to transform the square into an 'urban plaza' by respecting the historical and symbolic meaning, continuing socio-cultural activities and fulfilling the present needs is recommended.

Key Words: Dharahara-Sundhara square, Privatisation of public space, Urban design, Public domain, Socialisation, Historic meaning, etc.

Contextual Study and Objectives of the Paper

Public spaces in the form of squares (Durbar square to town square to neighbourhood square) and residential courtyards (and Buddhist monasteries) including street and pedestrian lanes are the most singular important urban design element of Malla towns of the Kathmandu Valley. Accounting for about 10-12% of built up area of residential neighbourhoods (Adhikari, 1998), these community spaces comprising of religious monuments (temples, chaityas, etc.) and social amenities (rest house, dabali, well, community tap, stone spout, etc.) are the venue for numerous socio-cultural and religious activities in daily lives as well as in festival seasons and act as 'figure' against the 'ground' of compact urban fabrics. Riverfront promenades, greenery parks and open spaces together with construction of huge palace complexes with extensive landscaping and gardening (covering the whole street blocks) developed in the

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Rana period (1846-1951) along the historical peripheral areas represent another typology of public space. The networking of such public spaces together with the harmonious balance between man-made structure and natural ecology, integration of open and built spaces, and architectural composition of buildings and monuments all have not only supported the existence of a culturally advanced urban society of 'Newars' in the Kathmandu Valley but they have also proved that those builders were extraordinarily skilful as well as capable of integrating visual and functional principles into the social needs (Hosken, 1974).

These public realms, the heritage of the past and part of vernacular architecture are equally significant for rapidly urbanising Kathmandu in providing respite from busy urban life, building community and creating liveliness, enjoyment and safer environment through merging public and private lives. Moreover, they are the symbolic power of public and icon of democracy. However, the need for protection of such important spaces is hardly realised in the city growth process. Disregarding the haphazardly grown urban settlements, even in the planned land and residential developments, implemented by both public and private sectors, the quantitative areas allocated for public space are inadequate (2.5-5% of the total developed land area) and their qualitative designs are substandard and user unfriendly, whereas encroachment of community spaces is continuing unabated in already built up areas. As a result, Kathmandu Metropolitan City (KMC) comprises of only 6% open space (compared to 10-20% in other metropolitan cities of the world) with per capita organised open space of 0.97 sq. m. (which is about 9.7 sq. m. in Delhi) (Pradhan, 2003). Destruction (and degradation) of public spaces in Kathmandu is taking place in many forms. First, many existing public spaces are being converted into different uses by the government itself. For instance, the central open space in Kathmandu - Tundikhel measuring originally two-third miles in length and about 300 yards in width¹ - has been reduced to present size due to construction of Rani Pokhari (by King Pratap Malla in 1671), conversion into parade ground (in the mid-1830s during Rana regime), and development of Ratna Park, Dasarath Stadium and Shahid Gate (in the 1960s) including recent extension of Royal Nepal Army's facility and provision of public parking. Second, many community spaces of residential courtyards, public streets and pedestrian lanes are being encroached from business community by extending their commercial activities to the public spaces. Display of goods and loading and unloading functions carried out in the public space of the shop fronts thereby disturbing the neighbours and pedestrians can be seen in many residential neighbourhoods in the inner parts of Ason, New Road, Mahabaudha and other similar areas. Such encroachment also includes the illegal occupation of public lands along the riverfront and religious buildings (temple, patti, sattal, etc.) either by constructing private structures or occupying them for private uses. Third, many public spaces are being reduced or made ineffective in the public initiated infrastructure projects such as widening of road by reducing the pedestrian footpath, erection of overhead bridges by reducing footpath as well as renting the public spaces below the bridges. Fourth and last, privatisation of public spaces by transferring the planning, construction and management power to private sector is becoming a new growing trend. Numerous public spaces of historical and cultural importance such as Te bahal, Bhugol Park, Dharahara - Sundhara area and so on have been dramatically transformed under such scheme. Among them, the 'Dharahara - Sundhara' square located in Kathmandu Metropolitan City's Ward No. 22 is crucial from privatisation perspective not only due to the existence of two historically significant monuments namely 'Dharahara' (Bhimsen Tower) and 'Sundhara' (Golden Water Spout) but also because of its location in the vicinity of residential, commercial and official complexes. The form and function of this community

¹ According to Henry Ambrose Oldfield (in his book *Sketches of Nepal*) Tundikhel originally spread from Rani Pokhari in the north to the Dasarath Stadium in the south is one of the Asia's biggest parade grounds at that time.

space particularly in the last few decades has undergone a rapid transformation - from public open space to neighbourhood community square to regional bus park to open plaza to the state of neglect and dumping site and finally to the present state of commercialisation and commodification. Against this background, this paper aims to analyse the present ongoing redevelopment of 'Dharahara - Sundhara' square with fourfold objectives. First, it reviews numerous literatures to identify salient features of a successful public square. Second, it critically analyses the negative consequences of privatisation of spaces and highlights the lost opportunity based on the established framework. Third, it checks the public space formation process by relating the identified weaknesses and opportunities to the existing legal and institutional frameworks. Finally, it proposes some key strategy and urban design guidelines to develop the square as a true public place.

Literature Review and an Analytical Framework

From the ancient Greek's Agora to the Middle Ages' Commons to early twentieth century urban streets and parks, public spaces have been the stages for free speech, public discourse and diversity and melting pots of cultural differences. Medieval-origin town squares located in the geographic centre of the towns in most of the European cities continue to be the centre of social, economic and political activity with the town hall, the church, the restaurants, and the small shops that provide essentials and basics for everyday living encircling or around the vicinity of the square (Joines-Novotny, 1996). All goods and services are easily accessible on foot due to limited physical size of the town (wall built around the town or natural features such as a river or topography). These public squares with open court in the centre surrounded by buildings offer a high degree of control of the inner space, as well as facilitate a ready defence against external aggression by minimising the external surface area liable to attack and thus have symbolic value and was therefore chosen as the model for the construction of numerous holy places (Agora, Forum, Cloister, Mosque courtyard) (Krier, 1979). However, the two major town planning practices emerged in the 20th century - new town and garden city concept (proposing moderate to low density suburban development) and Charter of Athens (CIAM) (advocating super high density block) - discarded the earlier evolutionary incremental development process but advocated land use segregation, architecture as an art or sculpture with little consideration of the surrounding context and destruction of social fabrics within the framework of centralised planning and implementation system with public money. The earlier notion of city as a 'place to live, work and socialise' has been replaced by the perception of the city as 'an economic entity' in the modern age. Development of malls, theme parks, and sports stadiums - pseudo public spaces - in the suburban areas, accessible by automobiles only, in the mid twentieth century serving certain economic groups, on the one hand, has reduced the use of traditional public squares in the town centres. On the other hand, development companies have become larger, more complex and more powerful (Madanipour, 1999, 2003) with innovation of new technology and integration of national and international finance. Investors and developers have, by this process, become less concerned with the cultural and emotional value of public space. Instead, they regard it as a commodity. Consequently, built form has changed significantly. New additions to public space are more often developed and managed by private investors.

Positioning security guards, installing camera and in some cases even taking photographs for monitoring the movement of people while entering certain facilities in public and semi public spaces have further reduced the privacy, freedom of access and free use of those facilities. In the near future a person's movements on both public and private spaces will be monitored through the Global Positioning Systems (GPS). Such trend of privatisation of development with domination of business values has helped the demise of the 'civic realm' with numerous

consequences on socio-cultural activities as well as on human psychology and behaviour. To correct these shortcomings, many urbanites have advocated for the liveability of urban areas and design of public places taking inspiration from the historical style, vernacular architecture, regional identity and pluralism culture. Recent studies on analysis of public space have included human behaviours, users' experiences and socio-cultural aspects (Lynch, 1981; Jacobs, 1961; Christopher, 1977; Jacobs and Appleyard, 1987) compared to the earlier focus on artistic principles (Sitte, 1965; Cullen, 1961). Cities that focus on bigness, profit and self-aggrandizement are anathema to the themes of scale and humanity (Davey, 1999).

Though historical spaces were the result of intuition, traditional rules of thumb, social conditions, and the limitations of available materials (Madanipour, 1996; Moughtin, 1992), understanding of different components along with their underlying complex mechanism together with conscious thought and application of pre-perceived set of design guidelines can produce 'responsive' public spaces (Bentley et al, 1985) with human feelings and sensibilities. Characteristics of good public space depend upon the user and the purpose of the space. Each particular place is the result of relationships between actions, conceptions and physical attributes and these three notions make the sense of place (Nenad Lipovac, 1997), which is embodied in the location, spatial configuration and articulation of a place (Norberg Shulz, 1980). Physical features and appearance (buildings, open spaces, infrastructures, etc.), observable activities and functions (relation between the buildings and landscape and people's interaction with place) and symbolic meanings (customs, beliefs and historic resources) are important elements of public place (Garnham, 1985). Successful public space should have some common characteristics: character, continuity and enclosure, quality of the public realm, ease of movement, legibility, adaptability and diversity (DETR and CABE, 2000). They should also perform four main functions: access and linkages; purpose and activities; comfort and image; and sociability (Project for Public Places, 2000). Many places simply fail due to lack of places to sit; lack of gathering points; poor entrances and visually inaccessible spaces; features that are not functional; paths that do not go where people want to go (or a lack of paths where people want to go); domination of a place by vehicles; blank walls or dead zones around the edges of a place; inconveniently located transport stops; and a lack of things 'going on' (ibid.). As public space is directly related to 'good local environment' and provides a tool with which quality of life can be measured (Williams and Green, 2001), its design and management is vital to the future of urban life and culture (Worpole, 2001).

In terms of physical aspect, public square is a broad flat space surrounded by buildings and connected by paths having strong sense of spatial containment in the vertical and horizontal planes; the figure-ground picture is reversed in experiencing the squares with open spaces on the foreground and buildings at the background, rather than open spaces being the leftover voids between buildings. Bounded by surfaces with unambiguous information, it reinforces the urban connective web of paths and nodes with pedestrian as the core in influencing the layout of public space and buildings (Salingaros, 1998). It can be analysed based on physical dimension, microclimate, amenities and activities (Heng and Chan, 2000).

Acting as a 'buffer' zone, a public square creates a gathering place for the people, humanising them by mutual contact, providing them with shelter against the haphazard traffic and freeing them from the tension of bustling through the web of street (Spreiregen, 1965). As public spaces are nonexclusive, available to all, and held as community property, they should not only allow maximum opportunities for socialisation and participation (Gehl, 1987; Jacobs, 1993) in festival, ceremonies, parade and other forms of celebrations but should also be safe, comfortable and responsive to climatic and weather conditions to rejuvenate public life and entertainment. Then only, a feeling at home can be achieved and interrelations among human

beings is affirmed (Lennand and Lennand, 1995). Hierarchy of basic human needs (Lang, 1994) can be fulfilled by following a social logic (Hillier, 1996; Hillier and Hanson, 1984).

To be democratic public spaces, just physical presence and openness to space is not enough. But involvement of users (and citizens) in decision making process underlying the creation and management of them is equally essential (Paddison, 2003). The true public space should be responsive, democratic and meaningful and its formation process is guided by three 'critical human dimensions - the users' essential needs, their spatial right and the meaning they seek' (Carr et. al, 1992) under the influence of a number of sociological, environmental, planning, political and economic dimensions (Castells, 1989; Davis, 1990; Harvey, 1990; Stilwell, 1993). Ownership of public space, control over access to it including the designated uses are the three major attributes that constitute the socio-political nature of public space (White, 1998). After reviewing numerous literatures on public spaces, the success of 'Dharahara-Sundhara' square can be analysed based on the three interrelated components as (i) Physical form and spatial linkage, (ii) Socio-political setting and (iii) Historical and symbolic meaning.

Privatisation of 'Dharahara - Sundhara' Square

Commencing from November 2004, the redevelopment of 'Dharahara - Sundhara' square, the first public private partnership program is the trade off between Kathmandu Metropolitan City (KMC) and Side Walkers Traders (SWT) Private Limited comprising three phases of works: the first phase which is almost completed includes renovation and refurbishment of 'Dharahara' and its premises, construction of a 'smoking free peace park' including a NRs. 10 million insurance of the tower and insurance for those who climb the tower; second stage consists of demolition of incompatible structure, construction of reversible tourist rest place and recent construction of retail outlets in the north side and the final phase remains renovation of 'Sundhara' and peripheral development. The contractual nature between the two parties clearly reveals that the ongoing construction is different modes of privatisation of the public square. First, the KMC allowed the SWT to use the tower, water spout and five Ropani² of public open space for commercial purpose by taking monthly rent of NRs. 60,000. Second, it gave planning, maintenance and management authority to SWT including power to charge entry fee for not only climbing the tower but also for entering the peripheral greenery park. Last, the KMC has transferred its ownership of the site to SWT by leasing the site for 20 years. In addition to these, the extension of business activity - new retail outlets of Kathmandu Mall (Sundhara Mart) from east side and the construction of new retail shops in the north-west corner - has further intensified the commercialisation in the square with numerous negative consequences.

Negative Consequences and Loss of Opportunity due to Privatisation of Public Square

Physical form and of spatial linkage

Approachable from at least five different non-axial paths, the 'Dharahara- Sundhara' square spatially acts as a 'transitional space' between the 'transportation nodes' of Shahid-gate Bus Stop and Royal Nepal Airlines Corporation (RNAC) Tempo Stand and 'commercial zone' of Khichapokhari, Bhotebahal, Baagh Durbar and New Road areas (Figure 1a). It anchors the peripheral commercial buildings of the west and south sides and office complexes of the north, east and south directions into one whole unit. The nine storeys tall 'Dharahara', easily visible from the surrounding areas itself acts as a landmark. Instead of reinforcing these

² One Ropani of land comprises of 74' X 74'.

attributes, the present on going construction work has not only disintegrated the square into different sub-spaces without clear linkages but has also isolated it from the surrounding fabrics in many ways. Within the square, the diagonal pedestrian path from 'Khichapokhari' to the 'Sundhara' and the curved vehicular street from 'Sundhara' turning towards the north to Te-bahal has physically divided the square into three independent and isolated units: one is the raised platform comprising 'Dharahara' and a greenery park encircled by boundary wall with a gate at the centre; the second is the recently opened retail outlets in the north-west corner and the last part is the neglected 'Sundhara' with small open space in the south side (Figure 1b).

The erection of ticket house, retail outlet, boundary wall of the greenery park together with the encircling vehicular streets in the south and west sides and the confusing edges in the north and south have not only reconfigured the shape and size of the public space but have also isolated the square from the surrounding enclosing buildings. Despite the size of the square lies within the normal range (maximum distance for people to see other people or events is 230 to 330 feet, i.e., 70-100 meters) and the street openings to the square have narrow threshold (Figure 1c), the sense of being in a singular spatial unit is not realised due to 'L' shape of the square and numerous obstructions within it. The opportunity to reshape the square by acquiring additional open spaces of the surrounding buildings and by dismantling the obstruction and unnecessary boundary wall is not realised. Instead, commodification of space is done through division of the square into subspaces with emphasis on pedestrian and vehicular traffics aiming to attract customers.

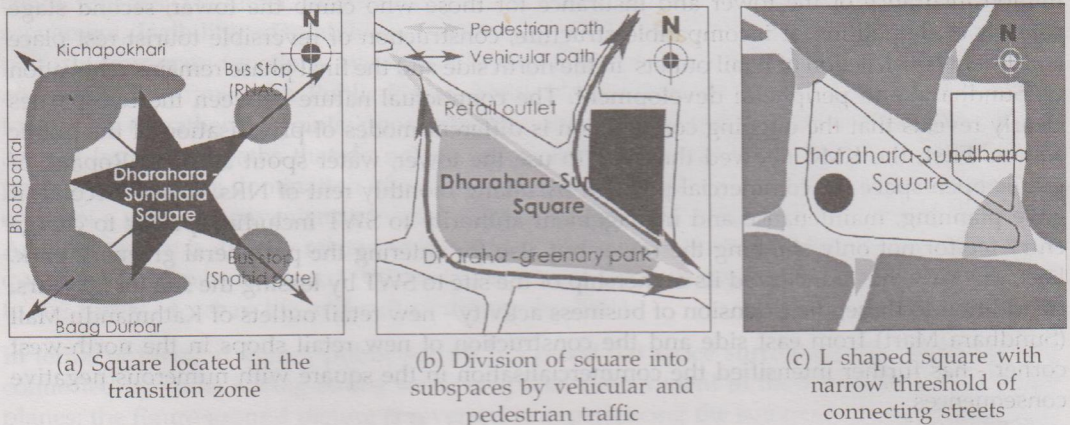
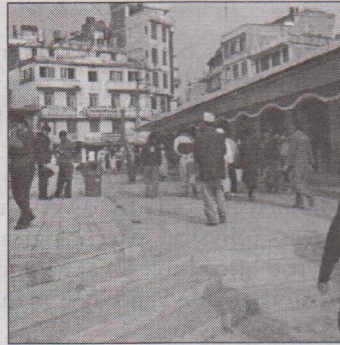


Fig. 1. Location of 'Dharahara - Sundhara' square, its space division and its spatial linkage with surrounding areas.

The square can function as an 'outdoor room' with a strong sense of spatial containment in the vertical and horizontal planes if it maintains certain qualities on the floor and the enclosing buildings. However, the case of 'Dharahara - Sundhara' square lacks such qualities. First, the floor of the square has three different levels with two types of pavements. The 'Dharahara' and its immediate surrounding has greenery park at the highest level whereas the retail outlets and its front plaza is stone paved at intermediate level and the remaining part, i.e., Sundhara area has also the flag stone paved floor at the lowest level (Photo 1).



(a) The greenery park - highest level



(b) The retail outlet -intermediate level



(c) Small open space - lowest level

Photo 1. Changes in level and different floor material in the subdivided spaces of the square

Second, more than half of the peripheral buildings especially public buildings - Nepal Bank Limited and Department of Mint in the north, the General Post Office building in the east and Nepal Telecommunication Corporation and Controller Office of Ministry of Defence in the south - are isolated from the surrounding buildings through a large gap in between and separated from the square through a high boundary wall in front of the complex thereby ignoring the existence and life of the square. Few low heights, old and neglected buildings of the south-west corner have broken the continuous line of buildings in the west and south sides. Third, the buildings enclosing the square have large variation in terms of building bulk, volume and height, architectural style and detailing, materials used and colour combination (Photo 2). Absence of continuous building façades and its unifying design elements together with poor articulation of rooflines against the sky has further diluted the feeling of enclosure and sense of containment. Finally, one storey new retail outlets in the north and east sides (extension of Kathmandu Mall) have further blocked the square from the surrounding buildings. All these combined with confusing entry points and sharp angular edges (on the north side) have mimicked the public space without really defining it.



(a) Rana period building on the north



(b) Modern private buildings in the north-west corner



(c) Public buildings on the south

Photo 2. Weak northern and southern edges of the square with different typology of the enclosing buildings

Regulation of the peripheral buildings through design guidelines and expansion of the squares towards the surrounding public buildings is possible, if the KMC works on it seriously. Private developers neither have such statutory power nor will be interested in such issues as it does not provide direct economic benefit to them.

Socio-political settings

As modern life has blurred the boundaries between work and home life; more people live alone and more people work from home; proliferation of televisions, videos and the personal computer has changed people's priorities from public life towards the 'pleasure' of private life and security, public space in such situation is arguably more important than ever before. It further creates social networking, enhances political awareness and mass education. The socio-political setting of the square is defined not only by diverse usages of spaces, spatial rights³ to use them and mode of public access (physical, psychological, social and economic) but also by the feeling of ownership and sense of control. Liveliness, diversity, safety and comfort all depend on the qualities of public realm provided and their management. However, the ongoing construction work hardly addresses these issues.

In terms of space use, at least three distinct types of activities exist in the square. The 'middle strip' just outside the boundary wall of 'Dharahara - Greenery Park' is generally occupied by either Cobbler (in the east and south of a greenery park) or bikes and cars (west and south of Dharahara). By renting this space to private sector for vehicle parking, the KMC has gained some economic benefits but at the cost of blocking the physical access and separating the activities of the square into two parts - one inside the boundary wall and other at the periphery of the streets along the embracing buildings. Except at night, these spaces of the middle strip are basically used for the same purposes most of the time both on working days and holidays with little variation in the intensity of uses (Table 1). In the morning on all days, the number of Cobblers and parked vehicles is small, but it increases in the afternoon and evening. However, the vehicle parking activity dominates most of the spaces (in the east, south and west sides) during the working days which is reversed on Saturday and holidays with concentration of Cobblers (Table 1). These functions are replaced by street vendors at night. Lack of street lighting coupled with mixing up of haphazardly spread vendors (selling cloths, utensils and fast foods) with parked vehicles (few in number) has created a confusing crowd particularly at the entry points (General Post Office and Khichapokhari sides).

Table 1. Changes in activity at the middle strip of Square at different time period

	Periphery of greenery park (east)	Periphery of greenery park (south)	Periphery of Dharahara (west)	Periphery of Dharahara (south)
Saturday and Holidays 8:00 AM (morning)				
Working days 12:00 noon and 5:00 PM (evening)				
6:45 PM (night)				

³ Carr, et al (1992) adapted Kevin Lynch's five aspects of spatial rights and identified them as access, freedom of action, claim, change, and ownership and disposition. These five qualities assess and guide the degree of freedom of use of a public space.

Within the boundary wall, the land use is limited and designed for targeting a particular group of people. First, the development of a greenery park with few benches and a small stall on the periphery of Dhara-hara has occupied significant amount of public open space for a single use. This park designed more to be seen than to be experienced is not suitable for such an urban location. Moreover, the park together with the tower has been fenced keeping a security guard at the entry point. Now, one has to pay an entry fee⁴ even to go inside the park and on the periphery of the tower. Second, the construction of new retail outlet in the north-west corner and extension of new shopping arcade of Kathmandu Mall (Sundhara Mart) towards the square from the east side has further reduced the open space but increased the business activities within the square. Third, the remaining small open spaces - one in front of the retail outlet and another on the south of Sundhara with a temporary stall and few wooden benches - though have free public access, their small size and location near the commercial activity makes general public feel that they are also dedicated to customers.

Like in the middle strip area, different activities in the subspaces do not change so much in most of the time both on working days and holidays except the intensification of their uses (Table 2 and 3). In the morning (around 8:00 AM) on both working days and holidays, the dominating activity is the pedestrian and vehicle traffic crossing the square. This is the time the greenery park is watered and shops start to open (Table 2). Only a few people occupy the benches kept on the south of Sundhara. At noon (around 12:00 noon), more people are engaged in these subspaces: customers shopping in the retail outlets; people climbing the tower; and others sitting on the benches and boundary walls of Sundhara for Sun bathing, reading newspapers and watching other people's activities. Flow of pedestrian and vehicular traffic significantly increases in the noon but the volume exceeds on the working days compared to holidays. Also, more people enter the greenery park and climb the tower on holidays than on working days.

Table 2. Changes in activities in the subspaces at different time period on Saturday and holidays

Particular	Dharahara & greenery park	Sundhara & southern space	Retail outlets on the north
Saturday and holidays			
8:00 AM (morning)			
12:00 noon (noon)			
6:45 PM (evening)			

⁴ An entry fee of NRs. 99 for Nepalese and NRs. 299 for tourist is charged with 50% student discount (only on Tuesday) and free of charge for senior citizen aged 65 and above. The structural analysis allows 15 persons to climb the tower at one time.

The square is more crowded in the evening (5:00 PM) though the dominating activity is still pedestrians returning home from their works. Again, it is on the working day one can observe more people engaged in the square (Table 2 and 3). Despite limited number of benches, disturbance from the vehicular and pedestrian traffics, and its small size, the space on the south of Sundhara is intensively used for the same purposes of chatting with friends, relaxing and watching the pedestrians and other activities within the square. Other people are busy in the retail shops buying something before returning to their homes. However, the number of park users decreases significantly in the evening.

Table 3. Changes in activities in the subspaces at different time period on working days

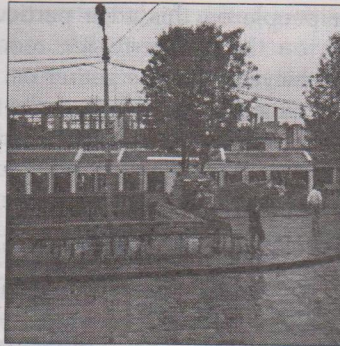
Particular	Dharahara & greenery park	Sundhara & southern space	Retail outlets on the north
Working days			
8:00 AM (morning)			
12:00 noon (noon)			
5:00 PM (evening)			

Since none of the spaces within the square has shed (except the footpath of the recently opened retail outlet) to protect square users and pedestrian from the rain and the Sun, people can not engage in any activity other than shopping during rainy time (Photo 3). Same is true at night as the provision of lighting⁵ on the public spaces is yet to be done. In both occasions, huge chunk of open spaces remain idle without any uses. The square simply acts as a street and is mainly used by vehicular and pedestrian traffics.

⁵ There is lighting provision inside the greenery park but not the outside public spaces with free access.



(a) Poor flow of vehicular and pedestrian traffic during rainy time



(b) Empty public space without shed



(c) Absence of lighting in public space

Photo 3. Major chunk of open spaces remain idle during rain and at night time

Except for those demarcated spaces, there exists a small portion of space, south of Sundhara which is supposed to be developed as another greenery park. This space fenced by low height boundary wall is at present filled up with mud and debris. Surprisingly, this area and its peripheral wall is the most used space within the square for multiple functions throughout the day on both working and holidays (Table 4). In the morning, the temporary vendors such as tea stalls and cigarette sellers provide services for pedestrian, local retail shop keepers and square users, whereas the same space is occupied by fruit vendors and other general public for relaxation, watching, chatting with friends and so on. Low brick wall with nearby stone wall of Sundhara, and few trees all in close vicinity help to create informal spaces, where people prefer to engage rather than in the other planned tiny spaces within the square. These activities continue till the evening (Table 4).

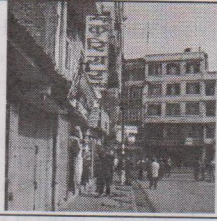
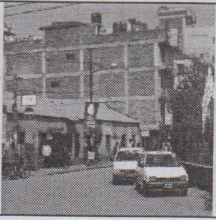
Table 4. People engaging in different activities at informal spaces of the square throughout the day

<i>Working and holidays inside the square</i>				
From 8:00 AM (morning) to 12:00 (noon) to 5:00 PM (evening)				

The activities at the edges of the square (between the encircling streets and the peripheral buildings) are of little concern to square users. Absence of public oriented activities on the ground floor of the buildings in the north of Sundhara (Nepal Bank Limited) and the south of the greenery park (Nepal Telecommunication Office and Controller Office) means monotonous edges. The remaining buildings of south house trade and tour offices, fast food and small restaurants and so on whereas the structures on the west side have retail shops on the ground floors with hotels and lodges on the upper floors. The space characteristic and activity performed on the building fronts of west and south edges is different (Table 5). As the retail shops on the north - west corner and west side of the square is also open on holidays, the display of goods plus the existence of footpath with temporary vendors (tea stall, cigarette

seller, etc.) is enough to engage people on this edge particularly in the morning on both working and holidays. Similarly, on the southern side too, despite disturbance from the haphazardly parked car, bike and bicycles, people gather on the building front for a cup of tea, a cigarette and so on in the morning, all available from the temporary vendors. Additional vehicle parking replaces this activity in the afternoon and evening. Security guards positioned at Department of Mint and Controller Office has psychologically discouraged pedestrian to use the footpath adjacent to these buildings and reduced the privacy of square users.

Table 5. Different activities on the edges of the square (peripheral areas)

	Western peripheral edge (North - West)	Western peripheral edge (West - South)	Southern peripheral edge (South)	Southern peripheral edge (East - South)
Saturday and Holidays				
8:00 AM				
Working days				
12:00 noon				

Thus, the present development has converted the whole 'Dharahara - Sundhara' square into the place that serves retail and business interests with exclusion of other uses. Commercial imperatives have defined the acceptable behaviours and exclude those who are not considered valid consumers (those with less disposable income and less mobility). Formation of such new public space is 'stage of consumption,' whose function is determined by 'security' (guards and well defined public/private boundaries), 'image' (places are given a distinctiveness), and 'management' (to maintain image and maximise commercial activity). It has conferred direct benefits (mainly economic) to the private sector (investor) but the indirect benefit (mainly social and environmental) to local communities and society as a whole is doubtful.

Significant reduction of public space has adversely affected the people's relaxation, socialisation, communication and celebration of events at regular intervals thereby weakening the social ties and public life in the square and hampering the scope of bringing people from different walks of society together at city level. The loss of such spaces isolates people, making them less helpful to others. It is the lower income and working class people who has suffered a lot as they rely on public space for recreation, socialising and symbolically staking their claim over a piece of the city. The benefits of open space - recreational, psychological and iconological - by its very existence (Nicol and Blake, 2000) are lost. And the creation of well connected, socially inclusive, mixed-use and accessible public spaces with facilities and amenities for all thereby shaping the cultural identity is not realised. Minimum public uses, lack of amenities, poor access including commercialisation of spaces have reduced the sense of ownership. The square is no more public place now.

As this development is little successful in providing public access and freedom of action, politically, people do not feel claim on the territory, sense of control and temporary ownership on the square. Poor physical design such as construction of wall and gate, positioning of security guard at the entry gate and the surrounding vicinity, absence of well defined and inviting entry points, visual obstruction combined with vehicle parking, Cobbler's activity and haphazard location of street vendors have not only made public access (physical, visual and symbolic) difficult but also restricted the freedom and right of other people. Moreover, poor visibility of the square from the surrounding routes, absence of ground floor activity and other rooms overlooking the square in almost half of the embracing peripheral buildings together with lack of street lighting and signage have reduced the effective informal surveillance and failed to map mentally the awareness on built environment. Such vulnerable settings have increased the fear of violence and social crime in using the square particularly at night. Vulnerable section namely women, elderly and physically disabled or mothers pushing carriages find it difficult to use the square.

Historic and Symbolic Meaning

The 'Dharahara - Sundhara' square comprises of two historically important structures namely Dharahara and Sundhara with a collective meaning. The first Dharahara, a 11 storey tower was built by the then Prime Minister (and Commander-in-chief) Bhimsen Thapa in front of his palace Baag Durbar in 1824. Nobody knows the exact reason of erecting such a tower, historians speculate many things: to show his power and strength of the country; to celebrate the victory of retaking the Terai region from British; to exaggerate the might of the Nepali army for British observers; to summon army quickly living around his residence by sounding a bugle in case of emergency; and to respect and worship the powerful god Shiva. Another nine storey tower (Photo 4a) was also built alongside the first tower by the order of Queen Lalit Tripura Sundari (daughter of Bhimsen Thapa's brother Kaji Nayan Singh Thapa) in 1825. The great earthquake of 1934 destroyed both towers: the earlier Bhimsen tower was completely obliterated whereas the second tower was reduced to four storeys. The present free standing tower measuring 203 feet (61.9 m)⁶ is the reconstruction of the second tower with change in architectural design and addition of a round balcony by the then Rana Prime Minister Juddha Shumshere in 1936. Nonetheless, this tower is significant from at least two ways. First, the tower has symbolic relationship with the 'Chauni barrack' (army unit of Shrinath), 'Tundikhel' (parade ground for the army) and the then prime minister's residence (at present Baag Durbar area) as it is believed that construction of this tower had military purpose⁷. Second, the tower lies in a straight line to the equestrian statue⁸ of Jung Bahadur Rana (in 1885) and Singha Durbar (in 1903) as a reminiscent of axial planning of Rana period (Photo 4b and c). Sundhara, one of the biggest and artistic water spouts of the Kathmandu Valley was constructed by Queen Lalit Tripura Sundari in 1928-'29 and it is inseparable from the Dharahara. The sunken spout is in fact layered on 'Mandala' form in four different levels with five taps on the lowest level: three taps on the northern face with the idol of 'Garudanarayan' and 'Bhagirath' on the top and bottom of the central tap, and one each on the eastern and western sides (Photo 1d). Moreover, this square used to be an intercity bus park with many ticket counters encircling

⁶ This tower originally has the height of 250 feet, i.e., 76.2 m. and the reconstruction was carried out by dismantling the two more floors and started from the second floor. The first white wash was spruced up for the coronation of the late King Mahendra (1955-1972) in 1956.

⁷ The timing of construction of military barrack at Chauni and this tower is at the same time.

⁸ At present, the statue (cast in England) is place to one corner of Tundikhel and the axis has become the layout of the road through the middle of Tundikhel to Bhadrakali temple and beyond.



(a) Second Dharahara built by Lalit Tripura Sundari

(b) Axial planning during Rana period

(c) Dharahara, equestrian statue and Singha Durbar

(d) Negligence of Sundhara

Photo 4. Historic meaning of Dharahara and negligence of Sundhara (Source: GTZ and UDLE, 1995)

the complex and development of lodges and hotels in the surrounding vicinity⁹. In 1986 under city beautification campaign, the bus park was shifted to the eastern side of 'Tundikhel' and the whole square was simply raised with brick pavement from the encircling streets. Though it was just an open plaza without any amenities except the existence of the tower and water spout, people of different age groups engaged in this place for multiple functions at different times of the day in different seasons. Children used to take bath on the water spout, play bicycle and ball, fly kite and so on whereas elders often engaged in passive activities such as Sun bathing, looking and observing the activities performed by others. Vendors were engaged in providing different services to pedestrian and plaza users. Moreover, this square was also used for organising rallies, celebrating different events including magician shows and display of goods.

Thus over a long period of time, many people have developed a 'meaning' to this place with 'connection' at various levels. With the changes in space and function, the meaning and connection also changes. For a space to have a deeper and long lasting meaning it needs to be 'richly embedded in its context' (Carr, et. al, 1992): the site's natural setting is its primary context and the history and cultural background forms the secondary context. However, the present reconstruction work neither recognises the importance of the meaning and connection nor assists the development of associative meanings that are special to the present time and place and the experience of the emerging culture. This can be felt due to numerous reasons. First, the renovation and reopening of the tower - revitalisation of urban heritage and boosting of civic pride - is limited to those who are willing to pay at the cost of isolating the tower from the surrounding spaces through fencing. Second, there is already loss of two taps of Sundhara (eastern and western taps) and cessation of water supply from the artistic taps. Instead, dirty water is logged in the bottom layer due to blockage of water source and drainage, all due to heavy construction of 'Kathmandu Mall'¹⁰, next to the square. In such situation, it is doubtful that the revitalisation of 'Sundhara', which is yet to be done, addresses the historical background and community's sentimental feeling.

Instead of developing this square as an urban park with provision of today's urban culture (festival, performances and concerts, ceremonies and celebrations and other events¹¹) and

⁹ There still exist some ticket counters as well as lodges or hotels towards the south and west sides of the square.

¹⁰ This new commercial complex is owned by Provident Fund.

¹¹ Large display screens in the public space act as windows broadening the potential of use and participation. Moreover, the presence of art increases the appeal of spaces as well the experience of the city, acting as a goods for consumption in the form of culture and entertainment.

public art to retain users' interest and commitment to the place, the present design has converted the previously developed different meaning, experiences and collective memory of the place into shopping and entertainment¹² activity for limited people. The freely accessible remaining tiny spaces - one in front of the retail outlets and other on the southern side of 'Sundhara' - bounded by vehicular street is hardly useful for any purpose other than part of business function. The experience of urban space - combined interaction of visual, acoustical, thermal and tactile information - is weak due to fragmented nature of space without well defined buildings, walls, arcades or pavements and boundary. As a result, the earlier experiences and memories of individuals or groups connecting them to the site have been lost for ever. The past image of public space with rich history and culture has been transformed into the image of venue for economic activity for elite group. Thus the sense of belonging, ownership and pride in the space can not be achieved. Finally, recent celebration of New Year 2006 on the premises of 'Dharahara- Sundhara' square organised by Side Walkers Traders Private Limited by allowing one hundred children (including street kids) to climb the tower and distributing lunch and educational materials has to do a lot with business promotion rather than social welfare program¹³.

Legal and Institutional Framework

After the enactment of the 'Local Self-Governance Act' 1999, which empowers the Kathmandu Metropolitan City (KMC) for physical planning and urban development within the municipality areas¹⁴ (MOLJ, 1999), it has initiated numerous infrastructure and redevelopment projects in Kathmandu. Among them, this redevelopment project is the first experience under public private partnership. Nonetheless, many shortcomings are identified in the redevelopment process.

While analysing the institutional capability of KMC, this project has been carried out under the state of controversy and confusion. First, the site was leased to Side Walkers Trade Private Limited for 20 years without inviting tenders. None of the concerned people namely officials of Environment Department within KMC, Chairman of Ward No. 22, board members of KMC, Local 'Sankata Sports Club' including local community was familiar with this secret contract between the mayor and the promoter of SWT (Himalayan Times, 2004a). Second, intense protest from the local people on the KMC's earlier attempt of developing a greenery park and constructing a café by leasing the site to the same private party in 1998 clearly reveals that the local community is against the present development. Even the Supreme Court ordered (verdict on March 7, 2003) not to start any construction work in the area until the case was finalised. During the lengthy legal battle (1998-2004) in the court, the site became waste land due to piling up of heaps of garbage from the locals and street vendors. Third, there is no detail study regarding the rent price of NRs. 60,000 per month and the design ideas of constructing a greenery park, commercial outlet and other activities. The conflict between KMC and SWT regarding the payment started to surface, as the latter party is willing to pay the said amount only after the renovation of the historic water spout and flow of water, which comes under the responsibility of KMC. Moreover, the party will pay the money to a committee to be led by a ward chairman and a ward secretary; however, the possibility of formation of such a committee is low (Himalayan Times, 2004b). The decision based on individual person's whim

¹² More than two third of the earlier open free spaces have been commercialised with restriction access.

¹³ Nepal Children Organisation also organised program in this premises: Children of Hakar Children Club, Bal Mandir (Shiphal) and Bal Mandir (Naxal) altogether 35 in number climbed the tower on 21 Jestha 2062 BS (Saturday) and drew their feelings (after looking from the balcony) on the canvas and gave award for first, second and third prizes.

¹⁴ Department of Archaeology (DoA) and other concerned agencies are also associated with the construction on historical and cultural sites.

and private party's profit motive in an environment of confusion and controversy can never be the best solution.

As planning standards and urban design guidelines for the redevelopment of public square do not exist in Kathmandu (and Nepal), the existing building bylaws, which is mainly concerned with individual buildings and applicable for only new construction is the only legal vehicle to regulate the transformation of 'Dharahara - Sundhara' square.¹⁵ The bylaws categorise 'Dharahara - Sundhara' square into two zones¹⁶: Dharahara and Sundhara including enclosing buildings of east and south as 'Open greenery sub-zone (Tundikhel)' and the remaining enclosing buildings of the north and west sides as 'Preservation Sub-zone' both under the 'Old Urban Area' (KVTDC, 2050 BS). Though the clauses regarding construction of buildings in both the sub-zones are vague and confusing, nonetheless, the present ongoing work at the square does not comply with the existing bylaws in many ways. First, the bylaws do not allow construction of any physical structure on the public plaza. Hence the permanent construction of series of retail shops on the north side can not be justified. Second, no one is allowed to do any activities that adversely impact the built environment of the square. Though what makes the degradation of built environment and monument is not clearly mentioned in the bylaws, it is difficult to accept that development of greenery park and fencing the whole complex including Dharahara to exclude ordinary people who do not pay entry fee, construction of retail outlets on the public space including permission of allowing vehicle entry to the square do complement the preservation of the square. Moreover, KMC's decision to allow paid parking and Cobbler's activities on the outer periphery of the boundary wall is not logical. Third, the extension of shopping arcade of Kathmandu Mall towards the east (Sundhara Mart) with a new entry gate has not only influenced the business activity in the square but also confused (and dominated) the entry to the square from Shahid gate side.

All these activities have adversely affected the community education and image of the Kathmandu Metropolitan City. The KMC which enforces the implementation of the bylaws and advocates for conservation of cultural heritage is in fact doing something opposite that degrades the public space and erodes the value of historical monuments. Instead of upgrading the outdated and ineffective bylaws, it has facilitated the commercialisation of public space for the short term economic benefit. Its activity encourages the individuals to neglect the cultural artefacts and to default the building bylaws.

Conclusions and Recommendations

Though the initiation of public-private partnership between the Kathmandu Metropolitan City (KMC) and Side Walkers Traders Private Limited (SWT) for redevelopment of 'Dharahara - Sundhara' square is appreciable and the on going construction work is successful to bring some visual changes in the previously neglected site, the whole program carried out in the state of controversy and confusion lacks in depth contextual study analysis, consists of numerous planning and design shortcomings and exemplifies the lost opportunity. The transformation of the earlier freely accessible public plaza into a single uses of commercial (and business) activity prioritising the customers with little consideration for other uses and users clearly means the privatisation of public spaces. Poor technical capability of KMC coupled with lack of urban design guidelines and existence of ineffective building bylaws has further accelerated the commodification of spaces for selling and consumption.

¹⁵ The existing building bylaws require the quantitative area of the open space based on the total development size in new development; however, there is no mention regarding qualitative aspects of public space design.

¹⁶ Urban plaza is not a space in two dimensions but it is the space together with the surrounding embracing buildings that give the enclosure to the square.

In terms of architecture and urban design, the subdivision of spaces through changing the floor level, fencing the park and building retail outlets has not only created a chaotic and confusing landscape but also disintegrated the square from the surrounding fabrics. Socially, the earlier multi-functional spaces used by all age groups in different time period are under transformation into a more circumscribed and regulated place with reduction of effective open spaces but intensification of business activities. Economically, the cost-benefit calculation has overridden the community's needs undermining the public dimension of the public square. Politically, the privileges of free civil expression, mobilisation and organisation of rally and processions available for any citizen at any time has been curtailed and the democratic 'civil sphere' is being reduced merely to a sphere of consumption. Finally, in the whole development process, those facilities which can be commercialised and give economic returns are first developed: renovation of Dharahara and development of a greenery park; construction of retail outlet and so on.

Key Strategy for Redevelopment of the Square

- (a) Designate the 'Dharahara - Sundhara' square as a 'comprehensive redevelopment area' and develop a separate legal and implementation mechanism, specific to this historical site;
- (b) Formulate the urban design concept with detail planning and design guidelines to transform the square into the 'urban plaza' in the transitional zone between commercial and transportation nodes by respecting the historical and symbolic meaning, continuing socio-cultural activities and fulfilling the present needs;
- (c) Develop a mechanism in public private partnership program to use private money for fulfilling the community needs as well as ensuring the investment return.

Urban Design Guidelines for Redevelopment of Dharahara - Sundhara Square

Physical form and spatial linkage

- (a) Reconfigure the 'L' shape public square into a regular shape by acquiring the land of Department of Mint and integrate it with the surrounding public buildings by removing the boundary walls (of the surrounding public building and the park including the circular walls around the tower) and other obstruction so that the whole plaza can be unified as a whole and can be easily seen from any corner;
- (b) Pave the whole area (square, surrounding streets and the front spaces of the enclosing buildings) with a single material (stone) and divide the square into subspaces on horizontal plane by changing the paving pattern, floor level and introducing the arches, or other similar structures that act a part of the landscape design of the square, and then design the well defined multiple entry points from the surrounding areas;
- (c) Regulate the surrounding enclosing buildings in terms of bulk and volume, building height including architectural design and detailing to create a sense of enclosure.

Socio-political setting

- (a) Encourage different activities in the divided subspaces with ample amenities, facilities and engagement for all age groups as well as for special people such as children,

elderly, women, physically disabled person without compromising psychological comfort, safety and security including the right of using the space in different times and seasons;

- (b) Ensure the free public access of all forms from different directions by removing the existing vehicle parking, Cobblers' activity, haphazard street vendors and the greenery park but developing the edge cafes, stalls, kiosks and encouraging the lower floors of the enclosing buildings for compatible public uses that encourage the visit of square;
- (c) Promote public art, electronic display and signage for public information and community education as well as for enhancing liveliness, diversity and excitement.

Historical and symbolic meaning

- (a) Enhance the historical image of 'Dharahara' and 'Sundhara' by revitalising the water spout, encouraging people to climb up the tower and inviting maximum number of people of different age, ethnic, and cultural background together in the square;
- (b) Promote the square as a 'public address' through design detailing and activities;
- (c) Develop distinct features and significant structure, natural elements (such as plants and trees) that stimulate the people's perceptions in daily life as well as provide the clue of passage of time through changing of the colour of tree.

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DIGITAL CERTIFICATES TO MINIMIZE THE RISK OF SECURITY THREATS

*Rajesh Kumar Singh**

Abstract

We are using digital certificates for security of our program, data in transmission and storage in some encryption and decryption formats, so that we can counter the security threats and our data integrity is preserved in storage and transmission. We use the digital certificates to enable the trust relationship with our peer members, group, administrators, and programs with different certificates for different groups so that a level of security is achieved. Organizations can have their own certification authorities that can issue certificates to devices, services and employees. We can purchase certificate to encrypt the data for integrity in transmission or storage. The e-mail clients automatically encrypt the messages on individual basis. We can import and export the certificates for use at multiple sites and locations. In our computer systems there is a certificate store that maintains the certificates and users rights accordingly.

Introduction

To minimize the risk of security threats, there are a number of auditing steps we can take. The following table lists various events that you should audit, as well as the specific security threat that the audit event monitors.

Potential Threat	Event
Random password hack	Failure audit for logon/logoff
Stolen password break-in	Success audit for logon/logoff
Misuse of privileges	Success audit for privilege use, user and group management, security change policies, restart, shutdown, and system events
Improper access to sensitive files	Success and failure audit for file-access and object-access events. File Manager success and failure audit of Read/Write access by suspect users or groups for the sensitive files.
Improper access to printers	Success and failure audit for file-access printers and object-access events. Print Manager success and failure audit of print access by suspect users or groups for the printers.
Virus outbreak	Success and failure write access auditing for program files (with .exe and .dll extensions). Success and failure auditing for process tracking. Run suspect programs; examine security log for unexpected attempts to modify program files or create unexpected processes. Run only when actively monitoring the system log.

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Certificates

A public key certificate, usually just called a certificate, is a digitally-signed statement that binds the value of a public key to the identity of the person, device, or service that holds the corresponding private key. Most certificates in common use are based on the X.509v3 certificate standard.

Certificates can be issued for a variety of functions such as Web user authentication, Web server authentication, secure e-mail (Secure/Multipurpose Internet Mail Extensions, or S/MIME), Internet Protocol Security (IPSec), Transport Layer Security (TLS), and code signing. Certificates are also issued from one certification authority (CA) to another in order to establish a certification hierarchy.

The entity receiving the certificate is the *subject* of the certificate. The issuer and signer of the certificate is a certification authority.

Typically, certificates contain the following information:

- The subject's public key value
- The subject's identifier information, such as the name and e-mail address
- The validity period (the length of time that the certificate is considered valid)
- Issuer identifier information
- The digital signature of the issuer, which attests to the validity of the binding between the subject's public key and the subject's identifier information.

A certificate is valid only for the period of time specified within it; every certificate contains *Valid From* and *Valid To* dates, which set the boundaries of the validity period. Once a certificate's validity period has passed, a new certificate must be requested by the subject of the now-expired certificate.

In instances where it becomes necessary to undo the binding that is asserted in a certificate, a certificate can be revoked by the issuer. Each issuer maintains a certificate revocation list that can be used by programs when checking the validity of any given certificate.

One of the main benefits of certificates is that hosts no longer have to maintain a set of passwords for individual subjects who need to be authenticated as a prerequisite to access. Instead, the host merely establishes trust in a certificate issuer.

When a host, such as a secure web server, designates an issuer as a trusted root authority, the host implicitly trusts the policies that the issuer has used to establish the bindings of certificates it issues. In effect, the host trusts that the issuer has verified the identity of the certificate subject. A host designates an issuer as a trusted root authority by placing the issuer's self-signed certificate, which contains the issuer's public key, into the trusted root certification authority certificate store of the host computer. Intermediate or subordinate certification authorities are trusted only if they have a valid certification path from a trusted root certification authority.

Certificate uses

Because certificates are generally used to establish identity and create trusts for the secure exchange of information, certification authorities (CAs) can issue certificates to people, to devices (such as computers), and to services running on computers (such as IPSec).

In some cases, computers must be able to exchange information with a high degree of confidence in the identity of the other device, service, or person involved in the transaction. In some cases, people need to exchange information with a high degree of confidence in the identity of the other person, computer, or service involved in the transaction. Applications and services that run on computers also frequently need to verify that they are accessing information from a trusted source.

In circumstances where two entities—such as devices, persons or applications or services—attempt to establish identity and trust, the fact that both entities trust the same certification authority allows the bond of identity and trust to be established between them. Once a certificate subject has presented a certificate issued by a trusted CA, the entity attempting to establish trust can proceed with an information exchange by storing the certificate subject's certificate in its own certificate store, and, where applicable, using the public key contained in the certificate to encrypt a session key so that all subsequent communications to the certificate subject are secure.

For example, when using the Internet for online banking, it is important to know that your web browser is communicating directly and securely with your bank's web server. Your web browser must be able to achieve web server authentication before a safe transaction can occur. That is, the Web server must be able to prove its identity to your web browser before the transaction can proceed. Microsoft Internet Explorer uses Secure Sockets Layer (SSL) to encrypt messages and transmit them securely across the Internet, as do most other modern web browsers and web servers.

Certificates can also be used to verify the authenticity of software code that you download from the Internet, install from your company intranet, or purchase on CD-ROM and install on your computer. Unsigned software—software that does not have a valid software publisher's certificate—can pose a risk to your computer and the information you store on your computer.

When software is signed with a valid certificate from a trusted certification authority, you know that the software code has not been tampered with and can be safely installed on your computer. During software installation, you are prompted to verify that you trust the software manufacturer. You may also be offered the option to always trust software content from that particular software manufacturer. If you choose to trust content from the manufacturer, their certificate goes into your certificate store and other software installations of their products can occur with a circumstance of predefined trust. In the circumstance of predefined trust, you can install software from the manufacturer without being prompted to indicate whether they are trusted; the certificate on your computer states that you trust the manufacturer of the software.

Certificate use in organizations

Many organizations install their own certification authorities and issue certificates to internal devices, services, and employees to create a more secure computing environment. Large organizations may have multiple certification authorities, set up in a hierarchy that leads to a root certification authority. Thus, an employee of an organization may have a multiple certificates in their certificate store that have been issued by a variety of internal certification authorities, all of whom share a trust connection via the certification path to the root certification authority.

Certificates issued to persons

We can purchase a certificate from a commercial certification authority, such as Verisign, to send personal e-mail messages that are encrypted for security or digitally signed to prove

authenticity.

Once you have purchased a certificate and you use it to digitally sign an e-mail message, the message recipient can verify that the message has not been altered during transit and that the message came from you—assuming, of course, that the message recipient trusts the certification authority that issued your certificate.

When you encrypt an e-mail message, nobody can read the message while it is in transit, and only the message recipient can decrypt and read the message.

Certificates and applications

Most e-mail clients allow you to automatically sign or encrypt e-mail messages or to encrypt or sign messages on an individual basis.

Certificate import and export

If you have certificates you want to use on other computers, you can export your certificates for import to other machines.

The certificate store

There are four basic sources for the certificates found in the certificate stores on your computer:

- The certificate is included with your installation of present day operating systems.
- You use an application such as an Internet browser to engage in a SSL session, during which certificates are stored on your computer after establishment of trust.
- You explicitly choose to accept a certificate, as when you install software or receive an encrypted or digitally signed e-mail from others.
- You request a certificate from a certification authority, such as a certificate needed to access specific organizational resources.

Over time, as you use the Internet and connect to servers that use certificates for authentication and other purposes, the certificate store on your computer will gain entries. Some certificates may have one purpose, such as server authentication or client authentication, while other certificates may serve multiple purposes. The certification authority that issues the certificate determines the purpose or purposes the certificate may serve.

The Certificates snap-in

You can use the Certificates snap-in to manage certificates for users, computers, or services.

Users and administrators can use the Certificates snap-in to request new certificates from certification authorities. In addition, users can find, view, import, and export certificates from within certificate stores. However, in most cases, users do not have to personally manage their certificates and their certificate stores. That can be accomplished by administrators, by policy settings, and through programs that use certificates.

Administrators are the primary users of the Certificates snap-in and, as such, they are able to perform a wide variety of certificate management tasks in their personal certificate store as well as the certificate stores for any computer or service that they have the right to administer.

Concluding Remarks

We should try to identify the vulnerable data and programs in our organization/s and try to

implement the security mechanism using digital certificates. A clear and well defined trust relationship must be maintained amongst our peer members, group, administrators, and programs with different certificates for different groups.

We should identify devices, services, employees and certification authorities that can issue certificates.

We should try to develop our own encryption and decryption mechanisms for integrity in transmission or storage of data.

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Appendix-I

KEYWORDS AND ABBREVIATIONS USED

Certificate

A digital document that is commonly used for authentication and secure exchange of information on open networks, such as the Internet and intranets. A certificate securely binds a public key to the entity that holds the corresponding private key. Certificates are digitally signed by the issuing certification authority and can be issued for a user, a computer, or a service. The most widely accepted format for certificates is defined by the ITU-T X.509 version 3 international standard.

International Telecommunication Union - Telecommunication

[Standardization Sector] (ITU-T)

The sector of the International Telecommunication Union (ITU) responsible for telecommunication standards. ITU-T replaces the Comité Consultatif International Télégraphique et Téléphonique (CCITT). Its responsibilities include standardizing modem design and operations, and standardizing protocols for networks and facsimile transmission. ITU is an international organization within which governments and the private sector coordinate global telecom networks and services.

Certification Authority (CA)

An entity responsible for establishing and vouching for the authenticity of public keys belonging to users or other certification authorities. Activities of a certification authority can include binding public keys to distinguished names through signed certificates, managing certificate serial numbers, and certificate revocation.

Private Key

The secret half of a cryptographic key pair that is used with a public key algorithm. Private keys are typically used to decrypt a symmetric session key, digitally sign data, or decrypt data that has been encrypted with the corresponding public key.

Public Key

The non-secret half of a cryptographic key pair that is used with a public key algorithm. Public keys are typically used when encrypting a session key, verifying a digital signature, or encrypting data that can be decrypted with the corresponding private key.

Public Key Infrastructure (PKI)

The term generally used to describe the laws, policies, standards, and software that regulate or manipulate certificates and public and private keys. In practice, it is a system of digital certificates, certification authorities, and other registration authorities that verify and authenticate the validity of each party involved in an electronic transaction. Standards for PKI are still evolving, even though they are being widely implemented as a necessary element of electronic commerce.

Secure/Multipurpose Internet Mail Extensions (S/MIME)

An extension of MIME to support secure mail. It enables message originators to digitally sign e-mail messages to provide proof of message origin and data integrity. It also enables messages to be transmitted in encrypted format to provide confidential communications.

Transport Layer Security (TLS)

A standard protocol that is used to provide secure Web communications on the Internet or intranets. It enables clients to authenticate servers or, optionally, servers to authenticate clients. It also provides a secure channel by encrypting communications. TLS is the latest and a more secure version of the SSL protocol.

Certification Hierarchy

A model of trust for certificates in which certification paths are created by means of the establishment of parent-child relationships between certification authorities.

Digital Signature

A means for originators of a message, file, or other digitally encoded information to bind their identity to the information. The process of digitally signing information entails transforming the information, as well as some secret information held by the sender, into a tag called a signature.

Secure Sockets Layer (SSL)

A proposed open standard for establishing a secure communications channel to prevent the interception of critical information, such as credit card numbers. Primarily, it enables secure electronic financial transactions on the World Wide Web, although it is designed to work on other Internet services as well.

Appendix-II

FIGURES

	1965-75	1975-89	1990-99	Current
Platforms	Multi-user timesharing computers	Distributed systems based on local networks	The Internet, wide-area services	The Internet + mobile devices
Shared resources	Memory, files	Local services (e.g. NFS), local networks	Email, web sites, Internet commerce	Distributed objects, mobile code
Security requirements	User identification and authentication	Protection of services	Strong security for commercial transactions	Access control for individual objects, secure mobile code
Security management environment	Single authority, single authorization database (e.g. / etc/passwd)	Single authority, delegation, replicated authorization databases	Many authorities, no network-wide authorities	Per-activity authorities, groups with shared Responsibilities, mass authentication

Figure 1: Different security mechanisms used with their evolutionary trends

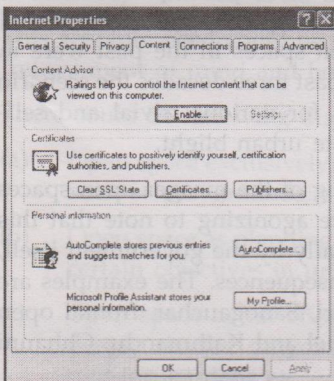


Figure 2: Certificates can be kept in accordance with the operating system so that the services provider and receiver can be authenticated.

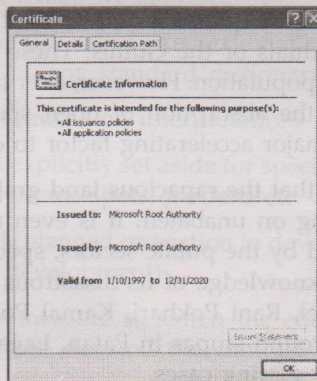
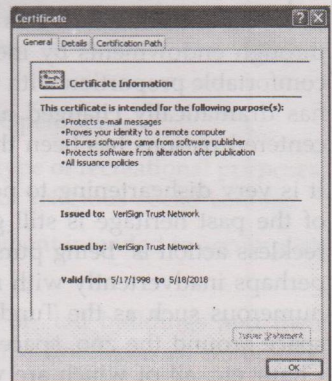


Figure 3: Examples of the certificates



FAST DISAPPEARING OPEN SPACES (DEFACTO LUNGS) OF KATHMANDU VALLEY

Bharat Sharma*

Quite often when some resource is depleted it is taken for granted that the latest magic technology will surely replace it. However, this kind of optimism can not be applied for land resource as it is very much fixed on our planet Earth, which once exhausted, has no substitute for it.

Hence, with increased pace of urbanization, which is the case in the Nepalese context, conservation of land resource deserves serious consideration. This concern for conservation applies to both protection of open spaces and preservation of urban centers. We have to be vividly clear that this conservation is not only meaningful to wilderness areas but is equally valid for protection of our urban environment.

The evolution and development of open spaces of urban Kathmandu has a historic logic and firm background in the distant past. The psychological needs of individuals, families and social groups encompassing society as a whole were well catered to. Thus, the physical urban form well reflected the social needs and hierarchy of the values of the inhabitants.

Throughout the world open spaces for parks, playgrounds and other amenities are mostly acquired with public funds by the city authority and the Government as per requirements, but in Kathmandu the case was quite unique in the past. Most of the open spaces were created through endowments by individuals or the Guthis. These open spaces in the past were in comfortable proportion with the population. However, over the past three decades the scenario has dramatically changed and the absorption of open spaces for various trivial and self-centered reasons has been the major accelerating factor to create urban blight.

It is very disheartening to note that the rapacious land grabbing of the meager open spaces of the past heritage is still going on unabated. It is even more agonizing to note that this reckless action is being pursued by the public sectors, specifically by the government itself, perhaps inadvertently with no knowledge of its disastrous consequences. The examples are numerous such as the Tundikhel, Rani Pokhari, Kamal Pokhari, Sanogauchar, frontal open space around the zoo, spaces around stupas in Patan, Lagankhel and Kathmandu, Chhauni Chaur etc. all of which are very glaring cases.

The government in particular and the public in general has to realize that the spread and distribution of open spaces across our urban as well as rural landscape is very essential for the healthy performance dynamics of the Kathmandu Valley. Hence, adequate standards of open spaces are necessary. These spaces act as an antidote for healthy living.

On the global scene it has been generally noticed that spaces devoted for urban recreational purposes range from 3 acres per 1000 population to 10 acres. On top of that 10% of the gross city area is reserved in the land use to meet future needs. Quite often it is analyzed that the components of open spaces including wet lands should be within the range of 20 to 25 percent of urban 'area' to make living condition comfortable and conducive.

In our case nothing of the sort as stated above has been initiated and, in fact, quite often things

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have gone to contrary. To convey the message loud and clear let us take an example of our historic Rani Pokhari and the surrounding areas. The pristine and very fragile environment has been ruined by the actions of the public sectors with utter disregard for its social well being. For example, in the distant past the government intended to build the C.D.O.'s office complex in the very location where earlier the office of Anchaladish was gutted down by fire in the sensitive Rani Pokhari bank. This proposal was not only a shortsighted step but a self inflicted wound. In naïve name of "public purpose" the government was on the verge of implementing an action without any future rationale or justification. In the name of so-called "public purpose", a very strong legal tool which clearly lacks social dimension and perception, change in the land use is often enforced in the name of noble intention and good cause with perfect deception. Hence, it is high time that the "public purpose" clause be redefined in the broader context. This is to protect the people and justify the inherent purpose of an action.

While talking about open spaces it is very pertinent to highlight its various roles which we may or may not be aware of. Until and unless we become conscious of its multifaceted qualities, it does not get its due appreciation and realization from the people, government, planners, professionals, politicians and above all the national watch dogs, the media. Kathmandu's open spaces serve more than just the most commonly associated needs for recreation, scenic enjoyment and physical buffers between varying land uses. More importantly, our rapidly disappearing open spaces function as complex but undeniably basic foundations to our own existence. As each ropani of our urban open spaces is encroached upon, filled out, leveled and finally built over, we are forced into an even more arbitrary, artificial and precarious relationship with resources upon which we survive.

This absolute need could be generally called "Recreational" where "Recreation" is defined as "refreshment of mind and body" by any standard dictionary.

There could be following distinct and vivid interpretations of "Open Space".

- (a) Open space exclusively and explicitly set aside for specific type of recreational purposes, such as playgrounds, zoos, picnic spots, gardens etc. or for religious social actions.
- (b) Open space as planning tool (planned restriction in development intended to accomplish certain objectives in urban development).
- (c) Open space as an effective measure to soften the effects of tall buildings and their deeply shaded canyons, which demand the contrast of tree lined plazas, miniparks, roof-top gardens etc.
- (d) Open space created by default because prevailing land development practices of the place does not play coherent and cohesive role.
- (e) Open space can be used to preserve existing conservation or agricultural uses or urban design measure or for stock of future urban land. In brief, it could play vital role to regulate urban growth pattern.

In urban context an open space in the form of parks (e.g. various chauras, Ratna Park, Bhoogol Park etc.) is best conceived as an environment in which human life patterns may be ideally related to natural and man made elements within its confines.

- (f) Open space as safe havens in times of unforeseen calamities e.g. during earthquake, fire etc.
- (g) Last but not the least is the role of open space as centre of socio-cultural activities highlighting social texture.

If we flip through the history of "Open Space" heritage of Kathmandu or listen to some respected elderly people, it will not be difficult for us to trace and to know that the valley was very lucky to have a lot of open spaces of various sizes and form (in terms of land stretch or water body) dotting its urban texture. It hardly matters whether we call it gauchar, Tundikhel, or chaur. It is undeniable that even before our first academically trained urban planner was born, people here were sensitive enough and perhaps believed that man and nature are indivisible and that survival and health are contingent upon an understanding of nature and her processes. The open space system in Kathmandu in the past not only catered to the multifold needs of human beings but simultaneously took care of pasture land for the livestock. Of equal significance are the wet-lands in the form of Dahas or Pokharis that are fast disappearing because of land-fill and consequential land-grab for built-up purpose (change of sensitive land use). By doing so we have not only diminished the open space but have impacted the very urban eco-system which sustains us.

Clearly, we have two very distinct "scenarios" of our open space systems—one in the past in which we cared a lot for it and another which has been ushered-in during the last three decades with heavy pressure from ever increasing encroachment and unabated expansion. With the uncontrolled urbanization going around Kathmandu and the fast deterioration of open space system, one wonders where we are heading to? Looking at the accelerated and alarming rate of disappearance of open spaces, one is compelled to admit that practically nothing will be left by the turn of the century. The very thought of our plight is extremely frightening. By the time the concerned institution wakes up from hibernation and makes an effort to publish an "inventory" of the open space system in Kathmandu in order to manage it, all that will probably be left will be the book only. It is not only a matter of great loss of physical amenity and aesthetic entity but rather an environmental disaster with break down in natural cycle as the nature is beleaguered day by day. To quote a few but glaring instances of our ruthless treatment of inherited open spaces would be the plight of the whole stretch of Tundikhel right from the north bank of Rani Pokhari and depletion of Sanogaucharan at Gyaneswor and scores more which we are aware of. Words can not describe the molestation of Kamal Pokhari. If things are permitted to be straightened out, the recently forcibly built ugly incompatible institutional structure on the south bank of Rani Pokhari would have to be dismantled to make the whole spatial relation fluid and congenial. Equally harsh action is needed in and around Kamal Pokhari too.

Let us not forget that social health and scenic costs far outweigh the so-called revenue generated by these rental structures which have been recently torn down due to some sane thinking. They are too trivial to match the visual as well as health qualities of open spaces. Even government institution in need of land should refrain from indiscriminate land grab of open spaces. There is no justification in this whatsoever and this tendency has to be curbed and deterred. "Tongue in cheek" kind of approach will lead us to chaos and disaster. It is no intention of this author to undermine any government institution but let us be firm that the so-called savior should not be spoiler and future generations should not inherit liabilities of the past. Let us feel and realize that the ecological dynamics of biota and biosphere have to be taken in all seriousness. Are we really futurist when it comes to thinking about the welfare of our children and generation to follow? As of now one is forced to be very skeptical. Let us vow to defend the last frontiers of our urban and rural landscape by our determined attitudinal values and deeds. To quote Mumford "if society is paralyzed today it is not for lack of means but for lack of purpose". Let the concerned Government institutions and various interested groups, CBOs and NGOs give serious thought to it.

We ought to realize that planning, designing and managing of our delicate and intricate environmental system does not imply that we make use of a fixed set of aesthetics only but embodies a continuous inner growth, a strong conviction which generates mechanisms to serve and alleviate the plight of city dwellers by pollution free air, and our eyes feel buoyant with perceptions of intrinsic qualities of open space. Today every bit of open space is vulnerable and prone to intrusion.

Going through the past history of open space of Kathmandu, it is very interesting to note that every ward was endowed with scores of spaces in terms of wet lands and dry lands. Today, without mentioning the numerous small parcels of land which have disappeared, even big chunks of open spaces like Kamal Pokhari, Sanogauchar, Lagankhel, Mitra Park, Rani Pokhari areas have been badly molested and have deteriorated. It is high time that the inhabitants of Kathmandu should no longer remain silent spectators but should behave like custodians. Let there be a new value system and new social dimension of responsibility and we all together should prove that there are oases of our concerns and creation for this beleaguered capital city.

If we take stock of the past endowment of open spaces, it becomes apparent that these acts were very religious in intention but were so much secular in their fulfillment of our varied activities, day in and day out. This kind of endowment is perhaps unheard of in western society.

Our open spaces show concerns for our children as well as senior citizens as there is no age bar to enjoy natural domain. But encroachment and blatant grabbing of our open spaces is very alarming.

Obviously we have become reckless and indifferent as not to care about our own life-line. Without resorting to rhetoric or slogan, we must prove that our collective concern is springing out of our conviction and matching action, not only to protect the frontiers of open space but also to expand them in an appropriate scale to keep Kathmandu alive in a healthy way. In fact protection of open space is just our own protection because this safeguards a healthy, scenic and pristine valley.

FINITE STATE MACHINE AND ROBOT CONTROL

Shailesh Bdr. Pandey*, Santa Bdr. Basnet**

A Finite State Machine (FSM) is comparable to a flowchart in the sense that it has a set of states that follow a certain path of execution. However, each state has transition to some other state caused by events or action within the state. Consider an example. You are in the kitchen (**state**) and you want to drink water. You then decide to walk over to the cupboard and grab a glass. This is an **event** (walk to cupboard) and you are now in a new **state** with new options available to you. You then open the cupboard (**action**) and grab a glass (**action**). With the glass, you walk over to the filter (**event**) and turn on the tap (**action**). Water is poured into the glass (**event**) and then you drink it (**action**).

FSMs are being used in games mainly due to its easy structure and ease of maintenance. FSM are used to control the chatting, movement, defensive and offensive strategies of the game. Nowadays FSMs are even used to control the Artificial Intelligence (AI) of the game. Aside from games, FSMs have a large role outside of the game industry. For example, cars, aeroplanes, and robotics (machinery) have complex FSMs. We can even compare the traversal of menu item of Windows applications with transitions in FSM.

FSM and ROBOTICS

The first step in developing the FSM is to identify the players or entities. For this paper, we have chosen to design an FSM to control the action associated with a human like robot **KANCHHA**. **KANCHHA** is a robot with arms, legs and head and has ability to talk. One can think of other features to be incorporated but for our case, it is limited to a few. But one should keep in mind that before designing the FSM the features are to be fixed and **FINITE**. When a new feature has to be added to an existing FSM, the entire FSM structure can get changed. In the *Table 1.1* the events and transition on the events are listed for **KANCHHA**.

Event	State
turnOn	Activated
turnoff	Deactivated (Idle)
Stop	Stopped
Walk	Walking
Run	Running
raiseLeftArm	LeftArmRaised
lowerLeftArm	LeftArmLowered
raiseRightArm	RightArmRaised
lowerRightArm	RightArmLowered
turnHead	HeadTurned(direction)
Speak	Talking(text)

Table 1.1 Events and transitions associated with KANCHHA

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The states shown in the table obey certain common rules. First, states do not have multiple roles. Every time **KANCHHA** is turned on, the same flow of direction will always occur. If at any time in the project there is an error in that flow, it would need to be fixed. This is one of the problems with FSMs because sooner or later someone is going to pick up the pattern. Ways around this would be to add more events to a given situation or randomize the actions performed.

Secondly, states are unique. No two states should have the same reaction to a specified event. For example, having **KANCHHA** "speak" and "shout" are synonymous in terms of speech. Therefore we eliminate one while keeping the other and include arguments to dictate how a certain text is pronounced (e.g. speak normally, yell, stutter, etc).

Thirdly, state transitions do not normally branch. For example, **KANCHHA** has a set of movement options. Such movements can be decided using IF-ELSE statements; however it is best to avoid that since the purpose behind states is to replace the need for IF-ELSE statements with events. Although states are flexible and do allow such conditional operations, it is always best to avoid them. It reduces complexity and lessens the chance of logical errors.

Now that we have a list of events and states, it is best to draw them out. The figure is called the state model. When we visually see the model, it is easier to pick out where things may go wrong or where things could use improvements. Note that circle indicates states, line indicates transition and the arrow head indicates flow of control.

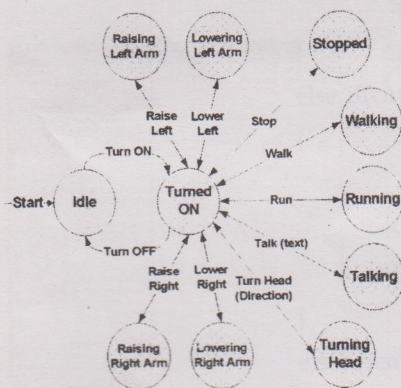


Figure 1.2: Initial state model of KANCHHA

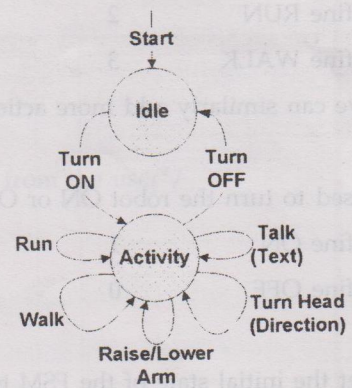


Figure 1.3. Simplified State Model

The initial FSM for our ROBOT is given in Figure 1.2. This model representation is actually insufficient. You should note that in a state, you perform a certain action and when you leave that state, the action is no longer performed. In this model, we can be in only one state at a time and thus perform one of the available choices of actions (walk, talk etc.) as there are no transitions between the states. But we may want **KANCHHA** to walk and then talk, so there should be a link between those two states. Since there are only a few movement states, the amount of transitions won't be all that bad. If you were to support a much larger base of states, then you will notice a massive set of transitions between them, undoubtedly creating confusion. Unfortunately there is no way around this. Diagrammatically speaking, you could specify a cleaner set of transitions, but ultimately when you program the states you will still have a complex amount of transitions to support. A better way to represent multiple states is shown in Figure 1.3.

Here we assign a new state Activity that holds all the activities **KANCHHA** can perform with transitions to itself. This allows for multiple events to run in parallel and so you could walk and talk at the same time. Inevitably, the programming will still be as complex. Take note that on events like talk, you would set up timers to display the text for T amount of seconds. When the timer expires, you would stop talking.

Implementing the FSM

```
/*define the states in the FSM*/
```

```
#define IDLE          0
```

```
#define ACTIVITY      1
```

```
/*define the actions KANCHHA can perform in the state IDLE*/
```

```
#define TURN_ON      0
```

```
/*define the actions KANCHHA can perform in the state ACTIVITY*/
```

```
#define TURN_OFF     0
```

```
#define TALK         1
```

```
#define RUN          2
```

```
#define WALK         3
```

```
/*we can similarly add more actions as we require*/
```

```
/*used to turn the robot ON or OFF*/
```

```
#define ON           1
```

```
#define OFF          0
```

```
/*set the initial state of the FSM to IDLE*/
```

```
#define STATE IDLE
```

```
void main( )
```

```
{
```

```
    int cmd;
```

```
    while(1)
```

```
    {
```

```
        /*get command from user*/
```

```
        cmd=GetCommand( );
```

```
        switch(STATE)
```

```
        {
```



```

case IDLE:
    if(cmd == TURN_ON)
    {
        /*call a function that turns the robot ON*/
        TurnPower(ON);
        /*transition to ACTIVITY state*/
        STATE=ACTIVITY;
    }
    break;
case ACTIVITY:
    if(cmd == TURN_OFF)
    {
        /*call a function that turns the robot OFF*/
        TurnPower(OFF);
        /*transition to IDLE state*/
        STATE=IDLE;
    }
    else if(cmd == TALK)
    {
        /*get text to be spoken from the user*/
        GetTextforTalking( );
        StartTalking(TEXT);
    }
    else if(cmd == RUN)
    {
        StartRunning( );
    }
    else if(cmd == WALK)
    {
        StartWalking( );
    }
    break;
}
}
}

```


The state model implementation of the FSM can be done with the help of a simple SWITCH-CASE statement. First we define the states in the FSM and actions that can be performed once in those states. We then define a special identifier *STATE*. Since the robot is in off state initially, *STATE* is initialized to *IDLE*. The value of *STATE* changes on actions performed in the states. The method *GetCommand()* obtains command from the input device we are using to control KANCHA.

Consider the state *ACTIVITY*. The actions that can be carried out once in this state are controlled via an IF-ELSE control mechanism. This allows us to carry out multiple events as per user choice. But to carry out multiple events in parallel say *TALK* and *RUN* simultaneously, we have to devise a mechanism that switches between these two events very fast giving the impression of parallelism (as done by the operating system when we are executing multiple applications).

In C this can be achieved through *setjmp()* and *longjmp()* functions. *setjmp()* basically captures the complete task state (the task state include segment registers, stack pointer etc.). A later call to *longjmp()* restores the captures task state and returns to the point where *setjmp()* was called thus giving impression of parallelism.

Conclusion

Finite State Machines are widely used in games to supplement AI given its easy structure and ease of maintenance. When given the problem that requires finite number of solutions, FSMs are definitely an easy method to approach. The format to design and develop FSMs:

- 1) Review the problem. Write down all the entities involved
- 2) Design a state diagram from the work you did in step 1
- 3) Review the state diagram. Make sure it meets all the requirements and does not fail under simple transitions.
- 4) Design the code

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SUSTAINABLE TOURISM AND COMMUNITY BENEFITS: A CASE STUDY OF ANNAPURNA CONSERVATION AREA PROJECT, NEPAL

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1. Background

The Annapurna Conservation Area, located in west-central Nepal contains two of the world's tallest mountain peaks (Annapurna 1 and Dhaulagiri) and the world's deepest valley of Kali Gandaki river between the Dhaulagiri and Annapurna range of Himalayas. It covers an area of 7,629 km² and is also the largest protected area of Nepal (KMTNC, 1997:5).

The conservation area contains one of the most famous trekking routes for the tourists, the 'Annapurna Circuit'. The geographical features of the terrain provide many micro-climates ranging from sub-tropical conditions in the south to alpine steppe and arid conditions in the north (Parker, 1997). Extremes of climate and topography have created excellent habitats for a wide variety of flora and fauna, including endangered snow leopard, blue sheep, musk deer, rare red panda and over 100 varieties of orchids (Gurung and De Coursey, 1994; Wells 1994; Parker 1997). The majority of the Annapurna's residents live at subsistence level or below with a high level of dependence upon the natural resources. According to Gurung and De Coursey (1994), over 90 percent of the local energy needs are met by the local forests.

Because of its spectacular landscape and diversity, the ACA has attracted an increasing number of tourists over the past two decades. The number had risen to about 76,000¹ in 2000 from just over 14,000 in 1980 (Parker, 1997). But with the overall decline of tourists in the following years, the numbers went down to 65,300, 38,000 and 40,000 in 2001, 2002 and 2003 respectively (THT, 2004). Nevertheless, the spring season of 2004 has shown a 37% increase compared to last year and hopefully the trend would continue.

2. 1 Defining "Sustainable Tourism"

The World Tourism Organization uses the following definition of sustainable tourism:

"Sustainable Tourism development meets the needs of present tourists and host regions while protecting and enhancing opportunities for the future. It is envisaged as leading to management of all resources in such a way that economic, social and aesthetics needs can be fulfilled while maintaining cultural integrity, essential ecological processes, biological diversity and life support systems."

The Federation of Nature and National Parks of Europe defines sustainable tourism as:

"all forms of tourism development, management and activity, which maintain the environmental, social and economic integrity and well being of natural, built and cultural resources in perpetuity" (FNNPE: 1993 quoted in Rogers et al, 1998)

¹ Source: KMTNC website <www.kmtnc.org.np>

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The term 'sustainable tourism' is widely accepted as tourism based on the principles of sustainable development. Since it is sold at various levels as being morally correct and environmentally suitable, it has created high appeal to the tourist as well as decision makers in the tourism industry (Wheeller quoted in Butler, 1998)

Butler (1998) further argues that wherever sustainable tourism practice has been adopted, it has tended to be accepted for three reasons; economics, public relations and marketing. Adopting sustainable tourism practices such as promoting less use of energy and water, requesting visitors to use towels and linens for more than a day not only reduces the operation cost but also creates a feel good environment for the tourists. Because of these reasons sustainable tourism, these days, has become more of a marketing and brand enhancement tool than actual practice itself. These kinds of initiatives may have moved significantly towards sustainability but whether they are true sustainable tourism practices or not is still debatable.

2.2 Principles of Sustainable Tourism

Within the framework of its definition of sustainable tourism, World Tourism Organisation has five basic principles of sustainable tourism; (WT0, 1998)

- The natural, historical, cultural and other resources of tourism are conserved for continuous use in the future, while still bringing benefits to the present society.
- Tourism development is planned and managed so that it does not generate serious environmental or socio-cultural problems in the tourism area
- The overall environmental quality of tourism area is maintained and improved where needed.
- A high level of tourist satisfaction is maintained so that the tourist destinations will retain their marketability and popularity.
- The benefits of tourism are widely spread throughout the society.

"to develop and implement effective land use planning measures that maximizes the potential environmental and economic benefits of travel and tourism while minimizing potential environmental and cultural damage"

2.3 Community benefits and sustainable tourism

National parks and protected areas in Nepal are mostly located far away from the city centres and urban areas. Due to limited resources and finances, the development in Nepal is often limited within the urban areas and nearby villages. For the local communities living inside these parks and protected areas, the basic infrastructures like roads, electricity and clean drinking water are inadequate and sometimes beyond reach. Sustainable tourism is not the ultimate cure for all these problems but if implemented can make these communities more autonomous and less dependent towards the state. Dowling and Fennell (2003) argue that the most prominent benefits of sustainable tourism policies and planning are the local developments which provide benefits for local communities and their natural environments.

If implemented and managed properly, sustainable tourism practice helps the local communities in two directions, first it protects the natural environment, culture, tradition and biodiversity for the future generations and secondly it generates revenue from the tourists which could be used for community development and towards better quality of life.

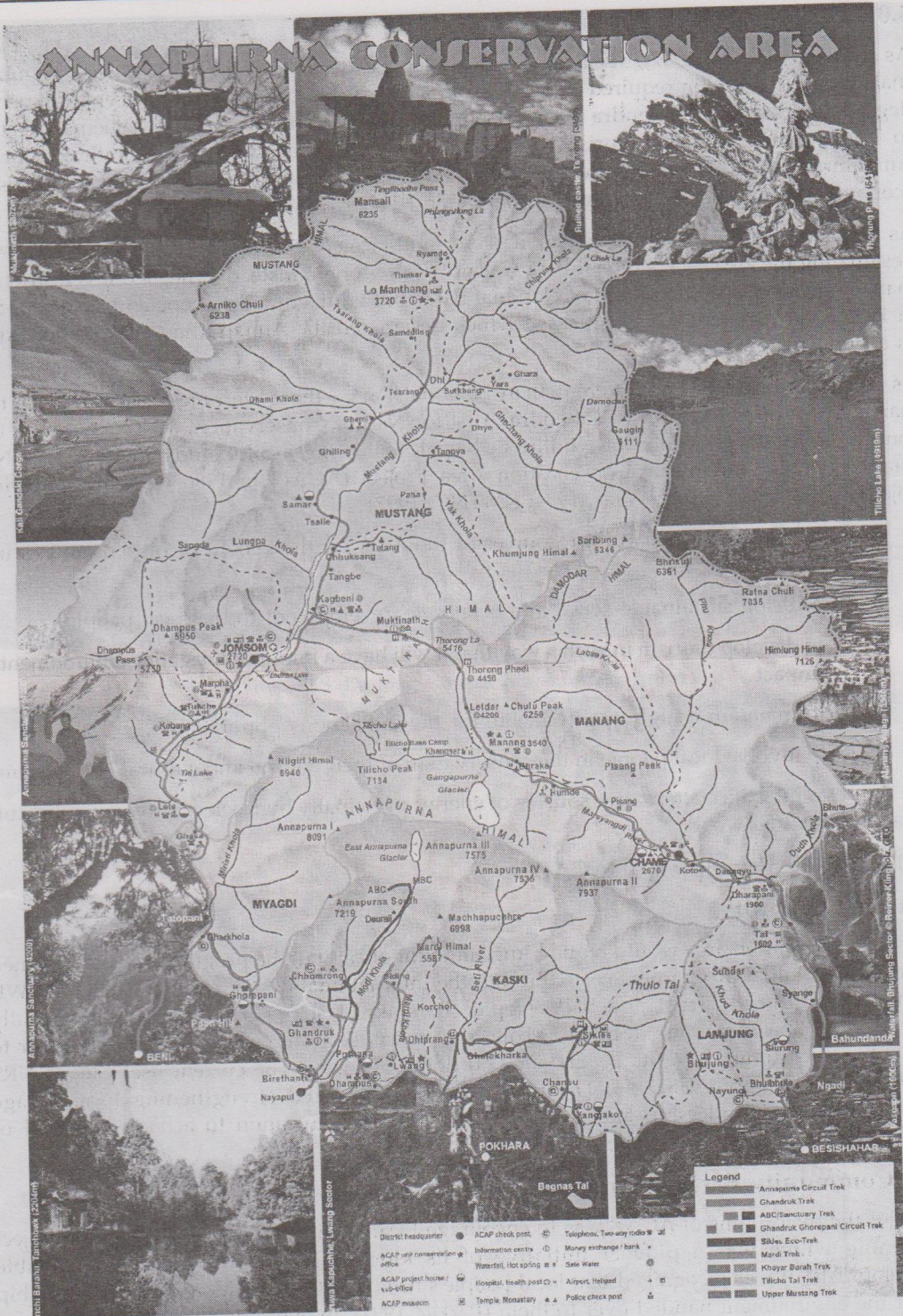


Fig. 1: Annapurna Conservation Area Map
(Source: KMTNC)

3.0 Need for Conservation

As argued by Parker (1997), due to environmental pressures in the mid 1980s, it was recognized that Annapurna region required protected status in order to prevent excessive environmental degradation. Late King Birendra during his unofficial visit to the area in 1985 issued a directive to improve and manage tourism development while safeguarding the environment of Annapurna region. The royal directive stipulated the need to strike a balance between tourism, economic development and nature conservation (Wells, 1994).

As problems in the Annapurna region were multifaceted (Gurung and De Coursey, 1994) designating the area as a National Park was not a cure for all. Instead, it needed less restrictive management policies than those of National Parks but with a broader scope and coverage. So, in 1986 a Government Act was passed which designated the Annapurna Conservation Area as a protected area.

As conservation area was different than National Parks, the government handed over the management of ACA to King Mahendra Trust for Nature Conservation, a NGO working for conservation and protection of wildlife in Nepal. Following a pilot study in 1985, KMTNC established the Annapurna Conservation Area Project (ACAP) in 1986 with the following objectives (KMTNC, 1989; Wells, 1994; KMTNC, 1997):

- to conserve the natural resources of the ACA for the benefit of present and future generations;
- to bring sustainable social and economic development to the local people;
- to develop tourism in such a way that it will have a minimum negative environmental impact
- to maintain a high quality of life for the indigenous population;
- to involve local people in the conservation of their natural and cultural heritage; and
- to introduce alternative sources of energy, principally hydroelectricity, as a substitute for fuel wood.

4.0 Guiding Principles of ACAP

4.1 Sustainability

As the conservation area would require huge amount of capital, the programme was designed to cover the initial programme costs through the international donor agencies such as WWF, King Mahendra UK Trust and SNV/Nepal. To make it self- supporting and financially sustainable the programme decided to collect an entry fee from each international visitor to the area, thus diminishing its dependency on donor agencies. The current user's fee is NRS 2000, which is about USD 26. The project also emphasized strengthening local village organisation and leadership and providing conservation education to achieve the goal of sustainable social and economic development.

4.2 Community Participation

One of the major aims of ACAP was to encourage local participation in each stage of project planning which was a pioneer initiative of its kind in Nepal. To achieve sustainable development, it was recognized that local people's need must be considered and stewardship over the environment handed over to them (Parker, 1997). In every development projects for the community, ACAP wanted a 50% contribution from the local people in terms of labour,



Fig. 2 Jhong River Valley, ACAP
(Source: H.S. De Jong. <<http://www.hsdejong.nl>>)

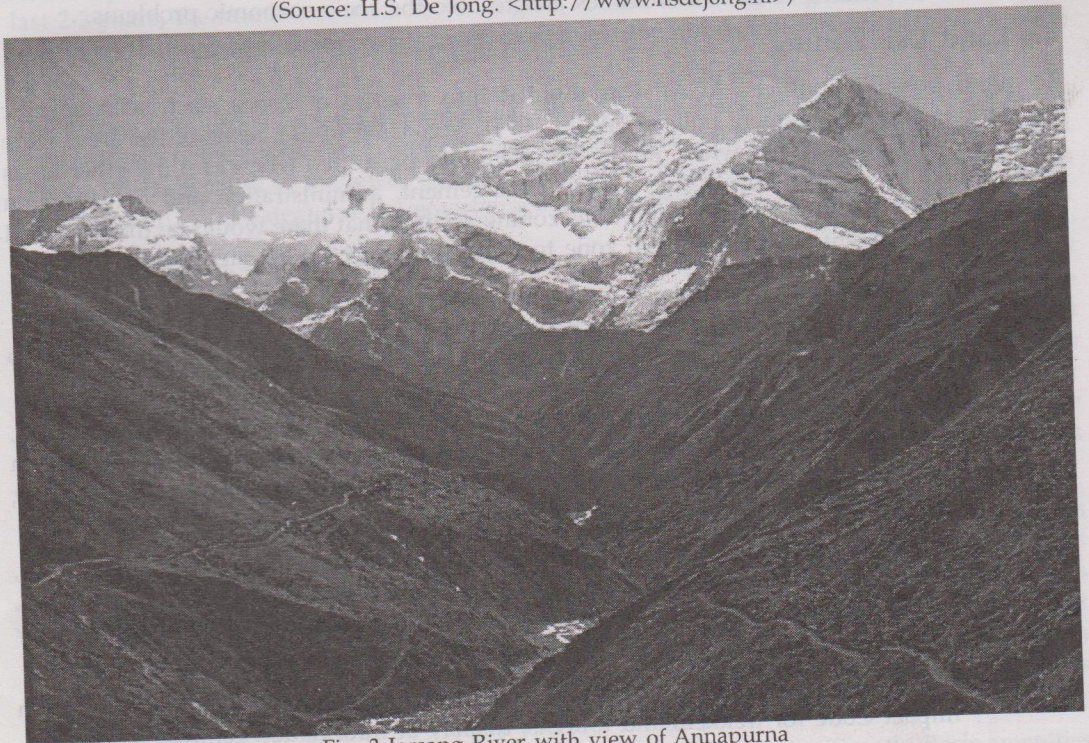


Fig. 3 Jarsang River with view of Annapurna
(Source: H.S. De Jong. <<http://www.hsdejong.nl>>)

resource or finance. This 50% partnership developed a sense of ownership and motivation among the local villagers towards conservation and sustainable development.

4.3 "Lami" Facilitator Approach

As most of the population around the area of ACAP area were deprived of basic amenities like clean drinking water and hygienic toilets, ACAP acted as a facilitator or "lami" by bringing the outside resources for locally initiated development projects. Activities were suggested by ACAP and coordinated by the local community through Conservation Development Committee (CDC) which was formed in each village

4.4 Conservation for development

As conservation and development were complementing forces, ACAP believed that development programmes, if incorporated within the conservation aspects, would be more sustainable. (Gurung and De Coursey, 1994). ACAP sought to exchange conservation for development. Development projects (initiated by ACAP) such as promotion of alternative energy and micro-hydro electricity reduced the dependency upon forest resources and created a natural ground for conservation and sustainable development.

4.5 Bottom -up approach

The officials of ACAP understood right from the beginning that without the participation of local community, it would be impossible to achieve the objective of long-term natural resource conservation. Thus it adopted a more decentralised, bottom-up approach to revive conservation (Gurung and De Coursey, 1994). Local communities were encouraged to participate and express their views in the open forums. This bottom-up approach helped the officials to understand the need and concern of the communities and resolve the socio-economic problems.

4.6 Land Use Zoning

To avoid possible conflicts, ACAP was divided into a series of zones, each with specific regulations and management policies (Wells, 1994). According to use, some of the areas were zoned as Wilderness Zones where no development was permitted whereas some other areas were zoned as Intensive-use Zones where management, administration and conservation education activities were concentrated. This zoning assured that there would be different and specific management policies for each zone to make the project more successful.

5.0 Project activities

ACAP has implemented extensive range of activities which can be basically categorized into four groups as suggested by Wells (1994). These are:

- **Community development:** improved water supplies, health clinics, family planning, toilet and garbage-pit construction, trail and bridge repair, agricultural extension and training, lodge training and management committees, mothers' group consisting of women from the village and grazing-land rehabilitation.
- **Forest Conservation:** community nurseries, fodder and fuel wood plantations, promotion of kerosene oil, Liquefied Petroleum Gasoline, Low wattage utensils, improved cooking stoves, solar energy. Alternative energy, Micro-hydro electricity projects.
- **Conservation education:** school programs, mobile AV shows, brochures, Minimum Impact Code for trekkers and tourists, display at information centres.

- **Research and training:** wildlife biology and habitat studies, botanical surveys, training for lodge owners and staffs

As protecting the environment was the main concern of the project, the first priority was to reduce the environmental impact created by tourism as well as increase the community benefits. The activities were mainly concerned towards minimising the impacts created by the visitors by educating the lodge and tea house owners and improving the built environment with provisions of better sanitation and waste disposal schemes.

Some of the other innovative schemes include installation of back boilers which automatically heats the water during cooking conserving about 40% of the total fuel wood consumption (Gurung and De Coursey, 1994).

6.0 Project Achievements

6.1 Tourism and Conservation

The most visible and immediate results of the project have been the reduction of environmental impacts created by tourists and trekkers and economic benefits to the local community. Before the start of the project, deforestation was one of the major issues to be addressed by the projects and ACAP was successful in reducing the firewood consumption by requiring the lodge owners to use kerosene oil. This can be regarded as one of the project's biggest achievement and was possible only after series of extensive discussions with the lodge management committees, whose members needed to be persuaded to make relatively expensive investment in kerosene burning stoves (Wells, 1994).

As Annapurna Conservation Area is the most popular trekking routes in Nepal, except for the last 2-3 years, the number of trekkers visiting ACA has been increasing each year. But ACAP has no regulations or policies, whatsoever, to regulate the number of visitors each year to the area.

The project was also successful in promoting collection and disposal of waste and litter in the southern part of the conservation area compared to the other trekking areas such as Sagarmatha (Wells, 1994). Because of the fewer camping grounds in the new ecotourism project area it is easy to control and safeguard the environmental impacts created by the tourists.

6.2 Social and Cultural Development

Community participation in development projects is a relatively new concept in Nepal. The approach of encouraging the community to participate in planning and managing the project can be regarded as major achievements of ACAP. The approach of 50-50 percentage partnership with the community for the local development projects helped to motivate the community for such participation. Wells (1994) has argued that the successes in the area are also due to the project leaders' and staffs' familiarity with the region and its people and their consequent ability to judge the appropriate nature and timing of attempts to induce change.

For the ecotourism project in Sikles, the project officials made sure that the economical benefits would be distributed evenly among the local villagers. The regulations required the villagers to manage and run a community lodge collectively, instead of operating individual lodges and teahouses. This would not only avoid unhealthy competition among lodge owners but would ensure more equitable distribution of the economic benefits. Due to difficulties in community ownership of a private enterprise, the concept of community lodge was discontinued.

The project has increased the living conditions of the local villagers significantly. Basic amenities

like clean drinking water and clean toilets have been provided to the local villagers with 50-50 percentage partnership approach

The project is also training the local youths in activities such as farming, dairies and growing vegetables and also some vocational training like mechanics and electrician. A small carpet factory has also been promoted in Ghandruk, the project headquarters.

6.3 Biodiversity Conservation and Conservation Education

Even though biodiversity conservation was not the initial agenda of ACAP, various individual project activities related to conservation have been indirectly benefiting the biodiversity. The local people have realized that economic development and conservation can go together bringing long term social and economic benefits and through which biodiversity is likely to benefit, even if indirectly and in unquantified manner.

The Conservation Education and Extension Programme (CEEP) has been in place since the inception of ACAP which was aimed to disseminate information of ACAP, facilitate community consensus building and encourage community mobilization towards conservation development (Parker, 1997) CEEP has been successful to increase the awareness among the community regarding specific environmental problems. Some other achievements of CEEP include literacy project which was aimed mainly at women within the conservation area. Similarly, to make children aware of the nature conservation, CEEP is running a formal curriculum at local schools from grade six to eight. CEEP has remained core features of the ACAP approach and is significantly linked with the overall project achievement (Parker, 1997)

7.0 Analysis and conclusion

7.1 Importance of community participation

As already mentioned above community participation was relatively a new concept in planning especially for parks and protected areas in Nepal. Quite often national parks were designated in an ad-hoc manner creating conflict between the park authorities and local villagers. When studies were being carried out for the Annapurna Conservation Area, the planners didn't want to repeat the same mistake again. Communities were highly consulted during the entire planning process, right from identification of the problem to the decision making. The communities too were interested to participate as they were convinced that the project would bring social and economic development. Even though park planning is often regarded as a messy process, with proper consultations and community participation, during planning and implementation, the project can result in a success story of nature conservation as in ACAP.

7.2 Government vs. NGO

The National Park's management in Nepal is handled by the Department of National Parks and Wildlife Conservation (DNPWC), a government agency, under the Ministry of Forest and Soil Conservation. As the regulations under the National Park Act restrict any kind of settlement inside the designated area, communities are often relocated outside the park area which often resulted in conflicts between the authorities and local villagers. To avoid all these conflicts, Annapurna region was designated as a "Conservation Area" and management of the area was handed over to KMTNC. Because of its NGO status, KMTNC could seek direct funding from the donor agencies bypassing the complicated bureaucratic government procedures. The independent and NGO status helped KMTNC to gather large amount of funds essential for implementing conservation policies in such a large scale. Working as a NGO also helped KMTNC to work closely with the local communities, who are often reluctant towards any government intervention.

7.3 Economic sustainability

To make the project economically viable and sustainable over the long term, ACAP introduced entrance fee for international tourists visiting ACAP. The fee currently is 2000 Nepali Rupees which is equivalent to USD26 approximately. Unlike the Department of National Parks and Wildlife Conservation (DNPWC), ACAP has been granted the right to collect revenue directly from entry fees rather than through government agencies. ACAP retains 50% of the total fee collected and rest of the 50% is handed over to the Nepalese government. Even though, KMTNC is still receiving funds through international donor agencies, the revenue collected through the entrance fee is helping ACAP to operate autonomously and also towards long - term sustainability.

7.4 Fifty-fifty Partnership

Ever since ACAP started its operation, all the local development has been carried out by 50-50 partnership between the ACAP and local residents. It has been a strict policy of ACAP of giving nothing for free. The partnership could be of different nature such as labour, resources or finances depending upon the nature of the project. This partnership approach developed a sense of ownership among the local residents which made it easy for the project officials to form Conservation Development Committee (CDC) in those villages and hand over the management of such projects to such CDCs which was essential for its long term sustainability. Even though most of the projects were done according to the above principles there were few exceptions like the micro hydro project where the project invested 70% and 30% was borne by the locals.

7.5 Conclusion

Study of this project shows us that with a holistic approach which recognises the needs of all stakeholders, sustainable tourism planning can protect and conserve the nature as well as bring economical and social benefits to the local community impacted by the tourism. The success of ACAP has also demonstrated that involvement of NGOs for nature conservation efforts could foster a better partnership between the public and private sector.

The project officials knew right from the beginning that without the involvement of local communities, it would be difficult to conserve and protect the nature. Communities were involved right from the beginning which helped the project to achieve its goals and objectives leading towards sustainable development.

For other tourism affected areas in Nepal, where unsustainable tourism growth has created massive environmental impacts, the model adopted by ACAP could be effectively applied so that the tourists, the local communities and the natural environment all benefit from tourism development creating a win-win scenario.

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7.5 Conclusion

Study of this project shows us that with a holistic approach it is possible to meet the needs of all stakeholders. Sustainable tourism planning can protect and conserve the nature as well as bring economic and social benefits to the local community impacted by the tourism. The success of ACAP has also demonstrated that involvement of NGOs for nature conservation efforts could foster a better partnership between the public and private sector. The project officials knew right from the beginning that without the involvement of local communities it would be difficult to conserve and protect the nature. Communities were involved right from the beginning which helped the project to achieve its goals and objectives leading towards sustainable development. The project has also demonstrated that involvement of NGOs for nature conservation efforts could foster a better partnership between the public and private sector. The project officials knew right from the beginning that without the involvement of local communities it would be difficult to conserve and protect the nature. Communities were involved right from the beginning which helped the project to achieve its goals and objectives leading towards sustainable development. The project has also demonstrated that involvement of NGOs for nature conservation efforts could foster a better partnership between the public and private sector. The project officials knew right from the beginning that without the involvement of local communities it would be difficult to conserve and protect the nature. Communities were involved right from the beginning which helped the project to achieve its goals and objectives leading towards sustainable development. The project has also demonstrated that involvement of NGOs for nature conservation efforts could foster a better partnership between the public and private sector.

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