Landscape Change in Kathmandu Valley, Nepal

by David Zurick and Autumn Rose

Individual photographs are credited as shown.

Every year it becomes more difficult to find historic Nepal in Kathmandu. As the traditional economy gives way to such global pursuits as tourism, export industries, and speculative investments, the landscape of the valley follows. The accretions of modern buildings now hide the vernacular architectures and national monuments - courtyards and durbar squares, Buddhist temples, and Hindu pagodas - which, in their cultural moorings, make Kathmandu a UNESCO Living Heritage Site. The expanding urban infrastructures now cover much of Kathmandu Valley, Nepal's most productive farmland in the Himalayas, further removing it from the food base of urban residents. Squatter settlements arise amid migration, poverty, and a lack of opportunity. Even the surrounding mountains that signify Kathmandu’s place in the world are less visible when obscured by thickening layers of smog and dust. And as more people move into it, the city spreads.

Urban Sprawl (2008): A bird’s-eye view of the Kathmandu Valley is gained from the top of Bhimsen Tower, located in the Sundhara neighborhood of Kathmandu. This view extends from the traditional urban core in the foreground to the northern suburbs as far as Budhanilkantha, located at the base of the Shivapuri Ridge. The northward sprawl of the city, as seen in this photography, consumes the valley floor. Beyond the cloud-draped ridges in the background are the high Himalayan peaks. Viewpoint: Bhimsen Tower looking north-northwest. (Photo courtesy David Zurick)
Urban Growth and Land Cover Change

As Nepal's capital city, Kathmandu is an urban magnet for power, wealth, and social revolutions. It contains 20% of Nepal's urban population, and people on the move in the country seek it out for jobs and other opportunities. In the mid-20th century, 400,000 people lived in the Kathmandu Valley. It now hosts more than 1.5 million residents and continues to grow at an annual rate of 6%. By 2020, the population will reach 2.5 million. Much of the recent population increase occurs outside the traditional urban core, spilling into the countryside, where the city and the valley have become almost indistinguishable.

Farmland and the agricultural economy - the historical source of the city's prosperity, are being lost to the urbanization process. From 1980 to 2000, agricultural lands decreased by one third in the valley and will be gone by 2050 if the trend continues. The number of farmers have likewise decreased by one third in the past 30 years, and, although nearly half the valley households are still engaged in some way in agriculture, the prospects for a vibrant farming life are bleak. People are turning instead to the brick and garment factories and to the service sectors for employment. The farmers in the valley, especially the indigenous community of Jyapu tillers, have traditionally supplied the city market with much of its fresh vegetables. It is difficult to imagine what would replace this supply of local food.

Hills and mountains ring the Kathmandu Valley. On the steeper slopes, above the terraced farms, shrubland and forests of mixed hardwood and pine predominate. Although damaged by heavy use over many centuries, the forests provide wildlife habitat, conserve endangered plants, protect watersheds, and, in regulated ways, supply the valley farmers with livestock fodder and wood for fuel. The largest tracts of forest include those at the Nagarjun and Gorkana reserves, the Phulchowki ridge, and the Shivapuri watershed. A number of small parks and sacred groves also exist on the valley floor, contributing important green space to the crowded living conditions. Altogether, about one third of the valley remains in forest, most of it under protected status of some kind, yet in the latter half of the 20th century, the valley forests declined by 40%, and it is clear that only with proper enforcement of conservation laws will the extant forest remain into the future.

The expansion of urban settlement onto peripheral land occurs amid increasing congestion within the city center. The open spaces that once existed in Kathmandu, and which provided the residents with nearby food gardens and pasture, are gone, overtaken by bus parks, shopping centers, squatter settlements, new residential colonies, and industrial complexes. The few exceptions to this trend are the scattered public parks and gardens, many of which are sadly neglected and overutilized by an urban population desperately in need of greenery and places to walk and to recreate. Some neighborhood-based, institutional measures are being taken to maintain the greenery of parks, including the successful community efforts at Balaju Park and the temple improvements at Pashupatinath, but most of the parks bear the impacts of the burgeoning city population with little public investment or even concern.

The crowded city neighborhoods with their high-rise buildings also threaten to obscure the valley's most prominent cultural markers, which thereby diminishes the cultural heritage of the landscape. Seven sites in the valley were classified in 1979 as UNESCO World Heritage Sites, and all of them are currently on the UNESCO World Heritage in Danger list because of the threats posed by construction encroachments, pollution, litter, and physical damage to the structures. In addition to the UNESCO sites, hundreds of other important cultural markers exist in the landscape, such as temples, shrines, stone waterspouts, ponds, and sacred gardens. Many of these smaller sites are located along riverbanks and are threatened as well by declining environmental quality and urban sprawl. The cultural markers overall contribute compelling beauty and a unique interest to the landscape of the valley. They bring tourism revenue to Kathmandu. And they reaffirm for valley residents a part of their own cultural identity. Their diminishment in the landscape is a threat to all these contributions.

Map of the City of Kathmandu
Environmental Trends

The concentration of people and industry in the Kathmandu Valley impacts the valley's water systems and air quality. The two sources of potable water in the valley, groundwater and rivers, are under assault by increasing use, diminished recharge rates, diversions, and pollution. All major rivers are tapped at their source for drinking water. In the dry season, they provide less than half of the daily water demand. Groundwater makes up the rest, but it is being withdrawn at twice the sustainable rate, and the water recharge areas in the mountains are declining along with the forests.

The rivers flowing across the valley suffer pollution from both household and industrial sources. Only 15% percent of houses are connected to municipal sewer systems. Others have septic tanks, but the majority of households discharge their waste directly into the rivers, resulting in bacterial levels that exceed the most basic public health standards. Household waste exacerbates the growing problem of industrial water pollution. Kathmandu hosts 75% of the industry in the country but lacks sufficient water treatment systems to deal with its discharge. The result is a toxic industrial stew in the waterways, especially those flowing past carpet factories, cooking oil manufacturers, and leather producers. Commercial agriculture in the valley adds additional loads of agrochemicals, which farmers increasingly use to sustain productivity amid declining acreage. The water contamination problem tops the public health threat in Kathmandu (approximately one-fifth of all hospital recorded deaths in the valley are due to waterborne diseases), and the overall pollution levels further undermine the viability of aquatic ecosystems that already are stressed by other forms of landscape change.

Kathmandu has become world famous for its air pollution. The city sits in a topographical bowl, and temperature inversions are common meteorological events. This only contributes to the problem of locally generated smog. Moreover, during the late winter and spring months, dust and other particulates are blown northward from India to fill the air above the city. The poor air quality undermines the respiratory health of valley residents and reduces the visibility of the mountains (mountain views are a primary tourism resource in Nepal, and their loss has direct economic consequences).

The declining air quality in Kathmandu arises from several sources. Vehicular emissions account for a major part of it; exhaust fumes increased four-fold during the last decade of the 20th century, so that they now contribute an estimated 40% of particulate matter. Industrial sources also play a key role in air quality, with brick factories alone producing 11% of the total particulate matter found in the valley air. Some important steps have been taken to address the air pollution problem, although with limited success. Brick factories that incorporate cleaner technologies, for example, dramatically reduce pollution levels, notably those around the city of Bhaktapur, where air quality in the last five years has shown a 25% improvement. Kathmandu has banned vehicles that pollute the worst, e.g., three-wheel motor rickshaws, and new vehicles on the city roads should pass international emission standards.

The environmental and societal trends noted above, which find expression in the landscape, have prompted a series of Kathmandu-based policy and planning initiatives funded mainly by international agencies. A series of five-year national development plans, begun in 1966 and continuing into the present day, contain various prescriptions for remedying the declining environmental quality. Recent programs and policies related to urbanization, prompted by new studies showing the deteriorating living conditions in the valley, include the Environment Sector Improvement Programme, which targets measures to improve air quality; the National Ambient Air Quality Standards; and the National Water Resources Strategy 2002, meant to improve surface and groundwater systems so that they meet the 2015 targets set in the Millennium Development Goals. Urban sprawl was first addressed in the 1969 “Physical Development Plan for Kathmandu Valley” and most recently is highlighted in the 2002 “Long-Term Development Concept for Kathmandu Valley.” Unfortunately, the policies to minimize the impacts of urbanization promoted in these reports are largely ineffective due to lack of enforcement either because of the absence of political will or insufficient funding.

Assessing Landscape Change

Given this litany of environmental challenges, the Kathmandu Valley is still a place of remarkable beauty and cultural heritage. Those of us who were there 35 years ago may find it to be a radically transformed place, with a barely recognizable landscape, but Kathmandu nonetheless continues to infuse the geographical imagination with its physical setting and to sustain one of the most remarkable assemblages of cultural and biological life on earth.

A visual inspection of landscape change provides some telling clues about its magnitude and the driving forces behind it. The historical image of the valley shows the predominance of traditional homes, farms, imposing monuments, and pedestrian traffic. Such views are easily discerned in old photographs because of the once clear mountain air. More recent photographs show the obvious changes: the awkward sprawl of buildings, roads brimming with vehicles, depleted water supplies, murky air, and a notable absence of cultural markers, open space, or vernacular architecture. The changes in the landscape suggest more than altered views. They indicate urgent challenges for people living in the valley and suggest a new world view that is emerging among them. The history of the landscape thus parallels the life history of the people who inhabit it.

In summer of 2008, we initiated a photography and ethnographic history project meant to shed light on the nature of Nepal's landscape change in the Himalayas. In this project, we seek to link a visual record of the land captured in historical photographs to the cultural stories of mountain residents contained in their life histories and to blend the imagery and oral accounts into an overarching geographical narrative of altered landscapes and changing worlds. This narrative, in turn, is supported by an empirical analysis of land cover change gained from geospatial technologies, including remote sensing imagery and archival aerial photographs. The study eventually will extend across the mountains of central Nepal from the lowland plains in the south to the High Himalaya near the Tibet border. We began the project in Kathmandu with field study in summer 2008, and the images and text captions that accompany this article resulted from that study.

Methodological Note

The recently disavowed Royal Court of Nepal employed first a painter and then a photographer to chronicle the life and land
of the kingdom during the last several centuries. These images constitute a remarkable archive of national imagery, much of which has geographic and ethnographic significance. Kiran Chitrakar is a descendent of the long line of artists who produced this work. Most recently, his grandfather, and then father, were the official photographers of the Royal Court of Nepal. Kiran now maintains the family photography archives in Kathmandu, which span a century of life and land in Nepal. We utilized some of the oldest Kathmandu images in the Chitrakar archives (ca. 1905) for our study, augmented with photographs made in 1960 by geographer Pradyumnan Karan. The latter specifically address the landscape from a geographer’s point of view. New photography was completed by David Zurick in May-August 2008. The photographic record available to our study thus captures a century of change.

The summer 2008 images were made, as far as possible, from the exact perspective of the old images. In some cases, this was impossible due to changing infrastructures, land use restrictions, or a simple inability to locate the old perspective. The landscape in some cases was indecipherable measured against a century of time. The photo pairs were then used in the field to support interviews and elicit discussions among people living in the documented landscapes. Most interviewees were enthusiastic about the photo sets. Old people found in them the geographical settings of their youth, while young people saw a place as it was before their birth. In both cases, the photo sets evoked valuable information about cultural life in the valley. The surveys were geared toward obtaining a better understanding of the driving forces behind landscape change in the Kathmandu Valley, as well as the individual and societal accommodations to it. What follows in this article is a small set of photo pairs centered on Kathmandu accompanied by captions that set the context for viewing the images.

Photographs 1a (ca. 1960) and 1b (2008): Loss of Valley Farmland. A study conducted by the Kathmandu Valley Town Development Committee concluded that 40% of the valley is agricultural land. However, the agricultural landscape is quickly disappearing as urbanization continues. From 1984 to 2000, the urban area grew from 3,096 to 9,193 hectares, while farmland decreased from 40,950 to 27,570 hectares. In 1961, when photograph 1a was taken, the population of Kathmandu was 121,019. In 2001, the population of the Kathmandu Valley was 1.6 million and will reach an estimated 2.5 million by 2020. Between 2001 and 2020, nearly half of the valley’s best (Grade A) agricultural lands will have been lost to urbanization. Such loss of farmland is a growing threat to the local economy and to food self-sufficiency, as valley residents depend more each year on food imports.

As the valley population grows and land speculation increases, real estate values rise (commonly at rates of 20-25% per year). Many farmers choose to sell their land to developers for the high financial returns rather than to continue farming under increasingly untenable circumstances. As a result, new housing colonies, industrial complexes, tourism resort facilities, and transportation infrastructures encroach upon the agricultural landscape.

Viewpoint: From Ring Road looking east toward Nagarkot Ridge. (Photo 1a courtesy P.P. Karan; Photo 1b courtesy David Zurick)
Evidence of unplanned settlements exists in the growing number of squatter settlements in the Kathmandu Valley. In 1985, there were 17 squatter settlements with a total population of 2,134. By 2003, there were 64 squatter settlements, home to 14,500 people. Sixty percent of squatter settlements are located on public lands with the remaining settlements on private lands, creating tension between squatters and landowners. Many of the settlements are located along riverbanks and on steep slopes. They lack electricity, sewerage, and stable structures. Most squatters are recent migrants to the city. Photograph 2a, made along the Bagmati River near the bridge to Patan, shows a pristine riverbank. Photograph 2b, taken from the same vantage point shows the current squatter settlements. Waste and pollution is clearly visible along the riverbanks, produced in part by squatters. The river contamination is exacerbated by the fact that municipal laws allow the contents of the city’s septic systems to be dumped along the riverbanks in this locality. Viewpoint: South side of Bagmati River in lower Kupundol looking northeast toward Thapathali. (Photo 2a courtesy Kiran Chitrakar; Photo 2b courtesy David Zurick)
Photographs 3a (ca. 1905) and 3b (2008): Infrastructure/Construction — Earthquakes. Rapid urbanization is often coupled with haphazard construction in the Kathmandu Valley. Nepal is an earthquake-prone nation, and over the last century, four major earthquakes with a magnitude of 8.0 or higher have occurred. Each year over 4,000 new buildings are constructed, most with little regard for earthquake standards. Many builders have inadequate knowledge of safety regulations, while others simply cheat on construction materials to cut costs. Meanwhile, the older buildings, especially those in the historic city core, which date back many centuries, are multistoried brick affairs and stand little chance of surviving a major earthquake event.

The Nepal government has no central department handling disaster preparedness and management. Building codes were introduced in 1994 but have not been implemented. Dangerous construction still occurs, such as skyscrapers being built without subsurface geological analysis. Estimates show that up to 45% of residential buildings in Kathmandu would sustain major damage if a sizable earthquake were to occur.

Bridges present a unique problem. There are a total of 54 bridges in the Kathmandu Valley, but no uniform bridge design exists and most of the bridges are vulnerable to collapse if a large earthquake were to occur. This would effectively cut off access to the cities within the Kathmandu Valley.

In response to the earthquake threat, some organizations have begun to educate the public about earthquake disaster preparedness. The Lalitpur sub-metropolitan city teamed up with the Department of Urban Development and Building Construction and the National Society for Earthquake Technology to provide better training to builders about constructing earthquake-resistant buildings. As shown in photograph 3b, education and legislative efforts are slowly beginning to change construction habits. The building under construction in the bottom right corner of the photo will be supported by steel reinforcements. Viewpoint: Bhimsen Tower looking east across the Tundikhel parade ground and toward the government complex at Singha Durbar.

(Photograph 3a courtesy Kiran Chitrakar; Photograph 3b courtesy David Zurick)
Photographs 4a (ca. 1960) and b (2008): Vehicular Traffic and Air Quality. The streets of Kathmandu are filled with vehicles of all sorts—trucks, buses, rickshaws, private cars, motorcycles, and tempos—all competing for space amid the chaotic traffic conditions. Photo 4a, taken in 1960 shows a serene intersection at the head of New Road, a commercial strip of electronics goods and ready-to-wear apparel shops. Photo 4b shows the same spot in 2008 under ordinary traffic conditions. As the city boundaries expand outward creating longer commutes, the professional middle class has bought into private car ownership in order to avoid the crowded and cumbersome public transportation system. As of 2005, a total of 472,795 cars were registered in the country, most of them in Kathmandu. This number is increasing at about 12% per year. As a result, vehicular emissions have become a major problem. According to a study by the Ministry of Population and Environment, exhaust fumes increased by more than four times between 1993 and 2001. Vehicular emissions now account for 38% of the particulate matter emitted in the Kathmandu Valley. Viewpoint: Intersection of Kantipath and New Road looking west toward Durbar Square. (Photo 4a courtesy P.P. Karan; Photo 4b courtesy David Zurick)
Photographs 5a (ca. 1905) and b (2008): Water Quality in Valley. The Kathmandu Valley receives its water from two sources: surface water and groundwater. Water in both sources is recharged by rainfall. The increasing population density of the Kathmandu Valley strains water resources, and comparisons between photographs 5a and 5b show the diminishing water flow in the Bagmati River, one of the largest waterways in the valley. The total water supply in Kathmandu is about 120 million liters per day in the rainy season and about 80 million liters per day in the dry season (photo 5b was made during the rainy season). Most domestic waste directly enters the rivers without treatment. Additional waste from septic tanks is dumped onto the riverbanks. Altogether, an estimated 20,846 kg of domestic sewage enters the Bagmati River daily (shown in these photographs). With declining river flow and contaminated surface water, the valley population increasingly turns to groundwater. It is estimated that the sustainable usage of groundwater is 26.3 million liters per day, and the total amount of groundwater currently used is 58.6 million liters per day. Viewpoint: Looking north across the Bagmati River toward the Tripureswpor neighborhood. (Photo 5a courtesy Kiran Chitrakar; Photo 5b courtesy David Zurick)
UNESCO has dubbed Kathmandu a Living Heritage Site. Currently, seven sites in the Kathmandu Valley are classified as World Heritage Sites. They were added to the list in 1979 for their display of cultural and historic achievements. In 2003, these sites appeared on the World Heritage in Danger list due to threats from rapid urbanization. Bouddhanath Stupa, pictured in photographs 6a and 6b, is one such site. In 1960, as photograph 6a shows, this popular Buddhist pilgrimage site was located well outside city borders. As shown in photograph 6b, the area is now bustling with traffic and overwhelmed by shops. To protect the heritage sites, the government initiated efforts to redefine the site boundaries and demolish encroaching buildings. At several sites, new monuments are being constructed and service areas and green spaces improved. At Boudhanath, vehicular traffic has been banned and teams organized to keep the place clean. Due to these efforts, Kathmandu’s world heritage sites were removed in 2007 from the danger list. Many other, smaller heritage sites, however, continue to be threatened by neglect or vandalism (including thefts for the international art/curio market). Viewpoint: Looking northeast (note the exact viewpoint for photograph 6a nowadays is impossible to obtain due to high-rise buildings). (Photo 6a courtesy P.P. Karan; Photo 6b courtesy David Zurick)