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Ambika Prasad Adhikari

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**Towards Developing Indicators
of Environmental Sustainability for Kathmandu, Nepal**

*Ambika Prasad Adhikari, Dr. Des., AICP
Arizona State University, Tempe, AZ
Ambika@alum.mit.edu*

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Towards Developing Indicators of Environmental Sustainability for Kathmandu, Nepal

Abstract

Sustainability is now considered a key objective of urban planning everywhere. However, due to inappropriate planning, weak institutions, lack of resources and poor implementation of policies, most big cities in the developing world have become even less sustainable, environmentally, economically and socially, than they were in the past.

Kathmandu, Nepal enjoyed a unique tradition, rich history and a moderate state of sustainability in all areas, particularly a strong environmental sustainability, in the past. However, the rapidly growing and modernizing city of Kathmandu is facing serious problems of sustainability in all fronts: economic, social, environmental and ecological. Whereas environmental and economic sustainability was tacitly imbedded in the traditional planning practices in Nepal, the rapid expansion and modernization of all the major cities in the Kathmandu valley is making them increasingly unsustainable.

This paper discusses elements of planning for a sustainable Kathmandu, proposes major indicators of sustainability, and discusses an approach to implement sustainable practices in urban planning and development as appropriate for Kathmandu.

Key words: Sustainability, Indicators, Planning, Kathmandu

What is sustainability?

The term “Sustainable Development” was first used by the World Commission on Environment and Development (WCED) in its report “Our Common Future” which was published in 1987. Its definition of sustainable development which “meets the needs of the present without compromising the ability of future generations to meet their own needs”¹ is still the most often quoted definition of sustainable development. Since then numerous writers and organizations have created more encompassing and specialized definitions of sustainable development. These definitions attempt to encompass a more comprehensive spectrum of sectors to ensure sustainability of a system. One definition particularly related to urban development was developed by the URBAN 21 Conference held in Berlin in July 2000, which states:

"(Sustainable urban development) is improving the quality of life in a city, including ecological, cultural, political, institutional, social and economic components without leaving a burden on the future generations”.²

In most definitions the concept of sustainability includes three major dimensions: economic, social and environmental. Due to the urgency created by several global, regional and local environmental problems, such as, global warming, bio-diversity loss, air and water pollution and problems of waste management, the environmental aspect of sustainability is more often emphasized by planners.

Particularly in urban locations, sustainability involves addressing the long term well-being of the people, conserving resources, making long term financial plans, empowering community and ensuring the integrity of the environment.

Figure 1 illustrates the various elements that need to be addressed to manage for sustainability of an urban environment³.

This paper seeks to address the sustainability issues particularly related to the urban development of Kathmandu, the capital city of Nepal. This paper is limited to devising an approach to develop sustainability indicators for Kathmandu, which can provide some reference to the policy makers, planners and urban development professionals working for the development and management of Kathmandu and similar other cities in developing countries. Given that the Valley's environmental quality is deteriorating at an unprecedented rate, ensuring the sustainability of the environmental quality is of paramount importance. The emphasis of this paper is on environmental sustainability of the Kathmandu Valley.

Sustainability in Kathmandu

This paper deals with the sustainability issues for the entire Kathmandu valley, as it is a single ecological unit. The valley includes the three main cities, Kathmandu, Lalitpur

and Bhakpatur. The valley covers an area of 900 square kilometers (347 square miles)⁴ total population of the valley is estimated to be 2.35 million (2000 population 1.645 million)⁵. The valley is going through an unprecedented rate of population growth. An indication of this accelerated growth can be seen by the rate of growth of Kathmandu district, which is estimated to 4.71 percent per year.⁶ The rate of population growth in Kathmandu is one of the highest in the world.

The valley of Kathmandu was historically a sustainable place from environmental and ecological point of view. It was agriculturally self sufficient and socially harmonious, bound in a social hierarchy that remained intact for a long period of time throughout history. The segregated social structure and its desirability are normative issues that beg a critical review by the standards of today's democratic and pluralistic norms in Nepal. That sociological part however, is not the topic for this paper.

The environmental quality of the valley is on a speedy decline as can be seen from the high levels of air pollution, water pollution and land pollution in the urban areas. The accelerated levels of pollution have been widely studied by experts, international agencies and Nepal government agencies.⁷

Many management practices will impact the level of sustainability the valley will enjoy. For example, the current population growth is clearly unsustainable if appropriate infrastructure, housing, water supply and other urban amenities cannot keep up with the rate of growth. Furthermore, planners and policy makers have to ascertain

whether adequate potential exists for supplying Kathmandu with water, building materials, waste management resources (such as, landfills), pollution control and other urban amenities to ensure an acceptable level of urban quality of life.

Additionally, the availability of energy and use of locally produced energy will also determine how vulnerable Kathmandu is for its energy needs. The increasing use of solar energy and photo-voltaic panels and bio-gas in the valley are helpful indicators of sustainable energy use. However, the use of individual electricity generators, even if they can be perceived as bestowing self-sufficiency to individual home owners and business, are bad indicators of sustainability in the long run. The generators consume petrol, need a regular supply of spare parts, and do not enjoy an economy of scale for energy production.

Traits of Effective Sustainability Indicators for Urban Environment

Sustainability indicators are the instruments for measuring the changes in the quality and state of sustainability of any system. The indicators comprise of information, data and parameters that measure the state of the environment and other sustainability factors. Without indicators, we cannot measure the status, trends and long terms changes in the factors that in aggregate demonstrate the suitability of a system.

The following are the main characteristics of the indicators that can explain and assess the sustainability of an urban area. If the indicators fit these qualities, they will help to

examine, monitor and predict how sustainable the urban system is. Although these traits can apply to the study of sustainability of many systems, they are particularly valuable to predict the sustainability in Kathmandu.

Relevance to the Local Conditions

Any sustainability indicator must be relevant and well-suited to the local circumstances. Kathmandu has a unique history, is facing a rapid urban growth, and is burdened by overstrained infrastructure. Furthermore, the environmental quality of the valley is rapidly declining. In this situation, the indicators that can define Kathmandu's sustainability have to reflect this difficult ground reality of Kathmandu.

Imbedded in Social Vision

Indicators become more useful if they help capture the community aspiration and vision of the locality. Kathmandu residents are struggling to modernize a largely traditional society and town in a hurry. Furthermore, people from all over Nepal aspire to come and live in Kathmandu hoping for better mobility, employment, education and other opportunities. Sustainability indicators for Kathmandu must be realistically based on the community vision of its residents, who wish to live in a clean environment, have adequate infrastructure and enjoy a high urban quality.

Easy to Measure and Compare

Nepal lacks critical long term data in urban sector that may be considered basic in developed countries. Especially in the environmental arena, the existing data is of recent origin. Long term time series data have not been kept in Kathmandu. For example, environmental record keeping in a comprehensive manner began only in the mid eighties. Thus indicators have to appreciate this reality.

Helpful to Devise Policy

Kathmandu desperately needs realistic and forward looking planning that can achieve goals and objectives efficiently. If indicators are available for key areas, and if the people and media become excited about the state of the environmental and development as reflected by the indicators, the policy makers can benefit from this linkages. Indicators should arouse a wide interest, and help policy and decisions makers devise swift programs to achieve the stated goals of sustainability.

Supporting the Community to Become Pro-active

Kathmandu's population is relatively young, and is highly motivated as many come from extreme hardship in the countryside. If attractive indicators are devised and publicized, it will motivate the community to become pro-active in their day to day behavior and their efforts to improve the quality of life in Kathmandu and also upgrade their own lives.

Reliability of the Information

Indicators should provide a reliable basis for comparing the sustainability of various infrastructure, utility, energy and urban design elements for Kathmandu. A vague and undefined indicator does not provide a reliable basis to create a rapid improvement of urban quality in Kathmandu.

Based on Available Information and Data

As the quality of data and information on the environment, transportation, housing, water supply and energy use is largely inadequate in Kathmandu; the indicators should be parsimonious using the limited data and information that can be accessed in Kathmandu. As more high quality data becomes available, the indicators of sustainability can also be revised and refined.

Some Possible Indicators of Environmental Sustainability for Kathmandu

This paper recommends some indicators that will be valuable in assessing the sustainability of the Kathmandu Valley. These indicators are derived and crafted on the basis of the qualities described above and can be valuable in examining the potential sustainability of Kathmandu Valley, particularly from an environmental and ecological standpoint and urban management.

The proposed Indicators are tabulated in Table 1.

Sustainability indicators provide concrete measure for the quality of environmental, water supply, transportation and other sectors to illustrate the status of the changes in their quality over time. Box 1 provides an example of indicators.

Comparative Indicators of Sustainability

Table 1 shows a subjective assessment of the quality of the some sustainability indicators for some Asian Cities. This comparative table is created based on personal experience, and literature review. This subjective assessment aggregates the indicators as shown in Table 2. Kathmandu's sustainability indicators rate poorly compared to selected Asian cities.

Conclusion

Sustainability is critical for planning and management in Kathmandu. Many of the urban practices and the ground reality of the situation in Kathmandu indicate that the present business-as-usual scenario is unsustainable. Particularly, the quality of life and urban environment has suffered a drastic level of damage vastly reducing the quality of life in the valley. The valley's environment is likely to deteriorate even more over time, if sustainable urban practices are not urgently implemented.

Sustainability indicators should be developed to reflect the uniqueness of the location. Kathmandu's unique urbanism requires selecting and modifying indicators that suit the local conditions.

Planners and policy makers need to be able to compare the indicators of sustainability on a regular basis to ensure that Kathmandu residents will enjoy a high quality of life for a long time, and the urban system will not collapse because of poor practices in urban management. Appropriate sustainability indicators will be required for a regular analysis to assess the urban health of Kathmandu.

This paper attempts to specify the characteristics of indicators of sustainability for Kathmandu, and recommends some indicators that will help in achieving sustainability in Kathmandu.



Figure 1: Sustainability Diagram, Source: WRI Power-save

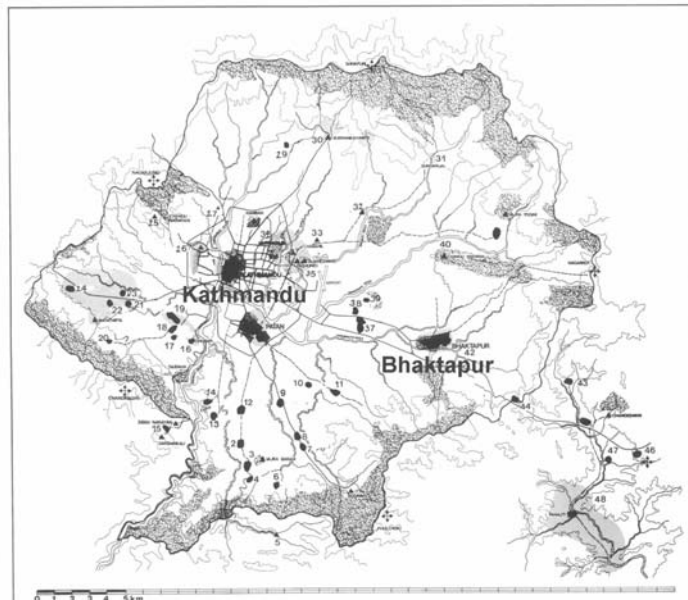


Figure 2: Map of Kathmandu Valley
 Source: http://www.gpgrieve.org/3maps/map_valley.html

| Sector | Indicators | Remarks ⁸ |
|------------------------------------------------|--------------------------------------------------------------------------------------------------------|-----------------------------------------|
| Environmental | Air pollution levels: concentrate of major pollutants | Indicator in use |
| | Water pollution levels: extent of major pollutants in drinking water | Regular monitoring needed |
| | Waste management - solid waste diversion rate | Critical indicator in current situation |
| | Waste management – capacity and number of landfills and transfer stations compared to waste generation | Weak area at present |
| | Environmental and Carbon Footprint of Residents | Needs to be developed |
| Water Supply and Distribution | Capacity of water supply sources to serve the valley | Needs to be developed |
| | Proportion of population served by potable water supply | Reasonable data exists |
| | Water consumption per capita | Reasonable data exists |
| Transportation and Accessibility | Rate of use of public transportation | Weak information |
| | Percentage of population with car ownership | Data presently exists |
| | Percentage of residents with access to public transportation | Weak information |
| Energy Use | Proportion of energy from renewable sources | Information exists |
| | Energy use per capita | Data exists |
| | Effectiveness of energy conservation programs | Needs to be developed |
| | Proportion of energy from local sources | Needs to be developed |
| Housing and Urban Design and Management | Percentage of housing that is affordable | Needs to be developed |
| | Public green open space per capita | Data exists |
| | Percentage of population living in squatter homes and slums | Data is scattered |
| | Percentage of land with urban agriculture | Needs work |
| | Percentage of land with urban forestry | Needs to be developed |
| | Population density by neighborhoods | Some data exists |

Table 1: Proposed Sustainability Indicators for Kathmandu, Nepal.

Box 1: Example of Sustainability Indicators

Air Quality Indicator

- The number of days per year when the warning or alarm levels for any specified pollutant (e.g., ozone, tsp, SO₂, NO₂) exceeds the defined levels of pollutant concentration.

Carbon footprint - GHG emission Indicator

- The annual total and percentage change in the per-capita total emission of CO₂, CH₄, N₂O and O₃ in the valley.

Water Supply: Level Indicator

- The annual volume of ground and surface water extracted for water uses as a percentage of the total replenishable freshwater volume.

| City | Environmental Quality | Water Supply | Transportation & Accessibility | Energy Use | Housing and Urban Design |
|------------------|-----------------------|------------------|--------------------------------|------------|--------------------------|
| Kathmandu | Poor | Poor | Fair-Poor | Fair | Fair-Poor |
| Calcutta | Poor | Poor-Fair | Fair | Fair | Poor |
| New Delhi | Poor-Fair | Poor-Fair | Fair | Fair | Poor |
| Manila | Poor-Fair | Fair | Fair | Fair | Poor |
| Bangkok | Poor | Fair | Fair | Good | Fair |
| Seoul | Good | Good | Excellent | Good | Good |
| Singapore | Excellent | Excellent - Good | Excellent | Good | Excellent |

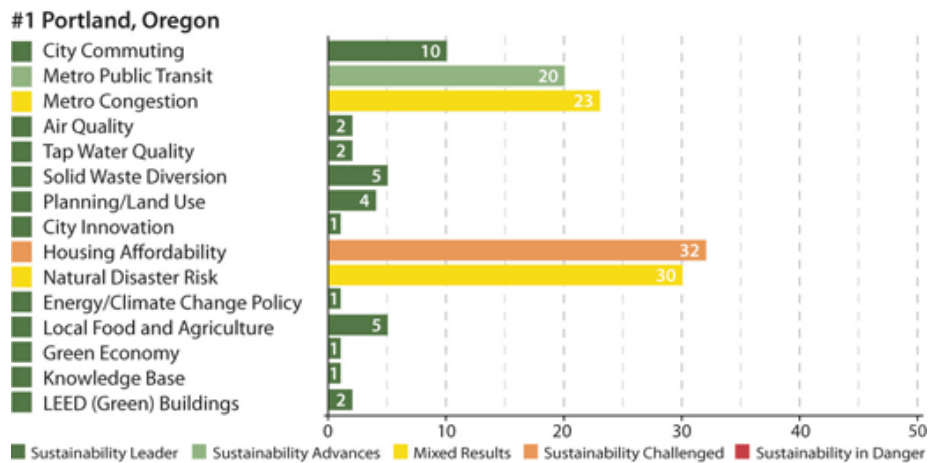
Table 2: Comparative Quality of Some Sustainability Indicators for Selected Asian Cities

Appendix I: Example Indicators in the USA

Sustainlane.com, which calls itself “The webs largest people powered guide to sustainable living”, has utilized 15 indicators to rank the most sustainable cities in the USA⁹. Each indicator has been assigned a weight and aggregating the ranking of each indicator, major US cities have been ranked for sustainability.

- SustainInae Indicators of Comparing
Urban Sustainability, USA
1. Commute to Work
 2. Public Transit
 3. Congestion
 4. Air Quality
 5. Tap Water Quality
 6. Solid Waste Diversion
 7. Planning/Land Use
 8. City Innovation
 9. Housing Affordability
 10. Natural Disaster Risk
 11. Energy/Climate Change Policy
 12. Local Food and Agriculture
 13. Green Economy
 14. Knowledge base/Communications
 15. LEED (Green) Building

Portland, Oregon has been declared the most sustainable city in the US by Sustainlane. Figure I provide a graphic representation of the sustainability ranking of Portland, USA, for each of the 15 indicators¹⁰.



End Notes

¹ UNCED (1987), Our Common Future, Oxford University Press, pp 43

² Regional Environmental Center for Central and Eastern Europe (REC), web site, <http://www.rec.org/REC/Programs/SustainableCities/What.html>, accessed on 09-16-08

³ <http://www.wripowersave.com/index.html>, accessed on 09-19-08

⁴ ICIMOD, UNEP and Government of Nepal (2007), Kathmandu Environment Outlook, Hillside Press, Kathmandu, Nepal

⁵ Author's estimate based on Central Bureau of Statistics (2000), Government of Nepal, census. <http://www.cbs.gov.np/>, accessed on 09-16-08

⁶ ICIMOD, UNEP and Government of Nepal (2007), Ibid

⁷ See for example several publications by URBAIR, World Bank, Nepal Meteorological Department, IUCN, UNEP, ICIMOD and other agencies on this topic.

⁸ Author's assessment

⁹ www.Sustainlane.com, accessed on 9/16/2008

¹⁰ www.Sustainlane.com, accessed on 9/16/2008
