

# GIS for Planning and Development

### This chapter covers

- The concept of a geographic information system (GIS) and its application to sustainable mountain tourism planning and development
- Skilful application of GIS in mountain tourism in developing tourism resource inventories, interactive mapping and visualisation, and suitability analysis and mapping

### Introduction: GIS in Tourism

Tourism deals with places and much of the information that is required for tourism planning and development is inherently spatial in nature. Geographic information systems (GIS) are emerging as a powerful tool and offer a 'toolbox' that helps planners and decision makers to make informed decisions. Decisions on sustainable and equitable development need to be based on accurate and reliable information. Spatial information, in particular, has a significant role in decision-making processes and is even more important in mountain areas due to the harsh topography. This chapter describes the potential use of GIS for mountain tourism with some illustrations of its applications through case studies from the region.

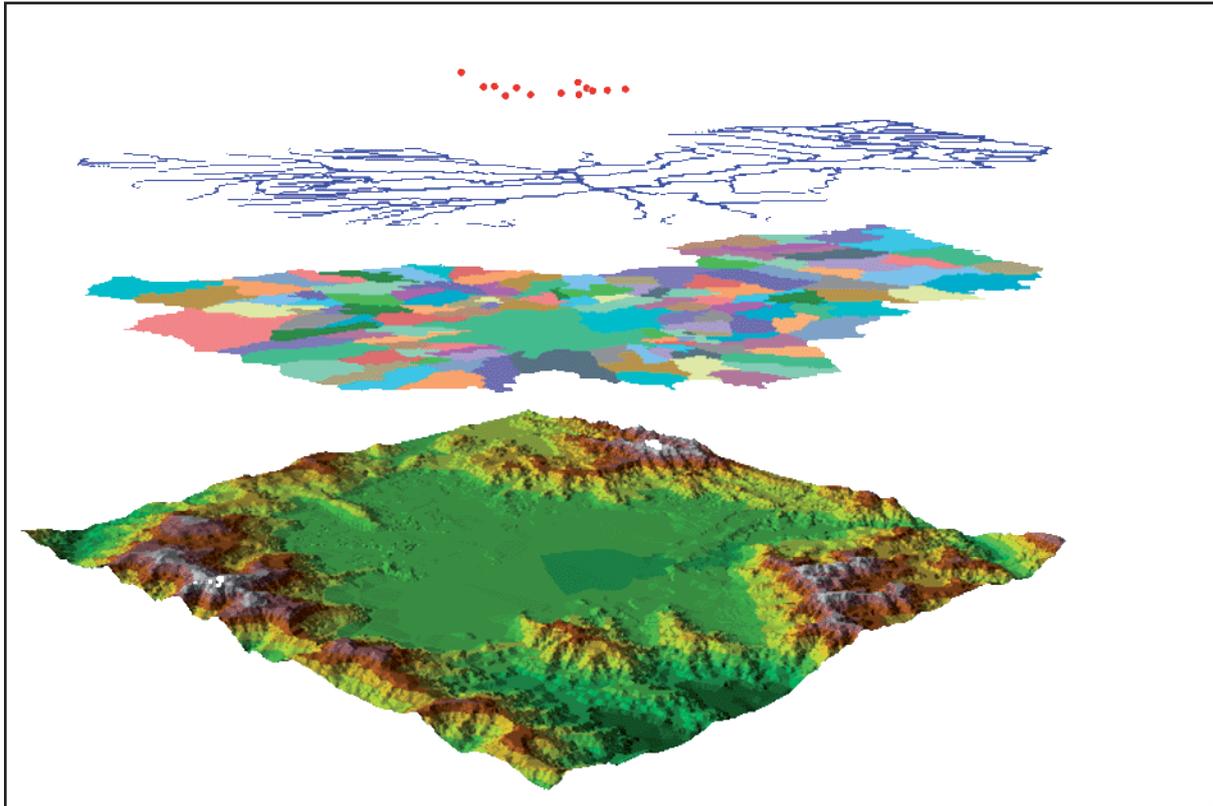
### The spatial dimensions of mountain tourism

Mountain areas contain a vast array of natural resources with snow-capped mountains, rolling hills, winding rivers, deep gorges, and blooming valleys. They are rich in biodiversity, often contain numerous pilgrimage sites, and have diverse cultural heritages and socioeconomic practices. As indicated in Chapter 3, mountains have much potential for tourism development.

The role of geography and spatial planning holds prominence in mountain areas due to its high spatial variability – one of the most influential factors in tourism decision-making processes. GIS offers a viable and promising spatial planning platform from which to integrate and analyse the different sources of information that are required for sustainable tourism planning and management.

### What is a geographic information system?

In simplest terms, GIS is a tool for planning and decision making. Tourism, as a movement of people to, and their stay in, various destinations (see Chapter 3), is related to place and time by definition and, therefore, always determined by location or a geographic component. Tourism, as well as other major challenges faced in the world today, such as migration, over-population, deforestation, and natural disasters, has a critical geographic dimension. Sustainable development needs to be based on accurate and reliable information with respect to time and space. In a GIS, the geography can be considered as a number of related data layers as illustrated in Figure 10.1.



**Figure 10.1: GIS as a system of multiple layers**

GIS combines layers of information about a place to give an understanding of that place. Which layers of information are combined depends on the purpose: for example, finding the best location for a new tourist location, assessing environmental impact of tourism, managing natural and cultural resources, or modelling the global environment. A GIS stores information about the world as a collection of thematic layers that can be linked together by geography. This simple but extremely powerful and versatile concept has proven invaluable for solving many real-world problems, and has many applications for tourism.

## **GIS for Sustainable Mountain Tourism Planning and Development**

Planning and decision making in sustainable tourism development is often a complex task because it involves a critical balance between social, economic, and ecological aspects that need to be analysed in a spatial context. Furthermore, compared to the plains and lowlands, the physical characteristics of mountains are complex and need to be analysed using a three-dimensional approach to arrive at an approximate representation of the topography. The application of GIS technologies to the mountain environment involves special considerations and much depends on the knowledge of the particular characteristics of the mountain environment and the understanding of how mountain systems work.

The use of GIS in sustainable tourism development and planning demands data and information from a range of disciplines and often involves multiple agencies (see Chapter 7). Information required may include information about natural resources, cultural heritage attractions, environmental sensitivities, access routes, and transportation, as well as information on the potential economic and social impacts of tourism (see Box 10.1). Effective tourism planning also requires monitoring and feedback mechanisms on the effect of planning decisions on tourism resources.

Although there has been limited application of GIS technology in mountain tourism, there is an increasing realisation of its potential for tourism planning, development, and promotion. The

### Box 10.1: Making GIS Answer

GIS is an analytical tool that helps to plan and manage mountain tourism. It can be distinguished by listing the types of questions it can answer.

#### **Location: What is at...?**

This question seeks to find what exists at a particular location – such as a hotel or a restaurant. A location can be described in many ways using, for example, a place name, postcode, or geographic reference such as longitude or latitude.

#### **Condition: Where is it?**

This question is the converse of the first and requires spatial data to answer. Instead of identifying what exists at a given location, one may wish to find locations where certain conditions are satisfied (e.g., the location of a 5-star hotel within 20 minutes walking distance from the city centre).

#### **Trends: What has changed since...?**

This question might involve both of the first two and seeks to find the differences within an area over time, e.g., changes in cultural heritage due to tourism impacts or the extent of urbanisation over the last ten years.

#### **Patterns: What spatial pattern exists?**

This question is more sophisticated. It might be asked to determine whether tourism-related crimes are occurring mostly near the city centre or to find out which tourist attractions are visited most frequently. It might be just as important to know how many anomalies there are and where they are located.

#### **Modelling: What if...?**

This question is posed to determine what happens if... For example, what if the number of tourists doubles in five years time in the national park, what would be the impacts on the ecosystem? Answering this type of question requires both geographic and other information (as well as specific models).

phenomenal growth of GIS tools in the recent past, as well as revolutionary products like Google Earth that have unprecedented visualisation capabilities, have opened up the possibility of using GIS for sustainable mountain tourism development and promotion purposes. Some of the GIS applications that are used in the sustainable mountain tourism sector are briefly described in the next section.

## Potential GIS Applications in Mountain Tourism

Tourism is a composite of activities, facilities, services, and industries that deliver a travel experience for both domestic and foreign travellers that includes various services such as transportation, accommodation, eating and drinking establishments, entertainment, recreation, historical and cultural experiences, destination attractions, religious pilgrimages, trekking and mountaineering, and shopping. As tourism implies travel from one place to another, location-based information has a special significance in the tourism industry. Cartography and making maps of tourism destinations are common ways of providing basic information to travellers. Such information is also increasingly made available online using interactive Internet mapping technology which gives travellers easy access to tourism-related information, helping them to plan their travels. Likewise, the use of GIS for sustainable tourism development is increasing. The following paragraphs presents some of the (potential) applications of GIS in sustainable mountain tourism planning and development. These applications illustrate the visualisation and analytical capabilities of GIS and GIS's relationship to the decision-making process.



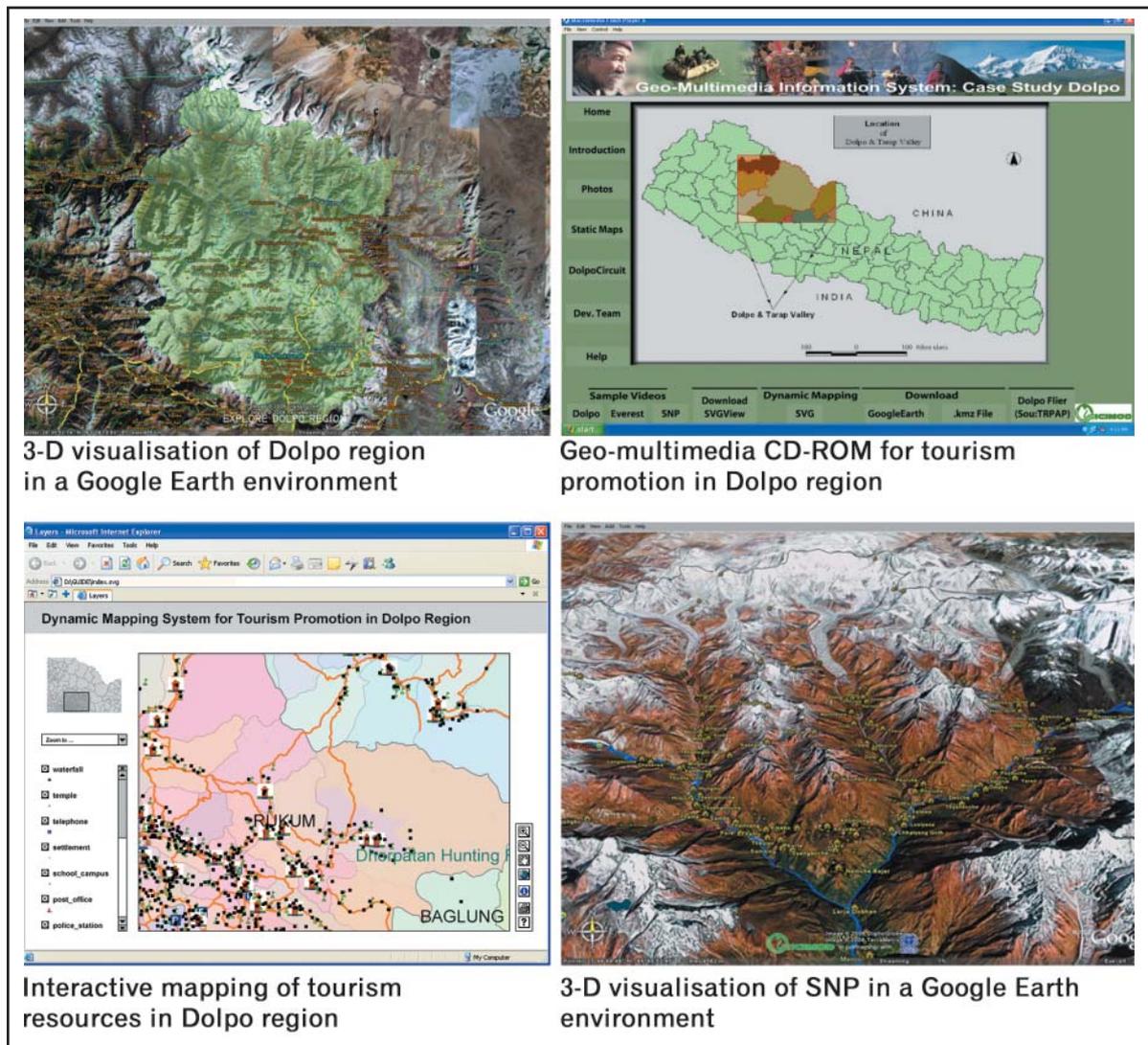


Figure 10.4: The Dolpo prototype

### Suitability analysis and mapping

GIS can be used for the mapping of areas that are suitable or unsuitable for tourism development. The existence of constraints within the landscape may be used to delimit those areas that are unsuitable or less suitable for a particular development. These types of application are useful in planning tourism infrastructure, for instance, in determining land-use zonation for potential ecotourism sites to demarcate specific areas for different types of land use. GIS can be used to identify a suitable location for a resort, explore conflicts, and examine tourism impacts. The following maps illustrate indicative applications developed during ICIMOD training courses as part of a short project done by students in Myanmar and Nepal. The maps below show bird habitats and a potential site for tourism development (Figures 10.5 and 10.6)

Other examples (Figures 10.7 and 10.8) illustrate the possibility of using GIS to identify suitable locations for tourism viewpoints. Using the three-dimensional analytical capabilities of GIS, new locations are determined based on the criteria that the major peaks in the Sagarmatha (Everest) National Park should be visible from that location. Also a new trekking route has been identified in the national park using cost-distance modelling and considering different parameters such as environmental considerations, connecting different settlements, and the existence of other infrastructure.

# The Future Role of GIS in Sustainable Mountain Tourism

In an information society, the role of GIS is expected to continue to grow in terms of technology, data, and application in a wide variety of disciplines. Although the use of GIS by ICIMOD in sustainable mountain tourism development is in the initial stages, the indicative applications presented in this chapter show that GIS has considerable scope for tourism applications in the future. GIS offers powerful tools for sustainable mountain tourism planning and development and can be used in such things as ecotourism development, tourism infrastructure planning, tourism carrying capacity assessment, GIS-based tourism information systems, spatial decision-support systems on tourism impact analysis, and more. With the diffusion of GIS through a large part of the society, it is expected that GIS-based applications will amply diversify into sustainable tourism planning and management.

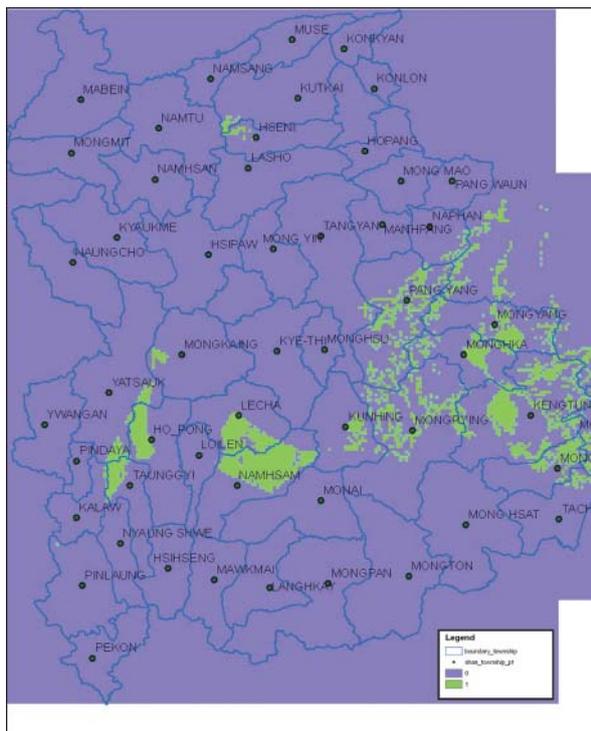


Figure 10.5: Bird habitat status in Myanmar

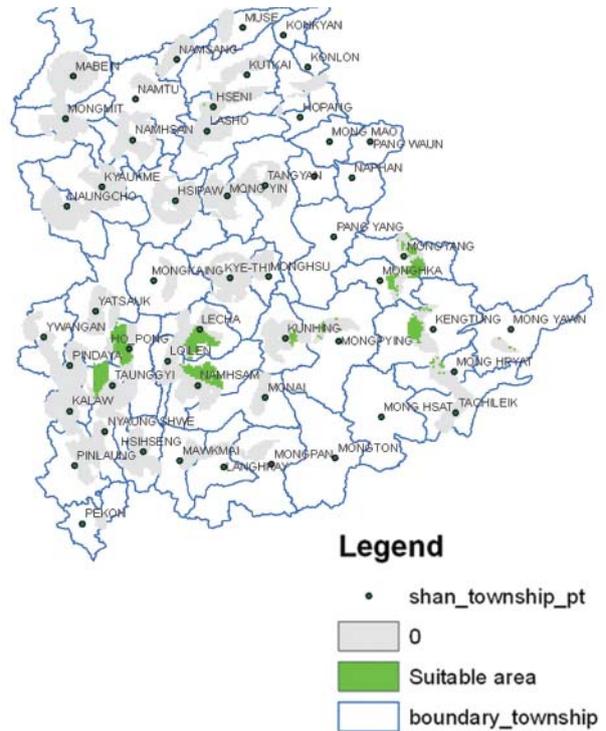


Figure 10.6: Suitability map for tourism in Myanmar

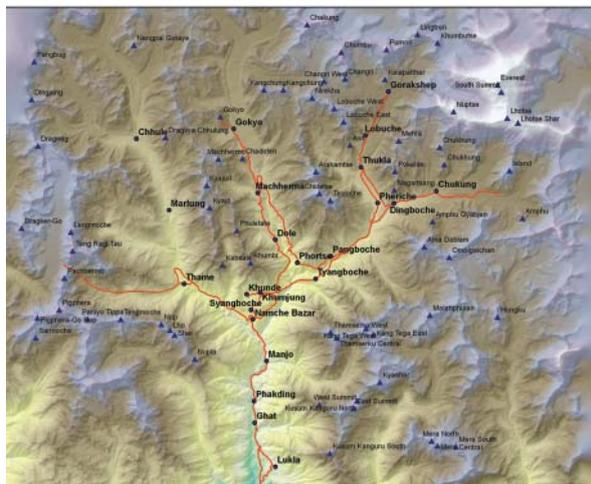


Figure 10.7: Finding the peaks in Sagarmatha National Park

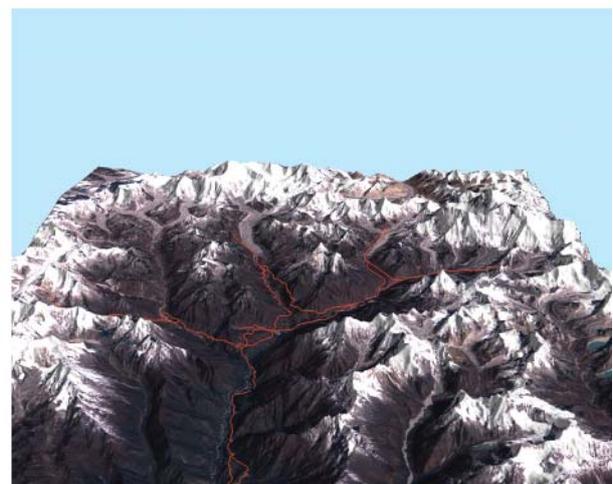


Figure 10.8: Finding the trails in Sagarmatha National Park