

# Part 1 Concepts



# Chapter 1 Thinking Spatially

What's going around you?

## Floods in Kathmandu. It's been raining too much!

This year's monsoon has brought more rain than usual to the country and even in Kathmandu there have been a number of floods (Figure 1.1). The effects of haphazard urban growth are revealed in the form of loss of public property and poor quality of life in areas where residential housing has been built without consideration of the area's suitability. The increasing population and the scarcity of land mean that people are building houses on farms and lowland.



Source: Nepalnews.com

Although the Bagmati and the Bishnumati are the two major rivers flowing through the Kathmandu valley, it is the Tukucha and Samakhusi rivers that give trouble more frequently since their banks have been heavily encroached by large buildings and squatter settlements.

Seeing this story, a person, who is familiar with Kathmandu, can visualise the scenario. He knows these problem areas, how these localities look and the types of houses that are prevalent in these areas. This is called a mental map. It is

generated from information stored consciously or unconsciously in a person's brain over the years. However, mental maps are not sufficient if we want to understand the problem in more detail or if we want to carry out remedial work in these areas. Therefore, planners, engineers and construction workers make use of maps and drawings to guide them around the area.

To find the areas that are most likely to be effected by floods, let's demarcate the area within 150 metres of these rivers (Figures 1.2 and 1.3). This buffer area can be considered as the flood-prone zone. Now, if we want to make plans to improve the situation, we need to involve local bodies such as the ward offices. We should identify the stakeholders; these are the wards falling in these flood-prone areas and the households that are likely to be affected by flooding. For this, we need to identify the wards and then the households that lie within the buffer zone (Figures 1.4 and 1.5).

What we have done is to look at rivers, wards and households, and relate them based on their locations. This is called spatial reasoning. For this, we use maps or spatial information.



**Figure 1.2**  
Kathmandu valley from space with rivers overlay



**Figure 1.3**  
Area within 150 m of Tukucha and Samakhusi rivers



**Figure 1.4**  
Wards that are intersected by the buffer zone



**Figure 1.5**  
List of households within the buffer zone



**Figure 1.6**  
Kathmandu valley

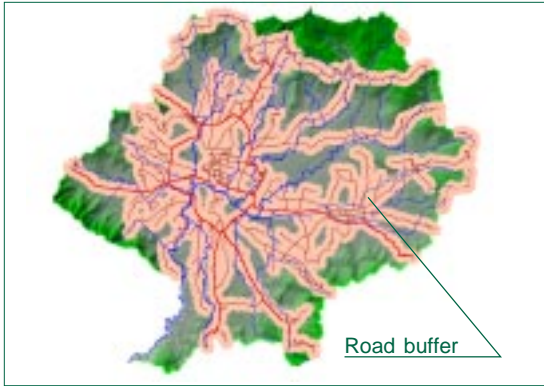
### Buying a new house

People from all over Nepal migrate to Kathmandu valley looking for jobs (Figure 1.6). After some time, they think of buying a piece of land and building a house; after all, everyone has a dream of making a beautiful house. However, there are many constraints to overcome before this dream can come true.

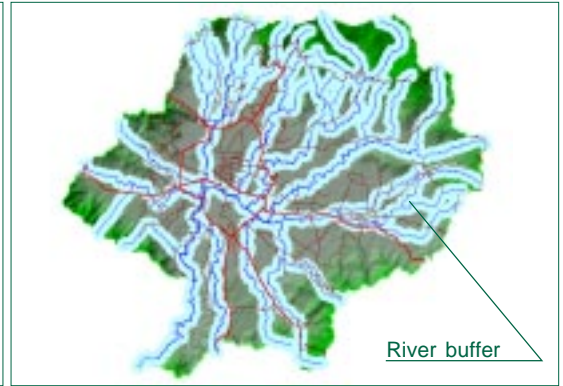
The first thing is to find a suitable land. With the rapid urban expansion in the valley, it is becoming more difficult to find good places for living. People have their preferences but there

are common issues that need to be considered.

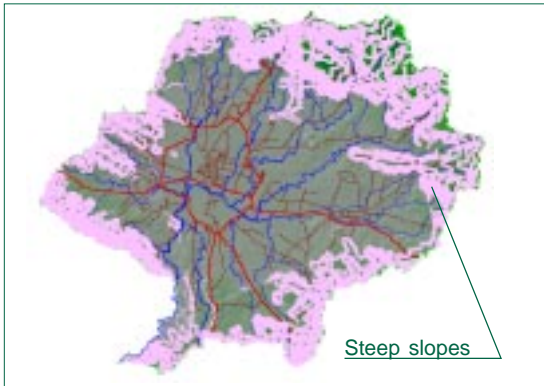
The land should be close enough to basic infrastructure such as roads, water and electricity supplies. In Kathmandu, facilities such as water and electricity are dependent on accessibility to roads. Figure 1.7 shows the area within 500 m of major roads.



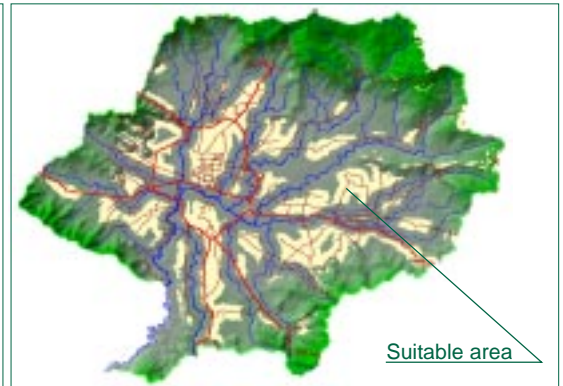
**Figure 1.7**  
Area within 500 m of major roads



**Figure 1.8**  
Area at least 500 m from major rivers



**Figure 1.9**  
Areas with steep slopes



**Figure 1.10**  
Area suitable for building

We have already seen that there are places in the heart of the Kathmandu valley that are frequently affected by floods. Figure 1.8 shows the area at least 500 m from major rivers.

Also, the land should be safe from natural hazards such as landslides that occur on steep slopes. The area that has a slope greater than 10 degrees is shown in Figure 1.9. This land would not be suitable for building purposes.

Excluding all land that is not suitable because of road, river or slope criteria, we find the area that is suitable for residence building (Figure 1.10).

We have used information based on geographic features—rivers, roads and slope—and their relationships to solve our problem.

### **Let's have a broader outlook**

So far, we have discussed our desire to build a house and the need for improvements in the urban environment of Kathmandu valley. However, what is the scenario if we look at the country as a whole? We know that there is a lot to be done in all sectors and all regions of the country to improve the livelihoods of the people. However, with our limited resources it is not possible

to meet all the needs at once. Then, how do we identify the most pressing needs?

**Table of Map 10: Gender Imbalance Ratio in Literacy Status**  
Ratio of females to males among the literate population of 15 and above years multiplied by the sex ratio of the same age group

S.No.	Best		Intermediate		Worst			
	District	Ratio	S.No.	District	S.No.	District		
1	Kathmandu	61.34	26	Nawalparasi	33.04	31	Katohi	24.68
2	Jhapa	53.26	27	Gulmi	34.74	52	Sindhuli	24.26
3	Lalitpur	52.96	28	Bagling	33.59	53	Siraha	23.07
4	Kaski	50.10	29	Parasa	32.96	54	Dobkha	22.85
5	Chitwan	49.45	30	Bhojpur	32.47	55	Sindhupalchok	22.54
6	Morang	45.63	31	Argahaanchi	31.94	56	Rasuwa	21.81
7	Mustang	45.57	32	Dangdeukhuri	31.65	57	Pyethan	21.66
8	Ilam	44.01	33	Okhadihanga	30.47	58	Jajurkot	17.40
9	Blockapur	42.02	34	Dhansha	30.14	59	Jumba	16.53
10	Lamjung	42.01	35	Bardiya	29.88	60	Ramechhap	16.46
11	Syangja	41.85	36	Mahottari	29.80	61	Rukum	15.79
12	Sunsari	41.55	37	Kapilvastu	29.52	62	Darchula	15.71
13	Palpa	41.46	38	Kabirpachhot	29.49	63	Salyan	15.59
14	Rupandehi	41.04	39	Panchthar	29.42	64	Dalekh	15.42
15	Parbat	40.03	40	Sorkhet	29.39	65	Dolpa	14.93
16	Manang	40.00	41	Rautahat	27.58	66	Dairi	14.86
17	Gorkha	39.49	42	Kanchanpur	27.58	67	Baradi	14.33
18	Tanahu	39.47	43	Khotang	27.42	68	Rolpa	13.78
19	Banke	38.43	44	Udayapur	27.18	69	Dadeldhara	12.06
20	Sankhuwasabha	36.94	45	Sarbhaj	27.12	70	Bajura	11.94
21	Taplejung	36.71	46	Soluikumbu	26.72	71	Kalikot	11.38
22	Terahum	36.35	47	Dhading	26.57	72	Humb	10.74
23	Miyagi	35.97	48	Nuwakot	26.24	73	Mugu	10.64
24	Dhulikhela	35.87	49	Saptari	26.18	74	Bajura	10.27
25	Makawanpur	35.19	50	Bira	25.24	75	Achham	8.75

**Figure 1.11**  
Data in tables

To make decisions for national priorities and plans, many data are collected and presented in tables. There are huge volumes of such publications. For example, the ratio of females to males among the literate population of 15 years and above looks like Figure 1.11.

Now, let us plot these figures on a map and see how it looks (Figure 1.12).

Similarly, we can look at the indices for poverty and deprivation, women's empowerment, socioeconomic and infrastructural development in Nepal on a map (Figures 1.13, 1.14 and 1.15).



**Figure 1.12**  
Gender imbalance ratio in literacy status



**Figure 1.13**  
Poverty and deprivation index



**Figure 1.14**  
Women's empowerment index



**Figure 1.15**  
Socioeconomic and infrastructural development index

We can see that when we plot values on a map, things become clearer and it is easier to make decisions. In this example, we can see that the situation in the far western region is the poorest in all indices. Therefore, greater focus is needed on development in this region.

What we see here is that when we add a spatial or geographic component to our analysis, we have a better picture of the real-world scenario. This is often called spatial thinking. It gives us better insight of our problems and allows us to make better decisions.

The use of computerised information systems is a growing part of our everyday life. GIS is one such system that uses the power of computers to answer questions related to location by arranging and displaying data about places in a variety of ways such as maps, charts and tables. In the following chapters, we will discuss more about maps, mapping and GIS.

