Space Basics – Earth Observation

Examples of Earth Observation in the classroom: Kathmandu – Now and then

The image

The infrared Landsat images show the city of Kathmandu in different years. The first image covers the recent dimension in a LANDSAT ETM satellite image. The second one was recorded by the Landsat TM satellite in 1989 and the third by Landsat MSS in 1976.

The strong reflection of chlorophyll in the near infrared band 4 leads to a reddish coloured vegetation in the shown false-colour combination. The urban areas are displayed in a dark-blue colour range. The different extensions of the city are well visible; even at a short glance.

Image technical information

- Instrument: Landsat ETM, TM, MSS
- Date of acquisition: 27 December 2001, 31 October 1989, 28 October 1976
- Path / Row: 141/41
- Colour combination: Red, Green, Blue band 4, band 3, band 1
- Coordinates:
  - NW Lat/Long: N 27.47 / E 85.10
  - NE Lat/Long: N 27.47 / E 85.28
  - SW Lat/Long: N 27.39 / E 85.28
  - SE Lat/Long: N 27.39 / E 85.10

General description of Kathmandu

Kathmandu is the capital of Nepal. The population of the Kathmandu district has grown from 426,000 in 1981 to 675,000 in 1991 to 1,081,000 in 2001. The city is situated in the Kathmandu Valley, more than 1,300 m above sea level.

The whole region was declared a world cultural heritage by the UNESCO in 1979, due to the accumulation more than 7,000 temples and other shrines in Kathmandu and the surrounding valley.

The river Bagmati, shrouded in legends, crosses the city-centre from north-east to south-west on its way through Nepal into the Ganges.

The international airport Tribhuvan is well visible to the east of the centre. Very prominent are the Ratna Park and the Tundikhel Parade Ground just east of the city centre.

Keywords

Kathmandu, Kathmandu valley, Nepal, World Cultural Heritage, urban development, seasonal changes.

Exercise

Goal - analysis of the urban development of Kathmandu and seasonal changes.

Study the different colours of the images. Allocate the colours to the four main classes of land-cover: urban area, forest, arable land and bare soil.

Compare and describe the three images with respect to the vegetation shown in reddish colours and find out the differences and the similarities. Explain the reasons for both occurrences.

Take a sheet of transparency paper and cover the image number from 1976 with it. Mark the corners of the image with cross-bars and draw the city-limits of Kathmandu in 1976. Put the paper on top of the image from 1989 by using the cross-bars. Draw the city-limits of Kathmandu in 1989.

Repeat the steps to draw the city-limits of Kathmandu in 2001. Colour the generated space with different colours and describe the expansion of the city.

To calculate the approximate surface changes place the transparency paper on top of a scale paper and count the squares in each polygon taking into account that one square mm equals 0.04 square km.

Based on the three images and your analyses of the urban expansion discuss the possibilities and constraints for further expansion of the city in the Kathmandu Valley.