UNIT 2 TECHNIQUES FOR URBAN PLANNING

Structure

2.1 INTRODUCTION

This unit tries to detail various survey techniques including GIS, project and estimates and draws their relevance to planning. After reading this unit you will know about various techniques of urban planning. Some of the techniques usually used in urban planning are listed below.

i) Survey Techniques.

ii) Analytical Techniques.

iii) Projection Techniques.

iv) Market Research Techniques.

v) Participatory Techniques.

vi) GIS Techniques.

After studying this unit you should be able to:

- Describe various techniques of planning
- Explain GIS and its use in planning
- Analyze projects and estimates.

2.2 SURVEY TECHNIQUES

The survey is one of the popular methods used in the planning process. By definition, surveys are a two-way communication process that enhances the nature and quality of communication between the surveyors and the citizens. According to Webster's Dictionary, a survey is "the action of ascertaining facts regarding conditions or the condition of something to provide exact information especially

to persons responsible or interested" and as "a systematic collection and analysis of data on some aspect of an area or group". Generally there are two types of surveys:

i) A census survey which involves contacting the entire group or total population or universe; and

ii) The other category is the most common, called a 'sample' survey. It is a representative part of a whole universe.

The processes involved in preparing and conducting a survey are:

a) defining the purpose of survey;

b) developing the hypothesis;

c) defining the population;

d) developing the survey plan;

e) determining the sample frame and sampling methodology;

f) designing the questionnaire;

g) undertaking field work and gathering data;

h) quality control and data reduction and

i) analysis and interpretation of data.

Now that you have read about the survey process, let us discuss the types of survey usually undertaken during urban planning.

i) Visual Surveys: These are direct inspection surveys which are performed by survey teams who move in automobiles, on bicycles, or just walking. For the purpose of speed and the necessity of covering an entire area, it is advisable that survey teams use fast moving vehicles in the peripheral areas of the city being surveyed. However, for intermediate areas, bicycles may be advisable, and in the inner city areas, the pedestrian mode may be preferred. These types of surveys can be used in the initial stages of the investigation.

A proxy is something that can inform the investigator about a variable but which is easier to investigate than the variable itself. For example, planners often need information about household income for purposes such as identifying areas for targeting basic services, or to design a cost recovery scheme, or to assess the results of an income generating scheme. In such instances, even rough information would suffice, but the documentary statistics tend to be very aggregative or outdated, or both.

ii) Diagramming: Diagrams can structure and present information in a readily understandable visual form. They can be used as substitutes for dialogue to elicit information from respondents. This participatory diagramming is a process which asks respondents to share information visually. Some diagrams (e.g., sketches and maps) can be prepared without the assistance of informants, but they reflect the way the investigator (rather than the respondent) perceives the environment. Many respondents, however, do not have the time to spend on diagramming; hence, this method can be practiced only in situations where respondents are willing participants in the investigative activity.There are many types of diagrams and their potential number and variety are limitless.

Mapping is one of the most powerful techniques of diagramming representing the physical and socio-economic attributes of an area (e.g.., infrastructure, land ownership, land use, density, social composition, etc.). Maps can be drawn from a high vantage point or by walking around the area to be mapped. These maps can be supplemented with photographs to highlight specific attributes.

With the help of people who know about the past and present conditions, changes and trends which matter to the people can be discussed and diagrammed.

Examples:

- fuels used
- credit sources, interest rates
- roofing material
- number of radios
- number of latrines
- type of cooking pot/chair
- number of bicycles/shoes/clothing scooters/cars

Priorities, or preferences, can be brought out through participatory diagramming procedures. Priority ranking can be most useful in revealing people's preferences (e.g., in service type, house construction, plot location, etc.) or in establishing processional priorities (i.e., what will be bought next if additional income accrues to the household); the resulting processional priorities (i.e., what will be bought next if additional income accrues to the household); the resulting possessions can be used as proxy indicator for wealth or income.

iii) **Dialogue:** Semi-structured dialogue is a flexible two-way process where only some initial topics are investigated. These topics can be revised as the practitioner gains insight in the area as information flows in from respondents. Semi-structured dialogue is, thus, an informal process, but it needs to be managed expertly, particularly the aspects listed below.

a) Behavioral factors
b) Questioning
c) Probing answers
d) Judging responses
e) Cross checking
f) Managing the conversation
g) Recording the interview, and
h) Avoiding errors and biases

Non-verbal communication is important to any dialogue. Due attention need to be given to messages coming from not only what is said, but also through change in tone, modulation of the voice, attitude, and body postures. Certain strict behavioral guidelines should be observed to minimize the impact of the investigator's behavior on the answers given by the respondents.

While listening to the answers, the investigator should always adopt a posture which would convey the feeling to the respondent that he/she is being listened to intently. Similarly, loaded and ambiguous questions should not be asked. Probing is an impression to the informant that he/she is being cross-examined. Contradictions and arguments should be avoided. The investigator should be alert about the reliability of the answers being given. Try and classify the information given into the following categories:

a) Fact

b) Opinion

c) Hearsay, and

d) Rumor

The information obtained through one interview should always be cross-checked with other information and discrepancies should be explained. With a view to managing the dialogue, it is always wise to keep the conversation on track. The dialogue should be recorded immediately when it is over. While recording the conversation, care should be taken that a proper noting is made to distinguish between what was actually said by the informant and what was felt and interpreted by the investigator.

There are four common biases in conducting interviews, particularly if only a limited number of interviews are conducted and the interviewer is not familiar with the area. The biases are:

a) **Elite Bias –** the tendency to give more weight to the answers of the educated.

b) **Hypothesis Confirmation Bias –** tendency to focus selectively on information and ideas which conform to the preconceived hypotheses, assumptions, and beliefs of the interviewer.

c) **Concreteness Bias –** tendency to generalize from the particulars without probing or cross-checking sufficiently.

d) **Consistency Bias –** tendency to search prematurely for coherence in the information collected, in order to be able to draw meaningful conclusions as quickly as possible.

2.3 ANALYTICAL TECHNIQUES

Generally an analysis breaks down complex phenomena into simple elements. It organizes, illuminates, correlates, classifies, displays and resolves. Various analytical tools are available today which perform one or several of these tasks. Town planners use these tools to study the state of the society, the settlements, and their physical and socio-economic attributes, technological directions, environmental condition, and the changes that occur over a period of time. Based on the understanding of the existing condition and the trends of change, the planners carve out short term and long term scenarios of the future, and then, design schedules of inter-connected interventions to steer development towards a desired future state.

The analytical techniques are applied in the case of simplified reports and trend analysis. Let us discuss both of them one by one.

i) **Simplified Reporting:** A report is a summary or else a detailed description of the studied phenomenon. Its structuring, organization, and presentation do help perform the tasks of analysis which relate to putting the information in an ordered format, identifying patterns, classifying, observing trends, correlating and inferring, with a view to arriving at insights, conclusions, policy guidelines, or, design directions related to problems/issues under investigation.

Finally, the effectiveness of the report lies in how it is displayed. The first golden principle in this regard is to keep the report as short as possible, yet, illuminative. Judicious use of tables, graphs, and maps is the other essential aspect of reporting. Maps and diagrams are very effective in describing organizational structuring of institutions; or presentation of cross-sectional characteristics of an area such as density, air pollution, land use pattern, and socio-economic variations over space and time.

A report may rely on simple deductive techniques for arriving at conclusions. These could be in the form of simple, logical reasoning, e.g., taking notes of diverse information in a sketch form and developing the sketch further for analytical purposes by using connectors between information that appear to be logically inter-connected. In specific situations, where time and resources permit, more elaborate statistical methodologies may be adopted. Rating the information by grouping it, and giving different weights and noting them in an ordered sequence is also part of the analytical process. This can often ease the most complex process of sifting and sorting the information in order to classify, connect, and highlight the important results. This is a relatively open-ended process in which insights are gained over several sessions of discussions, cross-checking, repeated formulation and reformulation of ideas, and arriving at conclusions.

ii) **Trend Analysis:** This is a simple technique to study changes in a system over a period of time. Availability of time series data, for at least three points in time, is a basic requirement for its application. The analysis can be displayed in the form of 'tables, graphs, maps, or diagrams. This technique is popularly used in study and analysis of change in urban economy, demographic pattern and physical form and pattern.

2.4 PROJECTION TECHNIQUES

These techniques are used, as the name implies, for anticipating future which is a necessary step in the planning process. In this section, only those techniques will be dealt with which aim at simple projections and operate on limited data.

2.4.1 Population Projection

Planners are invariably most concerned with population projections which form the basic framework for setting targets expected to be achieved within a specified time frame, be it for land use, services, or facilities. A few of the population projection methods are briefly explained below.

i) **Mathematical and Direct Methods:** These are simple or direct methods, since they operate with past population records. Where past data suggests that the population has been changing by constant absolute amounts, and

arithmetic progression is involved; the figures can be plotted on a plain paper (conventionally, with y = population, and x = time) and the resulting straight line extrapolated to give the projected estimate. More usually, however, population changes approximate to a geometric progression, i.e., the change in unit time is a constant proportion of the preceding figure; in this case semi-logarithmic paper should be used to yield a straight line for extrapolation.

If the past data do not seem to follow a definite progression, a 'best fit' straight line equation can be derived by the method of least square and extended to provide the projection. Graphical methods are most useful for short term projections, particularly when demographic changes show stable trends. Hence, these methods should be used for projecting up to 10 years in stable situations and 5 years where population change is more volatile.

ii) **Employment Method:** This method assumes that there is a very strong inter-relationship between population and employment and that indicators such as workers' population can be correlated with total population to yield extrapolated information.The reliability of this method is certainly no greater than those already discussed and the method should not be used for long range forecasting.

iii) **Ratio Methods:** This family of methods rests on the assumption that changes in any geographical area are a function of those experienced in wider areas. Thus, the population of a city is held to be a function of that of the region, which itself is a function of that of the nation, and so on.The requirements of such projections are time series of information for the areas to be used in the analysis and a forecast, or a set of forecasts, for the largest area. In the ratio method, the population of the second largest area (e.g., the region) is plotted against the population of the largest area (say, the nation). A curve is then fitted to the points thus obtained by least square, graphical, or other method. It is extrapolated to estimate the projected value of the present area for the target year.

This method has the great benefit of simplicity and the use of readily available data. However, this does not directly examine the components of change which are subsumed in the central assumption, i.e., there are certain forces at work in nations, regions, and sub-regions which make for pattern and order in the proportionate share which the region and sub-region have in the nation. Further, it is assumed that these relationships change, but slowly, over time.

As with other projection techniques described above, these are less reliable for longer periods and smaller areas. These are most useful for quick and cheap forecasting for the middle range (say, 0-15 years) for areas not less than a whole metropolitan area, or a city region.

2.4.2 Economic Projections

Simple techniques of economic projection, used in physical planning context, are discussed here. Fundamentally, planners are concerned with the likely demands of land development for various types of economic activities (broadly within various sectors of activities), the possible location of these activities within a city or city region, and the broad relationships between these activities, and the scale and timing of migration (entrepreneurs and workers and dependent

population) into and out of the area. These projections are ultimately relevant for calculating demand for housing, hospitals, schools and other social facilities.

The methods of economic projections are listed below:

a) Simple Extrapolation

b) Productivity Method

c) Projection by Sectors of Economy

d) Economic Base Method

e) Ratio Method

So far, you have read about various survey techniques, analytical techniques, and projection techniques of urban planning. Now, answer the questions given in *Check Your Progress 1*.

Check Your Progress 1

Note: a) Write your answer in the space given below.

b) Compare your answer with those given at the end of the unit.

1) What are the various processes involved in a survey?

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2) Describe trend analysis among analytical techniques of urban planning?

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2.5 MARKET RESEARCH TECHNIQUES

Essentially, market research techniques help the planner in analyzing how much should be built and produced in respect of various facilities which can be economically justified. For example, if the issue is housing facilities, then, market analysis helps to measure the local housing supply in kind and quantity. It also reveals the demand for new units and the pace at which supply may satisfy demand. Similarly, if market research is required to analyze the feasibility of a shopping centre project, then the analysis helps in determining whether the site is suitable. If the site is found suitable, then the analysis helps in deciding how much of it should be acquired and developed. The market research technique is a useful tool which planners use for establishing economically justifiable

development targets for various facilities. Some of the basic methods of marketing research are:

i) **Surveys:** The survey can be done in various ways such in-person survey, where the investigator present people with samples of products, packaging and gather immediate feedback; telephone surveys; mail surveys and on-line surveys;

ii) **Focus Group:** The investigator discuss with a group of respondents and these sessions are usually conducted at neutral locations, using videotaping techniques or tape recorders to record the discussions;

iii) **Personal Interview:** Personal interviews is done either through structured or unstructured questionnaire and which is usually last for about an hour and responses are recorded;

iv) **Observation:** In this method the actual behaviour of the consumers in action are observed by videotaping them. This gives a more accurate picture of customer's usage habits and behaviours; and

v) **Field Trials:** Filed trials are done in real life situations which help in gathering information regarding product modifications, price adjustments or packaging improvements.

2.6 PARTICIPATORY TECHNIQUES IN PLANNING

There can be no meaningful development in any society if the people themselves are kept out of the development process. In fact, they must be at the centre of it. People can participate in the development process in the following ways:

a) participation in decision-making, such as the identification of development priorities;

b) participation in implementation of development programmes and projects;

c) participation in monitoring and evaluation of development programmes and projects; and

d) participation and sharing the benefits of development, managing assets, etc.

Some of the well known participatory methods are:

i) **Workshop-Based Method:** In which collaborative decision making take place by organizing workshop with the stakeholders. These workshops are also called as "action-plannig workshops" and they are basically held to bring the stakeholders together for designing development projects. It is sone in a "learning-by doing" atmosphere;

ii) **Community-Based Method:** Here the project managers undertake participatory meeting/workshop with local communities. In such settings, local people are the experts, whereas outsiders are facilitators of the techniques and are there to learn. This technique energize people, tap local resources, local knowledge and lead to clear priorities and action plans;

iii) **Methods for Stakeholder Consultation:** Beneficiaries Assessment (BA) abd Systematic Client Consultation(SCC) are techniques that cous on listening and consultation among a range of stakeholder group. Both these method intend to serve clients better by making donors and service paroviders aware of client priorities, preferences and feedback;

iv) **Methods for Social Analysis:** Social factors and social impacts analysis is done in order to pay systematic attention to certain issues that traditionally has been overlooked by development planner. For example gender issues and issues related to the disadvantaged section of the society such as Scheduled Castes and Scheduled Tribes.

2.7 GIS: MAPPING, INTERPRETATION OF INFORMATION AND PLANNING

A geographic information system (GIS) integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information. It allows us to view, understand, question, interpret, and visualize data in many ways that reveal relationships, patterns, and trends in the form of maps, globes, reports, and charts. GIS helps us answer questions and solve problems by looking at data in a way that is quickly understood and easily shared. A GIS technology can be integrated into any enterprise information system framework.

2.7.1 Components of GIS

Let us now discuss various components of GIS. GIS constitutes of five key components, namely: Hardware, Software, Data, People and Method.

i) **Hardware:** It consists of the computer system on which the GIS software runs. The choice of hardware system ranges from 300MHz personal computers to super computers with capability in teraFLOPS. The computer forms the backbone of the GIS hardware, which gets its input through a scanner, or, a digitizer board. The scanner converts a picture into a digital image for further processing. The output of the scanner can be stored in many graphic formats, e.g., TIFF, BMP, JPG, etc. A digitizer board is flat board used for vectorisation of a given map object. Printers and plotters are the most common output devices for a GIS hardware setup.

ii) **Software:** GIS software provides the functions and tools needed to store, analyze, and display geographic information. GIS software in use are MapInfo, ARC/Info, AutoCAD Map, etc. The software available can be said to be application specific. When low cost GIS work is to be carried out, desktop MapInfo is a suitable option. It is easy to use and it supports many GIS feature. If the user intends to carry out extensive analysis on GIS, then, ARC/Info is the preferred option. For those who use AutoCAD and are willing to step into GIS, AutoCAD Map is a good option.

iii) **Data:** Geographic data and related tabular data can be collected in-house or purchased from a commercial data provider. The digital map forms the basic data input for GIS. Tabular data related to the map objects can also be attached to the digital data. A GIS will integrate spatial data with other data resources. It can even use a DBMS, used by most organization to maintain their data, to manage spatial data.

iv) **People:** GIS users range from technical specialists who design and maintain the system to those who use it to help them perform their everyday work. The people who use GIS can be broadly classified into two classes. The

CAD/GIS operator, whose work is to vectorise the map objects. The use of this vectorised data to perform query, analysis or any other work is the responsibility of a GIS engineer/user.

v) **Method:** Generally, a successful GIS operates according to a well-designed plan and business rules, which are the models and operating practices unique to each organization. There are various techniques used for map creation and further usage for any project. The map creation can either be an automated raster to vector creator, or, it can be manually vectorised using the scanned images. The source of these digital maps can be either map prepared by any survey agency or satellite imagery. The other components of GIS, besides these five key components are scale, map resolution, and map accuracy. Let us discuss them one by one.

a) **Scale:** Scale is used to measure the earth's surface. To show a portion of the Earth's surface on a map, the scale must be sufficiently adjusted to cover the objective. Map scale or the extent of reduction is expressed as a ratio. The unit on the left indicates distance on the map and the number on the right indicates distance on the ground. The following three statements show the same scale.

1 inch = 2.000 feet => 1 inch = 24.000 inches => 1:24.000

The latter is known as a representative fraction (RF) because the amounts on either side of the colon are equivalent: that is 1:24.000 means that 1 inch equals 24.000 inches; or, 1 foot equals 24.000 feet; or, 1 meter equals 24.000 meters, and so on. Map scale indicates how much the given area has been reduced. For the same size map, features on a small scale map (1:1,000,000) will be smaller than those on a large-scale map (1:1,200). A map with less detail is said to be of a smaller scale than one with more detail. Cartographers often divide scales into three different categories. Small-scale maps have scales smaller than 1 : 1,000,000 and are used for maps of wide areas where not much detail is required. Medium scale maps have scales between 1 : 75,000 and 1 : 1,000,000. Large scale maps have scales larger than 1 : 75,000. They are used in applications where detailed map features are required.

So each scale represents a different tradeoff. With a small scale map, we will be able to show a large area without much detail. On a large-scale map, we'll be able to show a lot of detail, but not for a large area.

b) **Map Resolution:** Map resolution refers to how accurately the location and shape of map features can be depicted for a given map scale. Scale affects resolution. In a larger scale map, the resolution of features more closely matches real world features, because the extent of reduction from ground to map is less. As map scale decrease, the map resolution diminishes because features must be smoothed and simplified, or not shown at all.

c) **Map Accuracy:** Many factors besides resolution, influence how accurately features can be depicted, including the quality of source data, the map scale, drafting skills, and the width of lines drawn on the ground. A fine drafting pen will draw lines that are 1/100 of an inch wide. Such a line represents a corridor on the ground, which is almost 53 feet wide.

2.7.2 Data Attributes

Although the two terms, data and information, are often used indiscriminately, they both have a specific meaning. Data can be described as separate observations which are collected and stored. Information is that data, which is useful in answering queries or solving a problem. Digitizing a large number of maps provides a large amount of data after hours of painstaking work, but the data can only render useful information if it is used in analysis. Various types of data used in generating information are given below.

- **Spatial and Non-spatial data**

Geographic data are organized in a geographic database. This database can be considered as a collection of spatially referenced data that acts as a model of reality. There are two important components of this geographic database: its geographic position and its attributes or properties. In other words, spatial data deals with where something is, while attribute data deals with the question - what is it?

- **Attribute Data**

The attributes refer to the properties of spatial entities. They are often referred to as non spatial data since they do not in themselves represent location information.

- **Spatial data**

Geographic position refers to the fact that each feature has a location that must be specified in a unique way. To specify the position in an absolute way, a coordinate system is used. For small areas, the simplest coordinate system is the regular square grid. For larger areas, certain approved cartographic projections are commonly used. Internationally there are many different coordinate systems in use.

2.7.3 Geographic Representation

Geographic objects can be shown by four type of representation, namely, points, lines, areas, and continuous surfaces.

- **Point Data**

Points are the simplest type of spatial data. They are zero dimensional objects with only a position in space but no length.

- **Line Data**

Lines (also termed segments or arcs) are one-dimensional spatial objects. Besides, having a position in space, they also have a length.

- **Area Data**

Areas (also termed polygons) are two-dimensional spatial objects with not only a position in space and a length, but also a width (in other words, they have an area).

- **Continuous Surface Data**

It is the range of a continuous function from a plane, or, a connected region in a plane, to three dimensional Euclidean space.

2.7.4 Types of Information in a Digital Map

Any digital map is capable of storing much more information than a paper map of the same area, but it is generally not clear at first glance just what sort of information the map includes. For example, more information is usually available in a digital map than what we see on-screen. Evaluating a given data set simply by looking at the screen can be difficult: What part of the image is contained in the data, and, what part is created by the GIS program's interpretation of the data? We must understand the types of data in our map so we can use it appropriately.

Three general types of information can be included in digital maps:

- Geographic information, which provides the position and shapes of specific geographic features.
- Attribute information, which provides additional non-graphic information about each feature.
- Display information, which describes how the features will appear on the screen.

Some digital maps do not contain all three types of information. For example, raster maps usually do not include attribute information, and many vector data sources do not include display information.

i) **Attribute Information:** Attribute data describes specific map features but is not inherently graphic. For example, an attribute associated with a road might be its name or the date it was last paved. Attributes are often stored in database files kept separately from the graphic portion of the map. Attributes pertain only to vector maps. They are seldom associated with raster images.

   GIS software packages maintain internal links tying each graphical map entity to its attribute information. The nature of these links varies widely across systems. In some, the link is implicit, and the user has no control over it. Other systems have explicit links that the user can modify. Links in these systems take the form of database keys. Each map feature has a key value stored with it; the key identifies the specific database record that contains the feature's attribute information.

ii) **Display Information:** The display information in a digital map data set describes how the map is to be displayed or plotted. Common display information includes feature colours, line widths and line types (solid, dashed, dotted, single, or double); how the names of roads and other features are shown on the map; and whether or not lakes, parks, or other area features are colour coded.

   However, many users do not consider the quality of display information when they evaluate a data set. Yet, map display strongly affects the information you and your audience can obtain from the map - no matter how simple or complex the project. A technically flawless, but unattractive or hard-to-read map will not achieve the goal of conveying information easily to the user.

iii) **Layering:** Most GIS software has a system of layers, which can be used to divide a large map into manageable pieces. For example, all roads could be

on one layer and all hydrographic features on another. Major layers can be further classified into sub-layers, such as different types of roads - highways, city streets, and so on. Layer names are particularly important in CAD-based mapping and GIS programs have excellent tools for handling them.

Some digital maps are layered according to the numeric feature-classification codes found in their source data sets. For example, a major road might be on the 170-201 layer. However, this type of system is not very useful. A well thought out layering scheme can make any data set much easier to use because it allows the user to control the features with which we want to work. A good layering standard has layer names that are mnemonic (suggest their meanings) and hierarchical (have a structured classification scheme that makes it easy to choose general or specific classes). For example, a map could have its roads on a layer called RD, its railroads on a layer called RR, its road bridges on a layer called RD-BRIDGE, and its railroad bridges on a layer called RR-BRIDGE. This scheme is mnemonic because it is easy to tell a layer's contents from its name, and it is hierarchical because the user can easily select all the roads, railroads, bridges, road bridges, or railroad bridges.

The range of geographical analysis procedures can be subdivided into the following categories.

- Database Query.
- Overlay.
- Proximity analysis.
- Network analysis.
- Digital Terrain Model.
- Statistical and Tabular Analysis.

So far, you have read about the market research technique, participatory technique, and the GIS technique of urban planning. Now, answer the questions given in *Check Your Progress 2.*

Check Your Progress 2

Note: a) Write your answer in the space given below.

b) Compare your answer with those given at the end of the unit.

1) How can people participate in the development process?

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2) What are the types of information that can be included in digital maps?

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2.8 GIS APPLICATIONS IN URBAN PLANNING

The Geographic Information System has been an effective tool for implementation and monitoring of municipal infrastructure. The use of GIS has been in vogue primarily due to the advantages mentioned below:

- Planning of project
- Make better decisions
- Visual Analysis
- Spatial analysis
- Improve Organizational Integration

i) **Planning of Project:** The advantage of GIS is often found in detailed planning of a project that has a large spatial component; and, where analysis of the problem is a pre requisite at the start of the project. Thematic maps generation is possible on one or more than one base maps. As an example: the generation of a land use map on the basis of a soil composition, vegetation, and topography. The unique combination of certain features facilitates the creation of such thematic maps. With the various modules within, GIS it is possible to calculate surface, length, width, and distance.

ii) **Making Decisions:** The adage "better information leads to better decisions" is as true for GIS as it is for other information systems. A GIS, however, is not an automated decision making system, but a tool to query, analyze, and map data in support of the decision making process. GIS technology has been used to assist in tasks such as presenting information at planning inquiries, helping to resolve territorial disputes, and placing pylons in such a way as to minimize visual intrusion.

iii) **Visual Analysis:** Digital Terrain Modelling (DTM) is an important utility of GIS. Using DTM/3D modelling, a particular landscape can be better visualized which leads to better understanding of certain relations in the landscape. Many relevant calculations, such as (potential) lakes and water volumes, soil erosion volume (for example: landslides), quantities of earth to be moved (channels, dams, roads, embankments, land levelling) and hydrological modelling becomes easier.

Aside form the previously mentioned fields, in the social sciences GIS can prove extremely useful, too. Besides the process of formulating scenarios

for an Environmental Impact Assessment, GIS can be a valuable tool for sociologists to analyze administrative data, such as population distribution, market localization, and other related features.

iv) **Spatial Analysis:** The use of spatial analysis, which is a technique of GIS, helps to:

- Identify trends on the data.
- Create new relationships from the data.
- View complex relationships between data sets.
- Make better decisions.

v) **Improving Organizational Integration:** Many organizations that have implemented a GIS have found that one of its main benefits is improved management of their own organization and resources. Because GIS has the ability to link data sets together by geography, it facilitates interdepartmental information sharing and communication. By creating a shared database, one department can benefit from the work of another - data can be collected once and used many times.

As communication increases among individuals and departments, redundancy is reduced, productivity is enhanced, and overall organizational efficiency is improved. Thus, in a utility company, for example, the customer and infrastructure databases can be integrated so that when there is planned maintenance, people can be informed by computer-generated letters.

2.9 URBAN PROJECTS PLANNING

At the stage of urban projects planning, the implementing local authority starts with a given size of funds or budget constraint. The financial plan for development projects requires:

a) The cost recovery strategy;

b) The choice of project out of alternative proposals; and

c) A system of reporting financial performance for mid-course correction, terms of size of investment, or pay-back arrangements.

The budget period is determined by the time covered by investment flows within capital budget cycle that coincides with the medium-term development plan. Ideally, there should be a capital budget for the development plan within which individual action agency capital budgets would be identified. But, this assumes the existence of a nodal development agency for each settlement centre, which may not materialize. Within the budget constraint, there would be alternative project proposals under various functional areas. The *inter se* functional allocation of funds are determined by the local authorities in terms of political choice, while in the case of urban parastatal these are confined within single functional areas.

Among the various project proposals, the final choice would be guided by the results of the appropriate project appraisal methods for non-market facilities (cost effectiveness for partially marketed facilities (cost-benefit) and for market-

oriented facilities (discounted cash flow). The non-market facilities are to be created through tax revenues (budget surplus or revenue hypothecation) while the market facilities are to be created on the strength of appropriate user charges. The partially marketed facilities would have the mixed financing characteristics of the non-market and market-oriented facilities. The requirements of subsidized provision of services would result in reducing revenue stream or enhancing the expenditure stream, such that a support market-oriented facility in fact becomes a partially marketed one (e.g., water supply), and a partially marketed facility may turn out to be a non-marketed facility (primary education health care). There is a case for state assistance to provide for subsidized urban services in order to make these financially viable, both in terms of facility creation and their subsequent service delivery.

The urban project financial reporting system would be concerned with specifications of revenue and expenditure targets, the choice of discount rate, and the assumed losses due to risk and uncertainty. At the higher governmental levels, the objectives of employment capacity utilization of sunk investment, and conservation of foreign exchange would also carry weight in deciding about the degree of subsidization of urban services providing to the local authorities. In case the actual experience of revenue inflows and expenditure outflows exceeds the target, or in the event of non-realization of the assumed financing parameters, there would be a case for taking corrective actions. This should be done annually for each project and at the time of review of the development plan. Such a review should result in a recasting of investment size, in the pay-back period, and the cost recovery strategy.

Fee-based urban services would be optimally utilized only through market competition among the providers which may result in their private supply. This would make the consumer response market-oriented so that disfunctional objectives are met through state level budgetary policies. The implications for urban development financing will require an innovative approach in terms of enhanced municipal tax revenues, and the extent of utilizing land profits for urban development.

So far, you have read about the applications of GIS in urban planning, and about urban projects and estimates. Now, answer the questions given in *Check Your Progress 3.*

Check Your Progress 3

Note: a) Write your answer in the space given below.

b) Compare your answer with those given at the end of the unit.

1) What is the advantage of GIS in spatial analysis?

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2) What are the requirements for a financial plan in development projects?

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2.10 KEYWORDS

Technique : The systematic procedure by which a complex or scientific task is accomplished

Geographical Information System (GIS) : A geographic information system (GIS) integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information.

Scale : A system of ordered marks at fixed intervals used as a reference standard in measurement.

Projection : A system of intersecting lines, such as the grid of a map, on which part, or, all of the globe, or another spherical surface is represented as a plane surface.

2.11 LET US SUM UP

Planning techniques are tools for understanding urban phenomena. These urban phenomena are captured by the use of GIS in the form of line, area, and polygon. As a tool of analysis, GIS adds to the planning and preparation of thematic maps. Project and estimates are part of planning, where we decide, make, and execute a project.

2.12 REFERENCES AND SELECTED READINGS

Clarke, Keith C, 1999, "Getting Started with Geographic Information System" Prentice Hall, New Jersey

Lo, C. P, 2007, "Concept and Technique of Geographic Information Systems" Prentice Hall of India, New Delhi

Ministry of Urban Affairs and Employment, 1996, "UDPFI Guidelines, Vol. 1, New Delhi.

2.13 CHECK YOUR PROGRESS – POSSIBLE ANSWERS

Check Your Progress 1

1) The various processes involved in a survey are:
   i) Defining the purpose of survey;
   ii) developing the hypothesis;
   iii) defining the population;
   iv) developing the survey plan;
   v) determining the sample frame and sampling methodology;
   vi) designing the questionnaire;
   vii) undertaking field work and gathering data;
   viii) quality control and data reduction and
   ix) analysis and interpretation of data.

2) This is a simple technique to study changes in a system over a period of time. Availability of time series data at least for three points of time is a basic requirement for its application. The analysis can be displayed in the form of tables, graphs, maps, or diagrams. This technique is popularly used in study and analysis of change in urban economy, demographic pattern, and physical form and pattern.

Check Your Progress 2

1) People can participate in the development process in the following senses:
   a) participation in decision-making, such as the identification of development priorities;
   b) participation in implementation of development programmes and projects;
   c) participation and monitoring and evaluation of development programmes and projects; and
   d) participation and sharing the benefits of development, managing the assets, etc.

2) Three general types of information can be included in digital maps:
   - Geographic information, which provides the position and shapes of specific geographic features.
   - Attribute information, which provides additional non-graphic information about each feature.
   - Display information, which describes how the features will appear on the screen.

Check Your Progress 3

1) The use of spatial analysis helps to:
   - Identify trends on the data.
   - Create new relationships from the data.
   - View complex relationships between data sets.
   - Make better decisions.

2) The financial plan for development projects requires:
   a) The cost recovery strategy;
   b) The choice of project out of alternative proposals; and
   c) A system of reporting financial performance for mid-course correction terms of size of investment or pay-back arrangements.