

CONCEPTS OF PLANNING FOR MAPPING IN A DEVELOPING COUNTRY

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Planning for national mapping needs is a complex exercise particularly for developing countries, since they are faced with the problem of scarce resources - material as well as personnel and yet must optimise their programmes to ensure speedy development. Mapping needs - if planned properly can be met with the use of appropriate modern technology. The paper discusses the perspective - constraints and possible solutions with particular relevance to a developing country.

PLANNING

Planning ranging over all organised human activity tries to render decisions and actions more rational. It is the best way of producing results.

In general, it is the process of evolving a scheme to achieve an aim within a certain situation and circumstances. One could plan to get a job done say within a time target or within certain monetary limits or within certain resources. In each case the plan would be different. The planning process must aim at optimising the system while achieving an identified aim within imposed constraints. One has to go through the following steps:

- (a) Problem identification
- (b) Break up of problem in functional/decision areas
- (c) Investigation of all possible alternative solutions
- (d) Rejection of incompatible solutions
- (e) Evolving a possible plan of action.

It must be appreciated that the aim of rational planning is not to pursue a distant ideal of total rationality - that can be left to philosophers - but of producing optimal results in given circumstances, which includes the limited capacities of decision makers and executors and the interpersonal equation

of human resources within each group and between various hierarchies.

Because of varying degrees of latitude available in each of the factors involved in planning there is scope for many solutions to the same problem. Though planners may have different approaches to the problems due to latitude available in each factor and relative relevance of each factor to different planners, each approach should be logical and practical. As a professional planner one should not only be able to find a solution but also be able to appreciate and evaluate other possible solutions.

Another factor which has often not been considered in technical planning is the socio economic one. The technical plan has to fit in the prevailing socio-economic ethos. This factor should be given due weightage - at higher levels. Capital intensive - labour saving sophisticated technology may have to be rejected in favour of simpler technology requiring lesser capital investment and offering increased opportunity for employment, at least in developing countries which are not even monetarily rich. It will not have much relevance while planning at a lower level. On the other hand this factor may carry considerable weight while planning at higher levels - say National level.

A final word about implementation phase of every plan is worth observing - Plans and their implementation should be continuously kept under watch and discriminatory scrutiny so that they could be modified or improved upon as promptly as possible with references to such criteria as the

- (a) actual physical progress of the plan
- (b) resources problem
- (c) opportunities that might arise from time to time
- (d) changing pattern of demand.

One should take a realistic and pragmatic view of objective reality and prevailing environment and not be unduly influenced by subjective intuitions to work and plead for idealistic plans which may have relevance to other situations and different times.

## Principles of Planning

Planning to be effective, must be based on well tried out principles. These are as constant as the principles of surveying and together with the latter form the basis of a sound survey project. Principles of survey planning are:

- (i) Task Evolution (clear identification of problem).  
This may sometimes need discussion between the planners and those that are setting the task/problem.
- (ii) Task Analysis (i.e. understanding the problem). In analysing survey tasks the following will have to be considered:
  - (a) Task and extent
  - (b) Accuracy
  - (c) Monetary constraints
  - (d) Time schedule and phasing
  - (e) End products required
  - (f) How and when what survey data would be used by the user - coordination between user and surveying agency.
  - (g) Any other constraints
- (iii) Assessment of the available know-how (mainly technical)
- (iv) Generation of alternative plans - At this stage one should have a fairly open outlook and should consider all those factors which may even remotely have some relevance. Subsequently of course, the factors could be considered in their relative relevance and significance. All possible should be explored.
- (v) Optimisation of resources
  - (a) Personnel
  - (b) Equipment
- (vi) Simplicity of plan
- (vii) Flexibility of plan
- (viii) Judicious use of past experience
- (ix) Integrated approach

- (x) No pre-conceived ideas
- (xi) Contingency planning
- (xii) Foresight (futuristic trends/needs should be anticipated)
- (xiii) Inbuilt performance evaluation and review structure.

Planning as a Photogrammetrist - its scope

What do we understand with the concept "planning" as related to surveying and mapping ?

Having identified the principles of planning, we can now see the role a professional photogrammetrist may be called to play in a planning exercise. He may be called up to play two distinct roles.

- (a) as a member of a multidisciplinary group dealing with a task in which surveying support is needed;
- (b) as a planner of a specific survey task.

In the first role he should not look at the problem from a narrow specialist point of view but take a perspective and an integrated view. A survey planner must be prepared to take a more meaningful role than that of a specialist. He should be an active participant in a planning group. The survey planning group should generally be constituted, as follows:

- (a) Representatives of users
- (b) Map makers
- (c) Representative of the Planning Agency of the Government
- (d) Representative of Finance Department
- (e) Economists
- (f) Social Scientists

A factor on which major emphasis should be placed is the understanding of the totality of a 'task'. Level of planning is important, with respect to which the role of the planner

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photogrammetrist is to be defined. The levels at which planning will have to be carried out are:

- (a) National/Regional
- (b) Organisational
- (c) Executive
- (d) Sub group or the functional group.

Whatever may be the role of the planner photogrammetrist in a planning exercise, one thing is quite clear, at his level, he will have to be a hard core professional. Knowledge of photogrammetric aspects of mapping alone will not do, the field of knowledge will have to be a wider one. A good all-round knowledge, supplemented by knowledge of the whole system of surveying and mapping, over and above a detailed knowledge of the photogrammetric sub-system is a must. This is necessary to understand, analyse and appreciate the problem from a wider perspective. Then and then alone, he will be able to play a constructive role in the whole exercise. Planning is a professional subject and thus has no limits for professional excellence. A survey planner will have to self assume the role of a systems expert, a financier, an economist, a user or a specialist.

In the other role as a planner of a specific survey task he will have to have thorough knowledge and understanding of all aspects of surveying and mapping over and above his own specialisation. For problem solving and for analysing various technical options intimate understanding of the whole range of technology, the whole survey system, is a must, only then a reasonable solution can be ensured.

#### Complexities of Planning

Planning for a mapping project can be a very complicated task. Factors contributing to the complexities are:

- (i) Technical alternatives
- (ii) Rapid development of technology
- (iii) Availability of new equipment due to advances in technology

A mapping project can be executed by various equipment-method-personnel combinations resulting in varying performance characteristics with respect to time, cost, accuracy and information content. Technological development has been very rapid in recent years. It has considerably revolutionised the options in respect of material, equipment, human resources and techniques. The change-over from a simple technology to that of an advanced one, has brought in its wake tremendous problems to the planner. The planner has before him a complex field of equipment, methods and techniques to choose from and evolve a realistic plan.

To evaluate and properly judge the portential and different technical possibilities a system approach is necessary.

Only by proper advance planning and optimising the total mapping system can a simple, and economical working solution emerge. The principle is the same as that for surveying, i.e., from 'Whole to Part'. Once rigorous planning is carried out for a system, sub-systems will fall into their places.

#### Role of a Photogrammetrist at National Level

To function as a planner at the National level a photogrammetrist will have to assume an advisory role primarily in the field of mapping and then in photogrammetry. Then only will he be able to justify his role. Towards this a thorough understanding of the following factors is essential:

- (i) Users (relevance of the various users needs)
- (ii) Needs and priorities
- (iii) Time and phasing
- (iv) Material resources
- (v) Human resources (local and from outside country)
- (vi) Technology - within country; elsewhere in the world.
- (vii) Existing policies (technological, political, social and economic).

(viii) Priorities (of various users in the national frame work).

(ix) Contingencies, their appreciation.

A very important factor amongst those enumerated above is 'Time'. This single factor is directly or indirectly related to all other factors. Users change with 'time', their needs change with 'Time'; resources, both human and material keep changing with 'Time', and likewise technology, policies and priorities are subject to changes with 'Time'. Needless to mention, contingency itself is a function of time and it will be only apt if overall planning of a mapping project foresees unforeseen contingencies that may arise in the area of mapping. Drought, relief works, floods are a few natural calamities which would require organised work and for which proper map cover is essential. A planner would do well to justify his role if he can foresee such contingencies based on the geography of the areas of mapping, and provide for it adequately in the overall planning.

Mapping programmes should generally be considered on basis of time rather than cost. It should also be borne in mind that mapping programmes are long term operations and generally there is considerable gap between the initiation of a survey project and its final completion - often of a few years even. This should be appropriately considered and explained - unrealistic and false expectations do a lot of harm by damaging credibility.

These parameters of planning are to be considered in their proper perspective, relative to the time for which these are relevant. Although it is only possible to plan with whatever resources are available it is advisable to foresee the futuristic trends in technology and other connected areas and plan out a reasonably flexible solution. In this context, a critical study of the past experience and the lessons learnt, combined with the present trends and the futuristic changes and their likely influences, will go a long way in the development of a realistic plan. Admittedly this is a very difficult task - but then planning is a complex problem. A factor which can reasonably well contribute to the success of a plan

is to provide for an inbuilt mechanism for evaluation and review. There should be enough flexibility in the plan so that based on periodic review the plan could be suitably updated/modified as necessary.

#### PLANNING FOR NATIONAL/REGIONAL MAP COVER

At the national level an effective basis to plan mapping cover is to consider all possible users and their needs so that fragmentation, duplication of effort, incompatibility of data collected is avoided. Although a wide variety of people are users of maps, it is possible to group them under certain common categories based on their requirements. The following list contains a fairly good cross-section of map users:

- (a) Defence
- (b) Administrative
  - . Civil (General)
  - . Urban Area
- (c) Engineers/Developmental work Engineers.
- (d) Resource Scientists
  - . Natural resources scientists
  - . Cultural resources (what man has constructed)  
Scientists
  - . Live resources scientists
- (e) Planners
- (f) Others

The users and their specific uses would be further clear from the following brief elaboration:

- (a) DEFENCE needs of
  - i) Army
  - ii) Airforce
  - iii) Navy are different

and should be catered for as such. Generally for each service maps may be needed for the following:

- (i) Higher War Strategy
- (ii) Strategic planning



- (iii) Tactical planning
- (iv) Close quarter engagement
- (v) Other special types
  - . Manoeuvrability maps
  - . Combined operations maps
  - . Landing maps
  - . Amphibian maps
  - . Paratroop maps
  - . Deep Penetration patrol maps
  - . Training Exercise maps

(b) CIVIL

The map uses could be categorised as

- (i) Jurisdictional
  - . International
  - . Inter-state
  - . Within State
  - . Individual-Cadastral (property survey)
- (ii) Police
- (iii) Law and order (Administration)
- (iv) Contingency
  - . Welfare programme
  - . Relief operations
    - . Floods
    - . Drought
    - . Natural calamity

(c) URBAN AREA - These requirements are very much different - than other general requirements for the region/country.

- (i) Municipal Administration
  - . Water Supply
  - . Electricity
  - . Sewage Disposal
  - . Roads
  - . Telephones
  - . Recreation
  - . Property registration

(ii) Developmental Authority

- . Discussion and Public Debate documents
- . Improvement Plans
  - . Overall planning
  - . Detailed planning
  - . Construction phase

(d) ENGINEERS/DEVELOPMENTAL AGENCY -

Maps would be required for various types of studies and works as follows

- (a) Catchment Surveys
- (b) Dams
- (c) Canals
- (d) Reservoir Capacity
- (e) Command Area
  - . for irrigation
  - . for Intensive development
- (f) for large industrial complexes
- (g) for urbanisation

(e) NATURAL RESOURCES - Scientists, engineers working in resource field require maps for location, evaluation and exploitation. Maps would be required in the following fields

- (i) Geology
- (ii) Forestry
- (iii) Soils
  - . to determine scientific use
  - . conservation
  - . erosion control
- (iv) Hydrology
- (v) Geophysical studies
- (vi) Oil exploration
- (vii) Agricultural Resources
- (viii) Land use studies
- (ix) Land Capability studies

(f) PLANNERS

Planners at all levels need maps. The various levels at which maps may be needed are

- (i) National
- (ii) Regional
- (iii) Local

(g) OTHERS

The following list is by no means exhaustive yet it is fairly representative

- (i) Geographers
- (ii) Environmentalists (for pollution control)
- (iii) Meteorology
- (iv) Tourists
- (v) Road engineers
- (vi) Railway engineers
- (vii) Power Transmission
- (viii) Tele communication
- (ix) Civil Aviation
- (x) Port - and inland water transport people
- (xi) Census
- (xii) Publicity Media
  - . Newspapers
  - . Other publication
  - . TV

It will be seen that maps/map data are needed in practically every organised activity. It is one of basic tools for a well run society.

Their needs could be classified under two broad categories:

- (i) Metric (Quantitative)
- (ii) Qualitative (Semantic)

But these two categories are quite broad and therefore it will be better if the classification is attempted a little more in detail. A reasonable way of doing so would be to

consider user needs under following headings:

- (i) Metric accuracy  
(Related to)
  - (aa) Plan
  - (bb) height/contours
  - (cc) Both Plan as well as height
- (ii) Semantic Information (Cultural information)
- (iii) Thematic Information
  - (aa) Quantitative
  - (bb) Qualitative
- (iv) Natural features - What all is of interest ?
- (v) Scale
  - (aa) Small
  - (bb) Medium
  - (cc) Large

It is a difficult task to meet each user's requirement separately. Needs, although diversified, can be partly met by having national series on the basis of time, money and resources available for meeting common needs. Special needs can always be met in a localised special manner or by special series for areas of interest.

Most of the users will require at least three different types of scales:

- (a) Small Scale (maps on scales 1:100.000 and smaller are generally considered as small scale) - for general study of the region to get:
  - (i) an overall view
  - (ii) to assess feasibility of various schemas in principle
  - (iii) to localise areas for further studies.
- (b) Medium Scale (maps on 1:50.000, 1:25.000 or 1:15.000 are generally considered as medium scale) - for detailed study of areas of interest:

- (i) to get detailed schemes with more accurate cost estimates
  - (ii) to prepare detailed plans.
- (c) Large Scale - for very detailed studies and for execution of projects. Highly project oriented requirements will have to be met.

Thus National Map Series on small scale can be a starting point towards the solution. Medium Scale series of specified areas can also be taken up. Further the planner:

- (i) will have to keep in view the total mapping potential available in the country. This could include Government agencies, private agencies, agencies run jointly by both and also foreign agencies.
- (ii) Depending on the urgency and the object of the mapping, the load could be distributed realistically amongst the survey organisations in the country. This will be with a view to make the best use of resources. Needless to mention that priorities of programmes will have to be fixed and phasing out of the mapping production will have to be resorted to.
- (iii) will have to plan for augmenting the survey resources, if necessary.

It is apparent that there is no ideal answer about a particular scale being the best scale for a national series. Extent of country, its stage of development and resources available play an important part. The following table of scales of national series of a few countries will be illustrative.

<u>Country</u>	<u>Scale</u>
Germany	1: 5.000
Sweden	1: 10.000
U.K.	1: 1.250
U.S.A.	1: 24.000 / 1:50.000
U.S.S.R.	1:100.000

The variance is significant - obviously the needs priorities and resources vis-a-vis task involved are different in countries.

In our own country prior to 1947 the national series did not have a common scale. Regions were identified for mapping on 1" = 4 miles, 2 miles and 1 mile depending upon the potential of the region and the expected requirement of the state. After 1947 we moved towards a uniform scale and finally worked for it as a policy after 1958 when metrication to 1:50.000 became a target. Now that mapping on 1:50.000 is scheduled to be completed by 1980 we have already adopted 1:25.000 scale as the basic scale, for a national series. Of course, 1:50.000 and 1:250.000 will also remain as national series but would generally be compilation scales.

