

INFO-GRAPHICS : ITS APPLICATIONS TO PLANNING IN INDIA

Anne Chappuis, Luc de Golbéry
Indo-French Compu-Graphic and Planning Project
Bureau of Economics & Statistics
Planning Department, Government of Andhra Pradesh
Hairatabad P.O. - HYDERABAD 500004 - INDIA

ABSTRACT

India's only hope of fighting poverty successfully is to use effective methods. It is essential to provide appropriate tools for analysis and aid to decision. Info-Graphics, the micro-computerisation of Bertin's Graphics Information Processing, is a cheap, reliable, easy to use, extremely powerful and universal tool for decision making. If it can be considered a luxury in developed countries, it is an absolute necessity for the developing countries if we really want to reduce the inequalities. Even more so if we plan transportable units.

INTRODUCTION

In India the Planning Department plays a key role at all levels of development. With most major infrastructures in place, the problem faced by planners is that of "unbalanced development", that is unequal development of regions and/or social groups. In such conditions the challenges for development are to analyse and communicate more and more numerous, detailed and complex information.

It is consequently essential to supply Planners with appropriate tools for analysis and aid to decision. The vast amount of data required to be processed and analysed and their timely output advocates for the use of computers. However the decentralisation process, which has already started, and the difficult environment call for a network of micro-computers rather than a big centralised main-frame.

On another hand the necessity to provide meaningful informations in an unambiguous and quickly digestible form pleads for the use of Bertin's Graphics Information Processing *. The foundations of Graphics Science have been laid down twenty years ago, but it is only now, with the advent of "computer graphics", telematics and other videotex, with the universal acceptance that "a small picture tells more than a long talk" that the image

Bertin J., 1981, "Graphics and Graphic Information Processing", Berlin - New York, de Gruyter

specialists realise to what extent Bertin was an extraordinary precursor. So much a precursor in fact that Graphics had to wait for micro-computers with graphic facilities to really find its full application.

The unfortunate fact that Graphics Science remained unknown among computer specialists led to the development of poor graphics softwares. They grossly under utilize the computer graphic hardware capabilities as well as the extraordinary powers of the human visual perception successfully tapped by Graphics Science.

INFO-GRAPHICS METHODS AND TECHNIQS

Info-Graphics (Info for informatics as well as information) methods and technics try to bridge this gap by implanting Graphics Science logic into micro-computers through specific softwares. This will lead in a first phase to the development of a complete Expert System for Automatic Cartography and later to a more general Information Processing Expert System designed as a decision aid.

Graphics like Mathematics is a science and a rational language whose vocation is to be applied in the vast domains of information processing and communication. This includes cartography, graphs, diagrams and goes far beyond by proposing methods and technics similar to multi-dimensional analysis in statistics. In other words Graphics Science transforms radically the empirical and artistical approach of traditional visual presentation into rigorous and scientific methods which multiply manifold the efficiency of their outputs and simultaneously minimises its cost by cutting down the empirical component.

Info-Graphics applied to development is usefull in two different domains:

- 1) Over worlded decision-makers have to analyse and synthetise an enormous amount of information to rapidly diagnose a problem. They also need easily communicable information to be able to argue about the choices with the politicians: For example during an administrative reform which consists of replacing the old 716 units by a thousand new ones, the new potential headquarters have to be identified amongst 27,000 villages. It is obvious that politicians will try to influence decisions to include their village in the list even if it is a very small unqualified one. If the decision-maker has:
 - a) a list of potential headquarters with their population and infrastructures
 - b) a map which locates them he can:
 - 1) verify whether the proposed village is on the list
 - 2) show to the politician that it is not and that it is a very small dot on the map

3) argue that the next village having a big dot should be selected instead.

To prepare such a list (27,000 X 15) and map the results in three months it is obvious that a computer is needed.

2) Communication of information is essential in the democratic process. In a mostly illiterate environment, graphic communication is a necessity. The following example will demonstrate this: The Gujarat Planning Secretary visited our laboratory three years back and was convinced that visual translation of information is important. He built up a cell in his department. He mapped the available village infrastructure (a black dot for presence, a blank for absence). These maps were displayed in the local administration. The reaction of an illiterate elected panchayat woman member illustrates the universality of graphics: She said "How is it that my village has only two "bindies" (the dot that women draw on their forehead) while the next village has so many". Privileges and inequalities become immediately obvious and democratic control by citizen voters becomes efficient.

The same maps also created an awareness of some of the development constraints among villagers: some villagers asked the Government to construct a power line to their village. It became very easy to show them on the map that their village being the furthest it needed a consensus of four villages for the department to construct the line. What would have been difficult to explain through speech became obvious on the map.

Through regional comparison people became conscious of their relative backwardness. This helped them setting up higher goals for their development programmes to try to bridge the regional unbalances.

In third world countries graphic translation of information is the most efficient and perhaps the only mean of democratisation provided:

- it is fast, cheap and reliable, which means micro-computerised
- it follows strict procedures to produce efficient and true pictures, which means the use of Bertin's "Semiology of Graphics" rules*.

Bertin J., 1983, "Semiology of Graphics", Madison, The University of Wisconsin Press

TEST OF THE METHODS

To test the methods on a real scale a relatively cheap micro computer graphic laboratory was installed in 1981, in the Bureau of Economics and Statistics, Planning Department, Government of Andhra Pradesh. It started functioning in a difficult environment (high fluctuation in voltage, frequent power cuts, heat, humidity, dust...). It is composed of the following equipment:

- micro-computer : Hewlett-Packard 9825, 64 K
- memory : cassetts of 280 K or diskets of 500 K (single face, double density)
- digitizer : Summagraphics (750 X 1000 mm)
- plotters : H.P 9872 A, 4 pens, 285 X 400 mm
Benson 1332, 4 pens, 92cm width
- graphic printers: Logabax with programmable characters
Epson with graphic function
- ondulator/de-ondulator with battery back up for power control.

The system which has been developed links data banks which can be geographical (state, district, taluk, village, hamlet) or not (household, individual, company etc...) to statistical and graphic processing and output. It works under the following constraints:

- easy use by non specialists
- fast retrieval of information
- security

Recorded information is documented on a key-word library system which allows fast and easy retrieval.

Base maps are digitised and recorded using

- polygon centers to produce plotter punctual maps
- vectors to produce plotter linear maps
- polygons to produce plotter zonal maps
- matrices to produce printer grid maps (punctual/zonal)

Once the user has identified his data he is faced with the following choices:

- direct listing
- statistical processing : uni-variate
multi-variate
- graphical processing : direct
after statistical processing

At any given time he can go back to any one of the steps to make new calculations and/or new graphic outputs.

The ease of use can be demonstrated by the fact that some of our Indian assistants who are villagers with a level of education varying between 10th grade and bachelor degree and without any computer training are able to use easily part of the system (data entry, printing,

calculations, classification and mapping). Trainees who were sent from other states to our laboratory were able to start using the system the very first day and could use it fully after three weeks. Besides they were able to go back to their home states with about thirty graphic documents (maps, graphs, bar diagrams, visual matrices).

THE APPLICATIONS

They are at present at two levels:

1) the State of Andhra Pradesh (60 million people):

- analysis, visualisation and communication of development data:

a) on a regular basis:

- * Documents at different scales (state, district, taluk) on population, climate, agriculture, industry, finance etc... are printed in the yearly publication of the Bureau of Economics and Statistics, (Season and Crop Report, Statistical Abstract, Quarterly Bulletin) meant for administrators and the public.
- * Rainfall: daily rainfall from 360 raingauges scattered throughout the state is recorded with one week delay to set up an alarm system which will inform the decision-makers that a drought is setting in and it is time to launch the special aid programmes for the daily agricultural labourers and marginal farmers. This system will later be linked to crop data for crop insurance.
- * Yields: sample seasonal crop harvest are recorded and analysed.
- * Timely crop report: a 20% village sample of the areas under different crops is recorded season-wise to arrive at an early estimation of the total areas. Linked to the yields it allows estimates of production.
- * A regularly up-dated data bank is available for decision-makers.

b) occasionally

- * Population: 1981 census data have been analysed for the 316 taluks of the state and a hundred thematic maps were prepared in a month. Multi variate analysis is in progress especially on weaker sections.

DISTRICT MAPS

Figure 1 : VILLAGE-WISE (PRINTER)

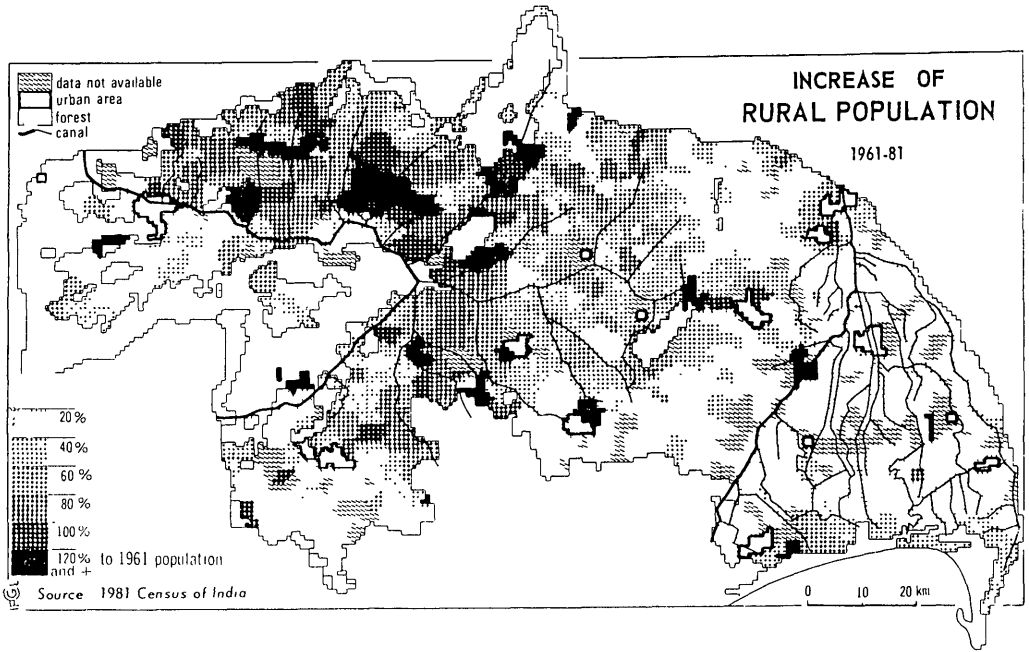
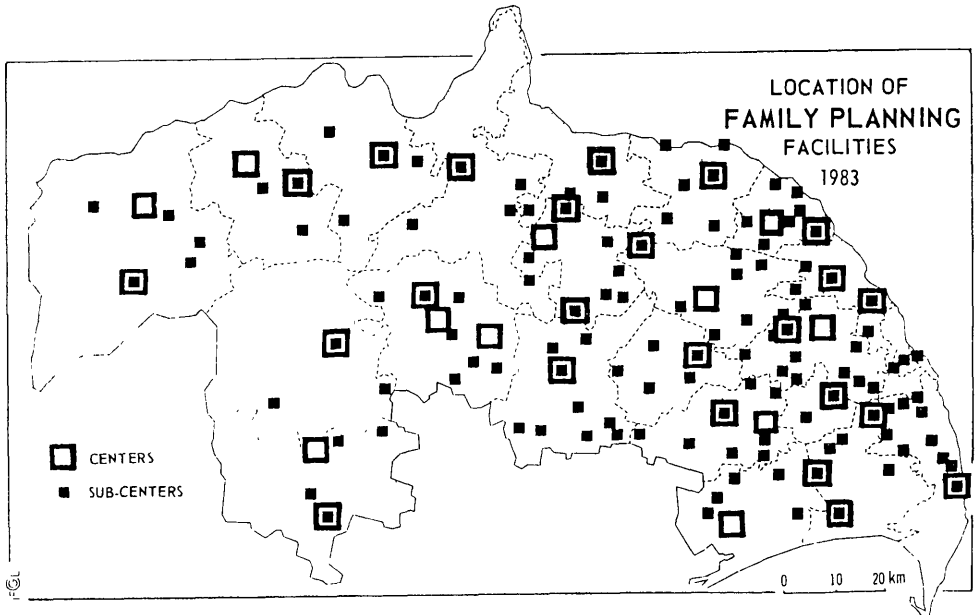


Figure 2 : VILLAGE-WISE (PLOTTER)



- * **Finances:** an inter-states comparative study of the evolution of state income heads over 25 years was prepared for the finance department.
- * **Administrative reform:** the Government of Andhra Pradesh has decided to change its smallest administrative units and create smaller units to reach the people more efficiently. They had to identify the thousand potential headquarters among the 27,000 villages of the state. Fifteen parameters on population and available infrastructure and services were recorded. A score was calculated and lists of reclassified villages were output and mapped for each district. These documents were sent to the District Collectors (heads of the administration) to allow them to prepare the final list without too much political interference. This was done in three months.

2) at the regional level: a district planning atlas

One of the districts, Guntur (three million people), was selected to build a village data base (for 750 villages) with data on population, agriculture, infrastructure, amenities, administration, non agricultural activities (about 500 parameters). Data is up-dated seasonally whenever possible. A planning atlas with a hundred thematic maps can now be prepared in less than two months for any one of the districts. Output on plastic sheets allows cheap and fast reproduction. This atlas is more a dictionary which the Collector can carry along with him and consult easily any time on his tour programmes. The format (22 X 34 cm) is that of the usual administrative files (figure 7 to 10). This document helped in the preparation of the seventh plan.

RESPONSE

1) The local government has decided:

- * to strengthen the state laboratory
- * to put info-graphic laboratories equipped with Indian micros in each of the 22 rural districts in order to:
 - keep and up-date data bases at different levels:
 - village
 - hamlet
 - household
 analyse them and make the necessary graphical presentation.
 - identify the backward zones and/or groups qualified for special development programmes.
 - follow and monitor these programmes and control their correct execution

- prepare a new system of agricultural data collection since the past system of "Village Officer" through whom the data was collected has been recently abolished.
- 2) The Land Record Department wants to micro-computerise its cadastral survey and clear their 18 years backlog in three phases:
- village skeletons
 - plots with related owners
 - link these with crop information
- 3) Seven other States (Kerala, Karnataka, Maharashtra, Gujarat, Jammu and Kashmir, Sikkim, Mizoram) and Sri Lanka have contacted us to help them set up similar laboratories.

FUTURE

Info-Graphics opens up new areas of applications to visual processing :

- decision aid for :
 - * economic and social development
 - * business management
 - * government administration
 - * regional planning
- communication :
 - * mass media
 - * road signs and other visual signals
 - * advertising
- education
 - * structuring of knowledge
 - * development of powers of analysis and synthesis
- real time :
 - * instrument panels in vehicles, scientific processes, industry etc...

In order to meet these demands it also make possible the creation of :

- Cartographic robots which are :
 - * inexpensive
 - * capable of assisting the cartographer and increasing his productivity, particularly in the area of "Business Graphics"
- Expert Graphics systems which may
 - * introduce Graphics in areas where it has not hitherto been used (government, business)
 - * replace the cartographer in areas where he is a luxury (e.g. the third world).

- Expert Information Processing System which will be able to
 - * assist any decision maker (administrator, businessman but also pilot) in his task
 - * assist scientists in their research process
 - * help everybody get a meaningful and non distorted understanding of the reality through telematic media
 - * help the mass media have a more powerful analysis and presentation of the news
 - * etc...
- Info-Graphics Education System which will
 - * help the teachers in their work
 - * help pupils in acquiring a much better power of analysis and synthesis

CONCLUSION

Bertin's "Semiology of Graphics", a universal tool which functions everywhere, particularly well with illiterates, applied on micro-computers gives a cheap, reliable, easy to use and extremely powerful tool for decision making. If it is considered a luxury in developed countries, it is an absolute necessity for the developing countries if we really want to reduce the inequalities. Even more so if we plan transportable units which can be installed anywhere for the required time.

BIBLIOGRAPHY

- BERTIN J., 1967, "La semiologie Graphique", Paris, Gauthier-Villars.
- 1977, "La Graphique et le traitement Graphique de l'information", Paris, Flammarion.
- 1981, "Graphics and Graphic Information Processing", Berlin-New York, de Gruyter.
- 1983, "Semiology of Graphics", Madison, University of Wisconsin Press.
- GIMENO R., 1980, "Apprendre a l'ecole par la Graphique", Paris, Retz.
- de GOLBERY L., 1979, "Micro-informatique et traitement graphique de l'information", in Cahiers Geographiques de Rouen No 10-11, Rouen, pp157-187.
- CHAPPUIS A., de GOLBERY L., PINCHON C., TAN CHONG CHIN, VERLUT X., 1982, "Cartographie automatique et info-graphique, essai d'application de la semiologie graphique a la sortie de cartes sur imprimante a caracteres programmables", in 2eme Colloque de Micro-Info-Graphique pp 11-23.