

POST-CENSUS CARTOGRAPHY IN FRANCE :
PRODUCTION INCREASE
DESPITE BUDGETARY RESTRICTIONS
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SUMMARY

The knowledge of population phenomena is determinant for defining a development policy. The whole aspect is insufficient : the geographic distribution must be apprehended. With computerized census processing, automatic cartography is the privileged way of diffusing the information needed by geographers and planners. For all that this tool should be known and financial arrangements should be made as soon as the census budgetary conception.

INTRODUCTION

Though a government organization, the Institut Géographique National-France provides a wide range of commercial services both in the French and international markets. Among these activities are to be found the thematic cartography generally speaking, and the statistical cartography in particular. For this purpose, the IGN has equipped itself in 1979 with an automatic cartography system, which has been gradually enriched by six years of experience and production, both in the hardware and software fields (Pasquier 1980, Pasquier 1982, Grelot 1984).

Among the suppliers of statistical data, the French Institut National de la Statistique et des Etudes Economiques (INSEE) holds a particular place in France. It coordinates the whole national statistical system, and carries out itself the heavy census operations, alone or with the assistance of other ministerial departments (Ministry of Agriculture and Home Office). After gathering and processing phases, INSEE publishes the census results.

Contrarily to other statistical organizations, INSEE does not possess any cartography unit. If it uses more or less summary softwares to produce very simple maps or study maps, its appeals most often to external organizations for the publication of detailed maps for the general public.

PRODUCED MAPS

Exploitation of past censuses

In 1978, IGN and INSEE made together an experiment by producing an atlas of some fifty maps over a region covering about one tenth of the French territory (Rhône-Alpes 1978). It was the first large production of statistical maps through data-processing.

This led to carry on this joint work over the whole France. For this purpose, IGN undertook the constitution of geographic reference files including the 36,500 "communes" (French smallest territorial division): a first file gives the boundaries of these communes, digitized from a schematization specially conceived at the scale of 1:500 000 for bearing considerable reductions ; two other files give the coordinates of

particular points located inside each commune, the centroid or visual centre, without rigorous mathematic definition, and the chief town (county town), position of the townhall.

Then two books were published, each including some twenty maps along with remarks. Data came from the 1975 general population census and from previous censuses (1936, 1954, 1962 and 1968) ; they were mapped either at the commune level (36,500 geographic units), or at the immediately higher administrative level, the canton one, with a file obtained by aggregating communes into cantons (3,500 geographic units). The first book deals with demography, and shows especially the distribution of the population and its evolution, as well as its structure per sex and age (IGN-INSEE 1980). The second book deals with activity, showing in particular some socio-professional distributions and housing ones, whether main or secondary dwellings (IGN-INSEE 1981). On the map itself appears a short comment of a few lines, inviting the reader to reflect on a particular aspect or make comparisons between several maps. More important comments give a geographic interpretation of each map or group of maps. An administrative map and a physical map go with statistical maps. The used scale is 1:2 500 000, which corresponds to the A2 standard size (42 cm x 59.4 cm).

These two books were published respectively in 1980 and 1981. Despite their unquestionable interest and their acknowledged aesthetic quality (Muller 1984), they have not been best-sellers, partly because of the data remoteness (5 or 6 years), the more considerable as the census was to take place in March 1982.

1982 census

For this census, arrangements were made to associate cartography with the publication of the first figure tables. Thus was carried out, five months after census, a first series of 17 maps, from the first estimates made public simultaneously (INSEE 1982). As the accuracy of the results improved, other maps were drawn up at finer geographic levels, with provisional results then with final results. As a whole, more than 40 maps will have been drawn in some thirty months. Other maps were also produced over more reduced geographic areas.

STATISTICIANS AND MAPS

Statisticians are not always sensitive to the charm of maps. They mainly reproach this means of expression with degrading information, with its possible perversion and the production time and cost of maps.

Degradation of information

Degradation of information is undeniable. Statistical cartography, mainly when geographic units are of reduced size, compels one to re-group raw data into classes, represented by various colours or symbols of various sizes and shapes. With this end in view figured data must be represented, then a choice must be made among the possible representations, a choice which can be made but after an interpretation necessarily impressed with subjectivity. But this finally represents but the passing from data to information, which after all is the characteristic of the communication of the knowledge holder towards a public. If accuracy is lost, on the other hand the geographic expression of a phenomenon is won, which no figure table can show with the efficiency of a map. If the number is the archetype of statistical data, the map remains the archetype of the representation of localized data, of geogra-

phic data.

Perversion of information

Perversion of information is a more serious risk. It may come from a wrong choice of thresholds, which leads to transmit a wrong impression of the statistical distribution, to an illusion. This is feared by statisticians who often ignore that cartographers fear in the same way the wrong use of visual variables and graphic language rules : there is no more risk of illusion, but of incommunicability. One only has to glance through documents advertising very popular commercial softwares to be convinced of the justice of this remark (Carter and Meehan 1984). Statisticians and cartographers must necessarily work jointly to avoid such dangers.

Production time

Map production time is an important commercial obstacle. Cartography brings a knowledge the larger and more interesting as the represented geographic level is small. By the force of circumstances, this requires a long time in the availability of data on the one hand, and in the choice of the most pertinent statistical variable and the most performing graphic expression on the other hand. Then the quick time limitation of data can be felt. However one can note that generally speaking demographic phenomena evolve slowly, at least for a number of them. Then the mapped geographic level must be adapted to the data accuracy, processing accuracy and data estimated variation between the census date and that of map production. This notion of processing accuracy was used in France for 1982 census : the "first estimates" were mapped at the regional and departmental level, then the "provisional results" at the departmental and cantonal level, then the "final results" at the cantonal and communal level.

Cartography cost

Obviously cartography cost is not to be neglected. Statisticians are sensitive to it, particularly when they are compelled to appeal to external organizations for this task. However it would be righter to compare this cost with that of works of publication of census results, and with the whole census budget. But in time of budgetary restrictions, it is quite obvious that to begin with what is not deemed essential and comes the latest in the work schedule will be sacrificed, and maps quite often fall into this category.

Nevertheless we verify that statisticians appeal more to graphic and cartographic expression. Evidence of it is given by the insertion of maps in the first official publication of 1982 census ; another evidence is a book drawn up by INSEE and entitled "Données Sociales 1984" (1984 Social Data), in which texts explain images and images do not illustrate texts (Bonin 1984). The constitution of a public interest group "Reclus" intended, among other things, for publishing an atlas of France within the coming years, must also provoke a leading effect and spread the use of statistical maps.

HARDWARE AND SOFTWARE DEVELOPMENTS

Directed since the beginning towards publication for the general public, the system used by IGN in thematic cartography has required from the outset important developments in statistical cartography particularly, for softwares available on the market at this time did not

correspond to aims looked for.

Softwares

Softwares cover two different aspects : on the one hand a statistical analysis helps to choose the representation and threshold ; on the other hand symbolization softwares offer a wide range of representations.

Thus for mapping an absolute magnitude, one disposes of representations in pinpoint signs :

- circles, squares, or pie charts, the total surface of which is proportional to the statistical variable ; in case of superposition, the smallest symbol, surrounded by a white ring, deletes automatically the biggest one ;
- cluster of points in a number fixed by the data value, so that the points might be distributed in an aleatory manner inside the corresponding area ; curiously, this representation does not obtain the favour of our usual interlocutors.

A density or proportion will be interpreted by a zonal representation, by varying colour and intensity ; if need be, hatchings are used when drawn surfaces are large enough.

Relations from commune to commune, like exchange flows or attractions, are represented by lines the width of which is modulated by the statistical data.

Being a country of high administrative tradition, France is not divided into 54 million Frenchmen, for actualizing Georges Bernanos'famous remark, but into a multitude of administrative wardings. Softwares of commune aggregation and symbolization of hierarchized or tangle boundaries have been then conceived to produce these maps of administrative references.

Hardwares

With these software developments are associated extensions of material configuration. The Sémio system (Pasquier 1980), provides screened films, insulated by a laser plotter, ready for printing ; the quality of these products is excellent. But the issue of films is followed by the constitution of a proof,obtained by Cromalin process, necessary for judging both the aesthetic rendering and the pertinence of the statistical choice, which results in a relatively high cost. Consequently complementary equipment has been acquired, for which we are developing proper softwares. We have acquired on the one hand an electrostatic colour plotter (Versatec ECP 42), which produces in one or several copies proofs of quality indeed lower than the Sémio system, but nevertheless quite satisfactory, and on the other hand a graphic colour console of high resolution (Lexi-data 3 700) which brings some interactivity at the expense of a display by sampling when the number of geographic units is important. These two materials are connected with a Vax 11/750 computer from Digital Equipment Corporation.

Further developments will consist in acceding, through telematics, to data bases established by national statistical organizations.

FUTURE CONDITIONS

The hope of seeing budgetary restrictions disappear soon is thin. The increase of statistical cartography publication must be looked for in

other ways : improvement of productivity, dynamic cartography, budgetary discipline, training.

Productivity improvement

Map production profits by data-processing productivity gains, design and drawing assisted by computer. Equipment allowing intermediate visualizations offer a great interest, though it does not show really what the printed map will be. The following stage will be the direct production of printing plates from digital files, without passing through films and proofs.

Dynamic cartography

By dynamic cartography I mean two different notions.

The first one is rapidity of production : maps must be published at the same time as figured data tables. This means that cartographic representation must be adapted to data accuracy, particularly for the two stages already evoked which provide estimates then provisional results. Then one must choose properly the basic geographic level, and may be give up the notion of exactness linked to a map by tending to unsharp representations.

The second notion covered by the expression "dynamic cartography" is the selection, among phenomena to be mapped, of those which bring an help to anticipation. The verification map, like the one which shows the distribution of the population or its density, must be established, but not necessarily updated with censuses : it will be more interesting to show the various components of the population evolution, the structure per age on which depends the life or extinction of a region or an economic system, to represent birthrate, urbanization, evolution of jobs, agriculture... These maps will be used for planning, much more than verification maps which reveal the past more than they give tendencies for the future.

Budgetary discipline

A census budget generally provides for three stages which are data gathering, data processing and publication of results. It is quite obvious that any side-slipping of the cost of the two stages results in reducing the financial envelope available for publications.

It appears clearly that the cartographic edition can almost never be added a posteriori to budgetized publications. Setting up supplementary estimates takes time and jeopardizes the simultaneous publication of figures and maps, an essential factor already emphasized. Then maps must be part of publications scheduled in the budget, and technical arrangements must be examined in time. This is still extremely unusual and requires an effort of persuasion and training.

Training

The map is a precious tool for communicating the statistical information. It illustrates it for it is first of all an image and its aesthetic quality attracts the reader ; it is in full harmony with our time in which are developing means of visual expression at the expense of textual expression. It synthesizes, but much better than any figure table with linear and sequential reading, it links data geographically and reveals at first sight the force lines of the represented phenome-

non. At last, the map teaches for it brings information in an attractive form which facilitates its storage.

To provide for the future of census cartography, a training effort is to be made, supported by the preceding remarks, to statisticians, planners, educators and general public. Reading a map must be as usual, as easy as reading a text or a figure table ; then understanding geographic phenomena and assimilating knowledge will be easier.

CONCLUSION

The next general census of the French population will take place at the end of the present decade. This leaves time to undertake, through sensitizing and training actions, the preparation of a budgetary item devoted to post-census cartography. Works of research in dynamic cartography are to be undertaken by then, specially by taking advantage of the publication, scheduled for spring 1985 i.e. 3 years after census, of results related to the socio-professional structure of the population. The required financing will be granted but if the statistical cartography proves that it is a planning tool, a tool helping to decide.

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