

Work Session on Geographical Information Systems
(Brighton, United Kingdom, 22-25 September 1997)

Item (iii) of the provisional agenda

GERMANY: NATIONAL REPORT

Submitted by the Federal Statistical Office of Germany ¹

I. INTRODUCTION

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1. GIS technology has been used at the Federal Statistical Office for about ten years. It was introduced to record, store and analyse data on land use. Based on the experience initially gained in conducting a pilot study on establishing a Statistical Information System on Land Use, which was to be based on data on a scale of 1 : 25,000, various applications have been developed for the environmental sector. These projects belong to the area of environmental-economic accounting which focuses on the inclusion of natural resources in depicting the performance of the national economy. The two main applications are described below. Other GIS projects at the Federal Statistical Office are currently under development.

II. GIS PROJECTS

2. **Developing a digital land cover map** on a scale of 1 : 100,000. The activities in the past few years have focused on developing a digital land cover map as part of the implementation of the EU CORINE Land Cover project at the national level. By visual interpretation of satellite image data and subsequent digitalisation, a stock of data on land cover covering the whole territory has been compiled in accordance with the CORINE method. External firms were commissioned to interpret and digitalise the individual map sheets. The data were verified at the Federal Statistical Office and then compiled to form a continuous and seamless stock of data.

3. The respective activities were completed at the beginning of 1997. They involved the development of a large number of computer-aided procedures for verifying the quality of the data produced. In the framework of the activities of the ETC/LC (European Topic Center on Land Cover of the European Environmental Agency), a Europe-wide use of part of these procedures will be possible in the future. Work has now been started to develop a concept for continued collection of land cover data, taking into account the specific conditions prevailing in the individual countries.

4. **Developing environmental indicators.** In an ecological area sampling procedure, areas of a size of 1 km² each are selected. Through aerial photograph interpretation and a field survey of the sample areas, information is collected on all ecological systems found and their basic structural characteristics. Another area sampling procedure based on the biotopes thus specified is carried out to examine the situation of the flora and fauna in a reasonable number of representative areas. Upon expansion, data are obtained on the essential structural characteristics of regions and ecological systems and on the plants and animals living there. The current pilot study will be completed in 1997.

5. GIS support in planning the redefinition of constituencies for the **2002 elections to the German Bundestag**. The number of constituencies will be reduced from the current 328 to 299 for the elections to the German Bundestag scheduled for 2002. As regards the redefinition of constituencies, various criteria have to be met such as ensuring a largely homogeneous number of inhabitants and maintaining as many administrative district and community boundaries as possible. The evaluation system includes a component for comfortably visualising proposals for constituencies and another component for an interactive development of new proposals. The quality of a proposed constituency variant can be judged immediately by the comparative tables provided. The option described above is available in a UNIX notebook. It is used for internal meetings at the Federal Statistical Office and related discussions at the Länder level.

6. The Federal Statistical Office is in charge of the maintenance of the so-called **main community record**. Basically, this record is a sequential data file including, in addition to community codes and names, data on the population and territories of communities. A digital community map forms the basis for various GIS applications. Presently, checks are being made to find out whether the digital community map of the Institute for Applied Geodesy can

be used to produce an official digital community map including additional information derived from the main community record. A product of this kind would be of great interest to public authorities. Instead of paying licence fees for using commercial products, an attempt could be made to market such a basic product as profitably as possible. And, as regards comparable applications in public administration, the data base available would be largely uniform. Initial consideration has been given to the application of GIS in the area of regional statistics and to marketing regional data together with the GIS software.

II. DATA SOURCES

7. The related projects of environmental-economic accounting focus on deriving space and thematic data from cartographic data sources. The essential basis is provided by satellite image data, analogous topographical maps and aerial photographs. Other statistical data collected in general surveys do not play an important role at present.

8. A commercial digital community map, supplemented by, for example, town constituencies, is presently used to provide the basic geometric structure of the constituency information system. In addition, election-relevant data such as population data and community results of the 1994 Bundestag elections, which were recomputed to cover the current territory, have been integrated into the system.

III. OUTPUT

9. The land cover map described in paragraph 2 provides a data base that is used internally for other applications as well. It serves, for instance, as a basis for drawing space-related samples in the framework of ecological area (see paragraph 4). A CD-ROM including these data was produced for the purposes of external users. The product encompasses the land cover map in various data formats, permitting GIS software-based further processing together with additional data. The CD also includes a comprehensive metadata information system which provides users with detailed information about data sources, the classifications used, the process of data production and also with general maps.

10. The constituency information system (see paragraph 5) also comprises a comprehensive plot creation component by means of which large-format constituency maps can be produced. Though in a slightly modified form, this system will be employed during the 1998 elections to the German Bundestag to reflect the election results in publications in the form of thematic maps.

IV. HARDWARE AND SOFTWARE

11. The software products used for GIS applications at the Federal Statistical Office are Arc/Info and ERDAS Imagine on UNIX workstations. Two workstation servers and six graphics workstations are available in a network for the work. In addition, a UNIX notebook is available specifically for election purposes. Extensive peripheral equipment (A1 plotter, A0 pen plotter, two digitisers, Exabyte driving mechanisms, DAT streamer, optical driving mechanism, CD driver, CD burner) has been provided. The work is based on a total of eight Arc/Info and three ERDAS Imagine licences.

12. The application of ArcView 2 as desktop GIS has been tested. However, this product is not yet applied on a large scale. The results of the Ecological area sample pilot project are intended to be presented in an information system on the basis of ArcView.

V. PERSONNEL AND FUNDS

13. Basically, three staff members of the higher service, three cartographers and two statistics staff members possessing very good GIS know-how have worked on the above-mentioned applications in the context of environmental-economic accounting. Support and close cooperation in this work has been provided by the data processing department of the Federal Statistical Office. In this context, the DP department has been in charge of selecting the hardware and software, giving advice with reference to GIS applications, and developing application programs (including graphics and user interfaces). Two service staff members and one programmer were available for performing the activities outlined above. The UNIX operating system has been maintained by other members of the DP department.

14. So far the prevailing number of GIS applications including personnel required have been financed from external research funds. This has contributed to the relatively fast development of the necessary infrastructure. The maintenance and upgrading of the GIS infrastructure have been integrated into the general DP work of the Federal Statistical Office. Due to the project structure, however, the work of some staff members in the GIS area is based on limited employment contracts which can be prolonged by follow-up projects only.

15. In view of the generally deteriorating financial situation of statistics, a further development of GIS could only be supported if this technology can facilitate statistical rationalisation and reduction of costs, or if products were obtained which could be sold to refinance the additional GIS investments.

VI. FUTURE PLANS

16. At the Federal Statistical Office, GIS has only been employed in the framework of specific projects briefly outlined in this article. In the course of time, a detailed know-how has been developed in the context of GIS-related work. This know-how might serve to efficiently use GIS applications in other areas of statistics as well. At the beginning of 1997, the further application of GIS in German official statistics was reconsidered. The heads of the Federal Statistical Office commissioned the Environmental-Economic Accounting division to coordinate the application of GIS at the Office and to make proposals for further action, which also includes the development of new fields of GIS application where that technology can be efficiently used to enhance statistical production. However, the federal structure of German official statistics makes the discussion of the above issue somewhat difficult. Since the statistical offices of the Länder are in charge of conducting surveys and analysing regional data, detailed coordination is required.

17. It is planned to coordinate agricultural statistics for the areas of actual and planned uses with the GIS activities of the Environmental-Economic Accounting division in the medium-term. And, following the example of Switzerland, the production of a statistical map for data distribution has been given first priority.

18. Furthermore, in the context of ETC/LC-based activities, procedures for verifying the quality of land cover data will be developed in late 1997/early 1998. They will be used at the European level. There is also a demand for land use data on a scale of 1 : 25,000. The launching of the project on specification of digital topographical maps on a scale of 1 : 25,000, which were produced in the framework of the ATKIS project of the land surveying administrations, is scheduled for this year. These topographical maps partly include detailed information on land use. By means of generalisation, the stock of data available is to serve the updating of the stock of land cover data on a scale of 1 : 100,000.