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**GIS in Switzerland: Synopsis on spatial data in statistical
and other federal and cantonal offices in Switzerland**

by

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The Swiss system of government

The federation or confederation is the Swiss designation of the State, and by constitution it is assigned the political authority for areas such as foreign and security policy, customs and monetary policy etc. Tasks which do not expressly fall within the province of the Federation are handled by the next lower level, i.e. by the cantons.

Switzerland consists of 23 cantons, three of which are divided into two half-cantons for historical reasons (Fig. 1). The cantons – often referred to as the “states” – are the original states which joined together to form the federation to which they transferred part of their sovereignty in 1848. They differ greatly among each other as far as population size, surface area, or the administrative system is concerned, since their number and boundaries are almost entirely historically defined.

All cantons are divided into political local authorities, the so-called “communes”, of which there are at present a few more than 2900. Their number is tending to diminish as local authorities combine. The communes are entrusted the authority on specific fields such as population register, civil defense, education and social welfare, energy supply, road building, local planning, taxation etc. The scope of local authority autonomy is determined by the individual cantons, and therefore varies widely. For specific purposes, cantonal as well as local authorities collaborate in various ways in order to cope with problems which cannot be tackled efficiently alone. For the moment, such intermediate structures are not relevant in the field of geo-information, however.

The GIS data inventory of the Swiss Informatics Conference

The Swiss informatics conference (SIK) is a consultative institution of the federal and cantonal administrations. Its objective is to promote the collaboration between all members of public administration in the field of information technology. To achieve this, it provides a framework for a systematic exchange of information, experiences and infrastructure elements. In different working groups subjects such as telecommunications and data exchange, training and formation, office automation, project management as well as geographic information systems (GIS) are discussed in detail. These working groups also try to agree on solutions for acknowledged common problems and take the initiative in regard to coordination of activities and standardization.

The GIS working group (SIK-GIS) exists since 1990 and presently consists of representatives of six cantons (Aargau, Bern, Geneva, Lucerne, St. Gallen, Zurich) and two federal offices (National Mapping Authority including the Swiss Cadastral Surveys Direction and Swiss Federal Statistical Office). Based on a publication issued in 1992 containing recommendations for GIS implementation in the public administration, the group recognized that an inventory on the continuously increasing publicly available GIS data would meet an important and wide-spread need. Since the geographic or spatial data administered in a GIS are hardly self-explaining, metadata on GIS data is indispensable.

The SIK-GIS group finally agreed on a data model for such an inventory and financed the development of a PC-based database application for the collection and administration of such a metadata inventory. In 1997, the first data collection survey in the public administration of all cantons as well as many federal government offices was organized. Although participation in the survey was and still is not compulsory, the response rate was quite high, proofing that the advantages and necessity of such an inventory is widely accepted. Last year, another attempt was made to completely update the inventory and to motivate additional cantons and federal offices to join the common effort and describe their data according to the specifications of the SIK-GIS inventory.

The inventory contains address information on the participating institutions (names of persons in charge with GI aspects), but its major focus is on GIS data itself which is described according to the following list of topics:

- Data title, project, scope
 - Hierarchical thematic definition according to a data catalogue and a few predefined subject areas
 - Important attributes
 - Data geometry and topology
 - Spatial coverage
 - Scale and generalization
 - Data collection and data capture (methodologies and starting/finishing times)
 - Actualisation and updating
 - Potential fields of application and legal reliabilities
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- Data access and eventual restrictions
- Data costs and emoluments
- GIS systems or software used and supported formats for data delivery and exchange
- Address information of the copyright holder and for technical as well as thematical information

The SIK-GIS inventory is maintained presently by the GEOSTAT service of the Federal Statistical Office and corresponds ideally with one of the main tasks of GEOSTAT, namely to provide access to a wide variety of publicly available GIS data covering the entire surface of Switzerland.

GIS in the Swiss Federal Administration

Switzerland is governed by seven federal counselors, each of whom is heading a government department (in other countries, these functions are referred to as ministers and ministries). The departments are subdivided in a certain number of offices and other institutions such as (research) institutes, groups, and military administrative units. Fig. 2 illustrates the present organization scheme of the Swiss federal administration.

Among the approximately 100 relevant federal government institutions, only around a dozen actually use GIS, spatially referenced geo-data, or can be considered as data producers. We can classify them into three categories according to their importance in regard to geo-information.

The following five institutions may be considered major players, both using large GIS installations for their own, specific purposes as well as being important producers of GIS data (indicated with the number of GIS data sets described in the SIK-GIS inventory):

- | | |
|--|----|
| • Swiss Agency for Environment, Forests and Landscape | 12 |
| • Swiss Federal Research Institute for Forests, Snow and Landscape | 44 |
| • Swiss Federal Statistical Office | 28 |
| • Swiss Federal Office of Topography | 15 |
| • Swiss Federal Office of Water and Geology | 20 |

Among the GIS users and data producers of medium importance are

- | | |
|--|----|
| • Federal Research Institute for Agroecology and Agriculture | 18 |
| • Swiss Federal Office of Agriculture | 1 |
| • Swiss Federal Office for Regional Planning | 22 |

Altogether, the Swiss federal administration accounts for about 200 GIS data sets or roughly one quarter of the publicly available GIS data in Switzerland according to the SIK-GIS data inventory.

GIS in cantonal administrations

From the 26 cantonal administrations in Switzerland, 17 have participated in the initial data collection effort in 1997 and provided information on their GIS data, while 14 have updated their earlier information and/or described new GIS data sets last year. Altogether, the SIK Data Inventory offers information on GIS data from 21 cantons today.

13 cantons have set up a dedicated GIS coordination center within their administration, including two cantons which did not participate in the SIK data collection effort (GR, VD). These 13 cantons may be considered the most active cantonal players in the field of spatial and geographic information and data processing. It may be of interest that there are only seven cantonal statistical offices actively involved in collecting and exploiting GIS data (AG, BL, FR, GE, LU, VD, ZH). Fig. 3 illustrates the distribution of cantons with GIS centers and with statistical offices active in the cantonal GIS infrastructure.

As the Swiss cantons are very different concerning their size and population (Fig. 1), they exhibit also completely different approaches regarding the use of GI technology and the production of GIS-compatible data. The most important of all the cantons in this regard, Aargau, already accounts for more than 240 data sets or roughly one quarter of all GIS data reported in the SIK Inventory. Even though this could be attributed partially to a inconsistent perception of what is actually a GIS data set (worth to be described in the inventory), it is still obvious, that, specifically, the cantons of Aargau, both Basel, Geneva, Lucerne, Zug and Zurich, are most advanced in this field, accounting for 550 described data sets or about 60 % of all public GIS data in Switzerland.

Similar differences can be found regarding the various cantonal offices and administrative institutions involved in the respective GIS network or GIS activities. Topping the others in this regard are Zurich (24 institutions) and Geneva (20). Fig. 4 illustrates the distribution of GIS data and “GIS institutions” among the Swiss cantons and also indicates the significant dominance of ESRI products among the cantonal institutions equipped with GIS software.

It is interesting to note that within the cantonal administrations, environmental and planning offices seem to be clearly the most involved in GIS data collection and GIS use in general. Fig. 5 illustrates the relative importance of different categories of “standardized cantonal offices” in regard to their presence in the SIK-GIS data inventory.

Range of available data

A majority of the described GIS data is related to local and regional planning as well as nature inventories and protected zones, which coincides nicely with the majority of the cantonal offices involved in GIS. Other important subject areas are cadastral surveys (these are the only type of GIS data available in a few, mostly smaller sized cantons), water/hydrology, and vegetation and land use. Fig. 6 illustrates the distribution of the GIS data classified according to the subject data catalogue of the SIK-GIS inventory.

About half of all GIS data have a polygon topology, half of which is combined with either point or line topology or both. Next in importance among the GIS vector data rank point data, followed by line data. Only 125 of the 960 data sets are raster data. Fig. 7 illustrates the distribution of GIS data according to its geometry and topology.

Range of available systems and software

Among the GIS systems, the ESRI products ARC/INFO and ArcView are clearly dominating. Among other products which were named several times, we find

- MapInfo
- Intergraph Microstation and MGE
- ARGIS

Conclusions

With the SIK-GIS data inventory, Switzerland is fortunate enough to have an instrument which gives a reasonably complete overview on the GIS data sets available in any of its federal or cantonal offices. Although the technical realization of this instrument is undoubtedly outdated and not fancy at all, its data content must be considered unique and of a high value. Besides of the PC application, the SIK-GIS group has also made available the major contents of the data inventory via the internet: <http://www.kogis.ch/sik-gis/index.htm>. This internet presence should be expanded and updated in the coming months. In the long term, however, such essential information will have to be served to the net users by a dynamic database rather than with simple and therefore inflexible HTML pages. This would simplify the administration significantly and make immediate updates and amendments of its data content feasible and painless.

Figure 1: Switzerland and its cantons

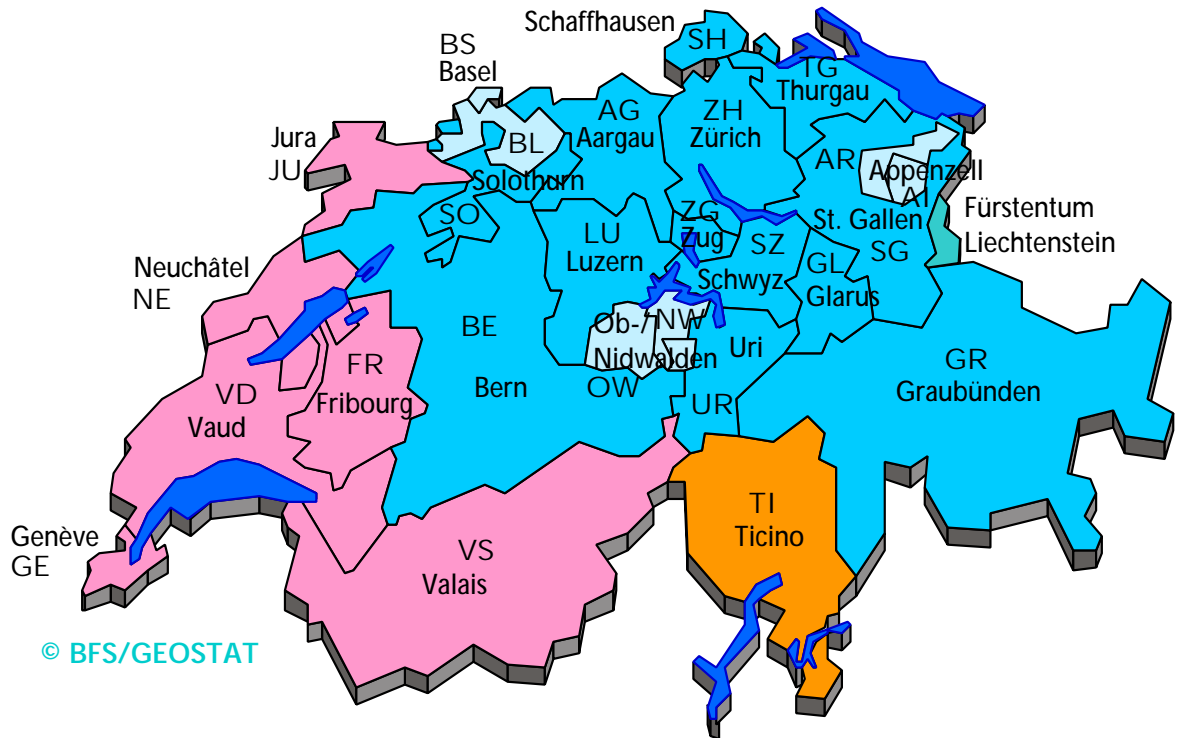


Figure 2: Organization of the Swiss federal administration (simplified)

Department of Foreign Affairs	Department of Home Affairs	Department of Justice and Police	Department of Defence, Protection of the Population and Sport	Department of Finance	Department of Economic Affairs	Department of Environment, Transport, Energy and Communications
Directorate of Political Affairs	Federal Office for Equal Opportunities for Men and Women	Federal Office of Justice	National Survey Office	Federal Finance Administration	Secretary of State for Economics	Federal Office for Transport
Diplomatic and Consular Representations of Switzerland abroad	Federal Office for Cultural affairs	Federal Office of Police	Chief Auditor's Office	Federal Personnel Office	Federal Office for Agriculture	Federal Office for Civil Aviation
Directorate for International Law	Swiss Federal Archives	Federal Aliens Office	Federal Sports Office	Federal Insurance Fund	Research Institute for Agroecology and Agriculture	Federal Office for Water and Geology
Directorate for Development and Cooperation	Swiss Meteorological Establishment	Office of the Federal Prosecutor	Federal Office for Civil Defence	Federal Tax Administration	Federal Veterinary Office	Federal Office of Energy
	Federal Office for Public Health	Federal Office of Private Insurance	General Staff	Federal Customs Administration	Federal Office for Professional Training and Technology	Federal Office for Highways
	Federal Statistical Office	Federal Office for Regional Planning	Army	Federal Alcohol Administration	Federal Office for Strategic Supplies	Federal Office for the Environment, Forestry and the Landscape
	Federal Social Insurance Office	Federal Office for Weights and Measures	Air Force	Federal Office for Information Technology and Telecommunication	Federal Housing Office	SIK: GIS member and important producer of GIS data
	Federal Military Insurance Office	Federal Office for Refugees	Armaments Group	Federal Buildings and Logistics Office		Important producer of GIS data
	Science and Research Group	Federal Institute for Intellectual Property				Producer of GIS data
	Research Institute for Forests, Snow and Landscape					

Figure 3: Cantonal GIS centers and statistical offices using GIS

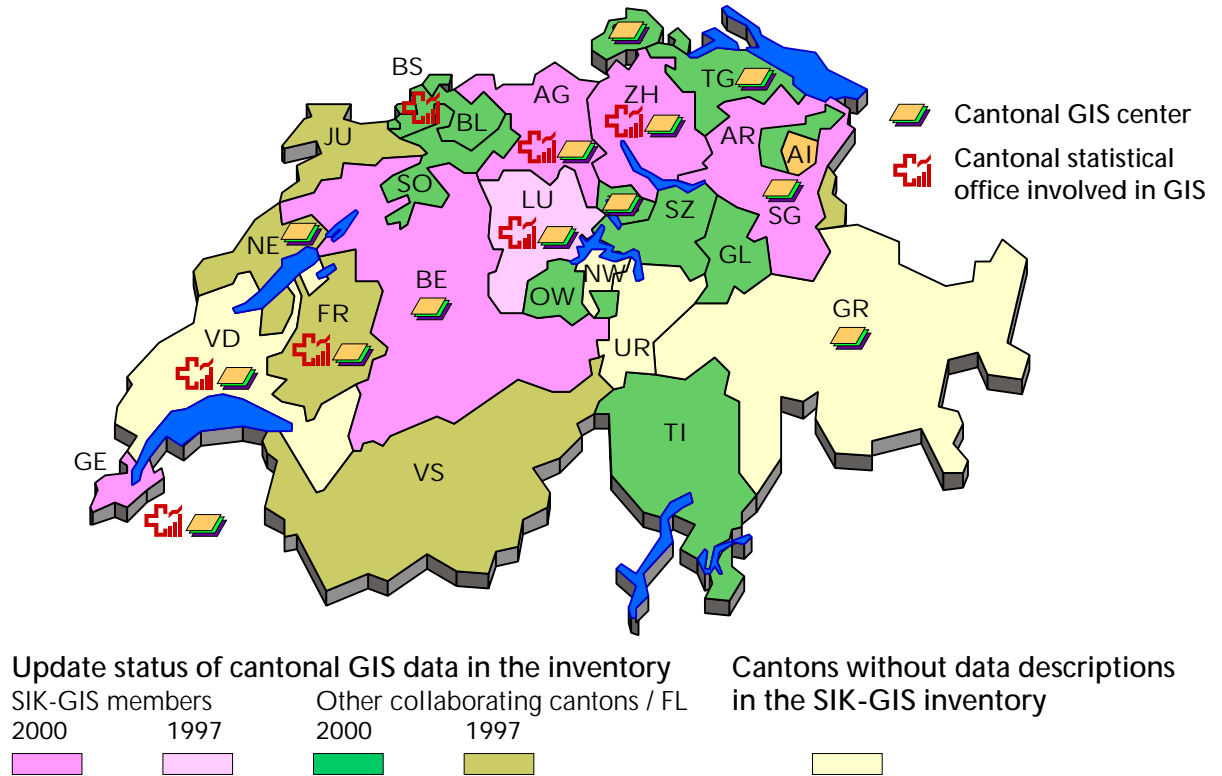


Figure 4: Number of GIS data sets and participation of cantonal offices in the SIK-GIS data inventory

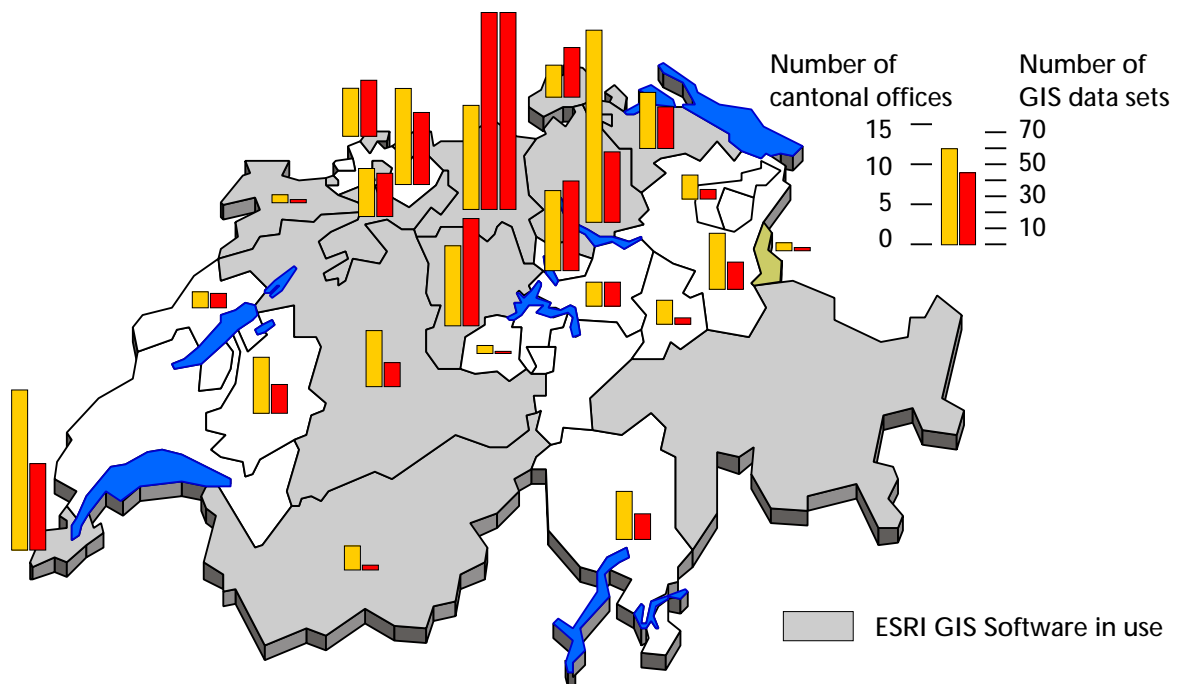


Figure 5: Representation of different "standard types" of cantonal offices in the SIK-GIS data inventory

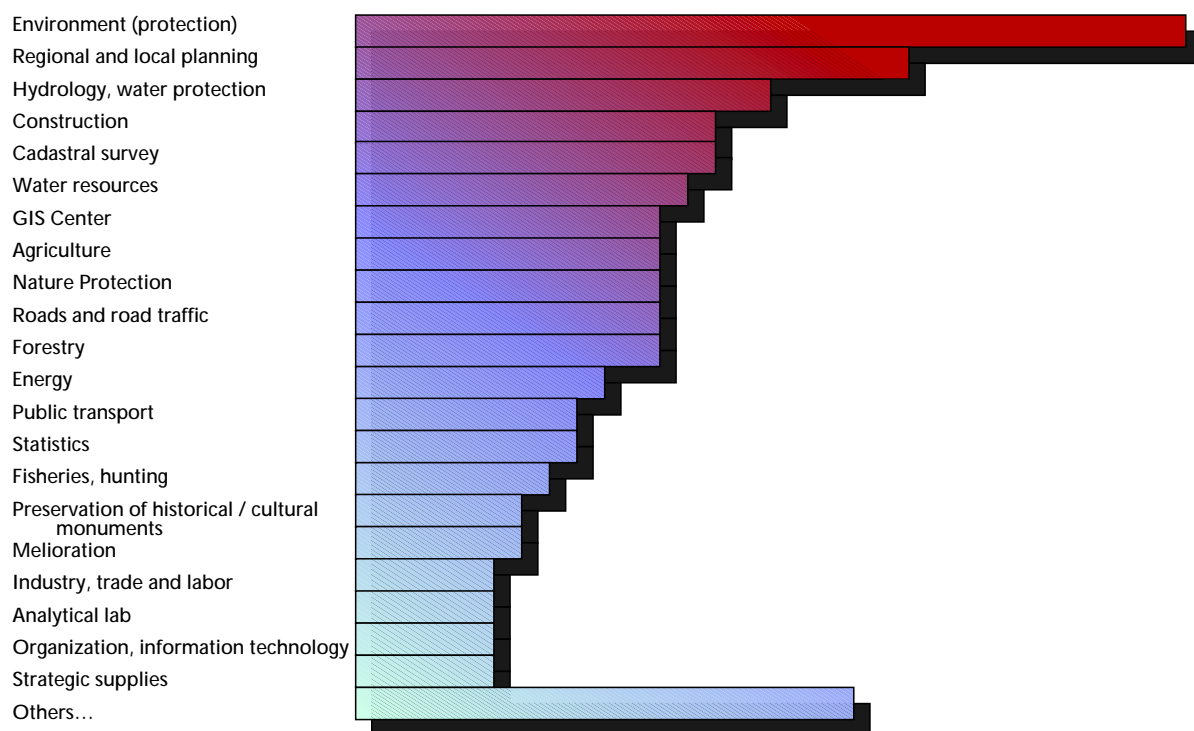


Figure 6: Publicly available GIS data according to thematical subject area

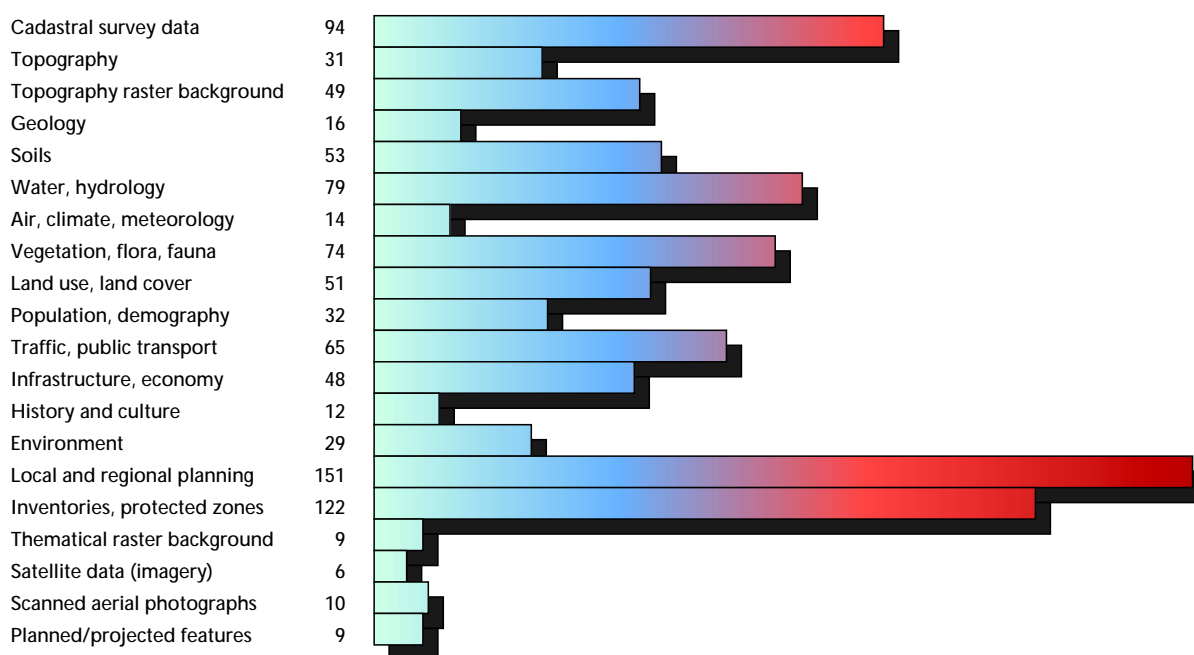


Figure 7: Publicly available GIS data according to its geometry and topology

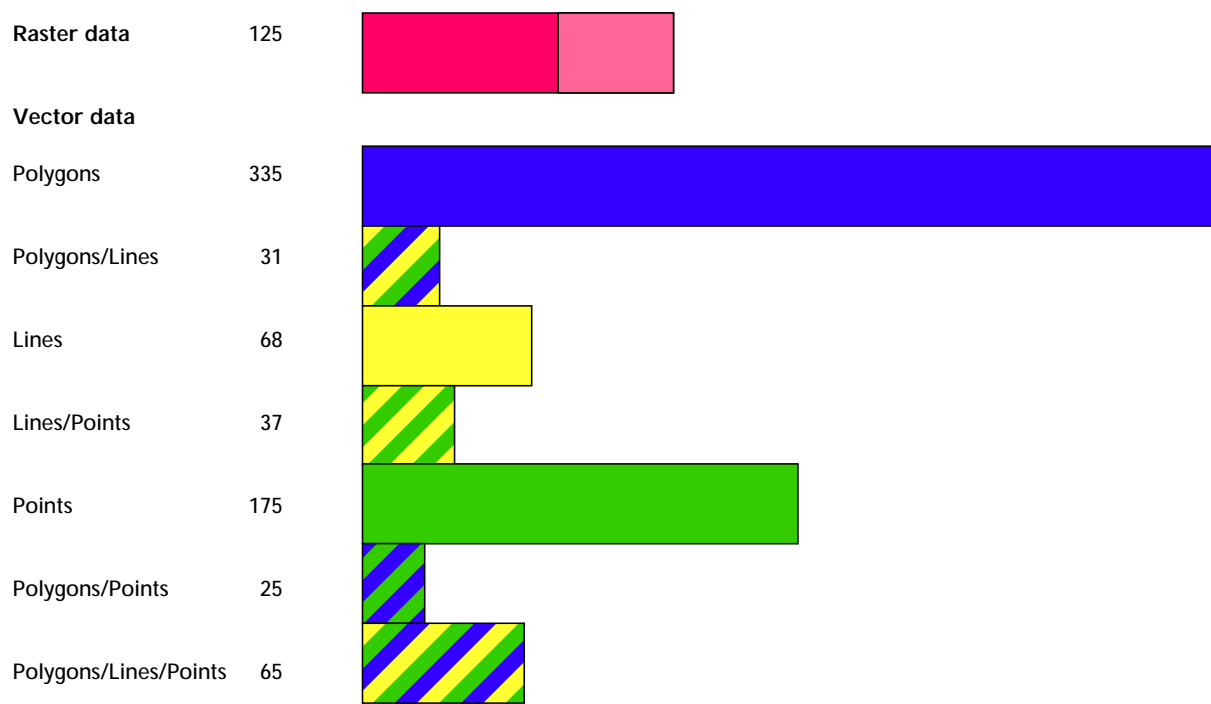


Figure 1: Switzerland and its cantons

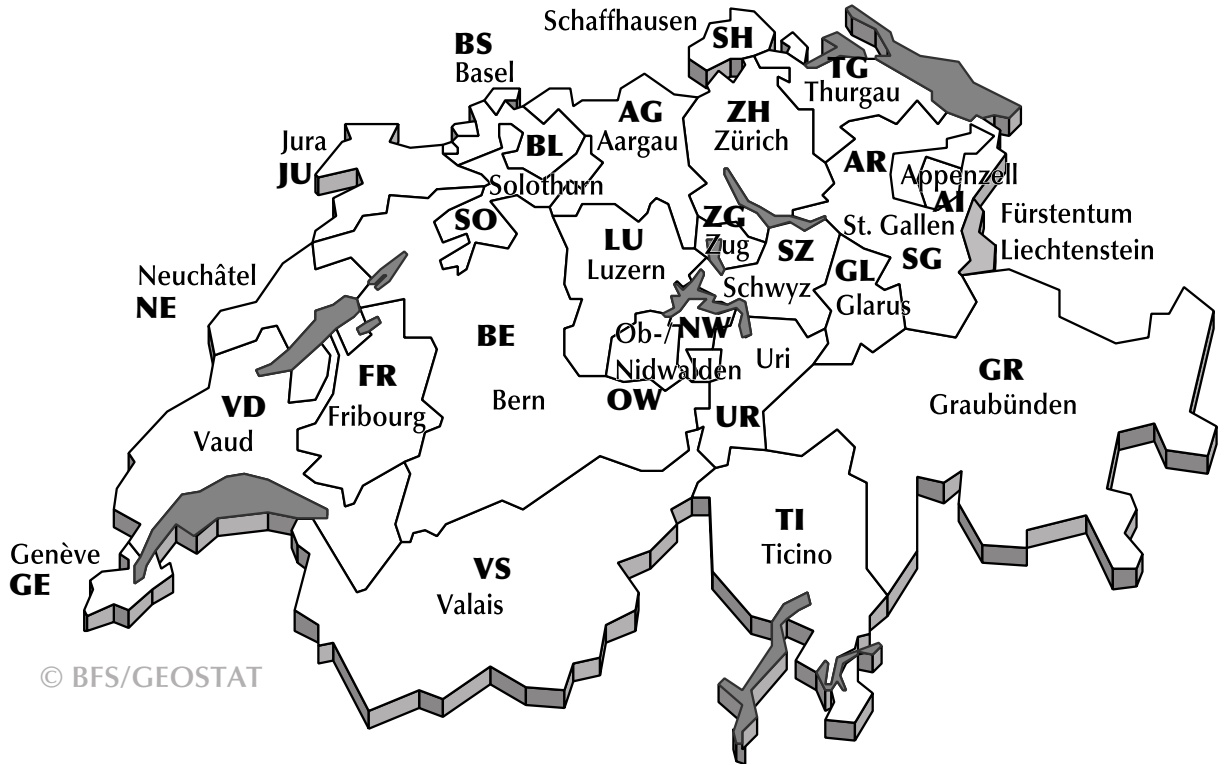


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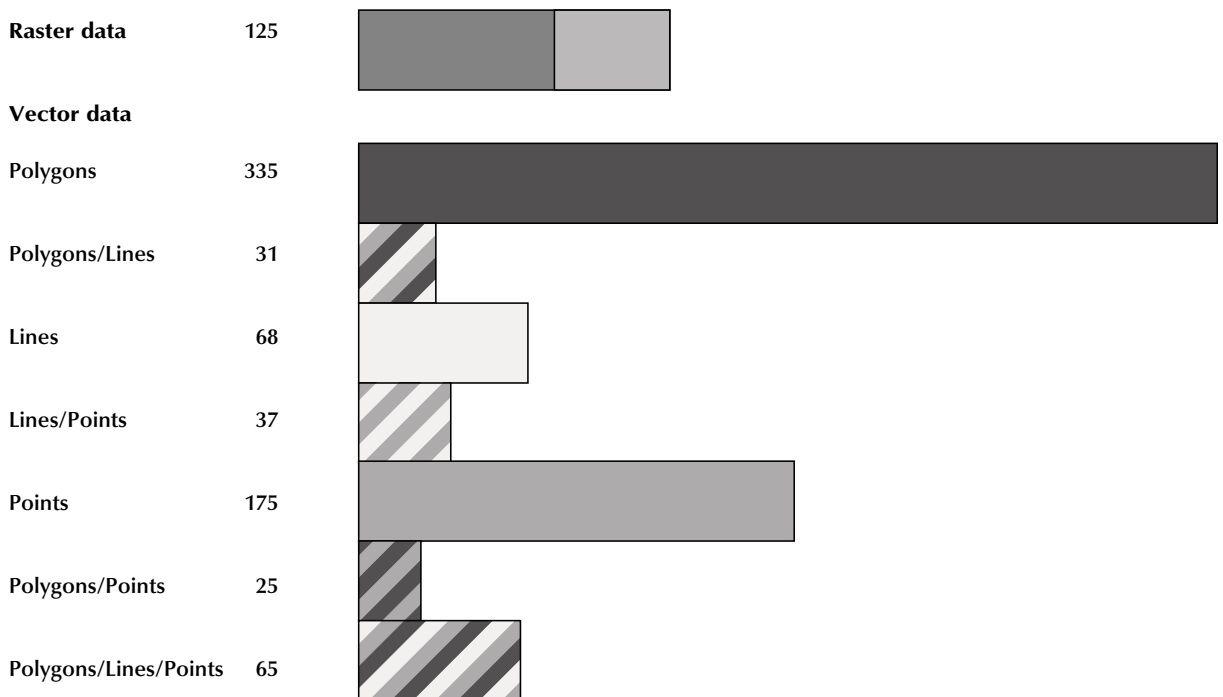


Figure 3: Cantonal GIS centers and statistical offices using GIS

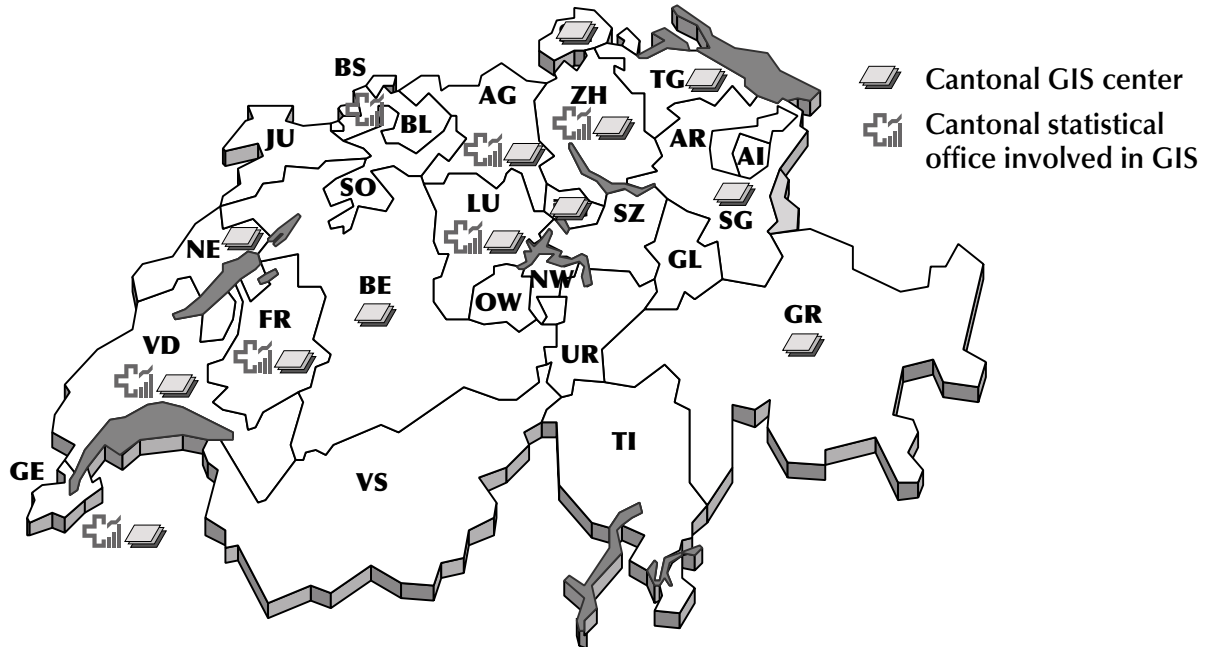


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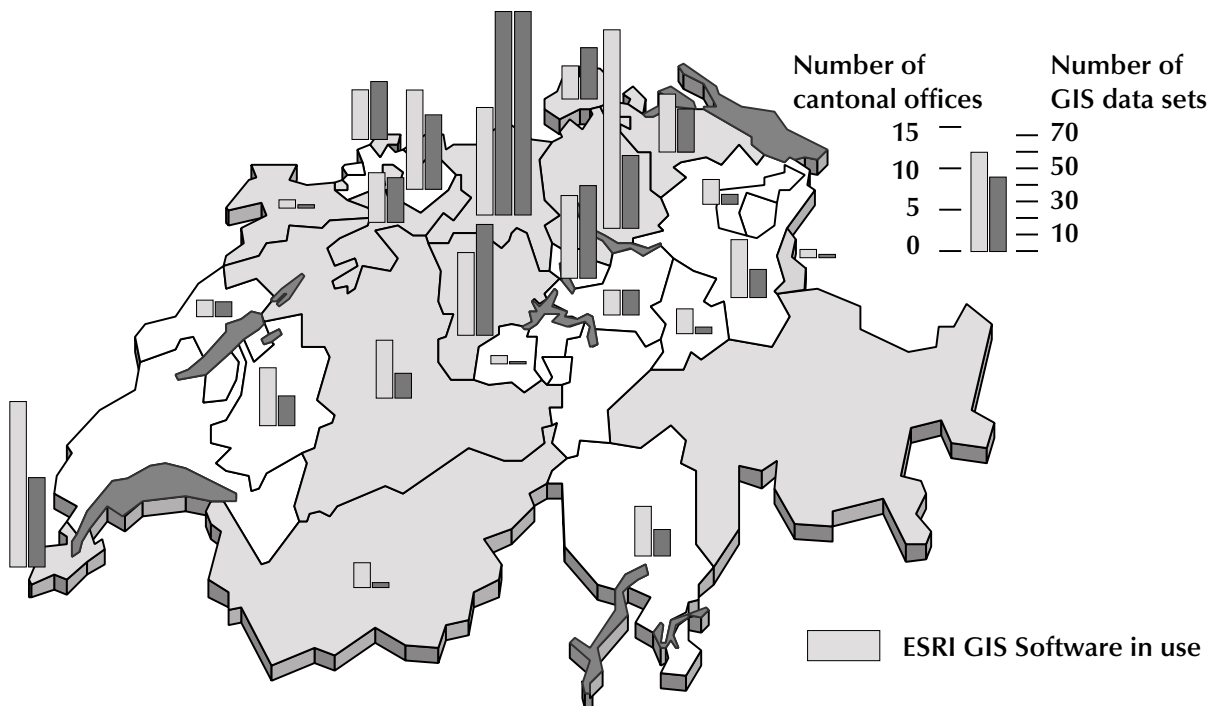


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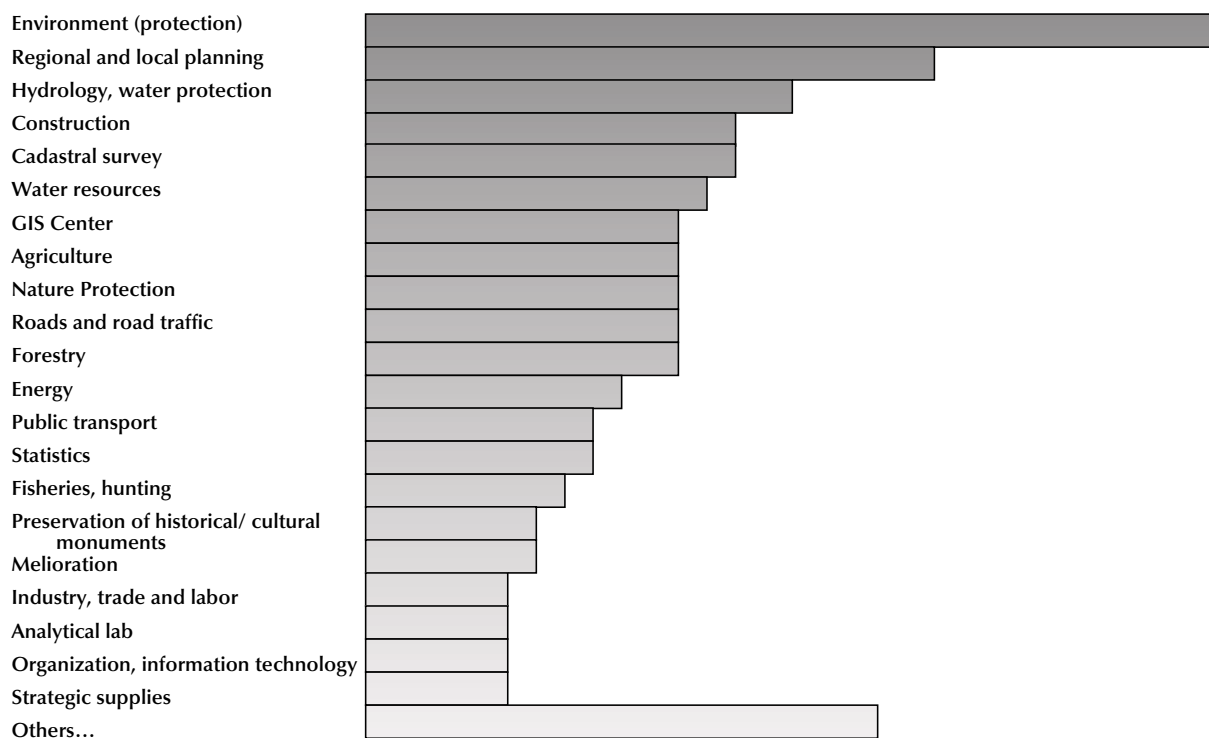


Figure 6: Publicly available GIS data according to thematical subject area

