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Practical cases of integrated sustainable irrigation planning tools

Les outilles pour un plan d'irrigation intégrée et soutenable: Des cases pratiques

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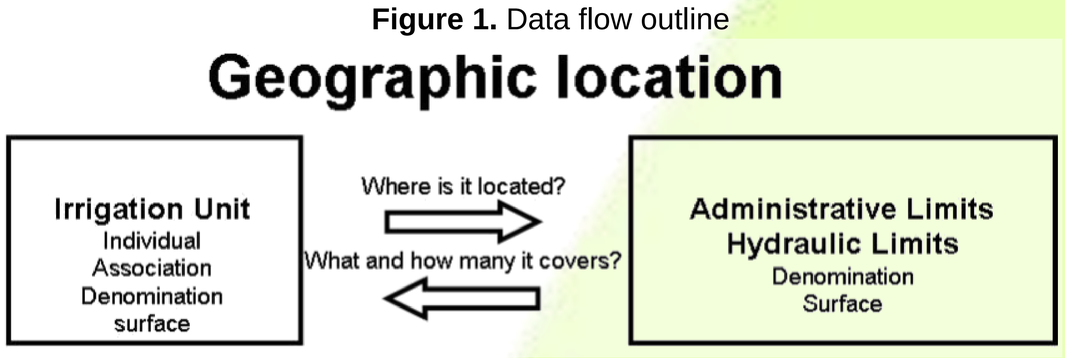
ABSTRACT: *Adequately irrigation planning should consider a group of assorted sources of data that must be globally integrated to analyze their interactions, as the activity sustainability cannot be separated from its environmental sustainability. In the irrigation planning tools designed at the Studies and Consulting Department in the TRAGSA Group there is a series of descriptors for each group of parameters as organization, agronomics, economy, society, climate, soil, environmental legislation, and environmental problems, to globally integrate activity and environmental sustainability.*

An appropriated software interface, covering geographical and alpha-numeric features, must be able to give a comparable integrated vision of the irrigated homogeneous zones. The sustainable management tool must process all available data in the most transparent way avoiding gross aggregates that could hide significant information. Geographic Information System provides adaptable resources for public information access. Monitoring should also be implemented as a systematic updating methodology.

As a conclusion, coordination, technological transference, irrigators and water management agencies behaviour and environmental appraisal of traditional irrigated areas are items to developed

Figure 1. Data flow outline



RELEVANT PARAMETERS

- **ORGANIZATION:** The level of detail of the discussed tools has been determined by this categorization and the availability of data often confronts the problem of inaccurate aggregation.
  - ✓ **Descriptors:** Regions, counties, water agencies zones…
- **AGRONOMICS:** Characterization of the established irrigation state is indispensable, not only to get an accurate diagnosis but to focus the future goals.
  - ✓ **D:** Annual changes in irrigable and irrigated area, irrigation practices, main crops…
- **ECONOMY:** Economic sustainability extremely relies on changing international markets and energy costs.
  - ✓ **D:** Agricultural production, water revenues, agricultural subsidies, MOM costs…
- **SOCIETY:** Cultural and historical reasons explain the established irrigated systems.
  - ✓ **D:** Land ownership, irrigators mean age, employment in irrigation
- **WATER RESOURCES:** Water is the most relevant resource in the irrigation plan, but usually from a very hydraulic, non hydrological, consideration.
  - ✓ **D:** Water abstraction, delivery and supply, security of entitlement supply, applied water quality…
- **CLIMATE:** More profitable crops can be adapted to new conditions through irrigation but agri-climatic characteristics keep its critical role.
  - ✓ **D:** Drought frequency, frost period, evapotranspiration
- **SOIL:** Sometimes a secondary resource in modern irrigation its quality decrease implies new environmental impacts.
  - ✓ **D:** Pedological class, slope, available water capacity…
- **ENVIRONMENTAL LEGISLATION:** The application of environmental laws is one of the most emerging topics.
  - ✓ **D:** EIA process, High Value Nature Areas intersected, declared boundary of nitrate vulnerable aquifers, endangered species in the area…
- **ENVIRONMENTAL PROBLEMS:** Irrigation is connected to a series of well known consequences, mostly because of a misuse of agronomics techniques.
  - ✓ **D:** Area suffering saltification and waterlogging processes, decrease in watertable depth, recharge/pumping balance …

PLANNING TOOLS

The TRAGSA Group has over 30 years of professional experience in forestry, environment and agricultural issues and is a point of reference in the performance of studies, projects and works related to all aspects of irrigation. The most important destination for engineering and consultancy generated by this enterprises group are competent authorities in agriculture and water management in Spain, South America and Northern Africa and therefore much of the job involves tool design for irrigation planning.

Figure 2. Graphic menus and features

The tools described in this paper have been specifically developed by the Studies and Consulting Department of the TRAGSA Group with the support of some other Departments. These tools can be applied to different areas, depending on either geographic scale or infrastructure development characteristics. A series of descriptors for each group must be entered in the corresponding datasheets.

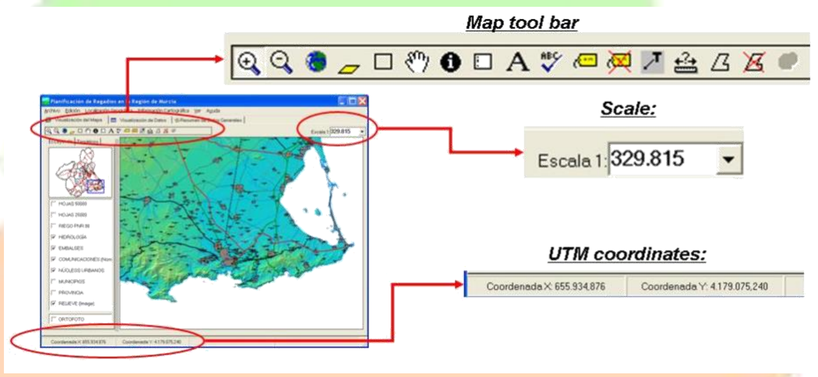


Figure 3. GIS interface

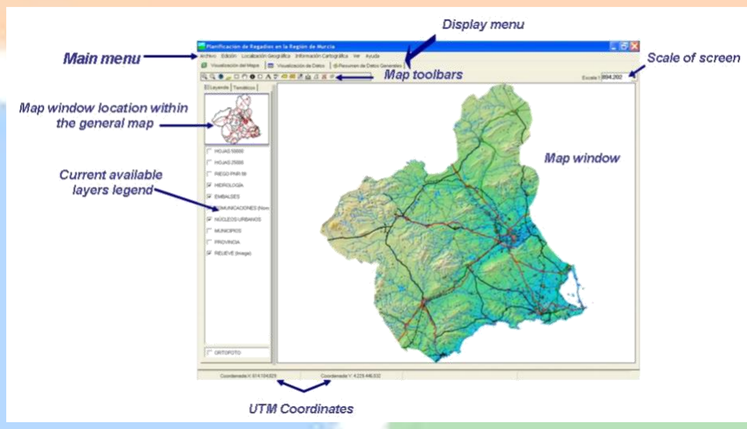


Figure 4. Predefined report within the GIS application

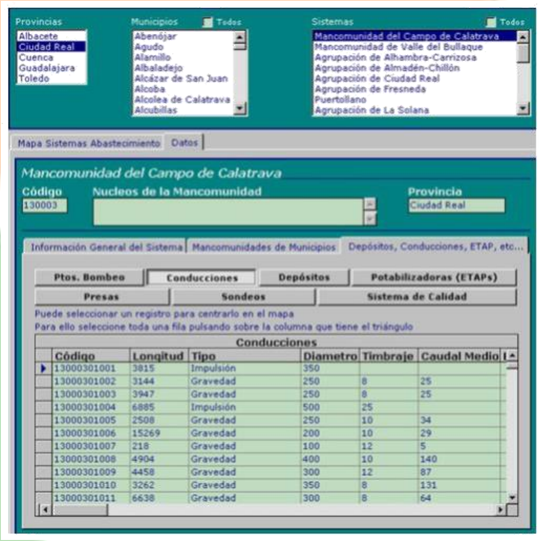


Figure 5. Location of a georeferenced image

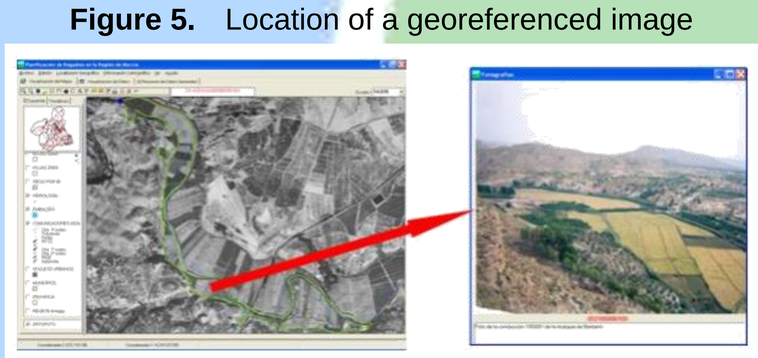


Figure 6. Display of two information types: graphic and alphanumerical

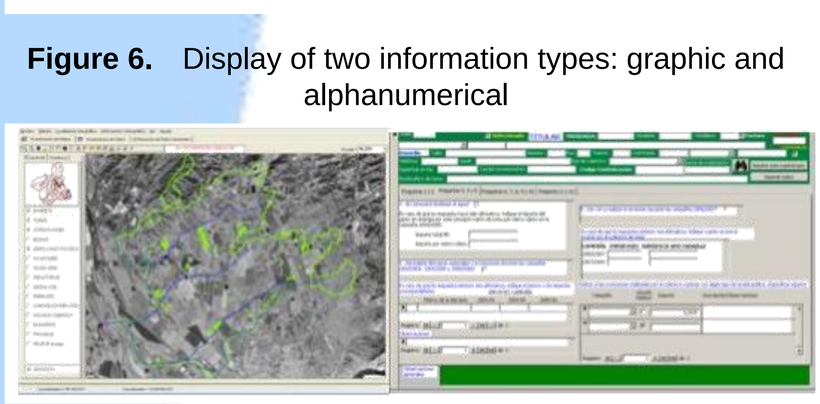
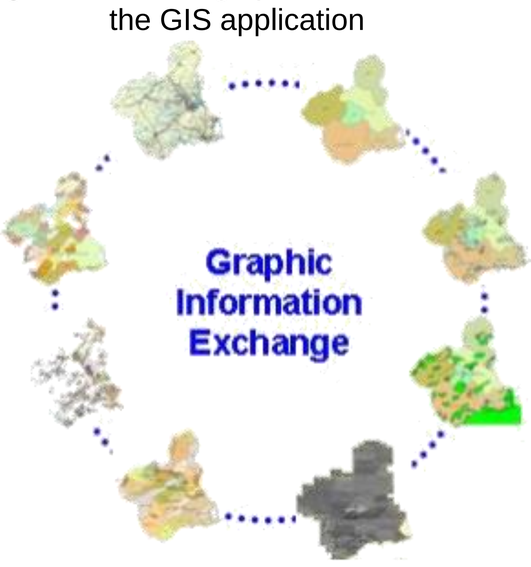


Figura 7. Exchange possibilities within the GIS application



CONCLUSIONS

- ***Coordination is the keyword to get a bigger and better amount of data from institutions and administrations, especially when economic resources for data collection are seriously limited.***
- ***Multifactor software programs, including data bases and GIS, present a very affordable tool to integrate sustainability criteria in daily water management.***
- ***Technological transference has become imperative because of the low knowledge flow between environmental research institutions and those responsible of water management.***
- ***Irrigators and water management agencies must change their usual ways to implement environment-friend techniques that can guarantee a more integrated approach.***
- ***Environmental appraisal of traditional irrigated areas must be developed to assess their unperceived environmental values.***

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