# the “progetto siepi©” and the decision support system PLANLAND©®

a plan-design for the rural landscapes ecological amelioration
and
its GIS Decision Support System

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# what is the “Progetto Siepi©”

- is the result of a landscape amelioration planning process, based on the (re) introduction or the improving of the agroforestry systems (hedgerows, linear forests, buffer zones, woodlots…) in a rural or suburban landscape
- the final output is a GIS based map, that displays both planned and existing agroforestry systems (and their associated ecological, social and economic databases), and a technical report

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# what is the "Progetto Siepi©"

- a series of design solutions are proposed for each planned new agroforestry system, that
  - are the most adapted to the pedo-environmental site condition
  - offer to the land owner a range of functional solutions (maximizing the timber production, or the crop wind protection, or the overall aesthetic value of the site, etc.)

# what is the “Progetto Siepi©”

- the analysis and the design are driven by a GIS Decision Support System (PLANLAND©®) that
  - allows quali-quantitative evaluations of the designed solution
  - allows a multi scalar comparison of the impacts from the farm to the landscape level
  - results transparent in the elaboration process and in the outputs

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# what is the “Progetto Siepi©”

- the evaluation account for
  - the agroforestry and crops incomes
  - the non point source pollution control
  - the windbreak effect
  - the landscape perceptive effect induced by the planning/design process
  - the influence on biodiversity (indirect inference)

# what are the advantages of the "Progetto Siepi©"

- the evaluations are based on ecological, environmental, economic, agronomic and ownership geo-referred information
- each land transformation is based on site constrains, on design solutions, and on verified relations between them
- all these relation are scientifically supported and tested

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# what are the advantages of the “Progetto Siepi©”

- it *does not* try to rule the land use by means urban *standards*, that:
  - were developed to rule the urban building but are inadequate to imitate the whole processes of an ecosystems mosaic
  - tend to generate, trying to imitate this complexity, intricate rules’ systems often complicated or vexing

# the "Progetto Siepi©" and the ecological network planning in rural areas

- the "Progetto Siepi©" and the DSS used to implement it (PLANLAND©®) can contribute to the ecological network planning in rural areas, in the perspective of the new EU *rural development* policy incentives
- the planning response to the rural development policy goals are based on a strongly scientific and verifiable approach

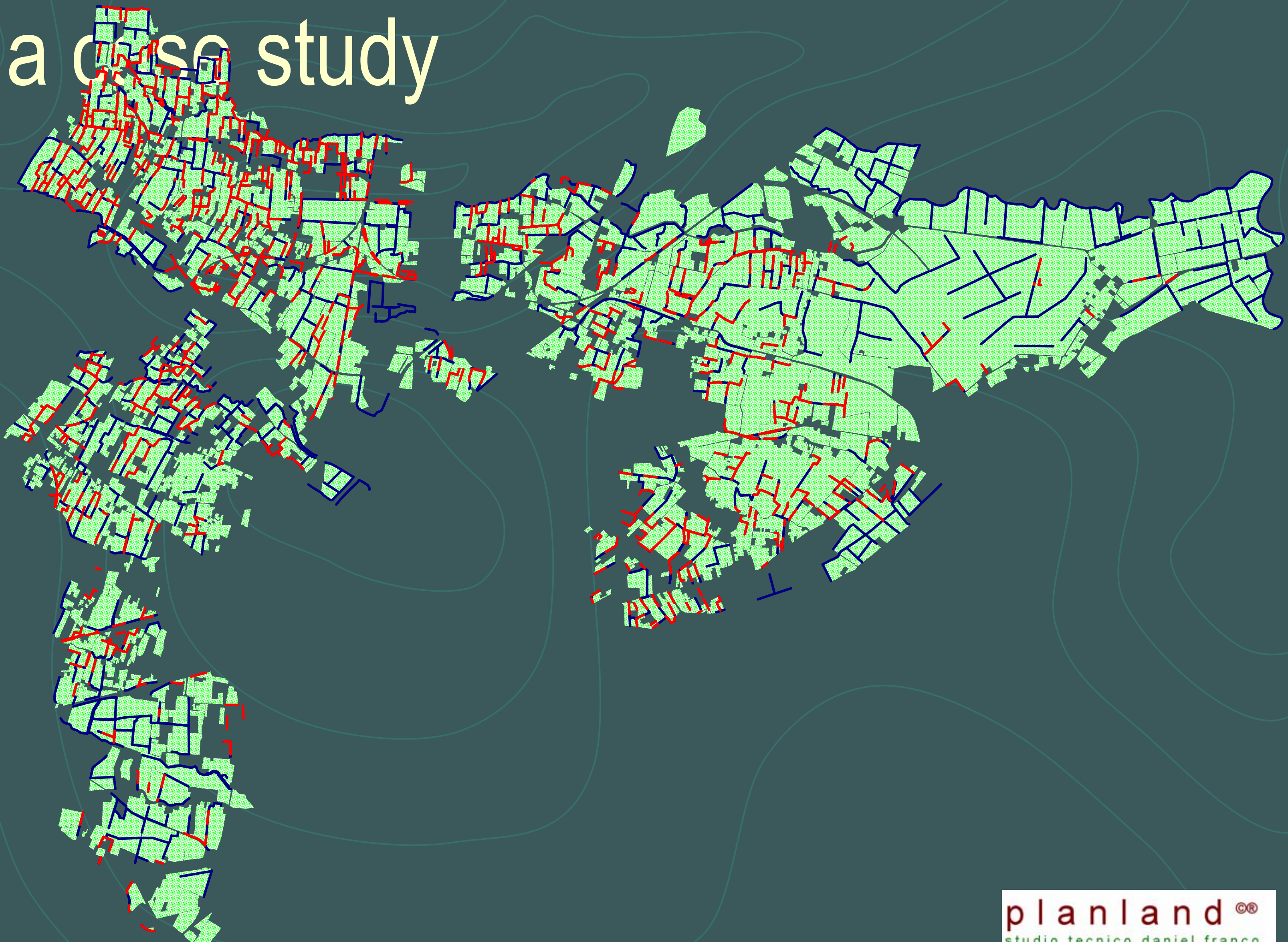
# how it enters in the global landscape planning process

- it can be a structural element of a specific local planning tool (at the county, municipality or province scale), or it can be used as a module in a wider spatial planning process
- it can be joint in a second moment  to an existing plan
- it can replace in an efficient and effective way the “abacus” and the regulation bodies on rural landscape with a single rule that refers to the  “Progetto Siepi©” for the suggested landscape transformations
- *it can be constantly adapted and updated*

# a case study

- the agroforestry ecological network of the Venice Municipality: the "Progetto Siepi©"

# a case study



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# the PLANLAND©® Decision Support System

- it is based on a *Landscape Ecology* approach from the theoretic and methodic point of view
- it has been continuously verified an updated by specific researches and literature data

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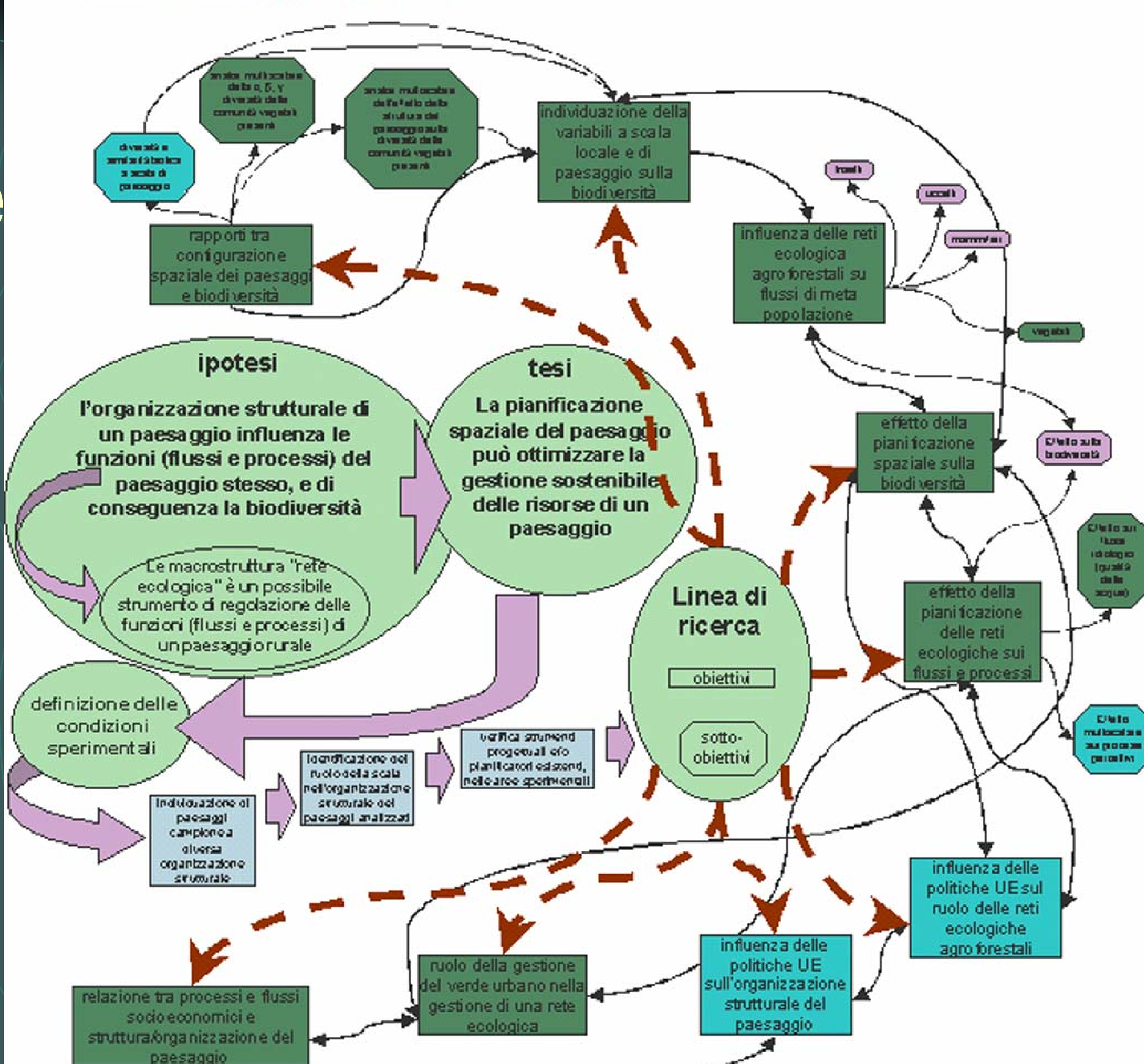
# the research about PLANLAND©®

- the research plan

the


individuazione della variabili a scala locale e di paesaggio sulla biodiversità
rapporti tra configurazione spaziale dei paesaggi e biodiversità
influenza delle reti ecologica agro forestali su flussi di meta popolazione
ipotesi
l'organizzazione strutturale di un paesaggio influenza le funzioni (flussi e processi) del paesaggio stesso, e di conseguenza la biodiversità
Le macrostruttura "rete ecologica" è un possibile strumento di regolazione delle funzioni (flussi e processi) di un paesaggio rurale
tesi
La pianificazione spaziale del paesaggio può ottimizzare la gestione sostenibile delle risorse di un paesaggio
effetto della pianificazione spaziale sulla biodiversità
effetto della pianificazione delle reti ecologiche sui flussi e processi
Linea di ricerca
obiettivi
sotto-obiettivi
definizione delle condizioni sperimentali
influenza delle politiche UE sul ruolo delle reti ecologiche agro forestali
influenza delle politiche UE sull'organizzazione strutturale del paesaggio
ruolo della gestione del verde urbano nella gestione di una rete ecologica
relazione tra processi e flussi socio economici e struttura/organizzazione del paesaggio

# the research about PLANLAND©®

## the papers


- Franco D., M. Perelli e M. Scattolin. 1996. Buffer strips to protect the Venice Lagoon from non-point source pollution. In: Proceeding of International Conference on Buffer Zones: Their the Processes and Potential in Water Protection. Heythrop Park, UK, August-September 1996. in litteris. http://web.tiscalinet.it/m_perelli/hedg.htm
- Franco D, 1997 La procedura PLANLAND©®: un nuovo strumento per l'analisi e la progettazione paesistica. Acer,1/97 - Acer,3/97 .
- Franco D. 1997.La planification des reseaux de haies dans le paysage rural: les besoins d'une approche en termes d'ecologie du paysage. In: Proceedings of "L'arbre en reseau". Rennes, France, 24-25 September 1997.
- Franco D. 1997. Planning of windbreaks and hedgerow network in rural landscapes. In: Proceedings of "Landscape Ecology: things to do ". Amsterdam, The Nederlands, 6-10 October 1997.
- Franco D., 1998. Hedgerows and non point source pollution: field test and landscape planning. In: In: Key concepts in Landscape Ecology. Dover J.W., Bunce R.G.H., 1998. IALE UK Colin Cross Printers Ltd, Garstang UK
- Franco D., Perelli M., Scattolin M., 1999. Agroforestazione e controllo dell'inquinamento diffuso. Estimo e Territorio, 6 (62): 25-37.
- Franco D., Zanetto G., Mannino I., 1999. An assessment of the agroforestry-network role on the socio-economic and cultural processes in the Venice landscape. Proceeding of 5th World Congress, International Association for Landscape Ecology Snowmass Village, Colorado, U.S.A., July 29-August 3, 1999.
- Franco D., Franco David, Mannino I., Zanetto G., 2001. The role of agroforestry networks in the landscape socioeconomic processes: the potentiality and limits of contingent valuation method. Landscape and Urban Planning 4 (55):239-256.
- Franco D., 2002. The scale and pattern influences on the hedgerow network's effect on landscape processes: first consideration about the need to plan for landscape amelioration purposes. . Environmental Management and Health, 13: 263-276
- Franco D., Franco David, Mannino I., Zanetto G., 2003. The impact of agroforestry networks on scenic beauty estimation: the role of a landscape ecological network on a socio-cultural process, Landscape and Urban Planning, 3(62):119-138
- Franco D., 2004. Ecological networks: the state of the art from a landscape ecology perspective in the national framework (invited lecture) In: atti del 40° Corso di Cultura in Ecologia; Giugno 2004 - Centro Studi per l'Ambiente Alpino dell'Università degli Studi di Padova (San Vito di Cadore, Belluno) Reti ecologiche: una chiave per la conservazione e la gestione dei paesaggi frammentati. http://www.tesaf.unipd.it/Sanvito/atti.htm
- Franco D., Bombonato A., Ghetti P.F., Mannino I., Zanetto G., 2005. The evaluation of a planning tool through the landscape ecology concepts and methods. Management of Environmental Quality: An International Journal 1(16): 55-70


## not publishd works


- Pierini A., 2000. Effetti della struttura dei paesaggi agrari sulla biodiversità. Tesi di Laurea specialistica. Università degli studi di Venezia - Dipartimento di Scienze Ambientali
- Bortolaso M., 2003. Un programma di ricerca sul paesaggio rurale e le reti ecologiche agroforestali: analisi bibliografica di metodi e temi emergenti. Tesi di Laurea specialistica. Università degli studi di Venezia - Dipartimento di Scienze Ambientali
- Favero L., 2004. La gestione delle qualità delle acque a scala di bacino: l'ecologia del paesaggio come approccio Tesi di Laurea specialistica. Università degli studi di Venezia - Dipartimento di Scienze Ambientali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# the PLANLAND©® Decision Support System

- the goals

# the PLANLAND©® Decision Support System

| | | |
|---|---|---|
| **Main objectives** | To optimize the comprehension (order of visual elements, patches and corridors) the readabilty (possible paths finding), the perspective/refuge distribution and the big trees presence in the landscape<br>To maximize the heterogeneity and complexity/ mystery of the landscape, balancing the genius loci and the perceptive unity/diversity.<br>To optimize the patches shape/dimension and corridor distribution (i) to minimize management costs and lost of income, (ii) to maximise micro-climatic functions and wildlife conservation | To maximize the nearness and density o the vegetated patches and the connection and circuitry of vegetated corridors, maintaining a visual balance the empty/ solid volumes between 1/3 and 2/3<br>To maximize the ecotopes compositive and structural complexity, usable for a cost/benefit balance (environmental, economic)<br>To maximize the hydrological functions of the ecological network, and the perceptive presence of water |
| **Secondary objectives** | To optimize the patches size (i) to create stepping stones, (ii) to develop ecotones<br>To allow at least two escape ways out in every corridor node | To optimize the patches distribution in order to obtain (i) inter patch distances covered by the rare species, (ii) distanc not grater than 1 km<br>To maximize the margins circumvolutio iso-diametricity and width of wooded patches |

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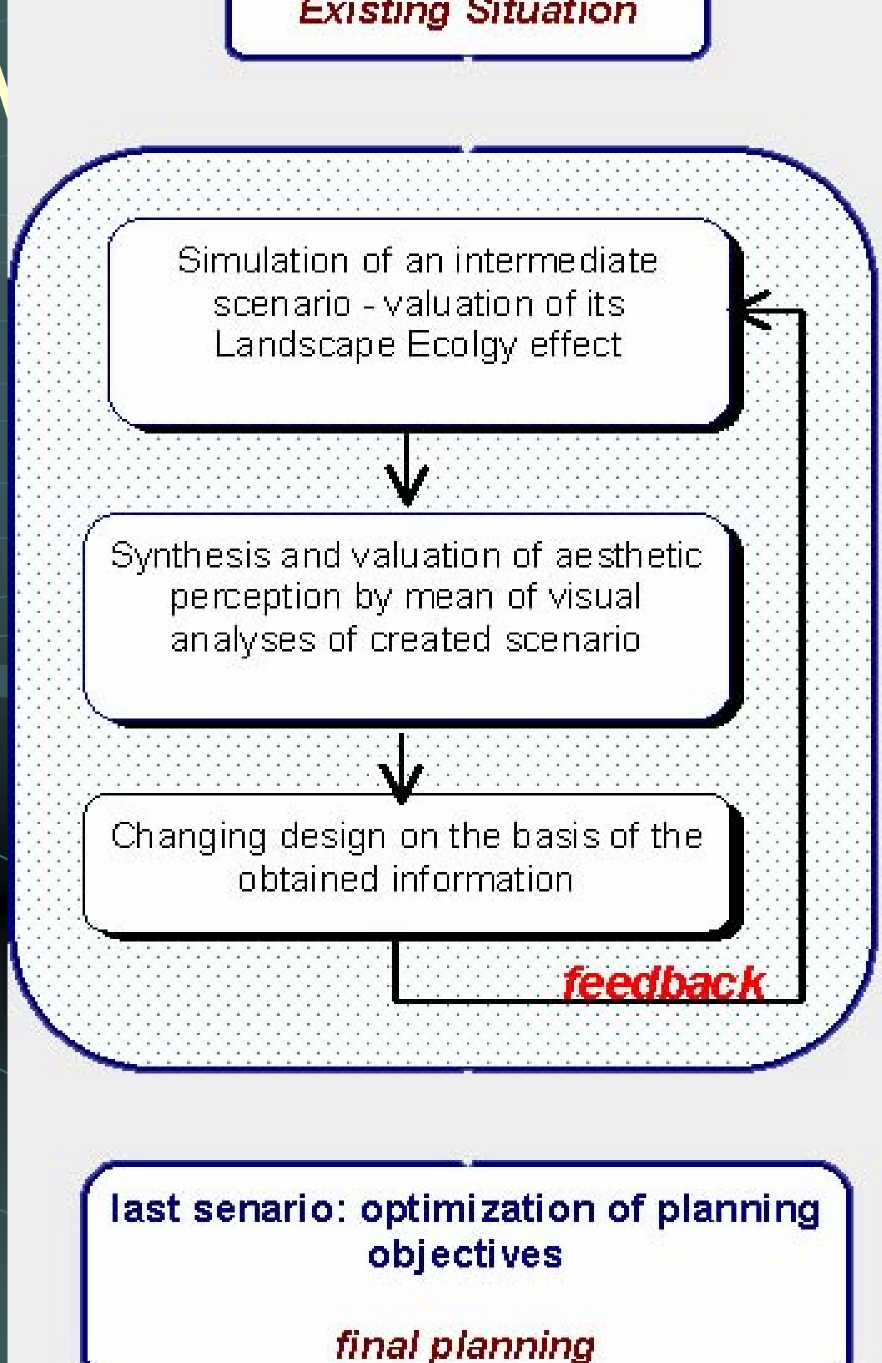
# the PLANLAND©® Decision Support System

- the steps
  - the analytical step for the "existing scenario" definition
  - the design step for the tradeoff optimization of the settled planning goals

# the PLA Support System



# the analytical step

- analyses of in use plans
- surveys and desk research
- landscape ecology analyses of the gathered data (literature data, on field data, remote sensing data)
- ecologically perceptive analyses (also) based on surveys
- fulfillment of the GIS' layers

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# the GIS layers

- geo
  - Pedological and hydrological units
    - Salinity, pH, texture, summer and winter water table depth, soil depth, drainage, hydraulic risk, soil type and class

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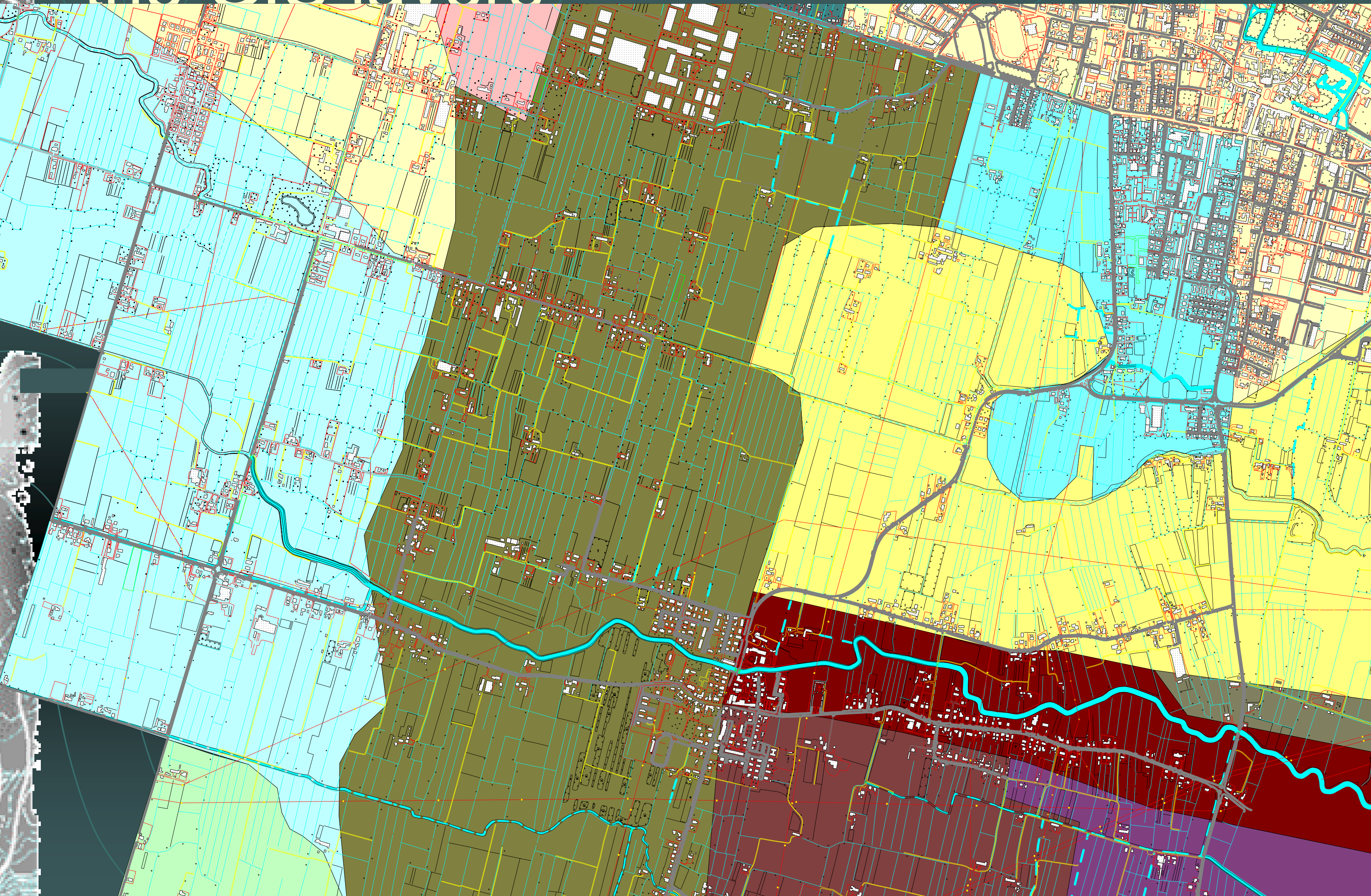
# the GIS layers



# the GIS layers

- Patches
  - Patch type (land use), spatial data, geographic data, ecological data, economic-farm data (ownership, gross markup, cultural class, etc.)

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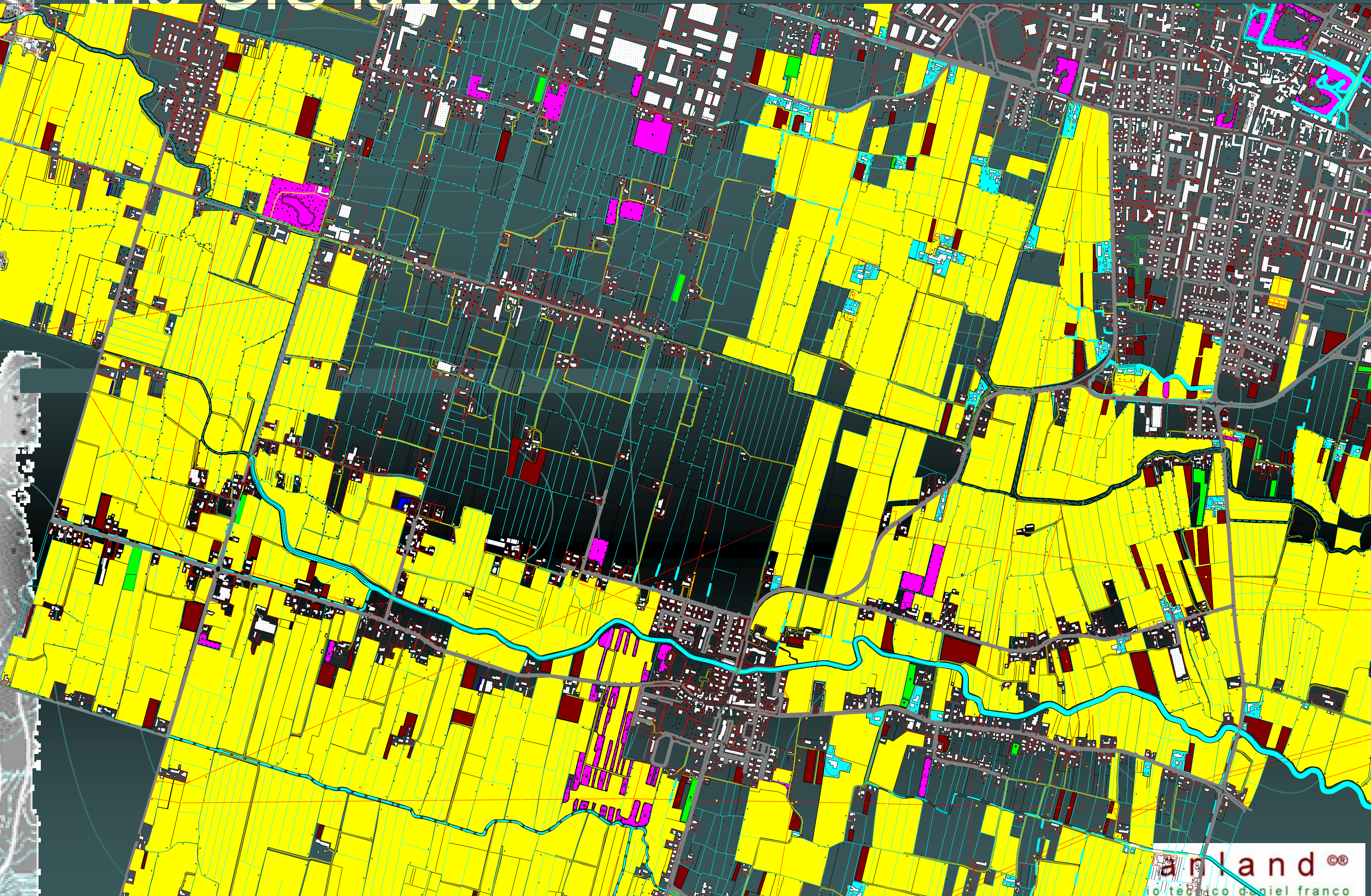
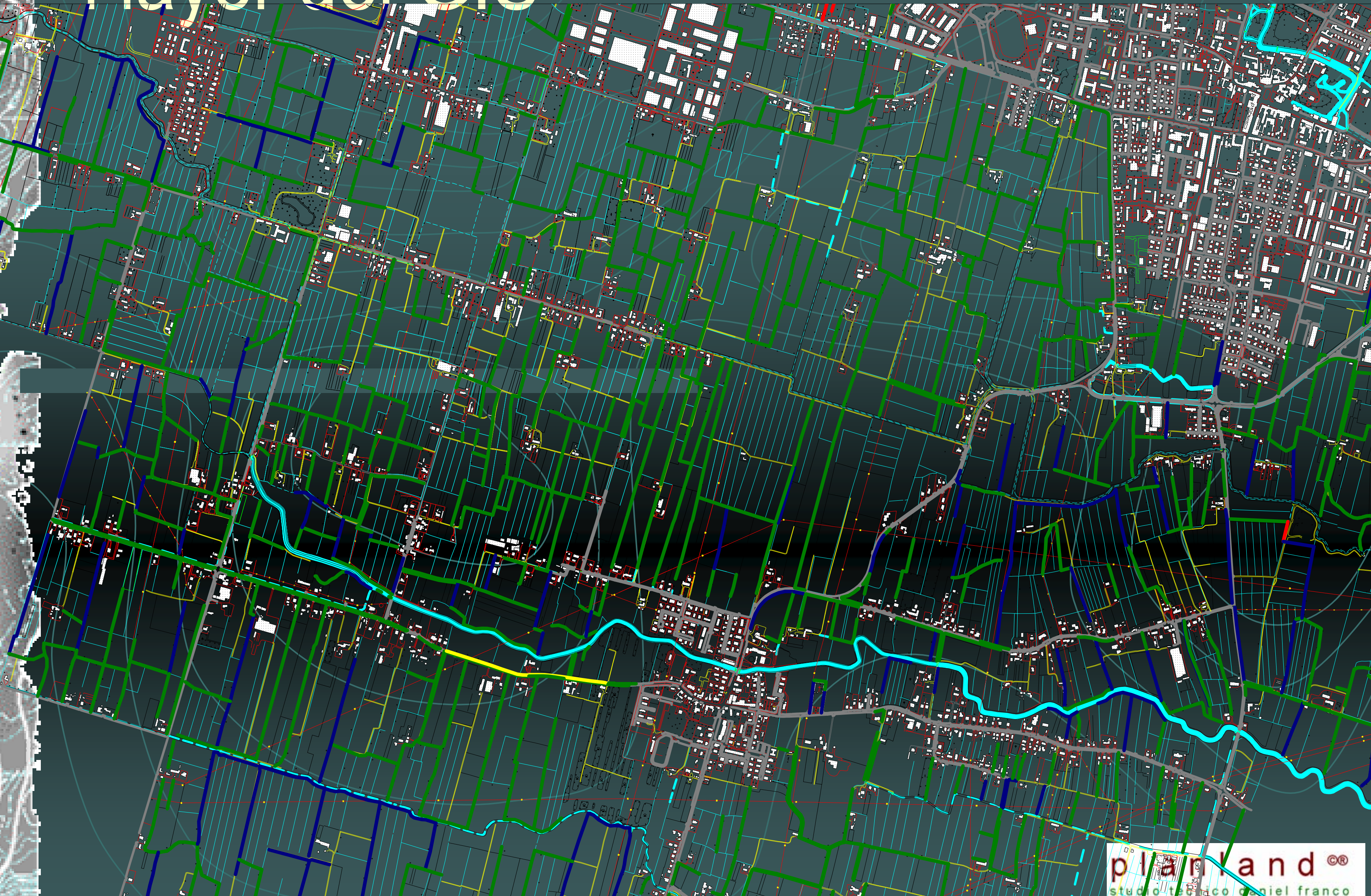
# the GIS layers



# i layer del GIS

- Corridors
  - Corridor type (hedgerow, road, stream), ecological data, spatial data, silviculural data, socio-economic data (ownership, gross markup, etc.)

# i layer del GIS



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# the evaluation / design step

- starting from the spatial distribution of the geo-referred data about the ecological, socio-economic and environmental characteristics, it is possible by means of a set of indicators ( http://www.planland.org/pdf/indicatorieng.pdf) to evaluate the landscape status (at different scale) from the ecological, socio-economic, cultural perspective
- the comparisons of the information given by the indicators about current landscape status and the design/plan status, allows to verity the impact at the site or landscape scale of the planned landscape transformations, and the planning goals attainment

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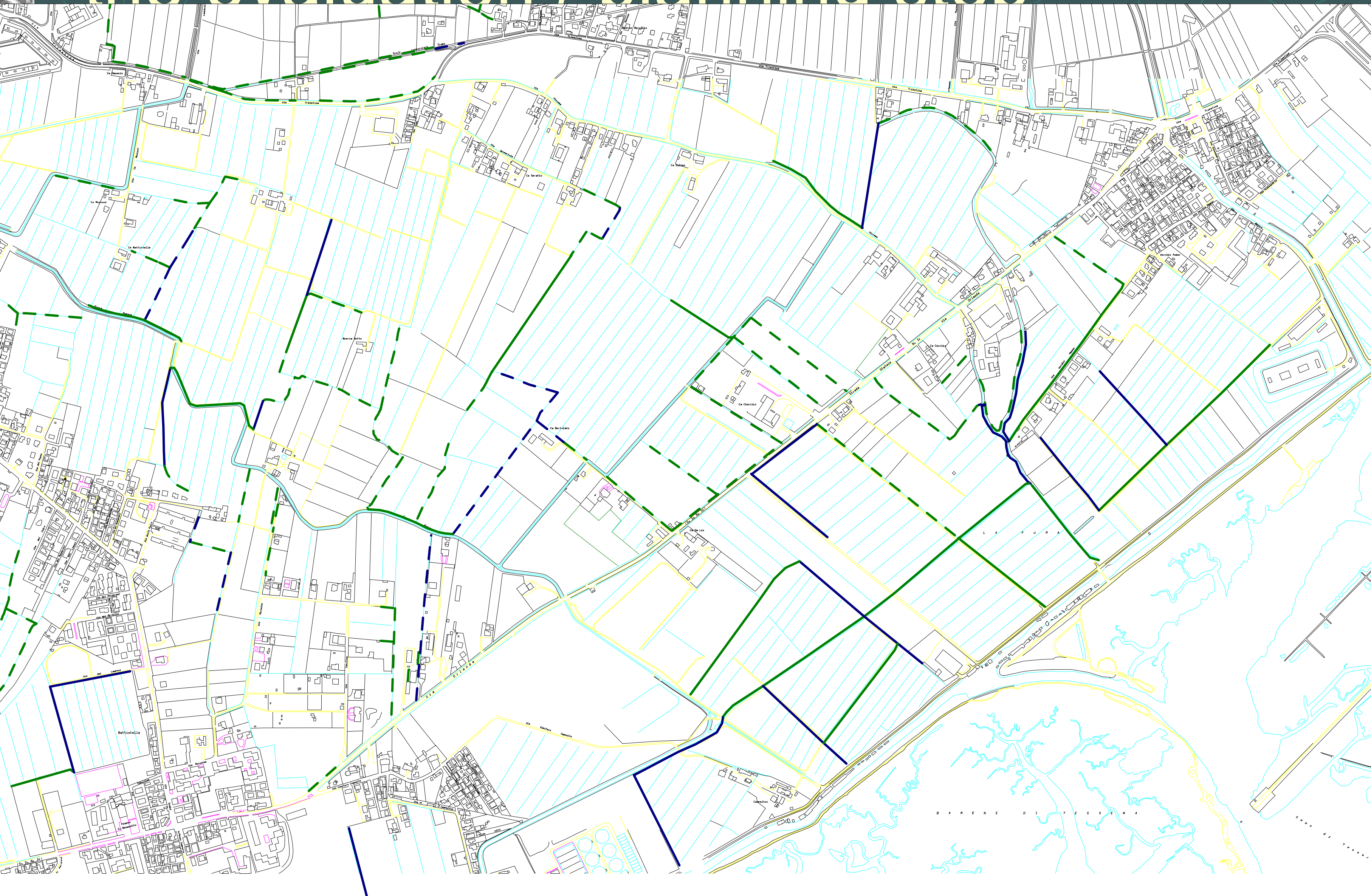
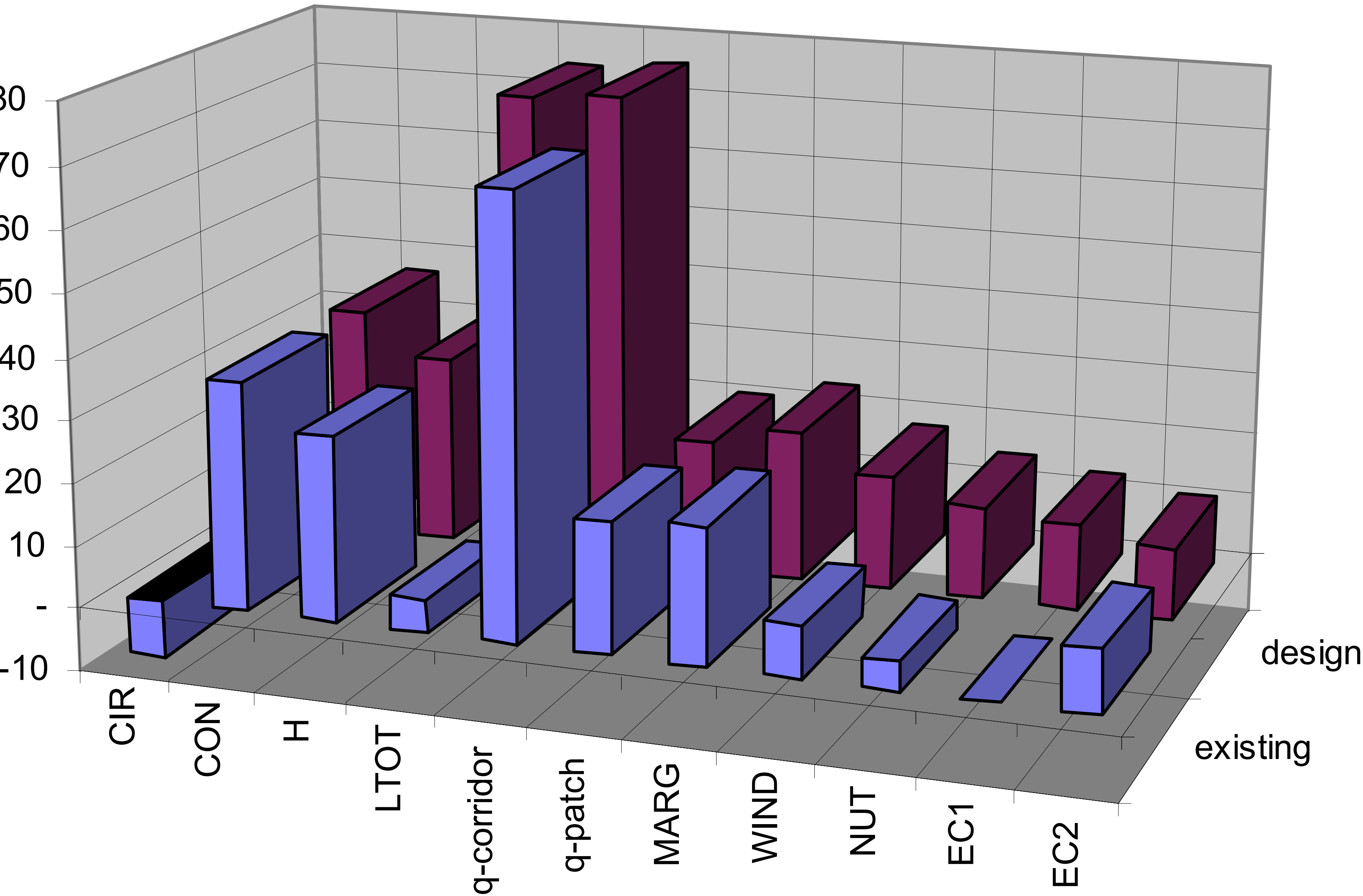
# the evaluation / planning step

- the analysis/design starts from the GIS dataset and produces estimations at the farm scale,  at the intermediate scale or at the landscape planning scale

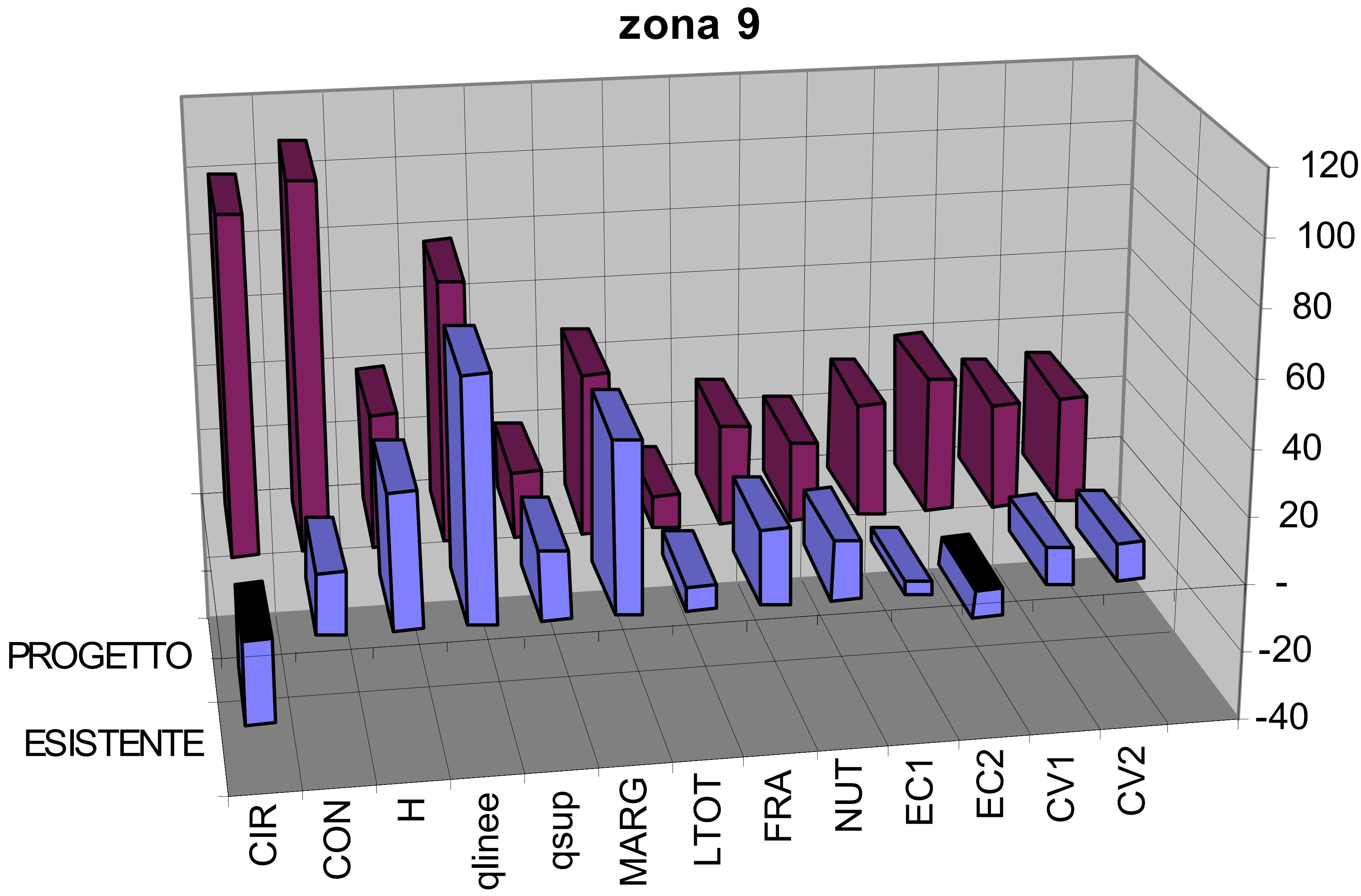
# the evaluation / planning step



# farm code: 192

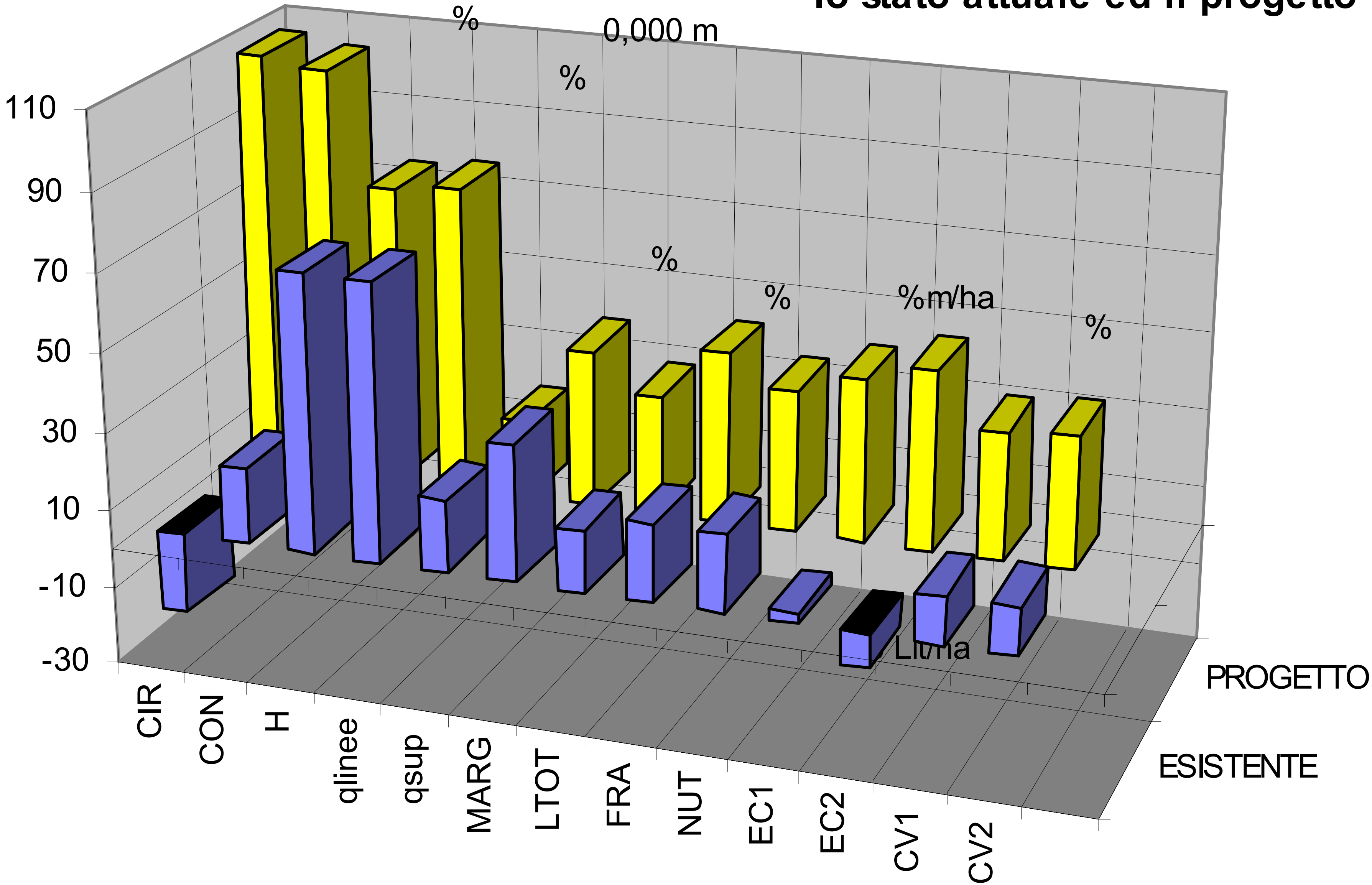


# the evaluation / planning step



# paesaggio

## lo stato attuale ed il progetto



# the design step

- for the species selection in the plantation design schemes PLANLAND©® uses the **SPECIE module**, that runs a hierarchical query of the (ecological, cultural, etc.) species demands *versus* the pedo-environmental conditions (GEO layer)
- the module can support the best selection of the species and/or the plantation design schemes
- Globally the module account for 8 categories of 41 characteristics, that range form light preference to allopathy

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# the design step

| AIN FUNCTIONS | TYPE | GROWING | SOCIAL BEHAVIOUR | TRATEMENT | ECOLOGY |
|---|---|---|---|---|---|
| ber | Multistoried multiline hedgerow (coppiced and high stand tratement) | 10-20$m^3$/ha/y | not tollerant | high stand | soil quality |
| t control | multistoried oneline hedgerow (coppiced and high stand tratement) | 5-10 m3/ha/y | tollerant | coppiced | soil deepness |
| ney | multistoried multiline hedgerow (coppiced tratement) | >5 $m^3$/ha/y | aggressive | tall coppiced | water table |
| drology | multistoried oneline hedgerow (coppiced tratement) | | adaptable | | soil texture |
| rny | 4th size tree | | buffer species | | drainage/hydr. risk |
| uty | 3rd size tree | | comments | | soil salinity |
| its | 2nd size tree | | | | soil hydrom. |
| ic | 1st size tree | | | | soil pH |
| rogen fixation | 2nd size shrub | | | | sun |
| nks stability | 1st size shrub | | | | climate |
| neer species | leaves | | | | salt tollerance |
| ndbreak efficency | deciduos | | | | atmospheric pollution tollerance |
| se abatement efficency | evergreen | | | | |
| | partially deciduos | | | | |
| | marcescent | | | | |

# the design step

- In this way the designer/planner choices are driven
  - by the plan goals and the feasibility constrains
  - by the natural elements that generate a landscape and by the cultural and historical influences that shape it

# conclusions

- PLANLAND©®  it is strongly based on a Landscape Ecology approach that try:
  - to show in a “no black boxes” way the optimum trade off among conflicting landscape planning goals
  - to use a integrated “twin engines”  for the evaluation and the decision, coherently connected in a single procedure by means of a GIS supported scenarios’ simulation

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# conclusions

- the PLANLAND©® advantages:
  - the evaluation tools are the same in the analytical and plan/design steps
  - there is the maximum visibility for the design choices versus the planned goals
  - the DSS avoids weighing criteria problems, the decision makers' responsibility covering-up, etc.