

From Bioregione to tools for Eco - Efficiency Local Food Supply

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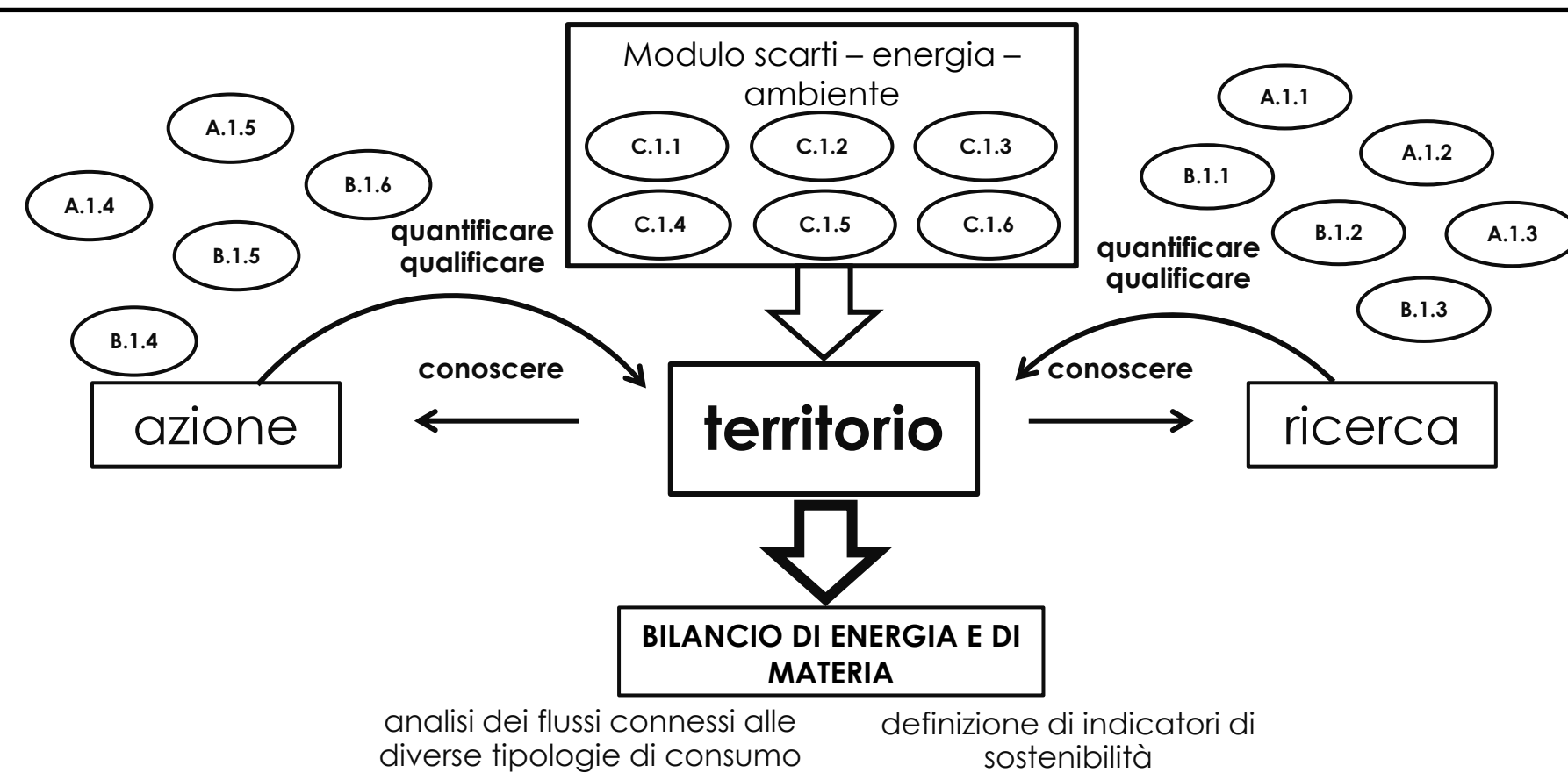
# Promuovere uno sviluppo locale sostenibile mediante l'organizzazione territoriale della domanda e dell'offerta di prodotti alimentari attraverso il sistema dei consumi collettivi

| Moduli | Produzione                                                                                                    | Consumi collettivi                                                                                                  | Scarti/Energia/Ambiente                                                                                                                                                           |                                                                                               |
|--------|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
|        | Politiche territoriali                                                                                        |                                                                                                                     | Sperimentazione di buone pratiche                                                                                                                                                 |                                                                                               |
|        | Università degli Studi di Milano<br>Dipartimento di Produzione Vegetale (DiProVe)<br>Laboratorio di Geomatica | Università degli Studi di Milano<br>Dipartimento di Economia e Politica Agraria, Agroalimentare Ambientale (DEPAAA) | Politecnico di Milano<br>Dipartimento di Architettura e Pianificazione (DiAP)<br>Laboratorio Analisi Dati e Cartografia (LADeC) -<br>Laboratorio di Progettazione Ecologica (LPE) | Politecnico di Milano<br>Dipartimento Built Environment Energy, Science and Technology (BEST) |

ndazione Cariplo – 6 febbraio 2012  
OGGETTO BIOREGIONE



UNIMI : DiProVe - (Laboratorio di Geomatica), DEPAAA  
POLIMI : DiAP (Lpe - LaDec), BEST



## modulo produzioni

- A.1.1** raccolta e integrazione funzionale dei database esistenti sulla produzione agricola
- A.1.2** raccolta e integrazione funzionale dei database esistenti sulla produzione di prodotti trasformati
- A.1.3** costruzione del database delle produzioni agricole e di prodotti trasformati per filiera di provenienza
- A.1.4** predisposizione di una scheda di valutazione e costituzione di un dataset dei risultati aziendali
- A.1.5** definizione di un set di indicatori agroecologici e socioeconomici per la valutazione dello stato e delle potenzialità dell'agricoltura in termini di miglioramento dell'ecosistema

## modulo consumi collettivi

- B.1.1** realizzazione di una ricerca sui volumi e sulla localizzazione degli acquisti collettivi
- B.1.2** realizzazione di una ricerca sui volumi e sulla localizzazione degli acquisti collettivi dei GAS
- B.1.3** implementazione del database dei consumi collettivi per filiera di provenienza
- B.1.4** raccolta dei docum. di gara della ristorazione istituzionale di un campione di Enti gestori
- B.1.5** analisi dei flussi economici connessi alle diverse tipologie di consumo
- B.1.6** definizione di un set di indicatori di sostenibilità relativi all'approvvigionamento di prodotti agroalimentari destinati ai consumi

## modulo scarti-energia-amb

- C.1.1** misurazione degli scarti nel sistema della ristorazione istituzionale
- C.1.2** individuazione delle cause probabili del rifiuto dei piatti proposti
- C.1.3** individuazione e caratterizzazione dell'efficienza logistica delle diverse tipologie di punti di "produzione" degli scarti
- C.1.4** elaborazione di un set di indicatori per l'analisi dei flussi di energia e dei relativi impatti ambientali
- C.1.5** test degli indicatori per analisi/simulazione delle variazioni dei flussi di energia/materia
- C.1.6** test del modello di

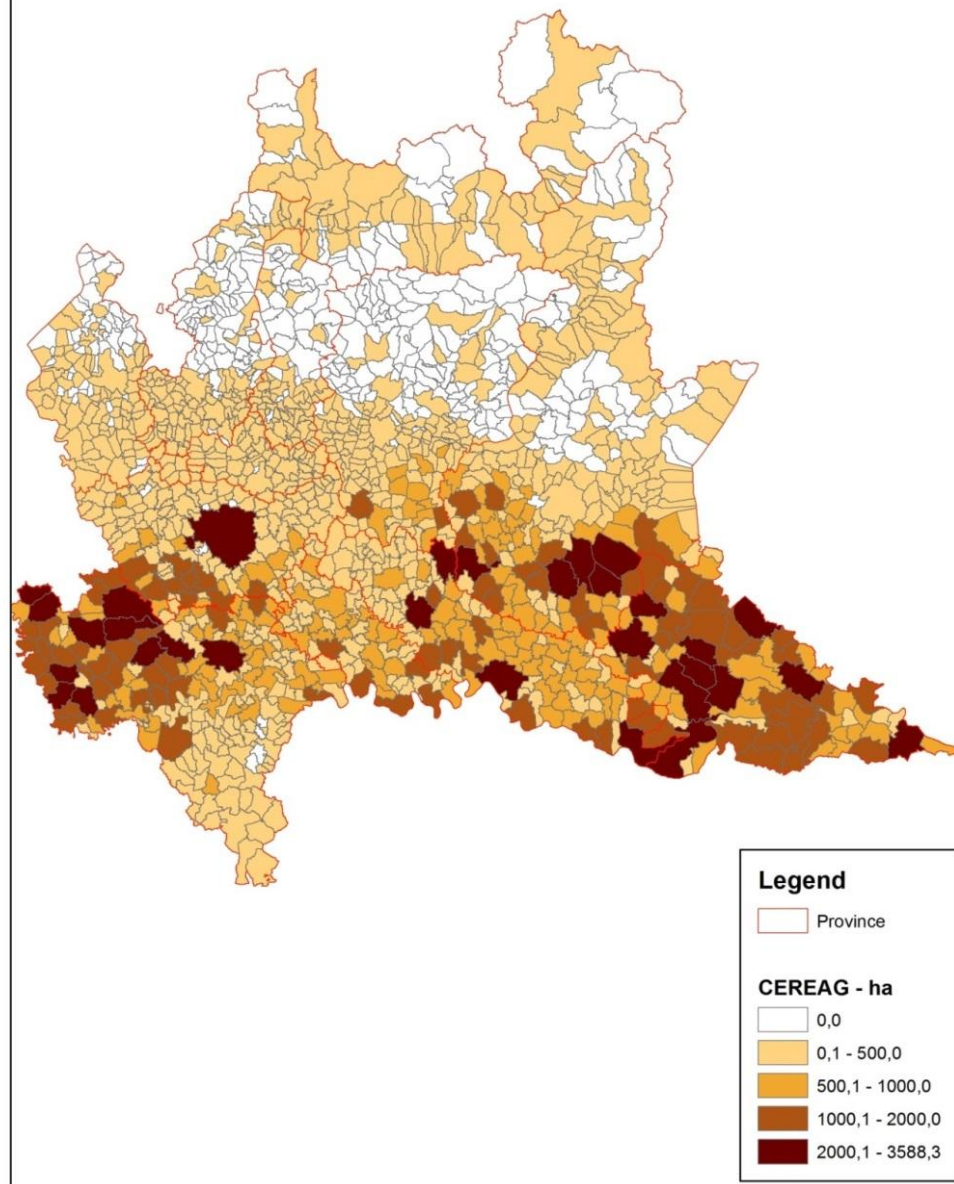
# What is a LAS?

The Local Agricultural Systems can be defined in the first instance as alternatives to the globalized food model that is based on the complex relationships between agricultural production, processing, distribution and consumption in a specific site (Dunn et al, 2004).

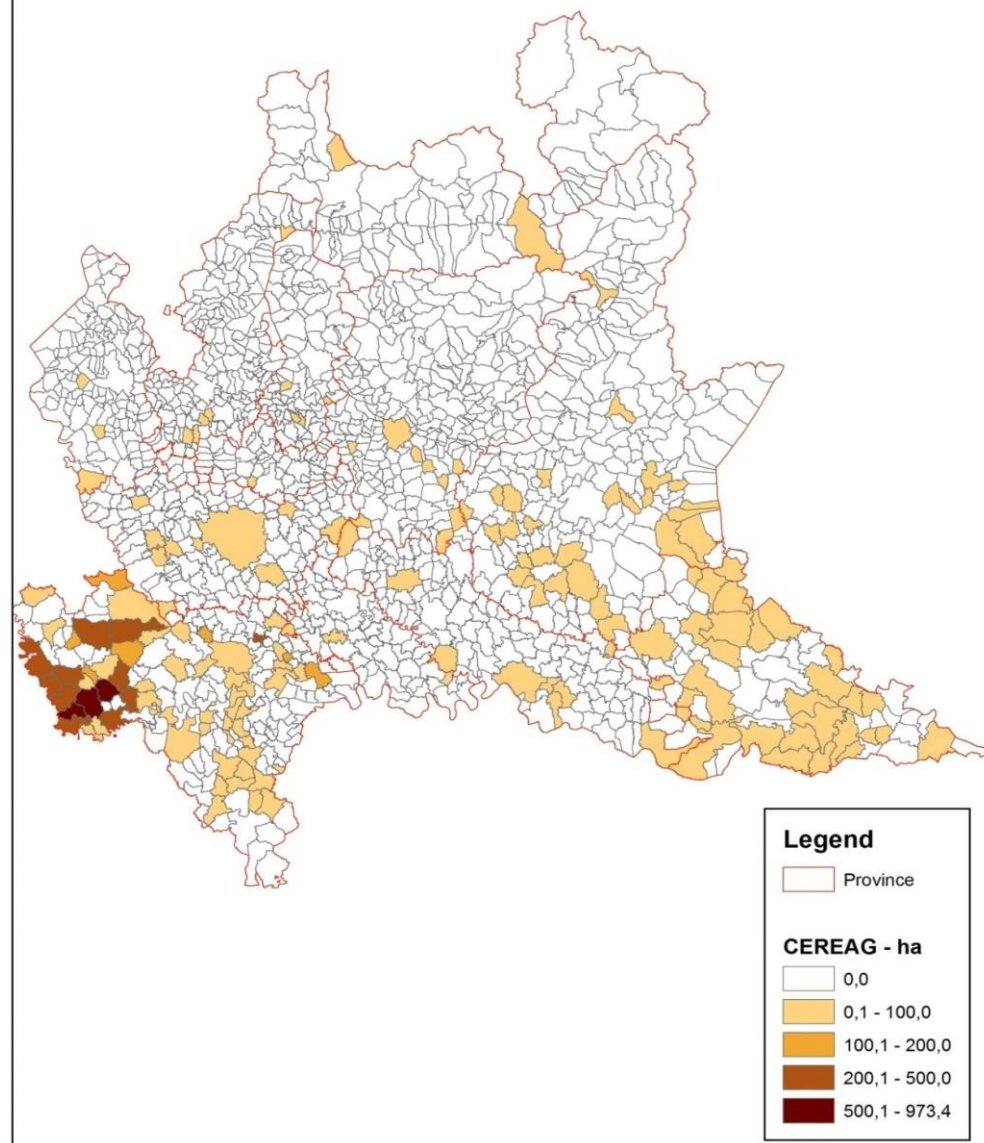
However, there is not still a commonly agreed definition of the term "local" and about what characteristics and perceptions are given it by the different stakeholders.



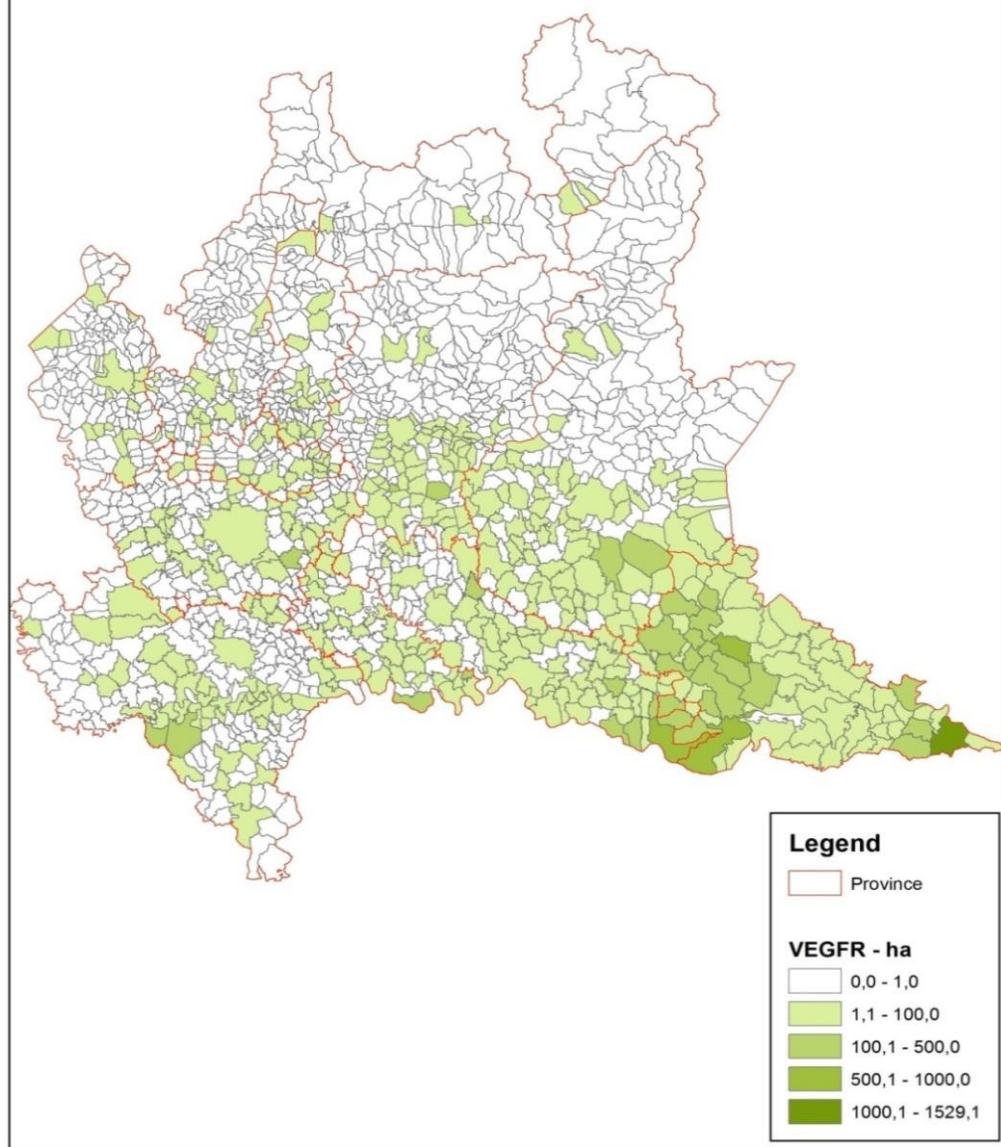
## All cereals



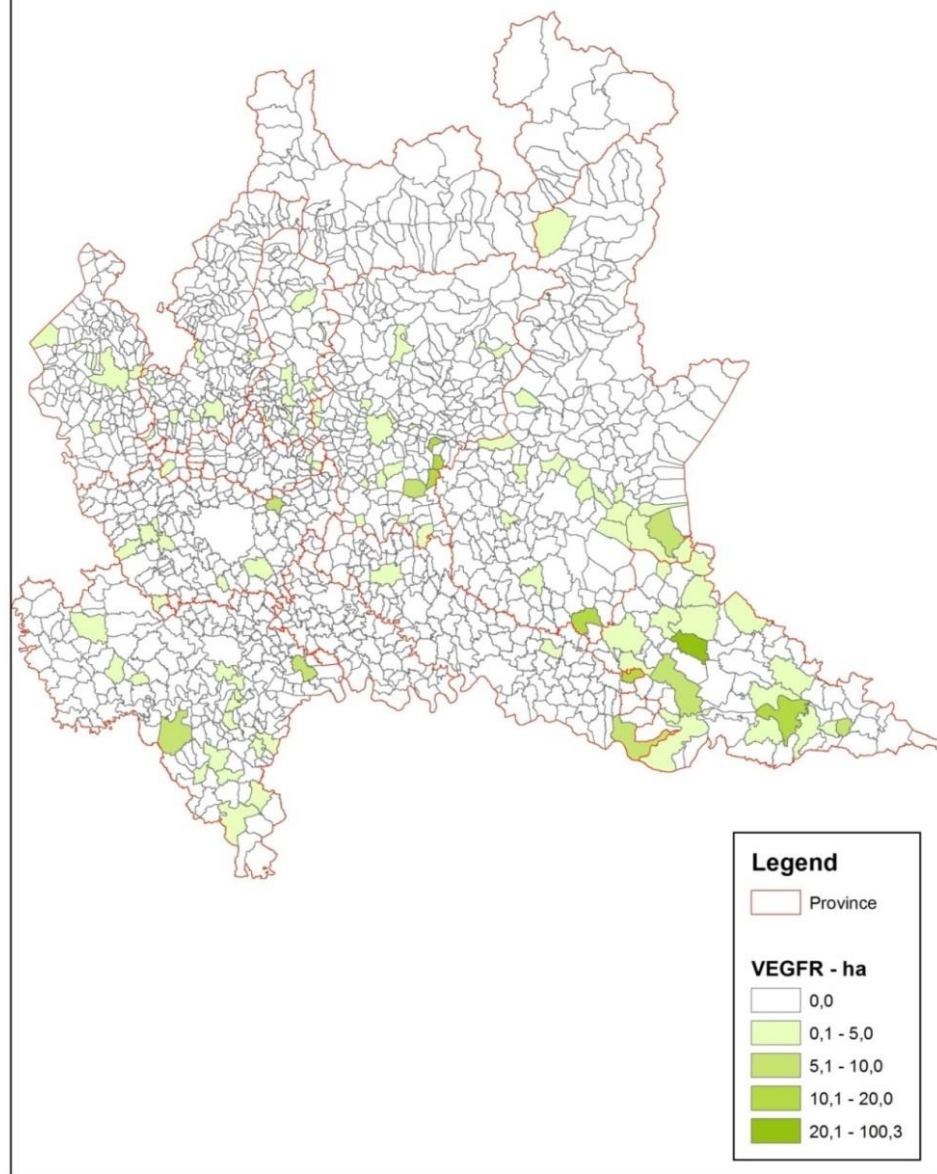
## Organic cereals



## All vegetables



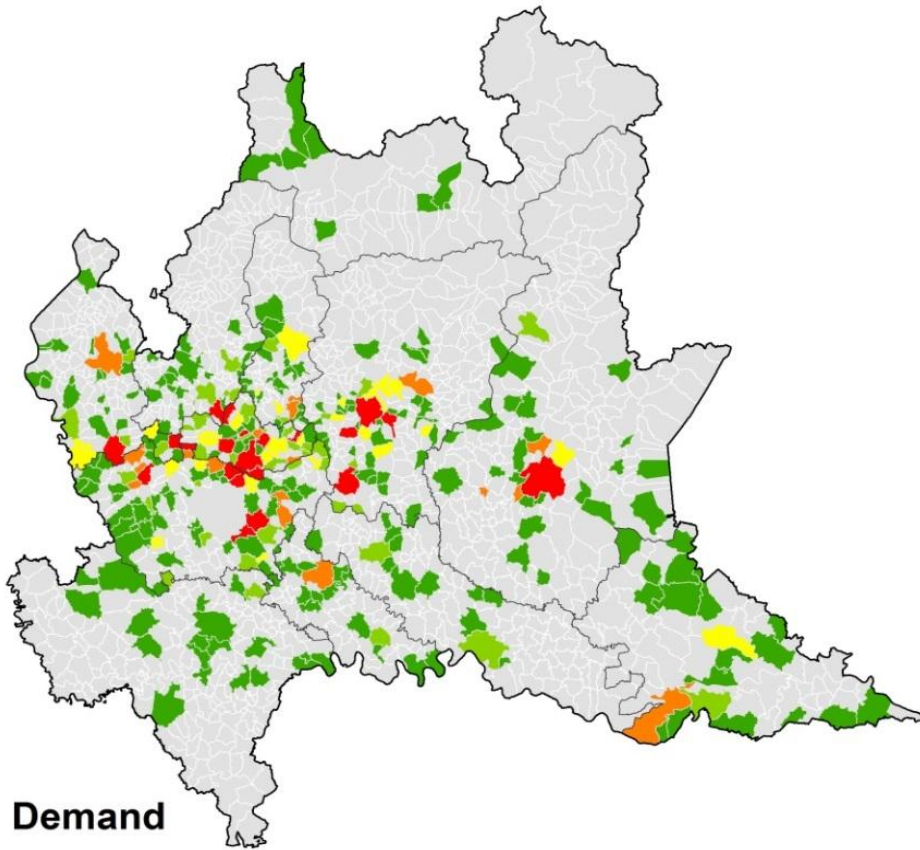
## Organic vegetables





# Organic cereals

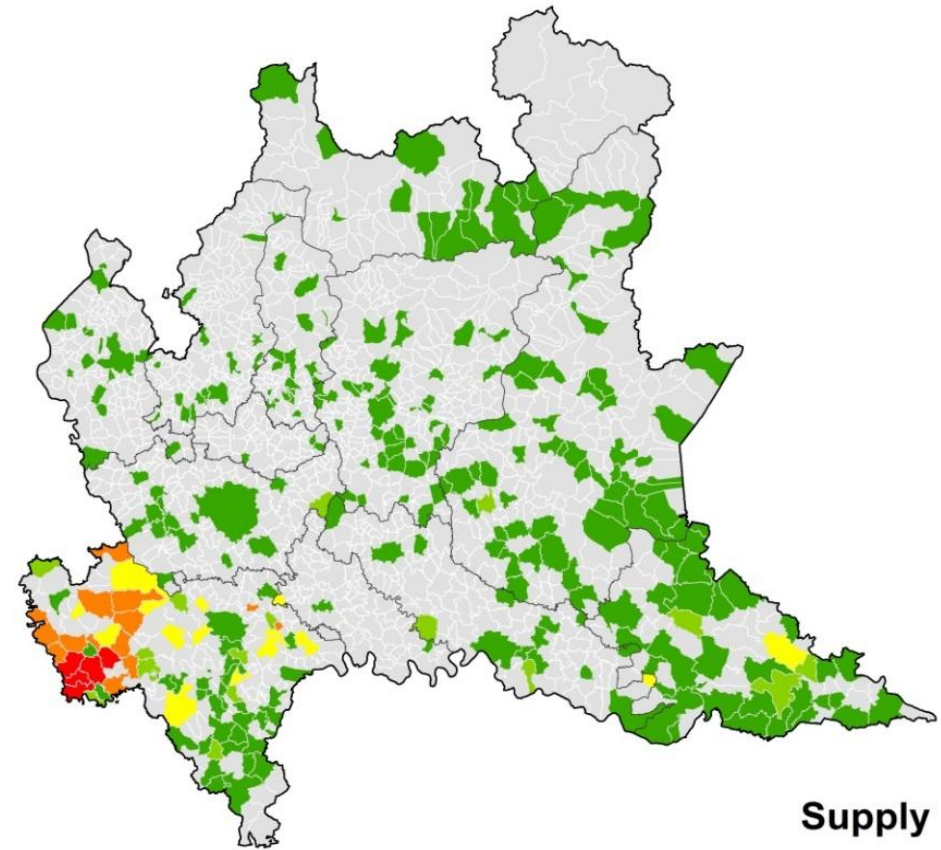
0 12,5 25 50 Kilometers



**Consumption [(equivalent) hectares]**

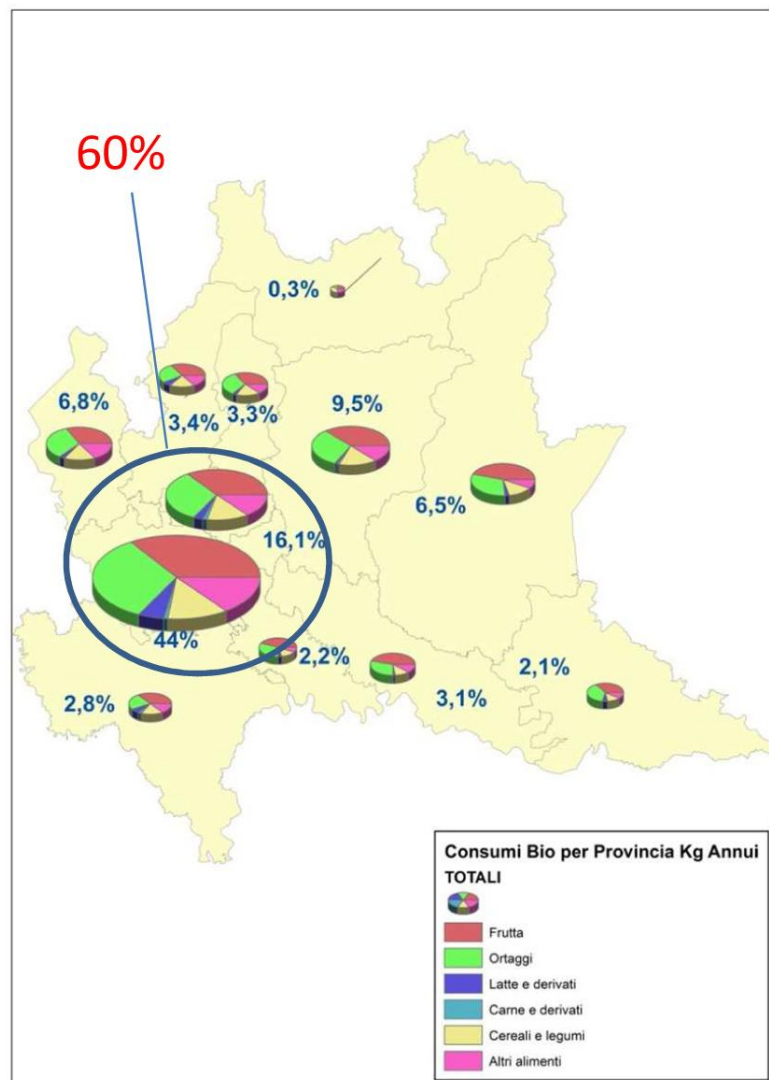


**Consumption | Production**



**Production [hectares]**





Il totale dei prodotti biologici richiesti nella ristorazione scolastica corrisponde ad oltre 11 milioni di t/anno, così distribuiti:

| CATEGORIE        | kg/anno bio          | % sul tot.     |
|------------------|----------------------|----------------|
| Frutta           | 2.598.262,29         | 23,52%         |
| Ortaggi          | 3.294.018,15         | 29,82%         |
| Latte e derivati | 586.541,71           | 5,31%          |
| Carne e derivati | 151.769,46           | 1,37%          |
| Cereali e legumi | 2.743.374,29         | 24,83%         |
| Altri alimenti   | 1.673.178,95         | 15,15%         |
| <b>Totale</b>    | <b>11.047.144,84</b> | <b>100,00%</b> |

Il 60% del consumo dei prodotti biologici si riscontra nelle province più urbanizzate (MI e MB), nelle quali il numero dei pasti erogati rappresenta invece il 42% del totale.

## Kilometro zero, filiera corta, prodotti locali

Si usano diverse espressioni per descrivere i prodotti commercializzati nei “mercati locali”:

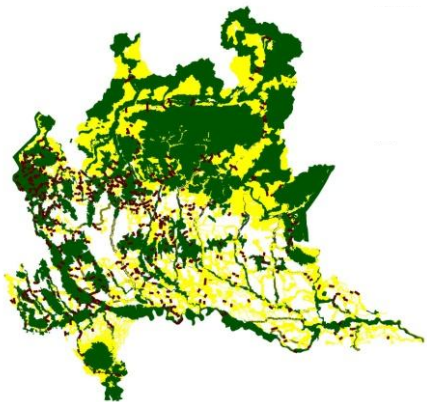
- **Kilometro zero** : è un’espressione che indica la brevità della distanza dal luogo di produzione al quello di vendita;
- **filiera corta**: significa invece la riduzione del numero di passaggi lungo il canale di distribuzione, tra chi produce e chi vende i prodotti; in questo caso si riduce il numero degli intermediari commerciali: ciò consente, abbassando i costi della distribuzione, un prezzo finale più basso;
- **prodotto locale**: l’accento in questo caso viene messo sulle caratteristiche “culturali” del cibo, legate alle tradizioni gastronomiche e alla produzione locale; in Italia in particolare la cucina regionale da sempre si fonda sulla tradizione produttiva locale.



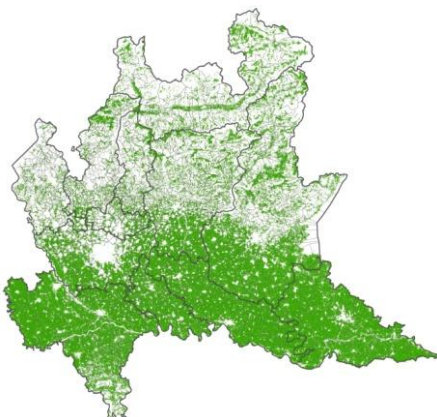


### prime elaborazioni

RER



Aree verdi  
allo stato di fatto art.43



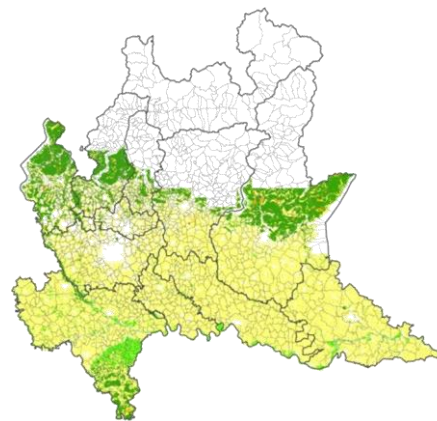
DUSAF



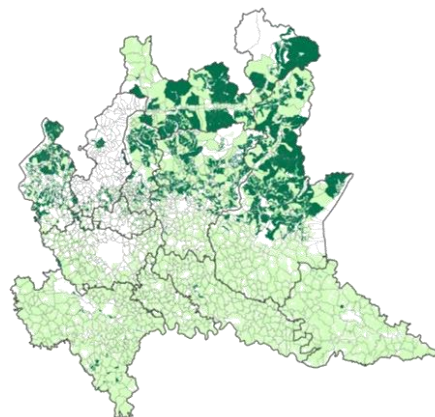
Ambiti agricoli strategici  
PTCP



CT10



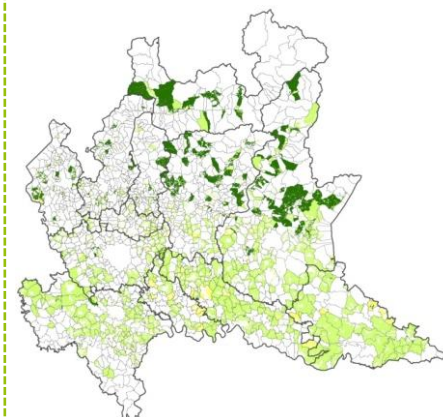
MISURC



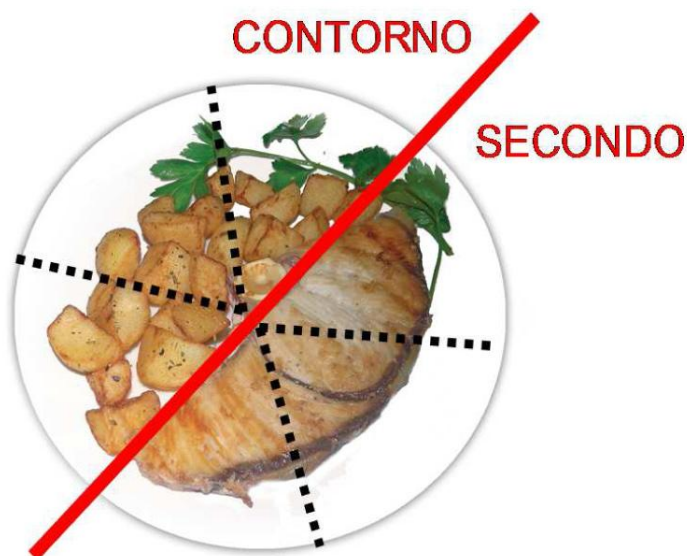
PTR



Tavola previsioni di piano  
PGT



Nel caso in cui il secondo piatto ed il contorno siano serviti nel medesimo piatto, si procede considerando le due pietanze separatamente (stimando quindi i terzi di contorno lasciati nel piatto e i terzi del secondo), come mostrato nella figura seguente



In seguito alla pesatura di ciascuna porzione intera di cibo cotto (effettuata durante il rilievo), gli scarti rilevati verranno quantificati in grammi.

Riassumendo, la stima finale degli scarti segue il seguente iter:

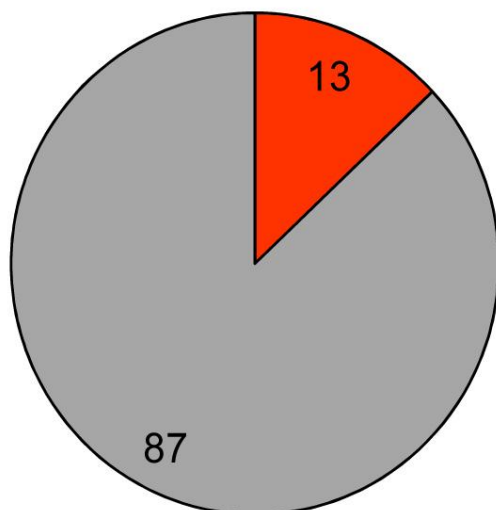
- valutazione visiva degli scarti e relativa quantificazione in terzi per pietanza;
- stima del peso degli scarti per pietanza in grammi.

## VALUTAZIONE DEI RISULTATI DELLA CAMPAGNA DI RILIEVO

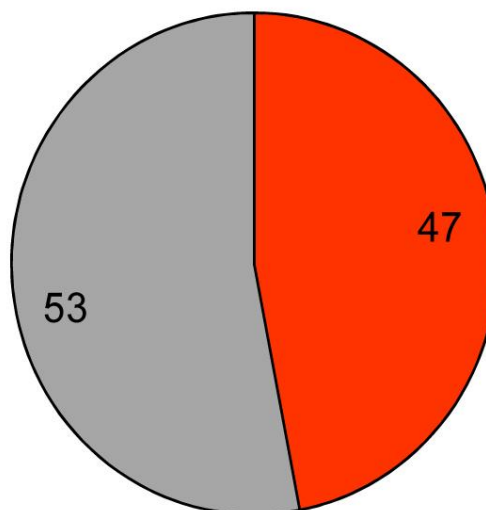
Dal rilievo è emerso che:

- nella Scuola dell'Infanzia viene scartato circa il 13% del pasto completo;
- nella Scuola Primaria viene scartato circa il 47% del pasto completo;
- nella Scuola Secondaria di primo grado viene scartato circa il 41% del pasto completo.

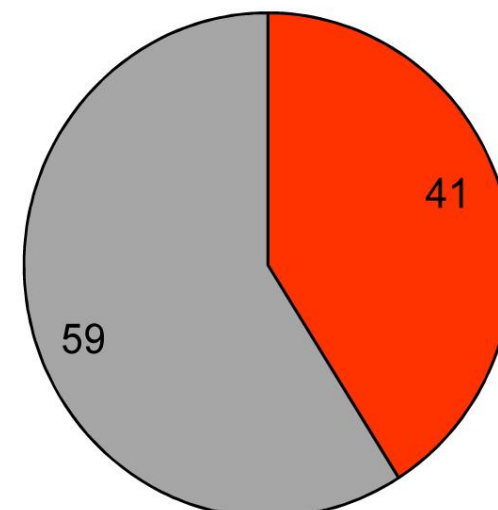
**scuola dell'infanzia**



**scuola primaria**



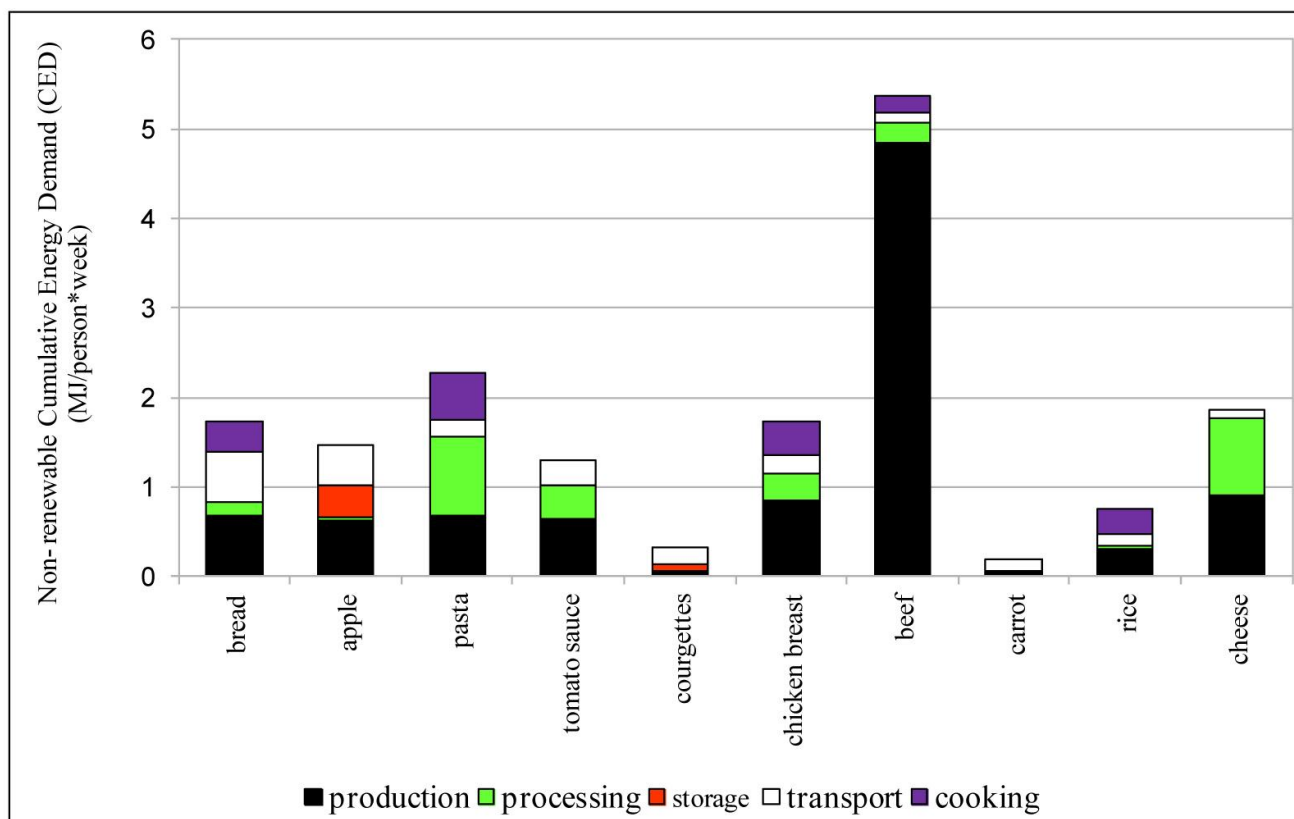
**scuola secondaria**



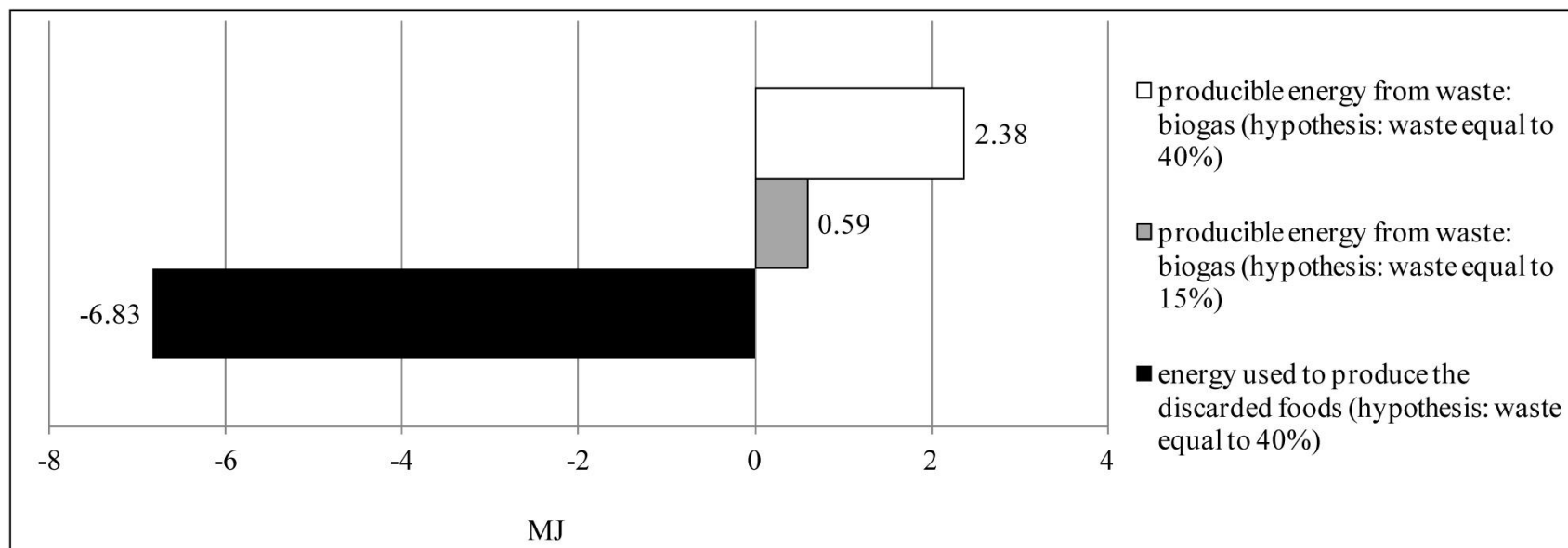
■ cibo scartato   ■ cibo mangiato



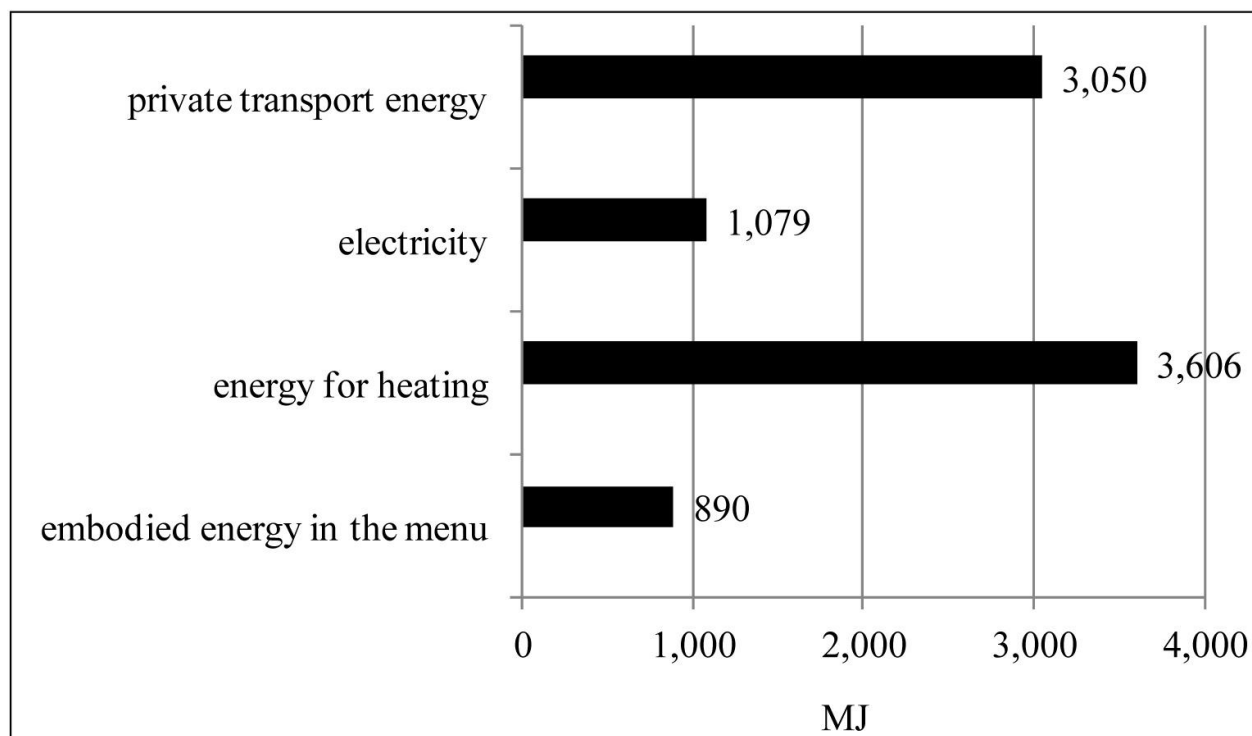
Non-renewable CED (Cumulative Energy Demand) of some foods on the menu of the case studies.



Comparison between the energy used to produce biogas from waste and the energy used to produce the discarded food (MJ per week per people).



Comparison between the average electrical consumptions of a school building, the energy to heat a school building, the energy for the private transport, and the embodied energy of the menu.



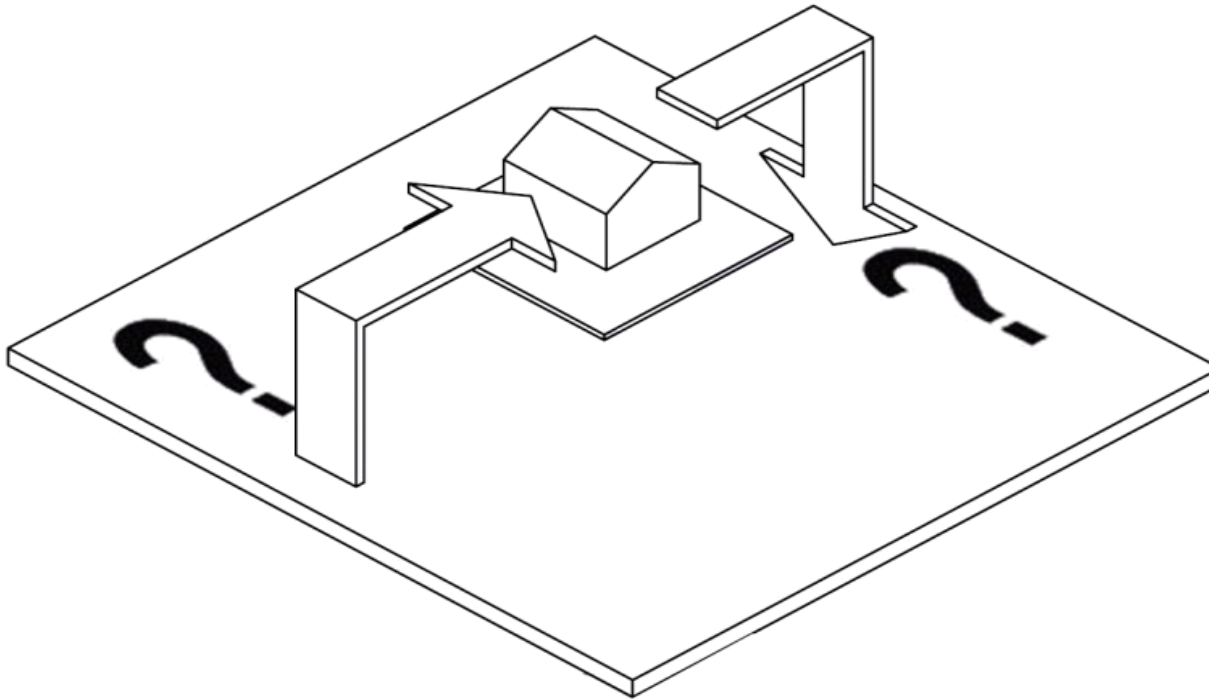
P. Caputo, C. Ducoli, M. Clementi, "Strategies and Tools for Eco-Efficient Local Food Supply Scenarios", in Sustainability 6, 2014, pag 631-651, MDPI, ISSN 2071-1050.



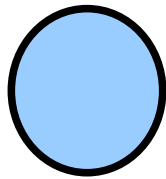
## ELAR – Ecodynamic Land Register

Elar is a methodology to assess different design choices on the basis of their contribution to achieve self-sufficiency with regard to energy and material flows, in a context defined as local.

Energy and material flows related to residential sector, food consumption, and private transport have been considered.



The information collected and processed using opensource GIS, are organized in order to enable the **transferability** of good practices oriented to local sustainable self-sufficiency, and to measure their effectiveness in terms of dweller environmental impacts reduction. These elaborations are carried out through the following main steps:



### **LDEM - Local Demand of Energy and Matter**

Matter and energy flows analysis enabled by local inhabitant.  
Geo-referencing the nodes of the considered flows.



### **RETP - Renewable Energy Technical Potential**

Analysis of local natural capital, defined as renewable energy technical potential at the local scale.



### **LSS – Local Self-Sufficiency Scenarios**

Developing self-sustainability scenarios rethinking local energy and matter demand and supply interactions based on good practices transfer.

## Tools

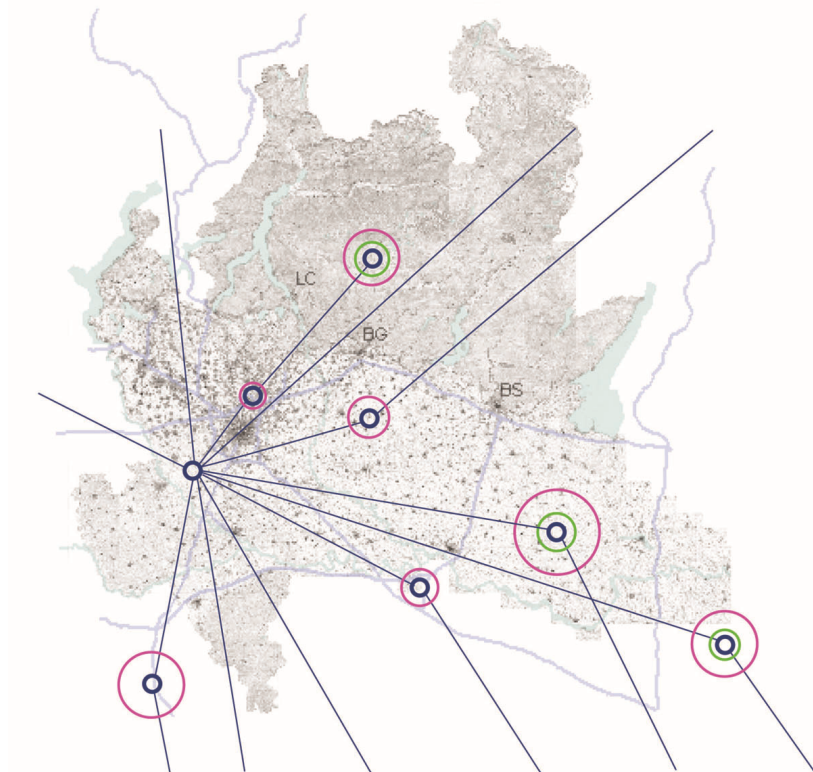
The elaboration and communication of the results are provided by two basic tools:

" **Resources / impacts geographies.**"

" **User histograms**"

Resources / impacts geographies are obtained by collecting on the same territorial support information on Local Demand of Energy and Matter (LDEM), and on the Renewable Energy Technical Potential (RETP).

Information on Local Demand of Energy and Matter (LDEM) are collected in the form of impact geographies, while information on Renewable Energy Technical Potential (RETP) are collected as resources geographies related to local supply.



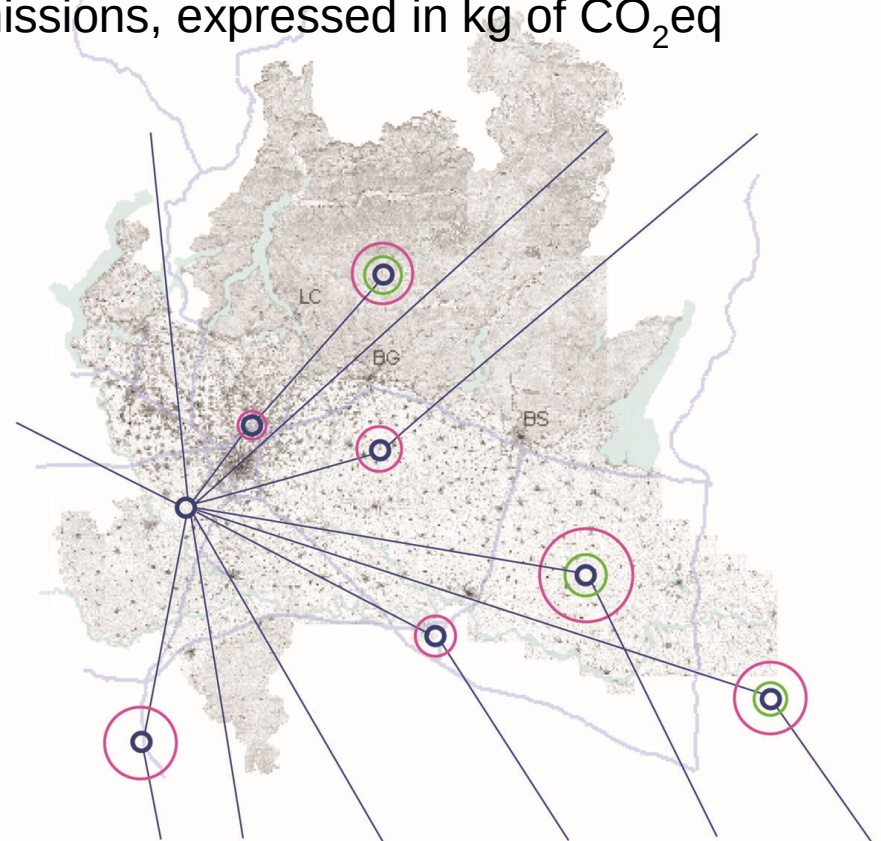
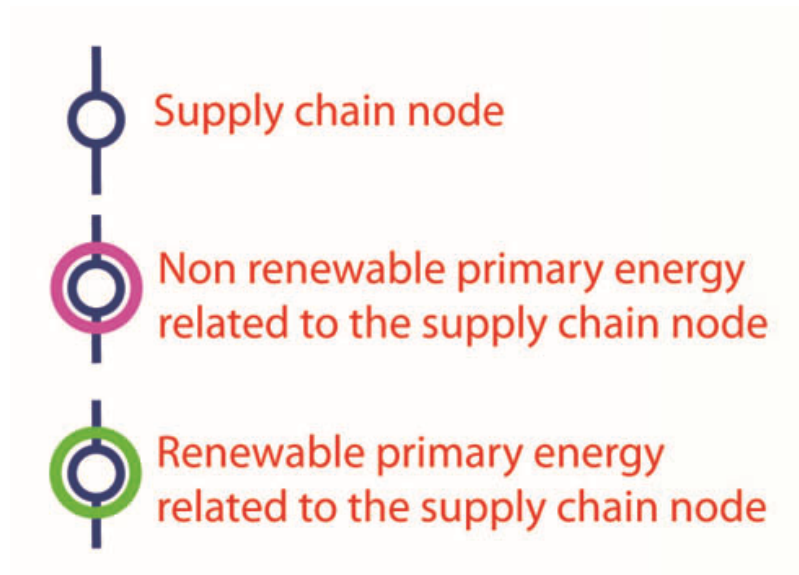
## Impact geographies

They represent the supply chains of production and consumption through geo-referenced vectors which locate supply chain different nodes.

Two different indicators quantify the environmental impacts associated to the different nodes of the supply chain:

**NRE – RE** the use of primary non-renewable/renewable energy sources, expressed in MJ equivalent

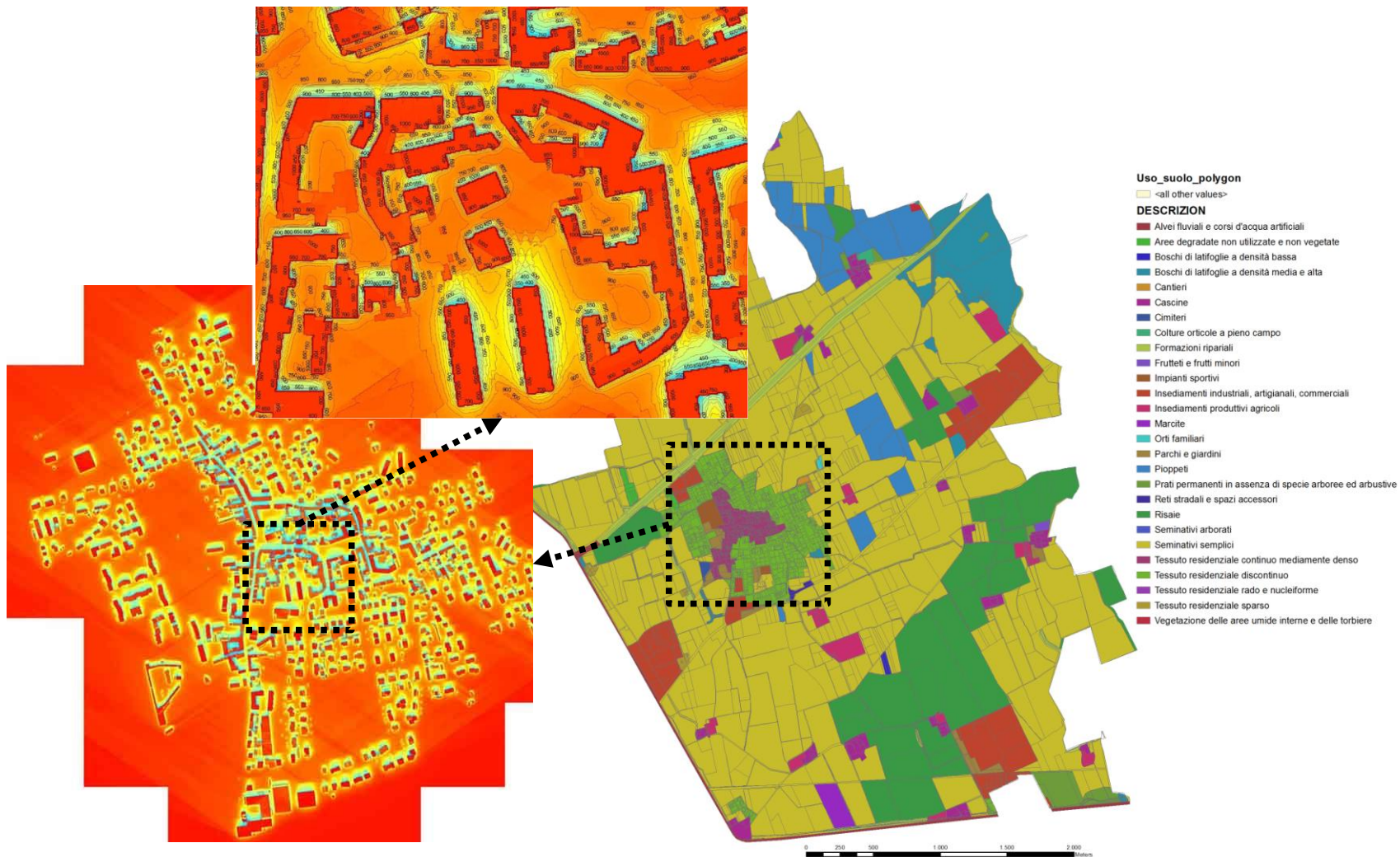
**GWP100** accounting of CO<sub>2</sub> equivalent emissions, expressed in kg of CO<sub>2</sub>eq





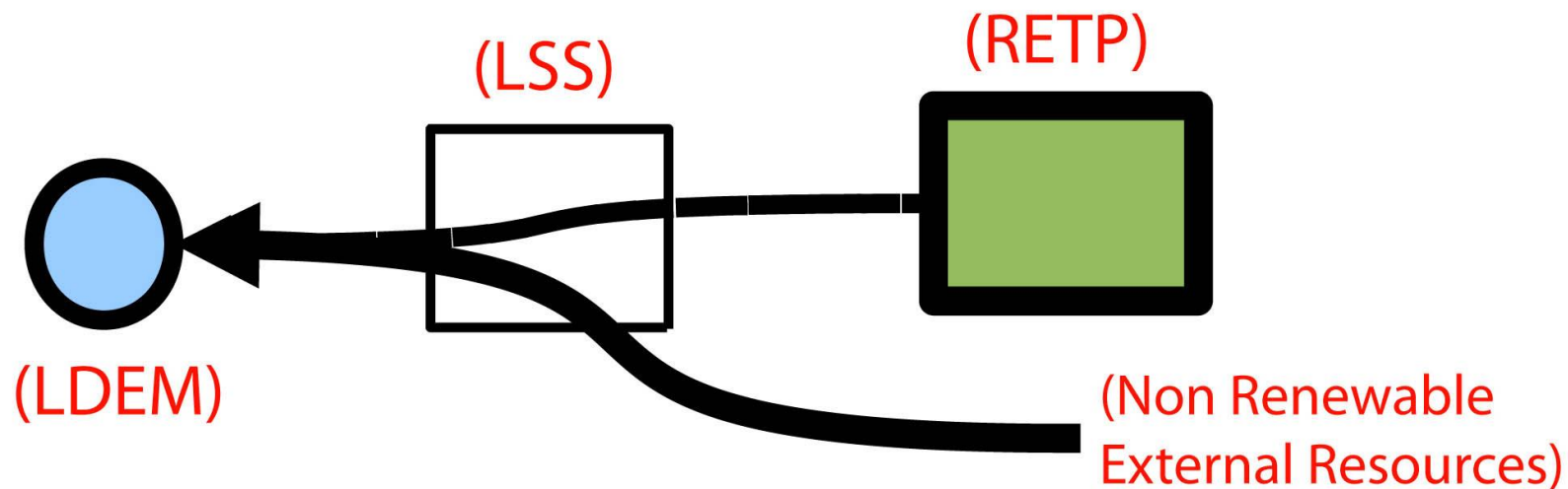
## Resources geographies

They are obtained by collecting in specific thematic maps quantitative data related to the locally available renewable resources. Once defined the boundaries of the local context, this phase of the methodology processes and stores in the same Geographic Information System data concerning local physical and biological/agricultural environment.

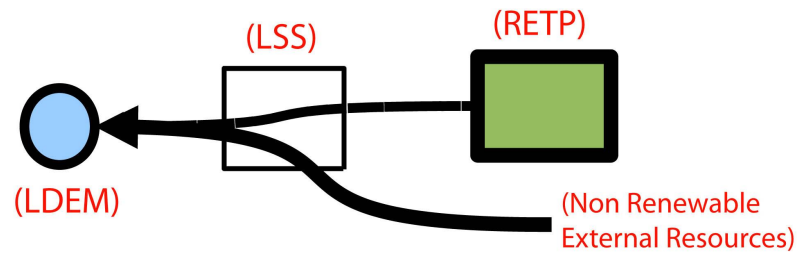


## User histograms

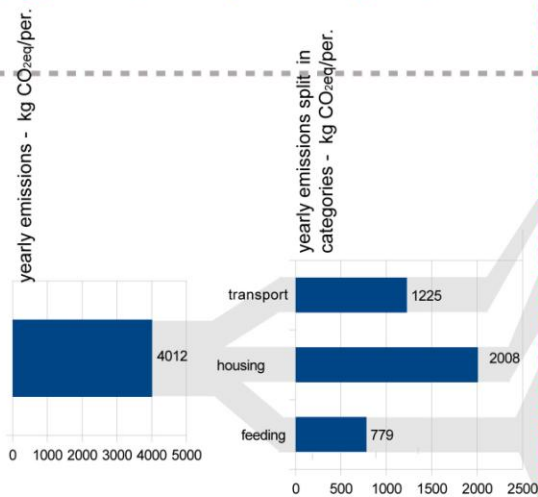
The user histograms build the connecting structure between the information collected in the geographies, in order to check different design choices. They report in terms of general flows and per-capita flows local demand of energy and matter and relate them with the extension of productive land per-capita. Histogram general structure can be easily understood looking at the following diagrams.



# User histograms

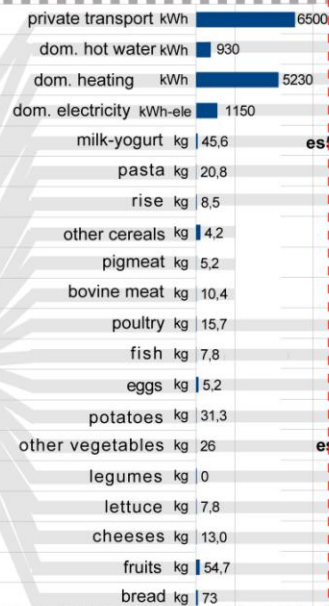


Impact indicators and thresholds values of sustainability:  
NRE Non Renewable Energy (MJe/person\*year)  
GWP100 (kg CO<sub>2</sub> equivalent/person\*year)



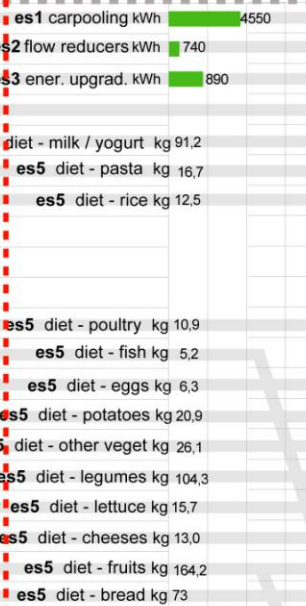
Local Demand of Energy and Matter per person (LDEM)

Local demand for energy and matter.  
Consumed amount yearly / person

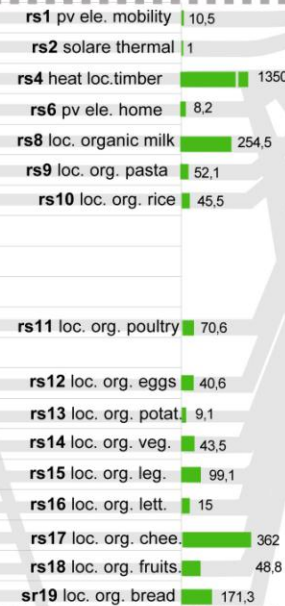


Local Self-Sufficiency Scenario, best practices application (LSS)

es: high efficiency strategies.  
Energy and matter consumption scenario

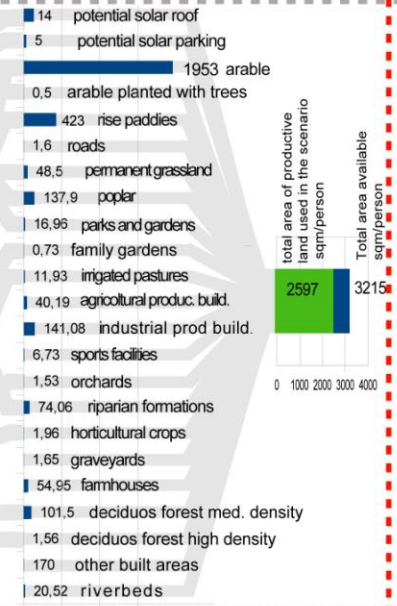


rs: local renewable resources use practices  
sqm of productive land



Renewable Energy Technical Potential, locally available (RETP)

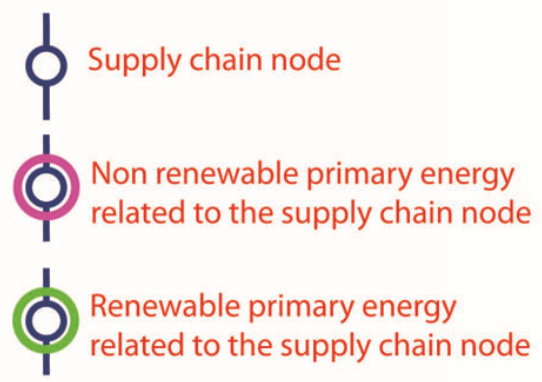
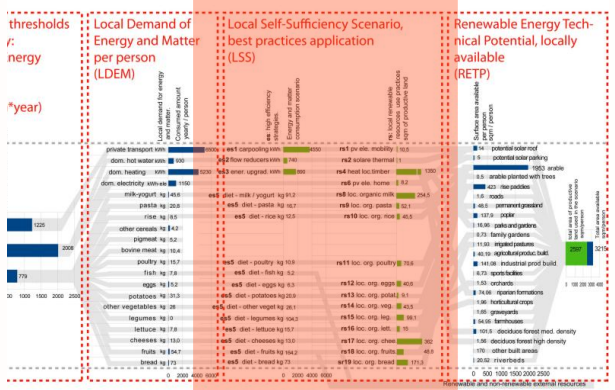
Surface area available per person  
sqm / person



Renewable and non-renewable external resources

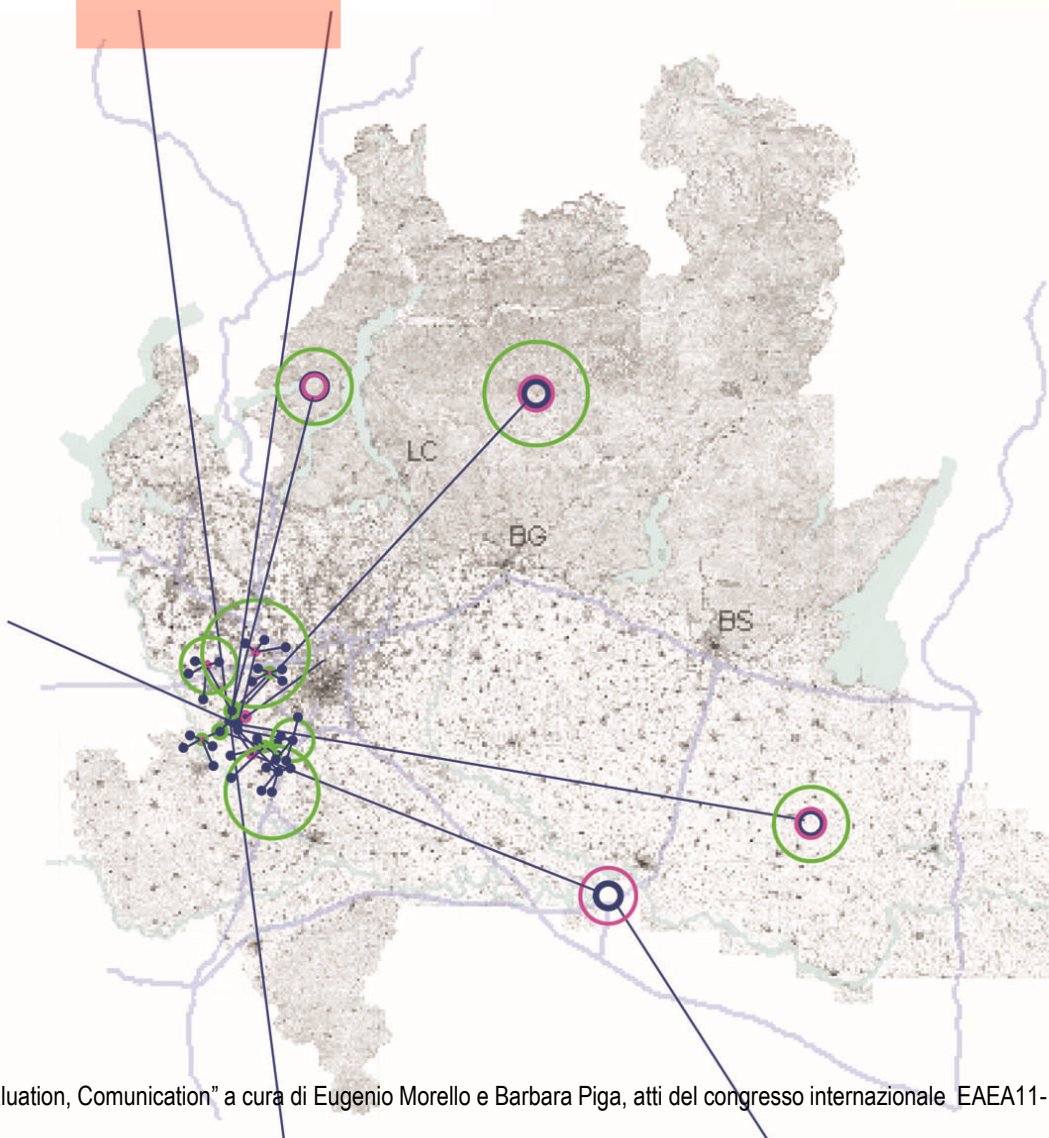
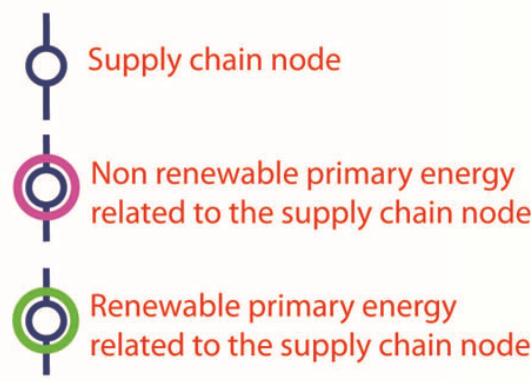
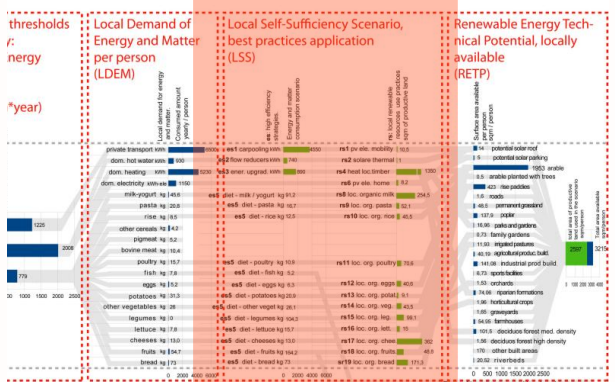


Local Self-Sufficiency Scenario, best practices application (LSS)





Local Self-Sufficiency Scenario, best practices application (LSS)



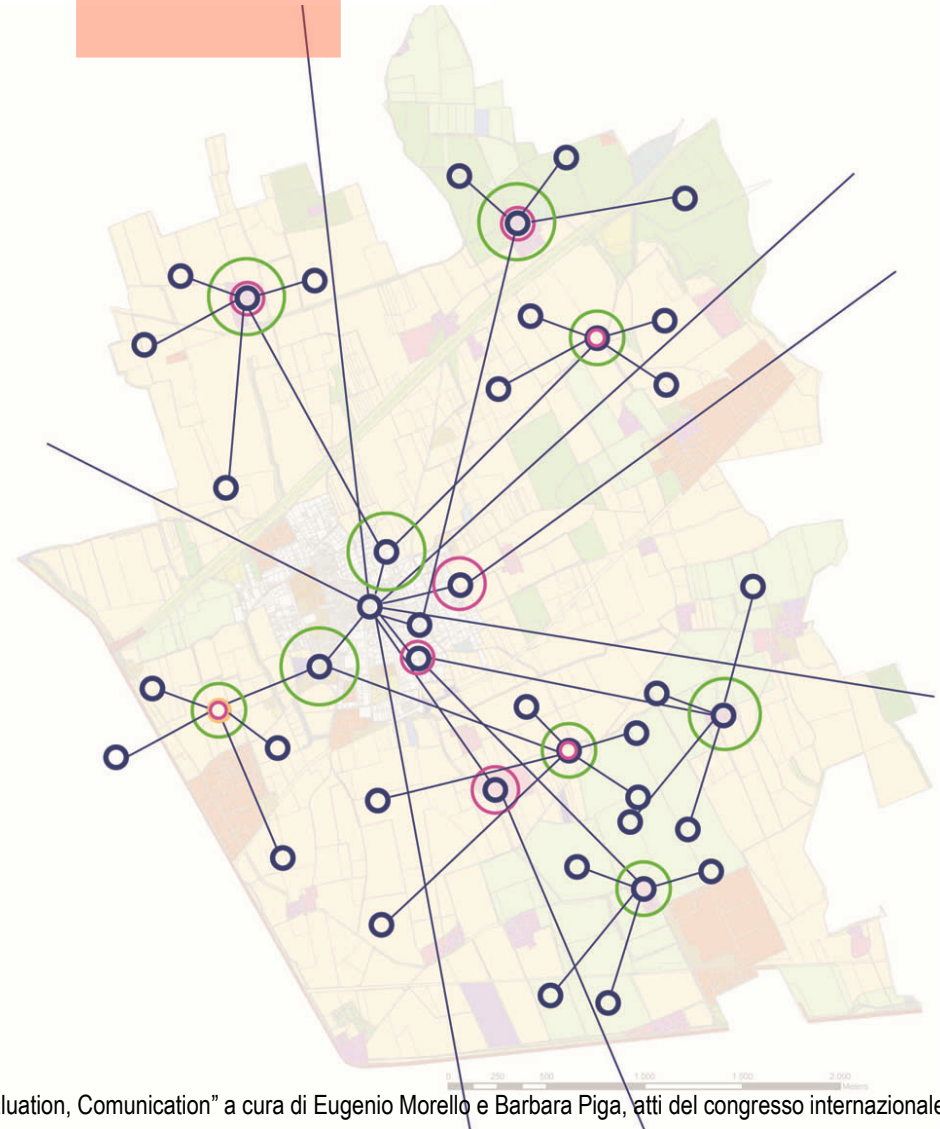
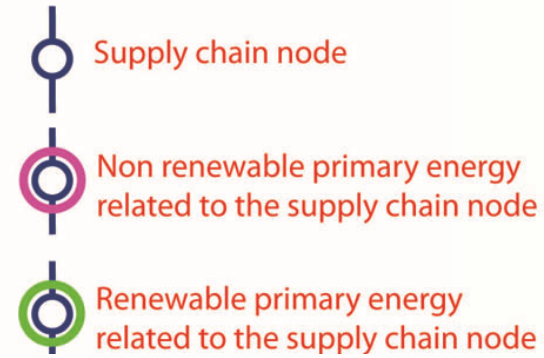
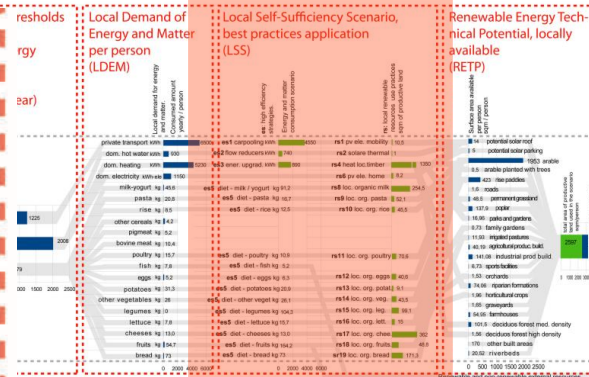
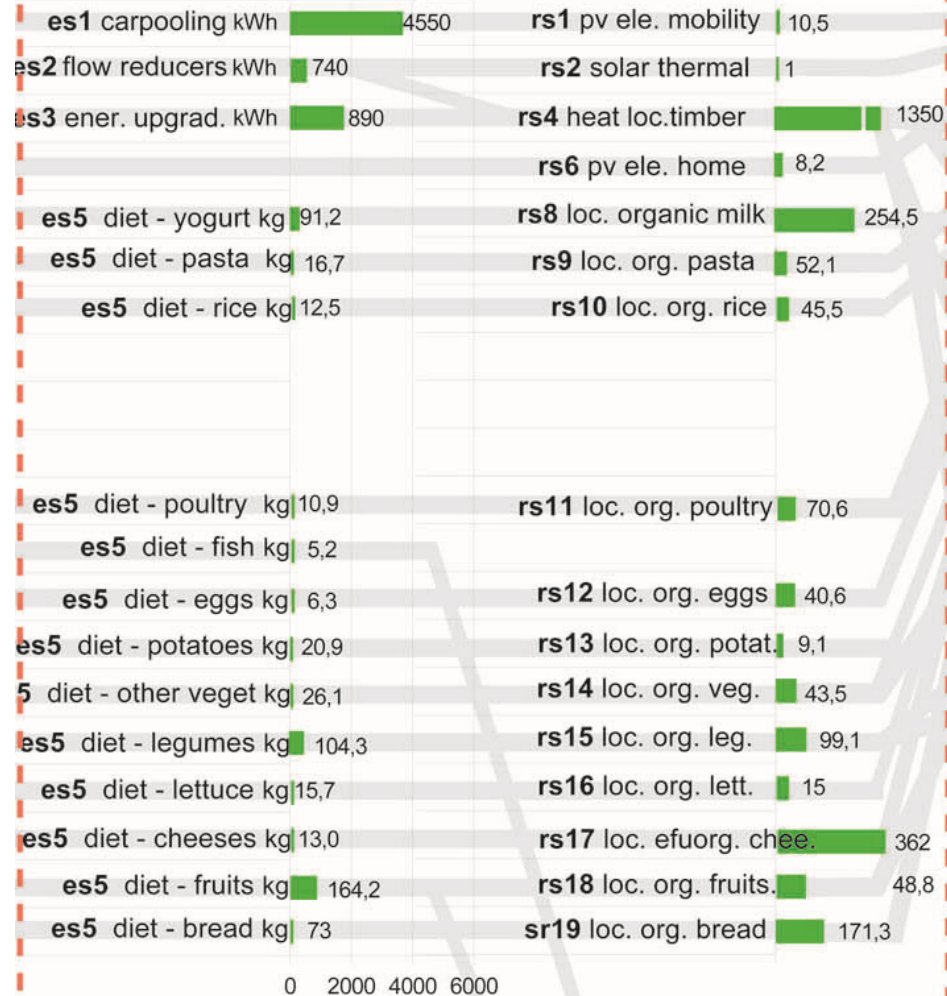


# Local Self-Sufficiency Scenario, best practices application (LSS)

es: high efficiency strategies.

Energy and matter consumption scenario

rs: local renewable resources use practices sqm of productive land



total area of productive  
land used in the scenario  
sqm/person

Total area available  
sqm/person

2597

3215

0 1000 2000 3000 4000

rise kg 8,5

other cereals kg 4,2

pigmeat kg 5,2

bovine meat kg 10,4

poultry kg 15,7

fish kg 7,8

eggs kg 5,2

potatoes kg 31,3

other vegetables kg 26

legumes kg 0

lettuce kg 7,8

cheeses kg 13,0

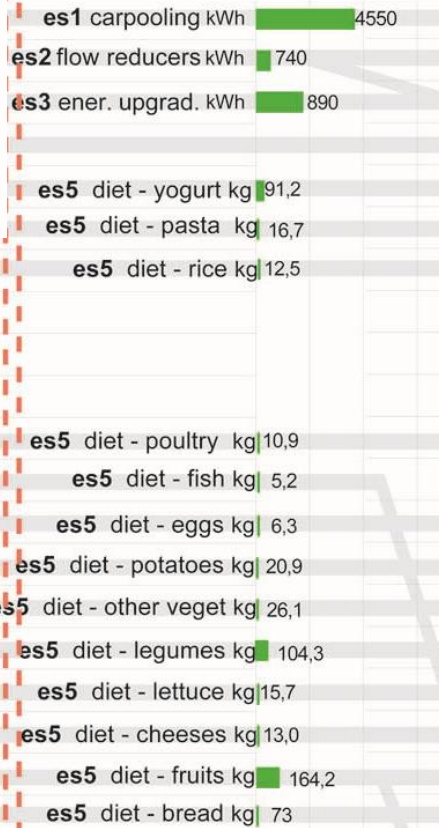
fruits kg 54,7

bread kg 73

0 2000 4000 6000

## Local Self-Sufficiency Scenario, best practices application (LSS)

es: high efficiency  
strategies.  
Energy and matter  
consumption scenario



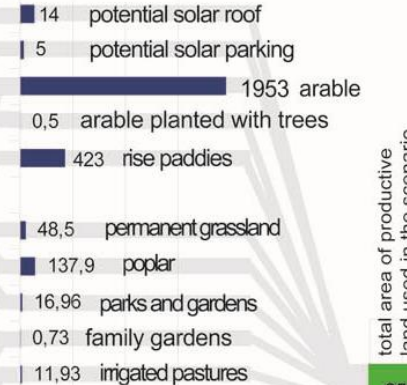
rs: local renewable  
resources use practices  
sqm of productive land



0 2000 4000 6000

## Renewable Energy Technical Potential, locally available (RETP)

Surface area available  
per person  
sqm / person



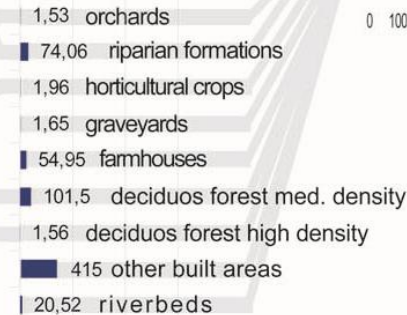
total area of productive  
land used in the scenario  
sqm/person

2597

Total area available  
sqm/person

3215

0 1000 2000 3000 4000



0 500 1000 1500 2000 2500

Renewable and non-renewable external resources