LEA (Local Environmental Analisys)

The purpose of the local environmental analysis is to quantify the potential volume of wastes that can be reused in the production cycle as secondary materials. It is done by identifying:

- which wastes can be reused from the technological standpoint, going from the wastes/rejects of a production cycle to secondary materials used in the same or other production cycles after appropriate transformation or processing;
- how much waste it is economically and environmentally advantageous to use in the reference area by considering both the cost factors associated with handling, waste treatment and transformation (alternative) into secondary materials as well as the demand factors such as whether or not there is a sufficient number of operators in the area who would be potentially interested in using secondary materials.

The general logic scheme of the territorial environmental analysis is structured as follows:

1) the starting point is a schematic analysis of the production processes – in our case for textiles, paper and flowers-plants – to identify the types of wastes associated with production for each sector;
2) for each category of wastes we then identify potential reuses by identifying the raw materials that can be replaced or the possible energy that can be recovered;
3) for the most interesting reutilizations – because they concern wastes produced in large amounts in the reference area and their transformation into secondary materials that are also requested in the area, we investigate the required transformation activities in order to determine how much secondary material can be obtained from the wastes, its quality and cost;
4) we identify the production activities that use raw materials which can be replaced with the secondary materials under consideration by analyzing the distribution of the local units in the reference area (on the basis of the classification and the ISTAT data concerning the business activities);
5) and finally we do the territorial environmental analysis proper by calculating and comparing the three types of costs: i) of waste treatment and final disposal; ii) of transformation into secondary materials; iii) of the replaced raw materials. In the event the waste is used for energy recovery the comparison is made between the costs of

treatment and disposal without energy recovery, treatment with energy recovery and the cost of the replaced energy sources.

Waste Disposal	**Transformation into Secondary Materials**	**Replaced Raw Materials**
Company Costs Transportation Treatment and final disposal	***Company Costs*** Collection and transformation Business intermediation margin Transportation	***Company Costs*** Ex-factory prices Business intermediation margin Transportation
Environmental Costs Pollution of: air water ground	***Environmental Costs*** Pollution of: air water ground	***Environmental Costs*** Pollution of: air water ground

The territorial environmental analysis was developed through the creation of a data processing program. The program makes it possible to analyze the amounts of waste production in the reference area system, the respective disposal costs, the potential amount of secondary material that can be obtained from the wastes and the avoided costs of raw materials for any cycle i.e. the activity that originates the wastes – transforming the wastes into secondary material – the activity to which the secondary material is destined. All this on the basis of waste output flows as obtained from the MUD forms.

A brief description of the program

From the functional standpoint the CLOSED program consists of a database and data access, verification and processing procedures.
The database contains the Environmental Statement information from the companies in the special wastes section. On the basis of the initial configuration the program makes it possible to process waste production and the respective disposal costs (analysis from the offer side) and the potential amount of recyclable wastes as secondary material (analysis from the demand side) for the selected sector.
The typical output of the offer-side analysis can be schematically shown as follows:

The typical output of the offer-side analysis can be summarized in a chart as shown below:

Area	Nr. LocalUnits ISTAT	Nr. Jobs ISTAT	Nr. Jobs MUD	Amount of waste MUD	Estimated amount of waste	Disposal cost	Environmental impact
Total PRATO							
Municipality 1							
…..							
Municipality n							
Total PISTOIA							
Municipality 1							
…..							
Municipality n							
Total LUCCA							
Municipality 1							
….							
Municipality n							
Total AREA							

The waste production analysis that can be done with the CLOSED program is based on the companies' environmental statements[1] and classifies wastes according to the European Community standard as defined by the CER that breaks them down into:
urban;
special;
and then into
non-hazardous;
hazardous.

[1] The Italian nature of the data base will make it necessary to replace the reference data bank if the program were to be used in other contexts.

The program analysis focuses attention on special wastes which in turn are broken down into:

- wastes from agricultural and agro-industrial activities;
- construction and demolition wastes; hazardous wastes from excavations (inert wastes);
- wastes from industrial processes;
- wastes from commercial activities;
- wastes from service businesses;
- wastes from waste disposal and recovery;
- sludge from water purification and other treatments, purification of reflux water and smoke abatement;
- health-care and hospital wastes;
- obsolete and dilapidated machinery and equipment;
- no longer serviceable motor vehicles, trailers, similar items and parts thereof.

The data processed for territorial aggregates (municipalities and provinces) include:

- the number of productive/manufacturing areas (local ISTAT units – 1996 Intermediate Industry Census);
- the number of jobs in the area as per ISTAT findings;
- the number of jobs as per the company MUD's;
- the amount of waste produced as per the company MUD statements.

Waste estimates: this datum is available only for the specific wastes produced by the processes surveyed in the project. For these categories we can estimate total waste production starting from final production or the materials used as inputs, or on the basis of the production jobs if the specific coefficients of waste production (per amount of product, material used or per job) are available. The estimate is necessary because the MUD datum is notoriously incomplete and also contains discrepancies that become evident when compared with the estimates. In practice, if there are no ad hoc surveys in the reference area, we use sectorial coefficients of mean national waste produced per job. This estimate is then obtained by multiplying these coefficients by the number of jobs in the sector being surveyed in the local/area system.

Disposal costs: are calculated with reference to the amount of wastes stated in the MUD and the estimate quantities. The calculation is done by assuming that the amount of wastes produced in each municipality are distributed amount the disposal or storage facilities (the data extracted

from the MUD do not make it possible to distinguish between disposal and storage which would be more useful and advantageous for analytical purposes) in the areas of the respective provinces. The costs are then calculated by adding the cost of transport from the municipality of origin to the disposal or storage facilities to the cost of disposal/storage processes. The program gives the user the parameters for these calculations and these include:

- transportation costs per ton/kilometer;
- an estimate of the distance from the municipalities to the disposal/storage facilities;
- the type of disposal (dump, incinerator, etc.) or storage facilities and the respective unit cost per ton of treated waste.

Environmental impact: is measured by calculating emissions of the main pollutants deriving from the transportation and disposal of wastes. Total emissions are calculated by multiplying the total amount of wastes taken to the disposal or storage facilities by:
the coefficients of emission per disposed ton specific of the various types of facilities (disposal emissions)
the estimate of the distances covered and the coefficient of emissions per ton/km (transportation emissions).

The program provides the user with the distance parameters. In practice the emissions calculations are limited to the dispersion of transport associated pollutants in the atmosphere. In this way we can obtain an estimate of emissions that could be reduced with respect to waste reduction actions through reutilization in neighboring areas (within the same district or in the surveyed districts).

The demand-side analysis processes the amounts of waste produced in the local system that are potentially recyclable into secondary materials. The processing is done on the basis of the user selected associations of specific types of wastes for the various sectors or non-specific wastes and possible reuse as inputs in place of raw materials in potential destination sectors.

In general waste reutilization is subject to a range of technical-economic restrictions that limit:

- the types of materials that can be replaced by secondary materials;
- the useable amount of secondary material of suitable quality to replace raw materials that can be obtained from waste transformation processes.

The program makes it possible to take these technical restrictions into account by using a "coefficient of reutilization." It is a value that represents the yield of waste transformation as is into secondary material that can suitably replace the selected raw material. This coefficient may have the following values in practice:

- 1 if the waste can be fully used without any weight or volume reduction (theoretical limit);
- a number between 0 and 1 if the waste has to undergo transformation processes that reduce the usable quantity.

Obviously, it is the users who decide the values to use as the coefficient since they know the advantages and limitations inherent in the technological reutilization of a given material.

Once the production cycle to examine – along with the waste produced by the original activity and the raw material to replace in the destination activity – and the respective yield in aggregate terms – with the coefficient of reutilization that determines how much usable secondary material (i.e. that can replace the raw material without substantial quality impact) can be extracted from the initial wastes – have been determined the program calculates the amount of potentially recyclable wastes present in the reference area system.

This calculation is done by multiplying the amount of waste produced in the area as determined through the offer-side analysis by the specific coefficient of reutilization.

The application of the CLOSED program permits an analysis of the waste cycles to close including waste categories specific to the surveyed productive sectors (fibers and sludge for the paper industry and waste flock from the textile industry), and non-specific wastes (plastic packing materials and plastics in general).
The program requires the activation of two procedures:

- the qualitative configuration of the internal organization of the production sectors, identifying the sub-sectors on the basis of the simplified diagram of the production processes and the identification of the list of raw materials used in each, as well as the possible pairs of wastes to reuse and raw materials to replace selected on the basis of technical-economic feasibility;
- the quantitative configuration of the raw material cost parameters (estimate of current prices) and unit cost waste of transportation, disposal and storage, as well as the determination of the distances

between municipalities for calculating total transportation costs and the coefficient of pollutant emissions into the air for the waste transportation and treatment processes for calculating environmental impact.

The raw materials for the reutilization sectors for the areas surveyed are those found in the analysis done with the LCA through the creation of the Inventory.

The specific parameters regarding inputs and outputs from the production chains typical of the surveyed districts are shown in the tables below:

LUCCA – PAPER/CARDBOARD

Water
Hydrogen peroxide
Oily adhesive
Flocculating agent
Agents for drying and glossing cylinder detachment
Agents for drying (and glossing) cylinder
Cardboard cores
Anti-silting agent
Anti-foaming agent
WS recycled paper reel
Recycled paper reel
Pure cellulose paper reel
WS treated pure cellulose paper reel
Cellulose
Glue
Detergent
Separator
Labels
Packing material
Skids
Aluminum polychloride
Polyethylene
Anionic polymer
Cationic polymer
Moisture resistant resins
Ritention agents
Soap
Boxes
Soda
Cardboard strips

PRATO – TEXTILE INDUSTRY

Sodium acetate
Acids
Formic acid
Acetic acid
Hydrochloric acid
Oxalic acid
Sulfuric acid
Hydrogen peroxide
Alkalis
Ammonia
Softeners
Antibastonante
Anti-wrinkle agent
Anti-pilling agent
Anti-foaming agent
Anti-fraying agent
Dyeing aids
Fulling and Washing aids/fuller
Optical whites (for wool/acrylics)
Sodium carbonate
Washable
Synthetic lubricants
Oiling agents
Oil
Oxidants
Perchloroethylene
Anti-precipitants (cationic and anionic)
Anti-reducing agents (for reactive dyes)
Processing agents (paraffin base)
Miscellaneous products
Products for boilers
Products for polishers
Products for osmosis
Products for dyeing
Resin
Reducers
Fluffing agents
Retardants
Salt
Detergent soap

Catalyst
Sodium chloride
Dyes (overall)
Decolorizing agents
Detergent
Dispersing agents
Equalizers for wool/acrylics
Synthetic fibers
Plant fibers
Total Yarns
Fixer
Glycols
Sodium hydrosulfite
Sodium hydroxide
Plastic packing
Soaking agents for printing
Wool/wool blends
Wool whitener
Sequestrant
Degumming agent for silk
Caustic soda
Solvay soda
Sodium dichromate
Sodium chlorite
Sodium hypochlorite
Sodium metabisulfite
Ammonium sulfate
Sodium sulfate
Sodium sulfide
Stabilizer
Acid developers
Plastic tarpaulins
Surfactants (textile)
Viscose (linen + polyester)

PISTOIA – PLANTS/FLOWERS

Agriperlites
Other antiparasitic agents
Canes, Other material
Canes, Bamboo
PVC tails
Slow release fertilizer
Chemical fertilizer
Organic fertilizer
Fertilizer for fertilization by irrigation
PP ropes
Bark
Weed-killers/herbicides
Coconut fiber
PE film for tunnel growing
PE film for mulching
Steel wire/ferrous mat.
Fungicides
Insecticides
Jute
Impregnated pine poles
Chestnut poles
Young plants
Pumice
Nylon mesh
Plastic mesh
Metallic mesh
Rags
Tarpaulins for waterproofing
Peat
Plastic pots