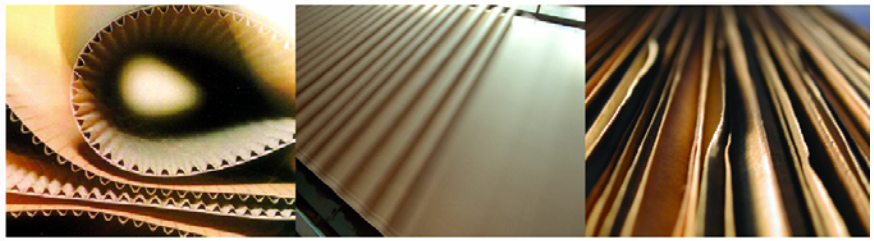
Cost-Benefit Analysis of separate paper and board collection in Italy



Prof. Alessandro Marangoni
AGICI Finanza d'Impresa

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WHY

Comieco has entrusted **AGICI** to perform a cost-benefit analysis of separate paper and board collection as a preliminary review of the data and numbers available to the Consortium highlighted that no research had ever been carried out to stress the economic, social, and environmental benefits of separate collection.

More specifically, the research focused on **two main issues: the economic and environmental benefits of separate collection and paper & board recycling**. As opposed to the common misconception that separate collection is carried out to a minimal extent, this analysis provides data that deny this idea.
The data refers to collection and actual recycling as well as, particularly, to a number of economic and environmental considerations, i.e. the tangible and quantifiable benefits for the citizens.

Separate collection and recycling as an opportunity to create wealth. Showing how separate collection, in Europe and in Italy, has promoted the creation of **new companies and jobs**, at the same time relieving the local institutions of a number of tasks and thus allowing to allocate human and financial resources to other areas. In this case too, data and numbers should be produced, possibly comparing Italy Vs. Europe, with historical and forecasting purposes in mind.

AGICI: Independent professionals specializing in strategic and financial consulting

AGICI works in close contact with **Companies**, **Administrations,** and **Institutions** for the purpose of conceiving and implementing value-creating development policies. An operational approach, supported by a strong theoretical background, ensures high flexibility for maximum compliance with the suggested solutions to specific customer needs. A close **understanding of the Italian company sector** and a wide web of national and international relations integrate the distinctive features of AGICI.

The Agici professionals have gained an experience in a number of industrial and service sectors, developing innovative projects and offering original solutions. The sectors:

- Environment
- Trade and Services
- Publishing
- Electronics and Components
- Real Estate
- Transportation and Logistics
- Utilities

AGICI has conceived the following initiatives:

Work Group for alliances and acquisitions in Italian local utilities

it provides a tool to interpret competitive dynamics in the different sectors:
water, gas, power, waste, transportations, and telecommunications.
Aim: understanding current trends, interpreting competitor actions, and setting up strategies and alliances.

Studies & Research

The “Global Utility Research Unit” research project was launched, developing every year a number of studies on the main public utility sectors: water, power, gas, and waste.

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Prof. Alessandro Marangoni

Academic activity

At the Bocconi University.

- Professor in charge of **"Corporate Economy and Management";**
- Professor of **"Service network and service marketing management"** and **"Environmental service economy and management"** for the Master in "**Public Utility economy and management";**
- Professor of **"Environmental accounting and evaluation"** and **"Environmental service management"** for the Master in **"Environmental service economy and management"**

He is the author of studies and publications on:

- Strategy, finance, and economy of industrial and environmental management companies
- Public utilities and their strategies.

His most recent publications include:

- **"**I modelli di sviluppo e aggregazione"
- "Il management di alleanze e aggregazioni: modalità di costruzione e impatti sulla gestione"
- "Alleanze e aggregazioni nelle utility"
- "Il settore idrico italiano. Strategie e modelli di business"

Professional activity

He is the Managing Director and a senior partner of **AGICI Finanza d'Impresa**, an independent professional company specializing in strategic consulting and extraordinary finance operations.

Company consultant, specializing in the strategic and financial area, with an experience in the strategic and operational management of medium-sized industries.
He also works as an **environmental strategy and management consultant:** environmental accounting and reports, environmental liability assessments, waste management, cost-benefit analyses.

He has developed specific skills in the public utility sector, both at an academic and a professional level, as a consultant to primary Italian and intenrational companies. He has been in charge of the Work Group on the Alliances and aggregations of Italian local utilities for about five years.

He is a member of the advisory board of the Management of Utilities review and of the scientific committee of IR Top.

SC Cost-Benefit Analysis
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SC Cost-Benefit Analysis
1. Background

The **Ronchi decree** increased separate waste: the quantity of recovered paper doubled in the 1998-2004 period, with benefits both for the environment and for the economy.

Aim: providing an economic, as well as an environmental evaluation of the results of six years (1999-2004) of separate paper and board collection

Cost-Benefit Analysis (CBA): reviews the direct and indirect impact of separate paper and board collection considering:

- economic issues: costs (or lost revenues) and benefits (or non-costs)
- environmental impact: money evaluation of environmental costs and benefits
- social impact: monetary evaluation of social costs and benefits.

Differential evaluations assuming different scenarios:

- "historical" scenario, actually in place with the development of SC
- scenario without SC, with non-separate waste collection and disposal and no material recovery and recycling.

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SC Cost-Benefit Analysis
2. The Cost-Benefit Analysis. Definition and theoretic background

The CBA allows, albeit with the well-known limits posed by the difficulty to evaluate external factors from the economic viewpoint, a more comprehensive and well-based evaluation of projects or activities, also considering their environmental and social impact

Ensure that the costs are lower than the benefits for the community, based not only on accounting and financial criteria, but also on environmental and social benefit principles

The steps:

1. **Define the project to be analyzed:** the impact of SC in Italy from 1999 to 2004
2. **Identify the significant effects:** both in terms of costs and benefits
3. **Quantify physically and assess the money value of the impact:** make different physical and monetary magnitudes homogeneous
4. **Capitalize cost-benefit flows:** make the costs and benefits developed at different points in time homogeneous
5. **Calculate the end result:** sum up the positive and negative impacts
6. **Sensitivity analysis:** highlight the variables affecting the end result

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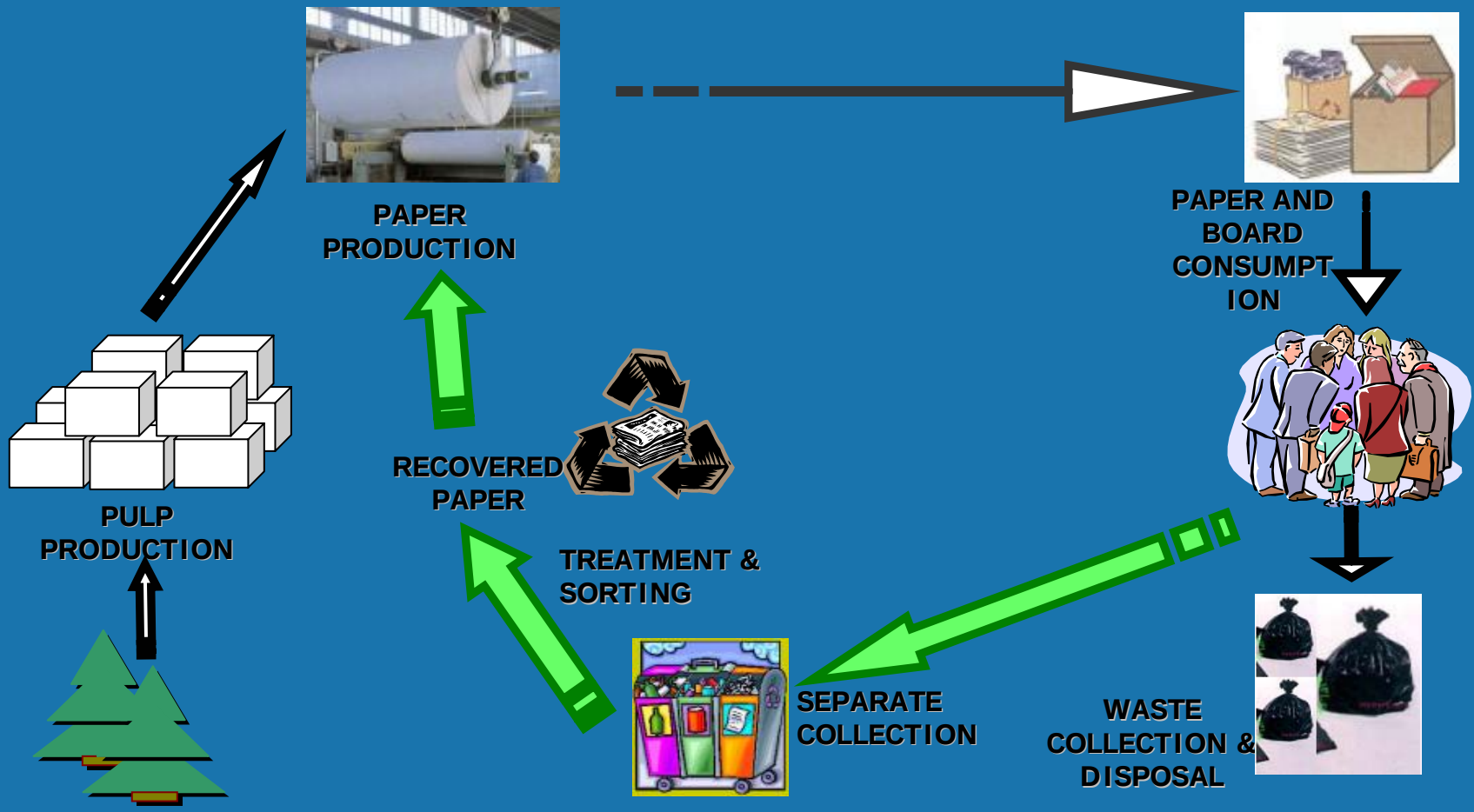
SC Cost-Benefit Analysis
3. The separate paper and board collection cycle



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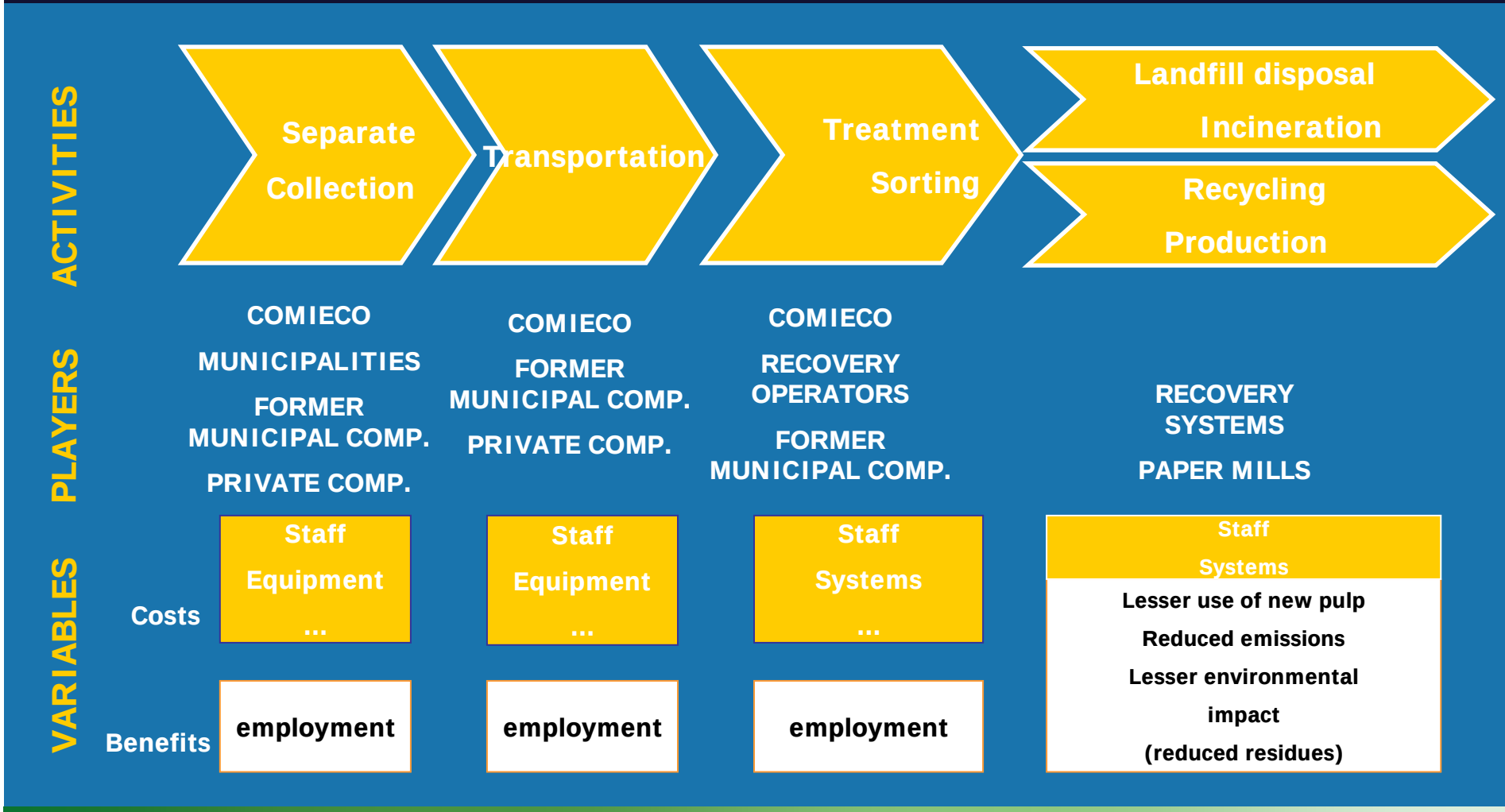
SC Cost-Benefit Analysis

4. The steps of separate paper and board collection and its key variables



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SC Cost-Benefit Analysis
5. The result of six years of separate paper collection in Italy

Costs			
	Separate collection costs	€	372.059.009,00
	Costs for reduced energy production	€	64.305.483,00
	Total costs	**€**	**436.364.492,00**
Benefits			
	Value of secondary raw materials	€	208.054.326,00
	Economic benefit of non-disposal	€	373.281.395,00
	Environmental benefit of reduced emissions	€	271.915.877,00
	Social benefit of newly generated jobs	€	193.896.444,00
	Total Benefits	**€**	**1.047.148.042,00**
BALANCE (BENEFITS)		**€**	**610.783.550,00**

Equal to 3.5 years of press paper consumption!

Note: These costs were covered with Comieco contributions for as much as 263 million EUR, equal to over 70 %, without considering the savings resulting from non-disposal.

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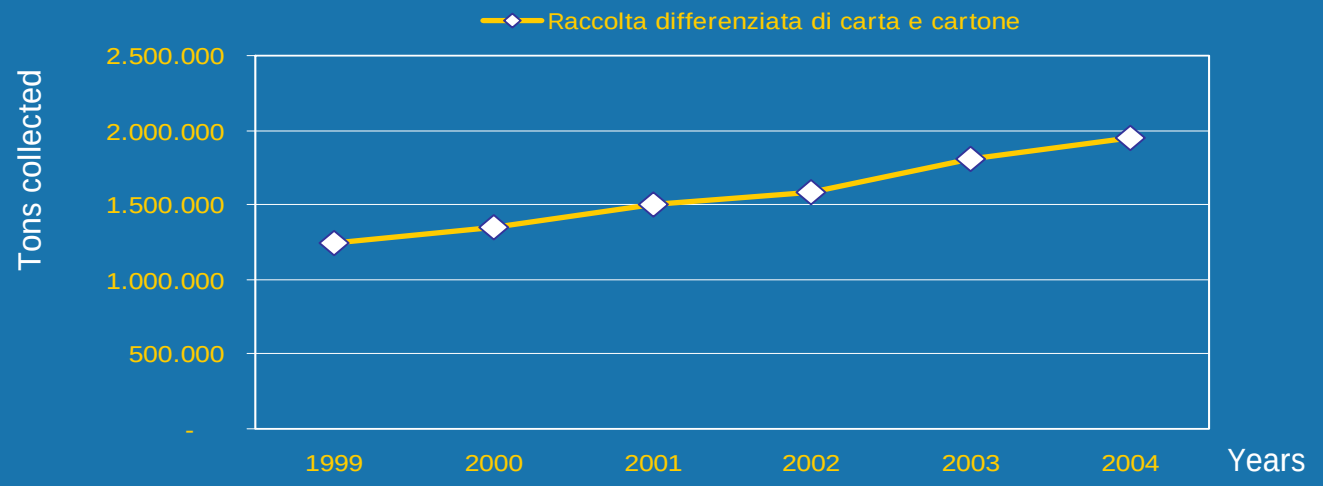
SC Cost-Benefit Analysis
6. The balance components

Six years of separate collection in Italy **9.449.398 tons**



Costs of separate paper and board collection: **372.059.009 €**

Costs include: staff, equipment, means and vehicles, depreciations, operating and maintenance costs.
Different collection methods were identified:

- Road based: one-material bell, one-material bin, and side loader
- Home based: one-material bin and bin for business customers.

The weighted cost was calculated starting from standard costs, as a function of the mix of management models year by year.

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SC Cost-Benefit Analysis

Costs for reduced energy production: 64.305.483 €.

SC reduced the paper waste to be used for incineration, thus reducing the electric and thermal power generated. This represents a cost of SC, because it points out to a reduced benefit in terms of generated energy.
Based on the total quantity of incinerated waste (Apat-Onr data), it has been estimated that 864,848 tons of paper and board were not treated from 1999 to 2004, with 1,379 million KWh less energy produced

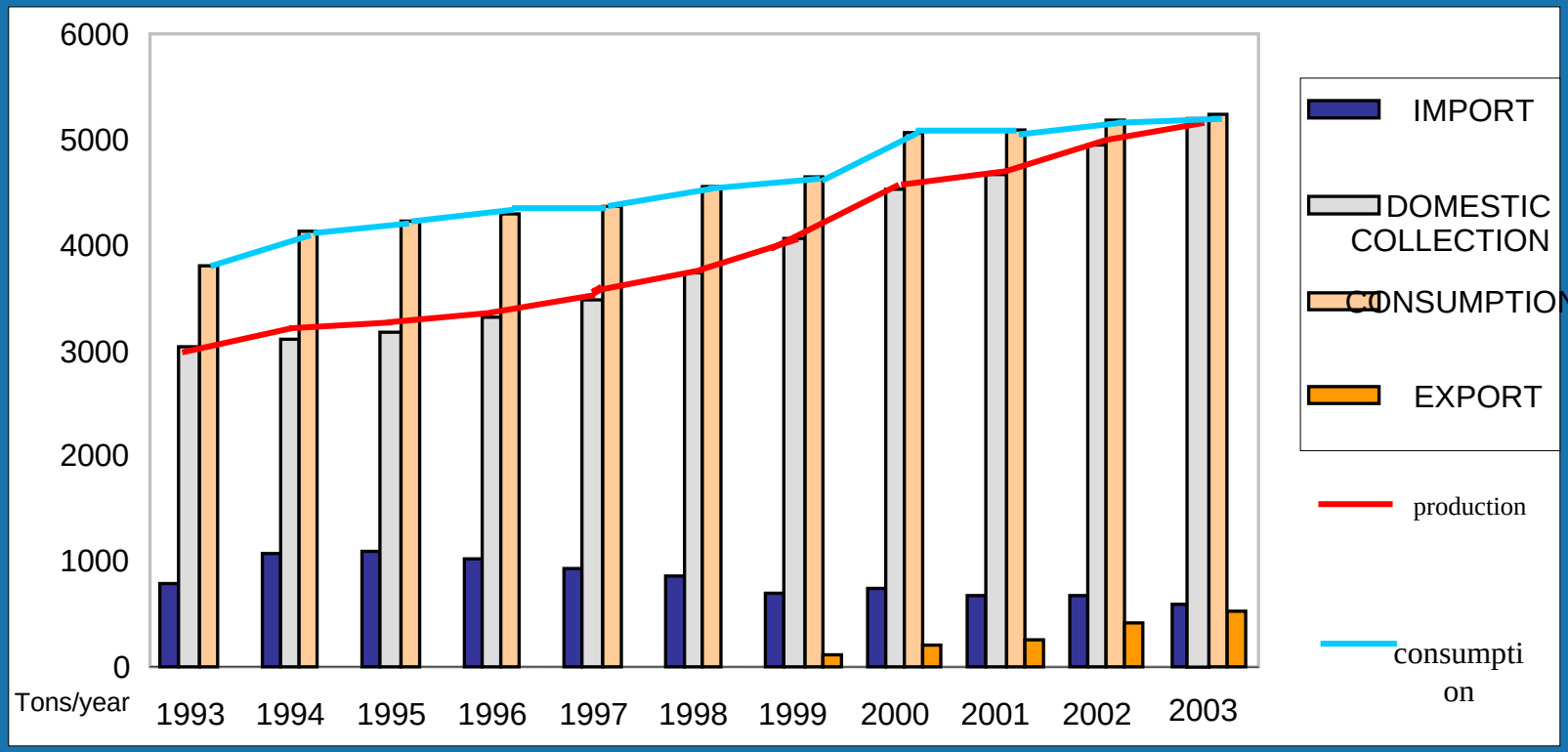
Value of secondary raw materials: 208.054.326 €.

The collected recovered paper is reintroduced into the paper production cycle as a secondary raw material, thus providing a valuable input to the production process and reducing the use of new pulp or the import of recovered paper from abroad.

The significant reduction of import flows implies great environmental and social benefits. The reduction of goods flows reduces the environmental costs (emissions) and the social costs (health-safety) of transportation, especially road haulage.

SC Cost-Benefit Analysis

At the end of 2004 Italy was a net exporter of recovered paper thanks to separate collection, with a positive impact in terms of availability of raw materials for the national paper industry and of independence from foreign sources



Source: processed Assocarta-Istat data

SC Cost-Benefit Analysis

Benefit of non-disposal and treatment: 373.281.395 €.

Reduced costs for the non-disposal of quantities of waste paper that would have joined urban waste in the absence of SC in the different years.
The reduced waste management costs are estimated based on the different possible processes:

- landfill disposal
- incineration
- composting
- biostabilization.

The calculation was performed by weighing the minimum and maximum costs based on the relevant quantities, and the total annual value of the reduced costs was calculated.

Economic benefit of reduced emissions: 271.915.877 €.

This item becomes especially relevant with the **Kyoto Protocol** and the onset of the **market of emission rights.**
It stresses the benefits of SC for the environment, also in terms of reduction of carbon dioxide emissions due to the reduced use of new raw materials
The benefit for each ton of paper produced from recovered paper instead of pulp amounts to 1,308 kg of CO2 reduced.

SC Cost-Benefit Analysis

Such benefits were evaluated in consideration of the market of blue certificates, recently established in Europe following the Kyoto Protocol.
The evaluation of one kg of CO2 is very complex today, because several estimates and few market prices are available.
The value range is quite wide, from a minimum of 7 EUR/ton to a maximum of 77 EUR/ton.
The selected value of 22 EUR comes from a number of comparisons among such data and it is based on a principle of caution.

Social benefit of newly generated jobs: 193.896.444 €.

SC produes a social benefit first and foremost in terms of employment.
From 1999 to 2003 the headcount increased in environmental service companies (+18.7% according to Confservizi), in countertrend compared to other public service sectors (-10%).
Separate paper collection alone generated an increase of over 6,500 jobs.
Such figure is the result of a calculation of the number of operators theoretically required to carry out collection in the different years estimating the annual number of hours of additional labour for SC according to the different collection systems.
Valuing was made in terms of gross salary as from the national collective labour contract of 2.8.1995 for environmental service operators.

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SC Cost-Benefit Analysis
7. The sensitivity analysis

Simulations acting on the sensitive variables and representing two borderline situations:

- ***worst case:*** maximum SC costs, minimum value of blue certificates, minimum value of recovered paper, and maximum waste disposal and treatment costs;
- ***best case:*** minimum SC costs, maximum value of blue certificates, maximum value of recovered paper, and maximum waste disposal and treatment costs.

	Worst case	Fair Value	Best case
SC costs	-381.638.713	-372.059.009	-362.434.306
Cost for reduced energy generation	-64.305.483	-64.305.483	-64.305.483
Environmental benefit of reduced emissions	123.598.126	271.915.877	457.313.066
Economic benefit of non-disposal	372.984.957	373.281.395	582.704.445
Value of generated MP	180.478.483	208.054.326	235.333.913
Social benefit of newly generated jobs	193.896.444	193.896.444	193.896.444
	424.968.815	**610.783.550**	**1.042.508.079**

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SC Cost-Benefit Analysis
8. The economic result of SC

It only considers the **economic values** of SC to assess the economic and financial sustainability of the system, whatever its social and environmental impact.

	Worst case	Fair Value	Best case
SC costs	- 381.683.713	- 372.059.009	- 362.434.306
Costs of non-produced energy	- 64.305.483	- 64.305.483	- 64.305.483
Reduced disposal costs	372.984.957	373.281.395	582.704.445
Raw material value	180.478.483	208.054.326	235.333.913
Total EUR	**107.474.244**	**144.971.229**	**391.298.569**

SC is **economically self-sufficient**, i.e. **its cost-revenue balance is always positive**, whatever the assessment and judgement of the beneficial effects of collection on the environment and on the social system in Italy.

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SC Cost-Benefit Analysis
9. Conclusions

The separate paper and board collection carried out in the past six years in Italy highlights a widely positive cost-benefit analysis.

The paper collected during the period is equal to one full year of production by the Italian paper industry

The cost-benefit ratio shows a positive balance of 610 million EUR as a result of the difference between total costs for 436 million EUR and benefits for 1,050 million EUR

Such benefit equals to three and a half years of press paper consumption!

The result is still positive if strictly economic values are only considered, thus highlighting the self-sufficiency of the SC system.

The sensitivity analysis places the total benefit in the 425-1,050 million EUR range, while stressing the cautionary character of the estimated value.

Thank-you for your attention.

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www.comieco.org

AGICI FINANZA D'IMPRESA
Via Podgora, 1 - 20122 Milano
Tel. +39 02 54.55.801- Fax + 39 02 55.18.18.94
E-Mail: agici@agici.it - www.agici.it