Corporate Environmental Accounting: 
how to translate the environmental concerns 
into the language of business

Stefania Borghini
Fondazione Eni Enrico Mattei 
C.so Magenta, 63 
20123 Milano-Italia 
e-mail: borghini@feem.it

ABSTRACT
Spending in waste management, waste water treatment and atmospheric pollution abatement by manufactures is running at a high percent of sales and rising according to recent North American and Italian statistics. Unfortunately conventional accounting practices -developed to serve financial reporting requirements- rarely illuminate environmental costs or stimulate better environmental performance. Environmental costs in fact are dispersed throughout most business and can appear long after decisions are made.

This project investigates the opportunities of using management accounting as an environmental management tool in medium and large Italian industries and in particular its possible relevance in improving both business decision making process and environmental performances. The empirical research relied on case studies of two representative firms: one large industry involved in the petroleum production (Agip), and a medium size industry, in production of coated fine papers (Cartiera Favini). The focus of these case studies are the corporate environmental costs recording and the role of environmental costs and liabilities in decision making processes. The Environmental accounting frameworks proposed by the literature are a baseline against which the case studies results are evaluated.

The final aim of this research is to develop a new framework that allows to translate the environmental concerns into the language of business and to enhance the profitability and the productivity of the company incorporating environmental costs in operational and capital budgeting.
Introduction

Environmental issues can not be considered any more only ethical issues, “environmental issues are business issues” states Martin Houlding, from KPMG Peat Marwick National Environment Unit. The damages that companies cause to the environment came back as economic damages to the companies themselves. The relation between the environment and the companies can now be represented as a circle where different actors play their roles.

Companies, producing goods and services, introduce qualitative and quantitative changes to the environment. All these environmental impacts cause a damage, in terms of economic and welfare losses, to the consumers and the company itself.

With the development of an environmental awareness consumers start to react to the degradation of natural heritage asking for more “environmental friendly” products and processes, putting pressure on public administration for more strict environmental legislation and public monitoring, and using their sanctioning power directly against the polluter.

Those factors affect the company’s profit. On one hand more strict legislation increase the costs of production, on the other hand the changing in consumers’ preferences make the company lose market share. Company’s profit is also directly affected by environmental depreciation, the diminishing land value, the reduction of natural resources available and their increasing costs, the minor efficiency of work in polluted areas, are only some examples. In this new scenario, even if all these components can significantly vary from country to country, companies have to internalise environmental aspects.

The paradox is that even if firms are spending more and more for environmental purpose, the last investigation of ISTAT shows as in Italy environmental operating expenses increased from 1989 to 1992 of 60,50%, and even if some of the most proactive companies are making a good use of environmental market opportunities (Body Shop, Unilever, 3M), they still miss a systematic approach.

The management tools are the same of decades ago, and these are inappropriate to capture all the new variables that the mentioned scenario presents. The management accounting system is based on a simplify model of reality which includes only the variables that, in a certain historic period, are considered relevant for the identification of costs and revenues.

The problem is the delay in the adaptation of these systems to the real world changes. And so the management accounting system after having received critics in the 1980 (Johnson and Kaplan) because inappropriate to support and control the new production methodologies (Just in time, Total Quality Management, Flexible Manufacturing), is now accused because not suitable to internalise the environmental variable.

Companies need a means to answer questions such as: how much does the company spend on environmental issues? what are the environmental costs as a percentage of product costs? which costs are essential to a credible prediction of the company’s future environmental costs? which are the activities that give rise to environmental costs? In other words companies have understood that the wiser course of action to truly internalise environmental costs it is not merely to bear them, but to anticipate and manage them, but now to guide their strategy an accurate accounting system it is crucial.

Objective of the study

In this research some of the most acknowledged solutions and proposals coming from the North American literature are analysed. The theory of Environmental Management Accounting is an attempt to point out or to introduce in the traditional management activities, all the costs and benefits due to the interrelation between the firm and the environment.

The basic idea of Environmental Accounting is that when cost allocation, capital budgeting, product design, control of investment do not incorporate environmental factors, they make look
environmental investments, projects, initiatives less attractive than what they are in reality. Therefore it is possible to say that blind systems of accounting “bears a serious responsibility for the growing level of environmental devastation”.

The solutions proposed by the literature\(^1\) are often very distant from the traditional systems of management accounting. Some of the traditional accounting basic assumption fall down in the new systems proposed by environmental management accounting. Therefore it is necessary to explore and define which are the current practices adopted by the companies to allocate environmental costs, to asses environmental projects, and to control the efficiency of environmental investments, in order to compare them with the literature proposals.

The purpose of this research is to investigate the opportunities of using into practice environmental accounting as a management tool. In particular which could be the relevance of such a tool in improving both business decision making process and environmental performances, which are the differences between the proposed solutions and the companies’ practices and which are the obstacles in implementing such systems. The empirical research relied on case studies of two firms one large industry involved in the petroleum production (ENI-Divisione Agip), and a medium size industry, in production of coated fine papers (Cartiera Favini).

Similar investigation have been already carried out by the World Resources Institute (Green Ledgers, 1995) and by the Environmental Protection Agency (Total Cost Assessment: applications to the pulp and paper industry, 1993) in relation to the experiences of the north-American industries. But it is not always possible to generalise their experience. Companies that have to deal with different scenarios can not repeat their experiences.

**Environmental Management Accounting**

Environmental Accounting is a young and evolving field. This line of thinking considers that accounting systems distortions account for firms’ failure to be aware of and pursue environmental win-win investments.

Much of the current debate about corporate environmental accounting centres on the methods of environmental costs identification and on the practice of introducing environmental costs into corporate decision making.

In the North American literature environmental costs are all the costs a company incurs due to the environmental impacts related with its activities. Those can be costs beard ex ante or ex post the damage. In this definition pollution abatement and control represent only a portion of the overall costs of a firm’s environmentally driven activities. Environmental costs include: environmental measures that prevent damages and future corporate costs or increase expected future benefits, and environmental losses that are costs incurred as a result of fines or penalties for non compliance with environmental regulations, compensation to third parties as a result of loss or injury caused by past environmental pollution, and any other costs incurred for environmental reasons for which there is no benefit expected.

The well known analysis of the EPA of U.S. tends to classify the environmental costs in order to underline the presence of costs that already received management attention and costs that maybe are obscured or overlooked (EPA; An Introduction to Environmental Accounting as a Business Management Tool).

The categories considered, in order of difficulty of estimation, are the following:

- direct costs;
- hidden costs;
- contingent liability costs;

• less tangible costs;

Conventional costs are directly linked with environmental impacts of a project, product, or process. These costs can include capital expenditures/depreciation or operating and maintenance expenses. To properly identify and quantify direct costs traditional data sources are sufficient. Typical example is the investment for a waste water plant.

Hidden costs refer to regulatory compliance or other costs that are “hidden” or lumped into general account. Very frequently, managers assign the costs of complying with environmental legislation (e.g., reporting and monitoring) to an overhead account, along with non-assignable costs such as rent, photocopying facilities, and secretarial labour. Typical hidden costs are compliance reporting, monitoring, legal support, sampling and testing, education and training, notification, waste management. Identifying and quantifying hidden regulatory costs involves two steps process. Step 1 involves identifying environmental laws and regulations that are applicable to the site/process. Step 2 involves estimating as accurately as possible the capital cost and operation and maintenance costs of complying with regulations, both now and in the future. Another significant hidden cost item is the value of lost or degraded materials.

Contingent liability costs can be divided in two categories: 1) costs associated with accidental releases and 2) legal damages and settlements for remedial action, personal injury, or property damage. Contingent liability costs are difficult to quantify, there is a method that estimates the probability and costs of contingent liability by:

1. reviewing plant experience related to environmental liabilities, such as remedial action or releases to air or water;
2. reviewing environmental liabilities occurring at other plants within the company or industry, or in another industry with similar operations
3. forecasting future liability based on past experience.
4. The estimated costs of contingent liability to include in the analysis can be calculated by multiplying the estimated probability of occurrence by the estimated cost of contingent liability

Less tangible costs are even more troublesome, though not impossible to estimate. When a company undertakes a pollution prevention initiative, it may realise benefits, including economic, that derive from improved corporate image, customer acceptance, and community goodwill. These benefit are difficult to quantify, but they should be considered in the analysis. The key to quantifying these costs is to relate an outcome to an economic consequence. For example, a company may target a reduction in toxic release inventory discharges for a public relation benefit. The benefit can be quantified in terms of increased sales, less expenditures on public education, etc.

Different temptatives have been developed that take and rework some of the main solutions presented by the new Management Accounting literature: Activity Based Costing, Total Cost Assessment and Life Cycle Costing, with the aim of introducing the four categories of environmental costs in different moments of the company decisions making process. The first measure (ABC) is an attempt to provide to managers more reliable information. The purpose is to give an integral cost price of products or raw materials, allocating the overhead (and consequently the environmental costs recorded as overhead) more accurately to the activities responsible for these costs. The basic premise of ABC is to describe how goods and services can be priced to reflect their true environmental costs. Total Cost Assessment is an approach to evaluate the true benefits of pollution prevention projects. It requests a comprehensive cost benefits inventory, profitability indicators that take into account the time value of money, long analysis time horizon. Life Cycle Costing considers the full costs over the product’s life cycle, from research to disposal from cradle to grave. This methodology allows to capture not only the environmental costs related with the production but also
those related with the consume and disposal stage. All these organisational measures, if introduced, should make the company shift its preferences from end of pipe to pollution prevention solutions.

The Case studies and the Italian Scenario

In the United States the regulators are turning to environmental strategies that target the causes, rather than the consequences, of polluting activities. Pollution Prevention is at the heart of this new prospective mindset. Among the others a large set of information policies at external and at internal level have been developed from the Pollution Prevention Act of 1990. Examples of information policies at internal level are the growing number of state and federal environmental regulations that call on firm to better account for environmental costs and benefits. Proposed Epa guidelines for hazardous waste generators ask firms to account for the true costs of waste management and to consider allocating them to the offending activities (US EPA, 1993). In the last few years the EPA has pursued the aim of diffusing environmental management accounting practices among companies, also through the publication of guidelines and case studies and trough pilot projects depicting P2 success.

In Italy on the contrary information policies are still not a real option, very few example of mandatory information disclosure (Decreto Legislativo 39/97) and until now the regulators and public authorities did not show any interest on company environmental accounting practices. In our Country no institutions have taken the role of the EPA in US for the promotion of environmental accounting solutions.

For these reasons in most of the Italian companies is still lacking even a knowledge of environmental accounting practices. A part from some exceptions, the few that implemented a separate environmental accounting system were motivated by environmental disclosure reasons, rather then internal management needs. The decision of publicising an environmental report that contains also monetary data, create the need for an environmental accounting system. It is only in a second moment that the management understand the utility of such information also for internal purposes.

It should be noted that when environmental costs are separately identified and recorded for disclosure purposes these are often defined, following the European definition (S.E.R.I.E.E)\(^2\), as: “only those deliberately and principally undertaken to prevent, control, reduce or eliminate the negative effects on the environment.” From this definition are excluded all the compensatory measures (compensation to third parties and fines), and that can lead to distortions when such information are used for internal purposes.

In the following paragraphs the two case studies are presented in turn. They open a window onto business decision making generally, and environmental decision making specifically. To have an interesting analysis the in dept project focus on firms that present already some form of environmental costs measurements and uses. For each of the case study a research focus has been identified: in particular in ENI-Division Agip, it was investigated how environmental costs influence company decisions at corporate and at production unit level, and in Cartiera Favini how environmental costs influence environmental investment decision.

Favini spa Case Study

Introduction

Favini spa is a medium size company, and produces different products for market niches. Its distinctive features are high quality products and a “green image”. The paper making sector is one of the biggest consumer of trees, water, raw materials and energy. It uses precious natural resources to produce a final product that it is often briefly used and then

\(^2\)Fondazione Eni Enrico Mattei; Il bilancio Ambientale d Impresa; M.Bartolomeo et altri
discarded, thus contributing to the accumulation of solid urban wastes destined either to recycling, dumping or incineration.

Because of that, to acquire a position in the green Italian market, they have developed an environmental policy that involves the company as a whole. Considerable environmental investments have been undertaken in the last 10 years in order to reach two principal objectives the reduction of tree cellulose consumption through the introduction of alternative materials (famous is the paper produced with algae of the Venice lagoon) and the reduction of emissions through recycling.

A continuous control of environmental performances is carried out and annually published in an environmental report. For the identification of the environmental effects, as reference physical unit, Favini chose the factory (production process), to assess the impacts related to the company’s activities, and the products, to develop an LCA analysis, where also the environmental effects related with the raw materials production are included.

The company structure is centralised, and the decision making authority is centralised too. The accounting system reflects this organisation, and so all the gathered accounting data are aggregated at corporate level, to provide the Managing Director with the necessary information to decide.

Since the strong environmental commitment and the continuous improvement of their environmental performances, the environmental justification process has been chosen as the focus of this case to understand which is the role and the weight of environmental costs and benefits and the managers choices.

**Environmental Costs Recording**

Favini has already implemented a separate environmental accounting system even if mainly for external purposes. To pass from the existing accounting and reporting information to an Environmental Balance Sheet, they have developed new accounting pools: Ecological Raw Materials, Labour Costs, Industrial Expenses, Environmental Marketing, General Expenses, Depreciation, and Assets. The Environmental Costs, to be suitable with the Environmental Balance Sheet structure and also with communication purposes, have been also traced to Environmental-Driven Activities (Preventive Measures, Monitoring Measures, Treatment/Disposal Measures, Conservation of Natural Resources) and to Environmental Management Areas (Air and Climate Protection, Water Protection, Waste Management, Noise Abatement, Natural Resources Protection, Environmental R&D).

<table>
<thead>
<tr>
<th>Area</th>
<th>Invest.</th>
<th>Operat.</th>
<th>European Subsidies</th>
<th>Total</th>
<th>Deprec. Environ. Plants</th>
<th>Total Operating Expenses</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air and climate protection</td>
<td>260</td>
<td>13</td>
<td>273</td>
<td>273</td>
<td>150</td>
<td>163</td>
<td>11.0%</td>
</tr>
<tr>
<td>Water protection</td>
<td>6</td>
<td>73</td>
<td>79</td>
<td>79</td>
<td>110</td>
<td>183</td>
<td>12.3%</td>
</tr>
<tr>
<td>Waste management</td>
<td>185</td>
<td>29</td>
<td>214</td>
<td>214</td>
<td>106</td>
<td>135</td>
<td>9.1%</td>
</tr>
<tr>
<td>Noise abatement</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Natural res. protection</td>
<td>79</td>
<td>1110</td>
<td>1189</td>
<td>216</td>
<td>973</td>
<td>61</td>
<td>64.2%</td>
</tr>
<tr>
<td>Environmental R&amp;D</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>0.3%</td>
</tr>
<tr>
<td>Other activities</td>
<td>46</td>
<td>46</td>
<td>46</td>
<td>46</td>
<td>46</td>
<td>46</td>
<td>3.1%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>530</td>
<td>1276</td>
<td>1806</td>
<td>216</td>
<td>1590</td>
<td>427</td>
<td>100%</td>
</tr>
</tbody>
</table>
The Role of Environmental Accounting in Decision Making Process

For what concern the role of environmental accounting in decision making process, the Environmental Investments Justification Process has been chosen as the case study focus. To analyse how environmental management accounting influences the decision making process, a first approach was to consider only alternative raw materials decisions, since this is what characterised most Favini environmental products. Then it was understood that every time an alternative materials enters in the production process relevant investments are needed, which are considered as environmental investments. For this reason the focus was shifted to environmental investments decisions.

The Environmental Investments Justification Process presents some interesting peculiarities if compared with the Ordinary Investments’ one. Many other considerations contribute to the assessment of the investments, among which are recognisable the different environmental costs/benefits categories: Hidden Costs/Benefits, Contingent Costs/Benefits, and Less Tangible Costs/Benefits. The last one in particular is often the main reason to implement environmental investments.

Three of the main interesting environmental project assessments has been analysed in depth: the implementation of a saveall screening to recycle back the white water, of the Mud Dryer plant, and of the Raw Materials Micronizing Mill.

For all these investments the company has not developed a complete implementation of the TCA method, but some interesting environmental costs analysis has been carried out by the company, as for example the evaluation of future compliance costs, in particular water discharges permits and treatment, to justify the implementation of the saveall screening.

For what concern the Micronizing Mill investment, to clear state the differences between the company’s practices and the literature proposals, a first draft of a TCA evaluation has been carried out in collaboration with the Quality Manager.

First of all, referring to the costs list in the EPA document “Total Cost Assessment: Accelerating Industrial Pollution Prevention trough Innovative Project Financial Analysis”, we have identified all the costs items that have beard a variation due to the project implementation. The development of the analysis was structured to allow comparison between a TCA approach and that which has been previously used by the firm.

### Table 2 Overview of cost inclusion by company and TCA

<table>
<thead>
<tr>
<th>Cost Categories</th>
<th>Company</th>
<th>TCA</th>
<th>Evaluation Method</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CAPITAL COSTS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purchased Equipment</td>
<td>X</td>
<td>X</td>
<td>historical cost</td>
</tr>
<tr>
<td>Site preparation</td>
<td>X</td>
<td>X</td>
<td>( n^2 ) of job hours of each worker involved + materials costs</td>
</tr>
<tr>
<td>Installation</td>
<td>X</td>
<td>X</td>
<td>contract worker cost</td>
</tr>
<tr>
<td>Permitting</td>
<td></td>
<td>X</td>
<td>permit cost</td>
</tr>
<tr>
<td>Facilities</td>
<td>X</td>
<td>X</td>
<td>( n^2 ) of job hours of each worker involved + materials costs</td>
</tr>
<tr>
<td><strong>OPERATING COSTS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct Costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raw Materials</td>
<td>X</td>
<td>X</td>
<td>increase raw materials costs</td>
</tr>
<tr>
<td>Indirect Costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy</td>
<td></td>
<td>X</td>
<td>increase energy cost</td>
</tr>
<tr>
<td>Pollution control</td>
<td></td>
<td>X</td>
<td>increase for external laboratories</td>
</tr>
</tbody>
</table>
These overview shows how a TCA method presents a more comprehensive costs list, and that most of the times these costs are not included in ordinary analysis only because it is not considered necessary. In fact most of the data were already available, even if out of the accounting place. Many of the operating costs could be forecasted referring to technological data of the Micronizing Mill plant (energy consumption) and to statistical waste data included in the Waste Register (waste transportation and fees/taxes).

It is also true that considering the medium size of the company and the existing investments evaluation structure, not a completely implementation of the TCA method could be expected in the short term. But a first important step in this direction should be the implementation of a standard format for investment evaluation where a comprehensive cost/benefit inventory is foreseen.

**ENI-Divisione Agip Case Study**

**Introduction**

ENI-Divisione Agip spa is the main Italian oil company and is a division of the National Hydrocarbons Corporation (ENI).

The oil production frequently involves long-term projects with different operational phases and considerable investments. The organisation structure of the company, is for the nature of the production process itself, particularly decentralised. Its reality is articulated and widespread in terms of territory with a distribution of decision making process authority.

The peculiar organisation structure is extremely important also for the Accounting structure. In fact, the allocation of costs, in these contest, is not to products, that in this case is not particularly significant, but to the different production units.

Also to gather environmental physical data for the environmental report as a reference physical unit the company chose the production and drilling units.
The oil & gas sector has a high impact on the environment and is strictly monitored by the regulator. Its environmental performances are also of concern of the other stakeholders, in particular the investors are interested in the environmental liabilities that for these companies can be extremely relevant. For that reasons the top management of ENI has recently publicly committed the company to pursue a continual improvement of environmental management and to present every year an environmental report, in order to guarantee investors and all the other subjects that can be interested in the performances of the company. Because of the distribution of decision making the focus of the case is twofold feasibility study at corporate level and raw material choice at unit level.

Environmental Costs Recording
Agip has recently implemented a separate environmental accounting system with almost the same characteristics of the ones found in Favini, also for Agip in fact the purpose is mainly for external communication. The major divergence between the two systems are due to the different methods of gathering information. In Favini almost all the data are gathered from the accounting reports at corporate level, in Agip the data are gathered directly at the sources, at each production and drilling unit.

Table 3- Eni-Divisione Agip Environmental Costs Recording

<table>
<thead>
<tr>
<th>ENVIRONMENTAL EXPENDITURES</th>
<th>1993 (L x 10^6)</th>
<th>1994 (L x 10^6)</th>
<th>1995 (L x 10^6)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>operating</td>
<td>invest.</td>
<td>operating</td>
</tr>
<tr>
<td>Water Protection</td>
<td>2009.726</td>
<td>9002.07</td>
<td>2502.44</td>
</tr>
<tr>
<td>Air Protection</td>
<td>962.192</td>
<td>3052.52</td>
<td>1283.52</td>
</tr>
<tr>
<td>Landscape protection</td>
<td>8</td>
<td>3450</td>
<td>8</td>
</tr>
<tr>
<td>Waste Management</td>
<td>1253.792</td>
<td>19990.2</td>
<td>1194.631</td>
</tr>
<tr>
<td>Soil Protection</td>
<td>2.9</td>
<td>55.4</td>
<td>31</td>
</tr>
<tr>
<td>Noise Reduction</td>
<td>54</td>
<td>88</td>
<td>48</td>
</tr>
<tr>
<td>Areas Reclaiming</td>
<td>11603.8</td>
<td>4170.6</td>
<td>637</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>0</td>
<td>1602</td>
<td>0</td>
</tr>
<tr>
<td>Other Activities</td>
<td>8070.82</td>
<td>0</td>
<td>9511.69</td>
</tr>
<tr>
<td>Total</td>
<td>23965.23</td>
<td>41410.7</td>
<td>15216.28</td>
</tr>
</tbody>
</table>

The Role of Environmental Accounting in Decision Making Process
Because of the distribution of decision making process authority, this case study has been focused on two different moment of the decision making process at unit and corporate level. In both situations, environmental accounting data are parameters that can influence the final choice.

Environmental Costs and Raw Material decision
Waste management costs, and in particular the influence of such costs in raw materials decision, is the subject chosen to show the relation between environmental accounting and decision making process at business unit level. At drilling unit level waste management costs are recorded in a separate item and in this way it is possible for unit manager to be aware of the magnitude of these costs. Due to the availability of
accounting data and the distribution of decision making authority managers with their decisions can directly influence the environmental costs for which are responsible.

Using Environmental Performance Indicators, that relate typologies of raw materials and waste disposal costs (toxicity and quantity of solid waste produced), unit managers are able to chose the typologies of raw materials in order to prevent waste management costs increases.

Box 1 Environmental Indicators

<table>
<thead>
<tr>
<th>Drilling Fluid Tons</th>
<th>Drilling Fluid Costs</th>
<th>Fluid + Waste Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>m3 drilled</td>
<td>m3 drilled</td>
<td>m3 drilled</td>
</tr>
<tr>
<td>Solid Waste Tons</td>
<td>Waste Disposal Costs</td>
<td>m3 drilled</td>
</tr>
<tr>
<td>m3 drilled</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Montestillo (an operative drilling unit) is a perfect example of how the consideration of how the inclusion of environmental costs in decision making process, and starting to approach the environmental costs with preventive measures, can lead to significant savings.

They have tested a new type of drilling fluid that has presented very satisfactory results: against an increase in the costs of the mud, compared with previous tests with more traditional mud, of 8.4%, there was a reduction of the solid waste produced of the 14%, and better performance of drilling (a reduction of drilled hours for each 1000 meters of 55.68%).

Decommissioning Cost and Feasibility Studies

The main instruments of decision making process at corporate level are the Feasibility studies where the long term projects are assessed with sophisticated economic analysis that includes also environmental back end costs (Decommissioning).

The inclusion of Decommissioning Costs in the Feasible Study (FIGURA) allows to consider these costs at the design stage. This practice is extremely important for decommissioning costs, in fact these will largely be a result of the platform design and consequently of the technologies and resources required to carry out a particular decommissioning option.

Figure 1 Cash flows analysis of an oil field
From this point of view the analysis develops a cradle to grave approach, from engineering, to the installation, operation, removal and disposal of the off-shore structures.

Table 4 Cost Categories

<table>
<thead>
<tr>
<th>Capital Costs</th>
<th>Operating Costs</th>
<th>Decommissioning Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off-shore Facilities and Works</td>
<td>Labour</td>
<td>Well Abandonment</td>
</tr>
<tr>
<td>Pipeline</td>
<td>Materials</td>
<td>Removal</td>
</tr>
<tr>
<td></td>
<td>Platforms Maintenance</td>
<td>Disposal</td>
</tr>
<tr>
<td></td>
<td>Transportation</td>
<td></td>
</tr>
</tbody>
</table>

Agip has developed different decommissioning costs categories and well plugging costs categories. In these categories removal costs are related to the physical characteristics of the structures (sea depth, n° of conductor piles, n° of legs, and weight), and waste disposal costs are the costs of disposing the structures in licensed, permanent waste disposal sites.

This way of considering decommissioning costs presents some advantages and disadvantages. With this criteria they overcame the uncertainties of decommissioning costs evaluation, and also the evaluation costs are extremely reduced. On the other hand considering decommissioning costs with this rigid criteria does not allow to consider, during the structures design, disposal options other than disposing as waste on land. As for example to design installations or parts of installations which could be re-use for oil or gas production offshore in another location.
Conclusions

Current Trends and Practices in Italian Companies

The two companies analysed in this project, have showed that environmental management accounting practices can be suitable with the structure of Italian accounting system, and that this practices are becoming more and more important to understand the full spectrum of costs. The environmental accounting literature proposals, often need to be adapted to the companies structures (organisation, production process, accounting system) and to the availability of environmental costs information, but the uncertainties to which the environmental accounting theory wants to give an answer, are the same also in Italian industries reality. To understand which are the reasons for the implementation of a certain environmental accounting structure instead of another, it is necessary to have a clear idea of many different variables: the company policy, the market, the products. In fact there is a strong link between implemented strategies and their measurements systems.

Studying the two case studies Favini spa, the medium size green paper making company, and ENI Divisione Agip, the biggest Italian upstream oil company, many strength of the current accounting practices have been pointed out.

Favini has already implemented a separate environmental accounting system. To pass from the existing accounting and reporting information to an Environmental Balance Sheet, they have developed new accounting pools: Ecological Raw Materials, Labour Costs, Industrial Expenses, Environmental Marketing, General Expenses, Depreciation, and Assets. The Environmental Costs, to be suitable for the company management, have been also traced to Environmental-Driven Activities (Preventive Measures, Monitoring Measures, Treatment/Disposal Measures, Conservation of Natural Resources) and to Environmental Management Areas (Air and Climate Protection, Water Protection, Waste Management, Noise Abatement, Natural Resources Protection, Environmental R&D).

The Environmental Investments Justification Process already presents some peculiarities if compared with the Ordinary Investments ones. Many other considerations contribute to their assessment, among which are recognisable the Epa environmental costs categories: Hidden Costs, Contingent Costs, and Less Tangible Costs. The last one in particular is often the main reason to implement environmental investments.

ENI Divisione Agip implemented a separate environmental accounting system with almost the same characteristics of the one found in Favini. The main divergence are due to the different methods of gathering information. In Favini almost all the data are gathered from the accounting reports at corporate level, in Agip the data are gathered directly at the sources, at each production and drilling unit.

Waste management costs are recorded at business unit level in a separate item. Environmental Performance Indicators are used by units manager to prevent waste management costs increases. Feasibility studies, where the long term projects are assessed, in the economic analysis includes also environmental back end costs (Decommissioning).

Differences between the two case studies

The companies object of the study present many differences in organisation structures, production process, accounting system, and marketing strategies.

Favini spa is a medium size company, and produces different products for market niches. Its distinctive features are high quality products and a green image.
Because of that they have undertaken an environmental policy that involves the whole company, with considerable environmental investments and a continuous control of environmental performances. The structure is centralised, and the decision making authority is centralised too. For the identification of the environmental effects, as reference physical unit, Favini chose the factory (production process), and the products to develop an LCA analysis.

Agip spa is the main Italian oil company and it is a division of the National Hydrocarbons Corporation (ENI). The main part of Agip production is designated to Agip Petroli, a company that belongs to the same group. For this reason they do not need to carry on a strong market oriented strategy. Therefore the environmental policy it is not devote to acquire a different position on the market, but more to guarantee their investors and public authorities.

The oil production frequently involves long-term projects with different operational phases and considerable investments. The organisation structure of the company, is for the nature of the production process itself, particularly decentralised. Its reality is articulated and widespread in terms of territory with a distribution of decision making process authority. The peculiar organisation structure is extremely important also for the Accounting structure. In fact, the allocation of costs, in these contest, is not to products, that in this case is not particularly significant, but to the different production units. Also the reference physical unit for the identification of the main environmental input-output, was identified in the production and drilling units.

All these considerations are extremely important to understand the differences between the two companies in environmental accounting practices. The importance that Less Tangible Costs have in Favini Environmental Investments assessment, in particular Corporate Image, is due to the fact that a great part of their products are designated to the “green market”. On the other hand, for Agip spa costs as waste disposal or back-end environmental costs have a higher relevance. In fact waste disposal costs represent almost the 20% of environmental costs, and so business units, with a better waste management, could reach significant savings. Decommissioning costs are included in investments assessment to create in time provisions for future liabilities.

In other words we could say that Agip is more concentrated on environmental costs and on strategies to avoid them, Favini look at environmental investments as market expanding investments. Other differences are related to the different organisation structure and accounting systems. The high level of disaggregated accounting data available for Agip business units and the distribution of decision making authority, allows units manager to be aware of the environmental costs for which they are responsible and thus to decide taking into account also those variables. This is not possible in the paper making company where all the accounting data are gathered at corporate level and decision making authority is centralised. In this situation in fact they have to face all the problems related to allocation of overheads, and so it could happen that a production line bears costs higher than warranted.

**The Existing Gap with literature proposals**

The literature review contained in the first chapter has represented the baseline against which all the environmental accounting practices have been evaluated. The official definition of environmental costs, present in both case study, is the European S.E.R.I.E.E. definition: “environmental costs are only those deliberately and principally undertaken to prevent, control, reduce or eliminate the negative effects on the environment.” In this way some costs that are included in the broader EPA definition are not included, as for example the environmental losses due to the payment of fines or penalties for non compliance; or damages paid to others for environmental damages to their property and future obligation to pay these costs, or all the
costs that are not heard principally for environmental reasons but which have effects on environmental performances.

Although this strict official definition, which is principally used to gather information for the Environmental Report, when the environmental costs enter into decision making process, their definition is widened in order to comprise all the aspects of environmental costs. Furthermore, as it was showed in Favini’s investments process justification, not only environmental costs but also benefits are variables that influence the final choice.

In Favini accounting practices the main distances from the literature proposals have been:

- cost allocation to products practices that do not take into account if products bear environmental overheads allocation greater or smaller than warranted
- the absence of a consistent framework for the planning and decision making process
- the use of simple financial criteria in investments analysis as pay-back period that do not consider the time value of money
- the inclusion of Corporate Image Benefits in environmental investments analysis mainly in qualitative terms
- the consideration of many environmental hidden costs (energy costs, waste management, monitoring) aggregated in the same item

Agip accounting practices also have presented some differences with accounting literature:

- future liabilities are not considered on a regular basis during investments decision making.
- the back-end environmental costs (end-life structures disposal) are considered in economic analysis as fixed costs, and not as costs that can be influenced by the design of the structures

**Obstacles and Problems for the implementation of Environmental Management Accounting**

Recently critics have been raised against this new line of thinking related to Environmental Accounting. E. James Boyd in a recent Discussion Paper (Searching for the Profit in Pollution Prevention: Case study in the Corporate Evaluation of Environmental Opportunities, May 1998), contradicts the view that firms suffer from organisational weakness that make them unable to appreciate the financial benefits of Pollution Prevention (P2) investments. Instead from the author’s point of view, the projects foundered because of significant unresolved technical difficulties, marketing challenges, and regulatory barriers. In the analysis developed with Italian industries, it seems that the scepticism into pollution prevention investments is due to a mixture of accounting based distortion and a still lacking of public monitoring and social awareness.

There are some obstacles that are directly related with the company organisation, accounting practices, and mentality and there are other obstacles that are related more with the peculiar Italian scenario.

During the two case studies some obstacles stand out among the others:

- first of all the accounting systems are structured more to be suitable with financial and fiscal requirements than to serve company management;
- accounting data needed for environmental accounting often are not already recorded in the accounting systems but must be researched out of the accounting place;
- even when environmental costs are recorded in the general accounting systems it is extremely difficult to identify them because the legal balance sheet structure requires that the accounting data are aggregated for typologies (Buildings, Salaries, Equipment, etc.) and not for destination;
• the consideration of environmental costs and benefits in decision making process often lead to the inclusion of so significant uncertainties in economic analysis that some manager prefer to do not consider them at all;
• some practices, foreseen by environmental accounting literature, request a big effort to be implemented and their benefits are not so evident for companies;
• in SME’s the scarcity of human resources harden the implementation of complex practices as ABC;
• every time environmental accounting methodologies are simplified to be implemented, it is possible to run the risk of reducing their validity;
• the presence of financial commitments often lead to the impossibility of considering environmental long term benefits, especially in SME’s;
• environmental accounting is still considered more a communication tool than a management tool (environmental reports).

There are also some obstacles that are linked with the Italian administrative and legislative framework:
• the most relevant obstacle is the fear of disclose environmental data; in Italy the environmental damage is punished with criminal sanction;
• some utilities prices, as water, are insignificant and so the effort spent for their identification does not worth the benefit;
• financial accounting methodologies for the creation of provisions for future environmental liabilities are still in a developing phase and so the possibility to use this information only for internal purposes discourage their complex evaluation;
• the regulatory and technological uncertainties make the future environmental costs even more troublesome to identify.

Conclusions and Recommendation

There is a widespread belief that in Italian companies, a part from what concern environmental reporting, the Environmental Accounting practices are not developed yet. The two case studies presented in this project have shown that even if the American Environmental Management Accounting Literature is not well known in Italy, some environmental accounting practices have grown spontaneously.

It is to say that managers account for environmental costs for the same reason they account for the other costs: because these costs affect the bottom line. Therefore it is natural that with the increasing trend of environmental costs, environmental accounting practices have started to be implemented in Italian companies even if without a systematic approach. Such situation can encourage a future deeper implementation of these accounting systems, since managers have already felt this necessity.

Therefore a first recommendation is to make managers understand that Green Accounting can have also a strategic role as a management tool. The policy maker should divulge and encourage the adoption of environmental information systems in companies such as environmental management systems (EMAS, ISO 14000), in order to enhance the awareness of environmental costs and liabilities and indirectly influence companies’ environmental performances.

On the other hand the regulator should reduce the uncertainties related with future compliance costs, only in this way companies will be encouraged to introduce also this variables in their investments analyses.

At company level the following are recommendations for a successful implementatio of an Environmental accounting management:
• if an environmental recording, namely environmental balance, is already in place, it is important to integrate the new environmental accounting practices with the existing environmental accounting framework in order to do not doubled the efforts for gathering information. The two measures can leave together each of them having a specific role into environmental management. The information included in the Environmental Balance Sheet are important to set reliable environmental target and to understand where environmental measures are more urgent; with an Environmental Management Accounting System the best measure to reach the environmental targets is identified;

• the environmental costs definition should be clear stated in order to do not create any misunderstanding. Italian companies generally refer to the S.E.R.I.E.E. definition, that is more appropriate for communication purposes, the new definition of EPA is more comprehensive and thus more suitable for internal purposes. The preparation of an Environmental Accounting Glossary is a key activity to establishing a common language.

• the implementation of environmental accounting should lead to consider environmental costs in all the moment of company management and not only, as it is often presented in American studies, for environmental investments decision making. Not always in fact it is possible to recognise if an investments will have environmental effects or otherwise, and so it is important to analyse for each investments if they will increase or not environmental costs

• No single environmental accounting method is appropriate to all firms. As it was showed during this project all the different variables of each companies (organisation structure, production process, products, environmental effects, accounting structure, decision making process authority distribution) must be evaluated to identify the most appropriate environmental accounting structure.

• When possible it is desirable to gather environmental accounting data ( energy consumption, water consumption, waste management, etc.) at business unit level, these information are particularly important for current operative administration and to make business unit managers aware of the costs for which are responsible. The allocation process to products in this is simplified.

• The implementation of an environmental accounting system, tracing costs to environmental driven activities, becomes necessary when the company has implemented an Environmental Management Accounting. A coherent system for evaluating environmental activities it is needed to set economically reasonably objectives.