

ECOLOGICALLY EQUIPPED INDUSTRIAL AREAS: EXPERIENCES COMPARED

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Abstract

After investigating the specific characteristics of Ecologically Equipped Industrial Areas (EEIA) and the solutions proposed by public authorities that have addressed this issue, this work examines the results of a survey of various industrial areas that were the first to take steps to set up EEIA.

The survey addressed both general aspects, tied to the type of area and sectors in which the companies operate, and also the specific, typical aspects of EEIA, i.e. the characteristics of the Area Manager, common infrastructures and services and also the related management system. The actions planned by each area for transformation into EEIA have been highlighted. On the basis of these analyses, this work highlights differences and similarities between the solutions proposed at theoretical level and those effectively adopted by the industrial areas that have set off along the path towards transformation into Ecologically Equipped Area.

Riassunto

Dopo un approfondimento circa i caratteri che contraddistinguono le Aree Produttive Ecologicamente Attrezzate (APEA) e le soluzioni proposte dagli enti pubblici che si sono attivati in questo campo, sono stati esaminati i risultati ottenuti da un'indagine svolta presso alcune aree industriali che, per prime, si sono attivate per la realizzazione delle APEA.

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L'analisi ha riguardato sia aspetti generali, legati alla tipologia di area e ai settori merceologici di appartenenza delle imprese, sia aspetti specifici che contraddistinguono una APEA ossia le caratteristiche del soggetto gestore, le infrastrutture e i servizi comuni nonché il sistema di gestione. Inoltre si sono messi in evidenza gli interventi che ciascuna area analizzata ha progettato per la trasformazione in APEA.

Partendo da tali analisi, il presente lavoro mette in rilievo le eventuali differenze e analogie che si riscontrano tra le soluzioni proposte a livello teorico e quelle effettivamente previste dalle aree industriali che hanno iniziato il percorso di trasformazione in Area Ecologicamente Attrezzata.

Keywords: Ecologically Equipped Industrial Area (EEIA), Area Manager, Common infrastructures and services, Industrial ecology.

Introduction

Many interesting questions that offer many different disciplines suggestions for further research and investigation rotate around the concept of "industrial area" (1-3). The aim of this study is to analyze industrial areas characterized by particular attention to environmental aspects.

The attempt to involve the areas in rewarding environmental mechanisms addressing companies developed shortly after the diffusion of the instruments for individual production sites. The rationale underlying this introduction is to obtain benefits for the companies that settle in these areas, to monitor the infrastructural and environmental aspect, creating truly excellent production hubs (4-5).

Both the HPA (Homogenous Productive Areas) tied to the EMAS and application of the ISO 14001 standard to the territories and districts are examples of this approach. However, practical application has highlighted various difficulties and limitations, also proposing suggestions for solving some of the most frequent problems encountered in the environmental management of territories with production units.

Art. 26 of Legislative Decree 112/98 (Bassanini) marked the introduction in Italy of the concept of "Ecologically Equipped Industrial Area (EEIA)", defined as areas "equipped with infrastructure, services and systems for the protection of health, safety and the environment".

The Decree assigns the Regions and Autonomous Provinces the task of regulating such areas, with a practical reference to "forms of

unitary management of the infrastructure and services” by an Area Manager.

In some ways, the EEIAs are intended to make the eco-efficient industrial area such a convenient economic and social hypothesis, for management of the common problems of production units, as to permit, through the same control and cooperation mechanisms, improved monitoring of the environmental variable.

Ecologically Equipped Industrial Areas in Italy: key insights

To-date, only the Italian Regions of Emilia Romagna, Toscana, Liguria, Piemonte and Marche (Abruzzo, Lazio, Calabria and Puglia have set up EEIAs without however having the necessary requirements) have moved in this direction, providing a general criterion of EEIA and postponing definition of specific criteria, able to establish a practical paradigm, to subsequent regulatory measures (6).

An analysis of the regulations defined by the above Regions reveals three fundamental elements in defining an EEIA:

- 1) **urban planning-territorial requirements** that are essential to guarantee suitable insertion of the area in the social, economic and environmental context in which it is located and with which it interacts (see Table 1);
- 2) **presence and characteristics of the Area Manager** i.e. the existence of a single entity responsible for managing the entire area in order to promote improvement of the environmental performance of the production site and valorisation of this (see Table 2);
- 3) **infrastructure, services and integrated environmental management** (see Table 3) which should be identified taking into account the particular aspects of the area and any criticalities, and also the needs of the companies, in order to guarantee greater economic and environmental benefits than those that can be obtained by a single enterprise (7).

These elements are accompanied by a fourth consisting of management requirements, i.e. the system requirements necessary for functioning of the area in its entirety (see Table 4).

Following approval of the Guidelines and Guidance Documents of the above-mentioned Regions, theoretical criteria have been defined to respond to problems tied to EEIA essential factors. However, practically speaking, the solutions proposed, generally all applicable and valid, have revealed various shortcomings on a bureaucratic and organizational level, in particular as regards identification of the stakeholders to be involved in

the actions planned and of useful sources of financing for the creation of EEIA. The fundamental aspects, critical issues and the various solutions proposed by the virtuous public authorities that have already moved in this direction are schematised in the tables below (Table 1-4) for each essential factor in defining ecologically equipped industrial areas.

TABLE 1

EEIA PLANNING AND DESIGN (8-9)

1. Planning and design (urban planning-territorial requirements)			
			
Main aspects: • Planning phase formalities and documents • Type of area to be considered (distinction between new and existing areas divided, in turn, into partially or completely abandoned areas)			
			
Critical concerns: 1. Different planning instruments according to type of area 2. Type of planning (management of areas that involve several territories) 3. Territorial equality			
			
Proposed solutions to critical concerns 1 and 2: Emilia Romagna			
	Municipal areas	Intermunicipal areas	Both types
Existing areas	Responsibility is assigned to the Municipalities, adopting general planning instruments		✓ Negotiation with tenant companies is advisable ✓ Generally, extension of the areas is envisaged
Newly-created area	Municipal Planning through the Municipal Structural Plan (MSP)	Definition and regulation are the responsibility of the Province (Provincial Coordination Territorial Plan – PTCP)	EEIA characteristics are defined by the Municipal Operating Plan which establishes: ✓ location of the EEIA; ✓ urban planning and building parameters; ✓ infrastructural services

Proposed solutions to critical concern 1: Province of Bologna	
Instrument for equality	Setting up of a FUND for joint allocation of the costs and revenues of territorial development projects that involve intermunicipal areas
Objects subject to equality	Urban transformations that generate high costs and major resources: production sites and services sector
Inputs to the Fund	✓ Secondary and tertiary urbanization costs ✓ ICI (Municipal Property Tax) of the new production sites ✓ Resources of the Province; ✓ Other resources established by the Municipalities involved
Expenses to be paid	✓ Works and infrastructure, territorial facilities and services for requalification of the production sites and of the functional hubs in order to assure urban planning-territorial qualification; ✓ Intermunicipal works/infrastructures and services; ✓ Redistribution of resources between the administrations involved according to objective criteria, regardless of the origin of the resources.

TABLE 2

EEIA MANAGER (10-12)

2. Area Manager

Main aspects: • Definition: company, enterprise, entity or institution, or parts or combinations thereof, in associated form or not, public or private, with its own functional and administrative structure that acts as Manager of the Industrial area, coordinating the tenant companies and other parties involved, representing the entire Industrial area. • Description of tasks, functions and responsibilities

Critical concerns: 1. Selection of the nature and composition of the Management Board 2. Economic sustainability

	
Proposed solutions to critical concern 1: SIAM project	
Public-private consortium according to the Urbanization Consortium model	➤ Consortium of local authorities and owners of the land located in the areas intended for production sites ➤ Need to set up an environmental management board comprising local authorities, representatives of tenant companies and technical entities ➤ Involvement of associations of citizens, category associations and of other stakeholders
Private consortium	➤ Creation of a legal status of communion for management, enjoyment and maintenance of joint assets ➤ Definition of the purpose of the consortium which, in addition to use of common assets, also includes the provision and management of joint works and services and the maintenance, monitoring and improvement of environmental performance ➤ Pursuit of a common interest, consisting in the need to regulate the territorial location, the design, the realization, settlement, management and disposal of the area ➤ Identification of the rights and obligations of members of the consortium according to the consortium agreement and which are forfeited when the member of the consortium sells its quota share and abandons the area
Mixed capital joint-stock company	➤ The company share structure may include the owners of the area who may become shareholders through contribution of the areas assigned, the Region, Province or Municipalities that may confer assets owned or grant surface rights and also private subjects selected on the basis of a public tender ➤ The purpose of these companies is to carry out the necessary transformations through prior purchase of the area, the design, execution of the interventions, the sale of the requalified areas and management of any public services ➤ With this type of company, the local authority recovers its primary role in the transformation of the territory and the decisions taken comply not only with the interest of the public component but also with the “test of the market”

Proposed solutions to critical concern 2: Province of Bologna
1. Territorial equality through setting up of a territorial compensation fund 2. Membership fee of the individual companies calculated, for example, according to surface occupied, business earnings, load of polluting products 3. Allocation of part of balance sheet items to the Municipal administrations if, amongst the services furnished, the Manager also takes over those that are the responsibility of the public entity 4. Participation of Municipal administrations in programming urban planning operations, for example allowing the Manager to use areas transferred to the public authority by private stakeholders

TABLE 3

INFRASTRUCTURE, JOINT SERVICES AND INTEGRATED ENVIRONMENT MANAGEMENT INSIDE THE EEIA (13)

3. Infrastructure, joint services and integrated environment management		
		
Main aspects: • Different types of infrastructures: compliance with the principle of eco-efficiency according to which the infrastructure and services must be tailored to the needs of the companies and are envisaged only if they make it possible to achieve greater environmental and economic benefits compared with the situation of a single infrastructure for each company • Presence of a Management Board that defines improvement actions addressing all aspects tied to a production site		
		
Critical concerns: 1. Selection of a joint infrastructure and collective services 2. Possibility of obtaining a single permit for environmental facilities		
		
Proposed solutions to critical concern 1: Marche Region		
Environmental aspect	Shared infrastructures	Collective services
Wastewater	Purifier and single sewage network	Monitoring of the amount of effluent emitted by the companies and payment of a fee according to amount sent to purification

Waste management	Infrastructure for integrated, safe management of waste, constructed according to the type and hazardous nature of the waste	- Differentiated waste collection - Design and application of any industrial ecology actions
Production of energy	Power stations for cogeneration of heat and electricity	- Appointment of an Energy Manager - Development of energy accounting - Design and application of Industrial ecology actions (heat recovery, combustion of wood waste)
Distribution of energy	- Natural gas and electricity distribution network - Low energy consumption public lighting systems - Use of high energy efficiency building	- Maintenance of centralized plants - Awareness raising and training of the companies
Management of emissions into the atmosphere	Air quality monitoring network	- Management of an air monitoring system - Drawing up of a plan for reduction of transport emissions
Storm water management	- Collective collection and treatment system - Storm water collection tanks	- Road brushing and cleaning system - Maintenance of spaces intended to guarantee improved hydro-ecological balance
Manager of mobility and logistics	- Common logistic areas - Parking areas for heavy vehicles - Spaces and accessibility systems for emergency and first aid vehicles	- Appointment of a Mobility Manager - Stipulation of agreements with public transport companies and organization of a collective system of transport
Manager of hazardous substances	Common areas for stocking hazardous substances with suitable safety systems	- Storage area surveillance system - Maintenance of a goods load/unload system

Proposed solutions to critical concern 2: Marche Region

- For certain environmental aspects, it is possible to obtain a single permit also through an agreement between the Manager and the services company or the authorized body and redrafting of an environmental regulation for use of the infrastructure.
- No particular environmental permits are required for energy production and distribution, control of emissions into the atmosphere and management of logistics and mobility.
- For management of hazardous substances, the possibility of a single permit is to be assessed according to the responsibilities that the subject is willing to accept.

TABLE 4

MANAGEMENT REQUIREMENTS APPLICABLE TO EEIA (14)

4. Management requirements	
	
Main aspects: For the definition of an EEIA, reference can be made to two different approaches: ✓ <u>Symbiotic or systemic model</u> according to which the production site is considered to be a closed system in which companies apply IE principles through exchanges of energy and material. ✓ <u>Compound or supra-systemic model</u> according to which the production site is considered to be a set of several open systems with their own consumption and emissions of material and of energy. These systems are inserted in a common supra-system which is the production site.	
	
Critical concerns: 1. Selection of the model to be adopted to set up the EEIA 2. Limited application of the systemic model and of the principles of industrial ecology 3. Ways in which industrial ecology may be useful in setting up an EEIA	
	
Proposed solutions to critical concerns 1 and 2: Marche Region	
Systemic model	Is based on the principle of stability of production and is easy to apply at vast production sites with companies that operate on a long-term basis and where it is easier to generate synergies and to establish relations of exchange that remain stable in time
Supra-systemic model	Is easy to apply in not very large production areas where synergy between the companies is more difficult. It is easier to promote the setting up of a common infrastructures and sharing of environmental networks and services that make it possible to improve the environmental performance of the entire area and also, at the same time, to define an improvement path for the individual companies.

Experiences of EEIA in Italy

Methodology and results analysis

The data reported in this paragraph arise from stakeholders that are contacted, in the month of November 2008 and January 2009, as reference subject of Italian zones that are implementing EEIA.

Of the Regions that have specified guidelines for the setting up of EEIA, as indicated in the tables above, there is evidence of effective application of what has been defined only in a number of Provinces. These are pilot projects, now in course (except for Ponte Rizzoli in the province of Bologna which as indicated seems to have reached the EEIA qualification) in others, start-ups still at the embryonic stage.

This second category includes various areas of the Province of Parma where the manager responsible for drafting an environmental programme, for defining the type of companies that will settle in the area and the actions to be adopted to achieve objectives (15) has been defined, and a number of areas in the Province of Modena, extension of which could permit qualification of the entire zone as EEIA (16).

The first group comprises various areas of Emilia Romagna and of the Marche that are currently addressing problems tied to setting up/transformation of EEIA.

This part of the work aims to verify, on the basis of bibliographical analysis and then by the dispatch of a questionnaire, the stage of completion of EEIA implementation in order to understand, by verifying the different methods of implementation and design, the ensuing difficulties, the solutions proposed and their consistency with those established at theoretical level, as summed up in Tables 1-4.

The main difficulty of this transition lies in the different territorial and management situations of the areas considered, due to the fact that these are existing realities with their own settlement and organizational characteristics. The fact that it has not been possible to identify a single type of stakeholder to whom to send the questionnaire (in some cases, companies that deal with management of the areas, in others the reference Municipality), is symptomatic of the different approach that must be applied to each single situation. For this reason, a prior study has been made of the characteristics of the areas to be surveyed and the questionnaires, sent to these to collect data, have been precompiled according to information already acquired. The inquiry has taken into account areas that were in a planning stage at the beginning of the study.

Among these areas, the ones that have answered are:

- EEIA of Ponte Rizzoli (Municipality of Ozzano dell’Emilia – Province of Bologna): the questionnaire has been sent to the competent officer of the Municipality of Ozzano dell’Emilia (during the development of the enquiry).
- S.I.PRO Area (Municipality of San Giovanni di Ostellato – Province of Ferrara): the questionnaire has been administered to the S.I.PRO Agency (Development Agency – Ferrara) responsible for managing the industrial area.
- ZIPA 4 (Italian acronym of Consortium Entrepreneurial Zone Province of Ancona) Area (Municipality of Jesi – Province of Ancona): the questionnaire has been administered to the ZIPA Consortium responsible for managing adjacent industrial areas.
- Piana di Talacchio (Municipality of Colbordolo – Province of Pesaro - Urbino): the questionnaire has been sent to the Engineering Office of the Municipality concerned.

Through the questionnaire, an attempt has been made to gather data and information regarding the elements indicated in the table below (Table 5).

TABLE 5

FACTORS CONSIDERED DURING THE INQUIRY

Factor examined	Aim of the analyses	Link with EEIA fundamental aspects
A. Type of area	To understand: – the origin of the area (existing or newly established); – Municipal or Intermunicipal.	A necessary characteristic in order to understand which planning and/or compensation actions are to be adopted (Table 1).
B. Dimensions of the area	To understand: – The number of workers – The total surface – The number of companies for improved characterisation of the area in order to study subsequent factors.	

Factor examined	Aim of the analyses	Link with EEIA fundamental aspects
C. Sector to which companies belong	Verify the possibility of creating positive synergies between the companies through exchange or sharing of common services and infrastructures.	Useful factor in selecting the management model, i.e. systemic or supra-systemic (Table 4).
D. Management system	Identify the proposed management system assumed for EEIA governance.	Necessary factor to verify which of the two models (systemic and supra-systemic) proposed is to be applied. (Table 4). A problem that has not been raised so far as, initially, other questions concerning planning and financing of the companies appear to be more urgent. In fact, this cannot be relegated to a subsequent step and it is advisable to determine the type of organisational instrument that will govern the area beforehand, in addition to the fact that, in the case of public funding, it will be necessary to guarantee a form of monitoring of the environmental variable that justifies the funding.
E. Area Manager	Identify the main characteristics of this figure at the EEIA in order to define the main tasks to be attributed to this entity.	Useful factor in identifying the area manager (Table 2).
F. Common infrastructures and services	Verify the need, usefulness and type of common infrastructures and services.	Check on infrastructures and services available in already operative areas in order to highlight any shortcomings and to analyse the priorities that may guide selection in new areas (Table 3).
G. Actions necessary for transformation into EEIA	Analysis of the actions to be taken to transform existing areas into EEIA.	

A. Type of area

The analysis of the areas considered has revealed that, apart from the case of the S.I.PRO industrial site which is a Municipal area (even though the new plan envisages a transformation that includes other neighbouring municipalities: Argenta, Migliarino, Ostellato, Portomaggiore, Voghiera), in the other cases, intermunicipal areas are involved.

For the latter, several public administrations must be involved, launching a process of negotiation between these, using the territorial compensation instrument. With regard to this, of the solutions proposed, the possibility of setting up a fund for sharing of the proceeds and expenses deriving from setting up of the EEIA is highlighted.

As mentioned, the industrial areas can be divided into existing or newly-constructed areas. In the first case, for planning and design aspects, due consideration is given to the possibility or need to envisage extension of this for transformation into EEIA. In fact, all the cases analysed belong to the first type and are, more specifically, existing industrial areas for which, except for the S.I.PRO area, an extension with EEIA characteristics is planned.

The type of area must be defined in order to identify town planning-territorial aspects useful for insertion of the area in the context in which it is located, in order to determine the stakeholder responsible for planning. Also, the planning instruments to be adopted vary according to whether municipal or Intermunicipal or existing or newly constructed areas are involved and also the path to be followed to set up the EEIA, as described in Table 1 (EEIA Planning and Design).

B. Dimensions of the area

The following factors were considered when defining the dimensions of the areas analysed:

- surface of the area: calculation of total surface (Figure 1) and comparison of the surface of the existing area with that of the planned extension (Figure 2).
- number of companies: comparison, also in this case, between the number of companies present in the existing area and those planned in the extension envisaged (Figure 3). The graph shows all the areas except for that of Piana di Talacchio for which no data regarding the expected number of companies has been received. Of this area, only the number of workers currently present in the existing part (around 177 workers) is known.
- number of workers: analysis of the size of the area in terms of jobs. Also in this case, reference is made to the number of workers currently present in the areas, as the number of workers following extension is not known. The number remains unchanged only for the S.I.PRO area as no extension is planned. Figure 4 shows the number of workers of the areas concerned except for the area of Ponte Rizzoli for which no data is available.

The various aspects considered are represented in the graph below.

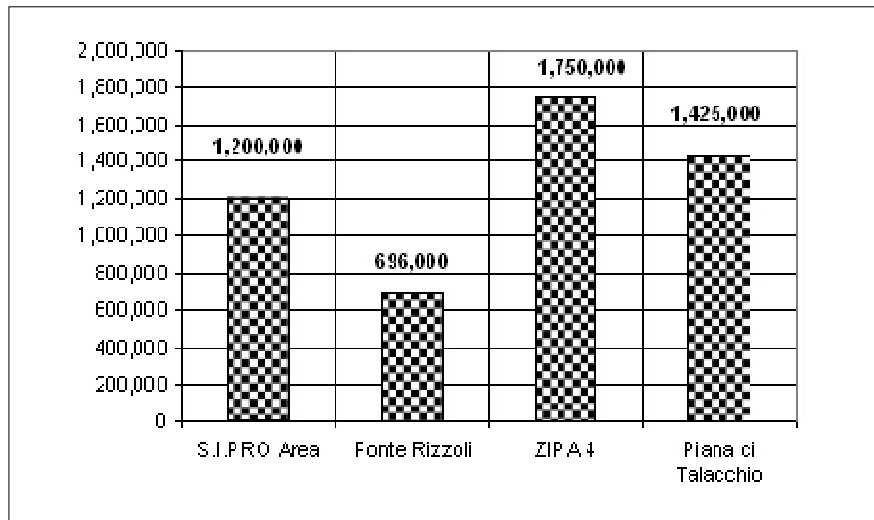


Fig. 1- Total surface (m²) of the areas concerned.

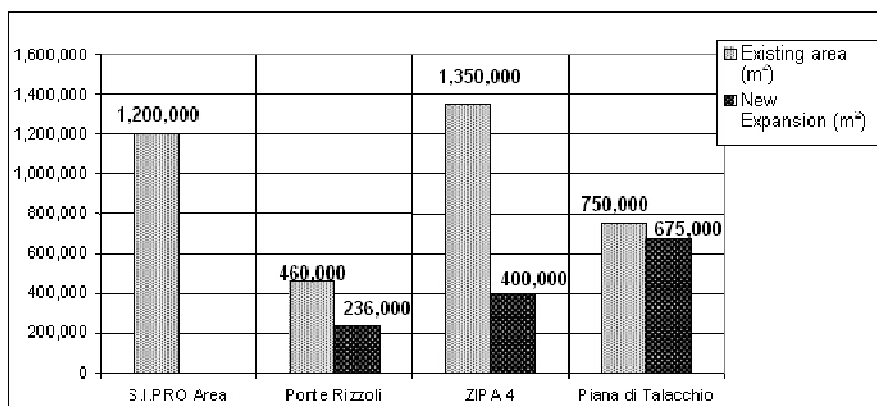


Fig. 2 - Comparison of the surfaces of the existing area and of the planned extension.

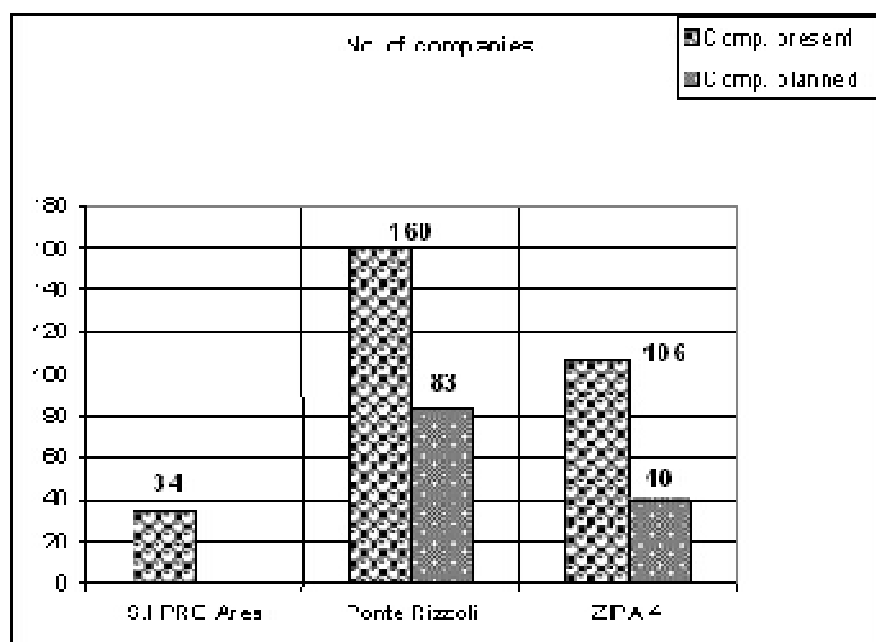


Fig. 3 - Number of companies (present and planned) in the area.

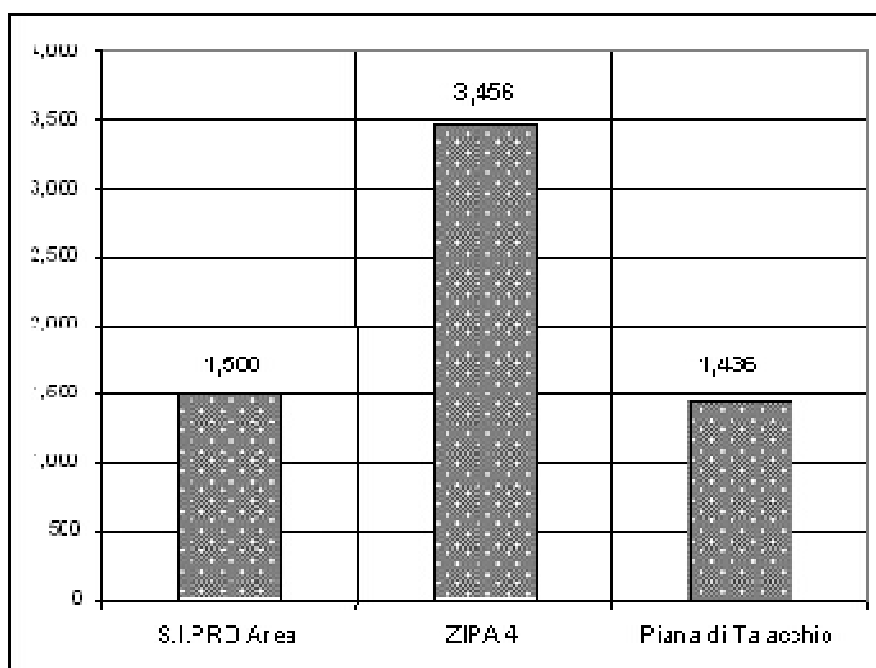


Fig. 4 - Number workers present in the areas concerned.

Extension of existing industrial areas will be designed, from the outset, according to EEIA requirements.

Achievement of industrial area quality objectives may be promoted by the infrastructures, services and production activities to be established. In defining the requirements of the newly-constructed lots, the characteristics of the existing area will have to be taken into account, considering these integrally with those of the extension so that the entire zone benefits from the significant improvements forged by the infrastructures and services set up in the area to be expanded.

To do this, it will be essential, where possible, to pilot selection of the new companies to be inserted and the process of negotiation with the companies and institutions present inside the existing area (17).

C. Sectors to which the companies belong

A useful factor in establishing an EEIA and, more specifically, for selecting the related management model, is the sector in which the companies operate, according to which it is possible to decide whether to create a model based on sharing of common services and infrastructures or an industrial ecology model based on creation of a network of exchanges of materials and energy (see Table 6).

TABLE 6

COMPANY SECTOR OF BUSINESS

Sector	S.I.PRO area	ZIPA 4	Piana di Talacchio	Ponte Rizzoli
Manufacturing				
Transport and storage				
Accommodation and catering services				
Other service activities				
Information and communication services				
Insurance and financial activities				
Professional, scientific, technical activities				
Construction				
Commercial activities				

It is interesting to note that all the areas analysed are characterised by companies operating in the manufacturing sector and that, in most of the areas, there are companies engaged in “transport and storage” and also in the sector of other services which vary according to the specific requirements of the tenant companies.

With regard to this aspect, it is worth noting that at the moment, in the industrial area of Ponte Rizzoli, 72% of the tenant companies operate in the manufacturing sector, 16% in the services sector and the remaining 12% in the commercial activities sector and that, for the extension project, in order to maintain these proportions, approx. 88,000 m² have been earmarked for production and manufacturing activities and a maximum of around 22,000 m² for services and commercial activities.

The setting up of a dynamic database containing the data of possible exchanges could trigger a “virtuous” loop able to establish industrial ecology mechanisms also between different areas. In this way, the presence of a particular type of waste in a hypothetical area 1 could meet the need of a hypothetical area 2 for a raw material deriving from such waste.

D. Area Manager

The survey has revealed that an area management board has not yet been identified in any of the industrial areas concerned although, in certain cases, various proposals have been put forward.

In the S.I.PRO area, the S.I.PRO Ferrara Development Agency, which has always been a reference point for the industrial area, will propose its candidature as EEIA Area Manager. Vice versa, in the area of Ponte Rizzoli, selection of the Area manager will be regulated by an agreement between the Municipality of Ozzano dell’ Emilia, where it is located, and nearby Municipalities interested in its development.

The case of the Piana di Talacchio area is of interest as regards definition of the possible legal status of the Area manager, i.e. a permanent consortium of owners and users that will assume the role of manager responsible for application of the Environment Management Programme.

This is therefore a private entity comprising owners or tenants set up at the time of the EEIA project and whose activities are supported by private funding.

The tasks that the S.I.PRO Area, that of Piana di Talacchio and of Ponte Rizzoli intend to assign to the Area Manager are set forth in the table below (see Table 7).

TABLE 7

TASKS OF THE AREA MANAGER

Area Manager task	S.I.PRO area	Piana di Talacchio	Ponte Rizzoli
Energy manager			
Maintenance management			
Air quality monitoring			
Emergency plan			
Waste cycle			
Purchase of energy			
Advertising signwork			
Services plan			
Mobility manager			
Technical-administrative support			

The proposal of the ZIPA Consortium, which has identified the ASI Consortia (Industrial Development Area Consortia) as legal entity of the Area Manager is equally interesting. The tasks of these consortia include the supply of services to companies present in the area, which can be divided into the following types:

- Planning;
- primary and secondary urbanisation;
- selection of the companies;
- management of services inside the area;
- setting up and management of waste purification plants and of other network systems;
- application of the contents of environment management systems;
- control-supervision of compliance with environmental values and reduction of costs;

These consortia are economic public entities, i.e. entities that pursue goals of public interest guaranteeing the typical professional competence and experience of private entities.

E. Common infrastructures and services

Another essential element in setting up an EEIA is the presence of common infrastructures and services. The infrastructures and the services present in the areas analysed are shown below (Figure 5 and Table 8).

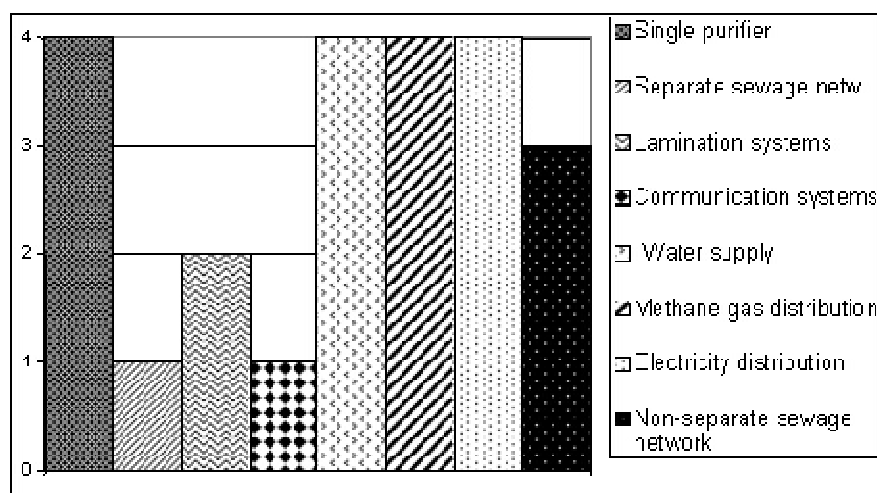


Fig. 5 - Common infrastructures.

TABLE 8

COMMON SERVICES

Service	S.I.PRO area	Ponte Rizzoli	ZIPA 4	Piana di Talacchio
Road sweeping and cleaning				
Differentiated waste collection				
Collective catering services				
Common equipment and spaces				
Postal and banking services				
Public transport				
Family care services				
Monitoring of the quality of waste water				

Infrastructures present in all the areas concerned include a single purification system for industrial and drinking water, the water supply network, the electricity and also methane gas distribution network.

These primary urbanisation works are absolutely essential to set up any industrial area. Unless the number of new companies that settle in the area is excessively high, they will use the existing infrastructures until these reach saturation point. As regards the sewage network, only the S.I.PRO area has a separate network that permits separation of sewage and storm water.

Lamination systems for discharge of storm water are present in only two of the areas considered, i.e. in the area of Ponte Rizzoli (where, however, adaptation is required according to flows of water) and in the S.I.PRO area which is also equipped with an innovative broadband network communication system.

The common services present in the areas concerned are linked to environmental aspects such as management of waste water, the production of waste, management of storm water and also management of aspects tied to mobility and logistics.

The other services present in the areas considered are not strictly tied to environmental aspects but permit indirect mitigation of aspects tied to the mobility and logistics and also to atmospheric emissions deriving from transportation and transit.

Therefore, according to the above, it can be said that, taking into account the particular characteristics of each area and the sectors in which the companies operate, there are various services and a number of infrastructures that must be present in an industrial area if this is to be transformed into an EEIA (See Table 3).

Creation of an EEIA according to the supra-systemic model, which envisages sharing of services and infrastructures, is the most readily and easily applicable solution regardless of the type and dimension of the companies present and taking into account that, very often, existing, already functioning industrial areas are involved.

A possible solution to promote and facilitate qualification of an existing industrial area as EEIA, confirmed by the experiences analysed in this work, consists in planning an expansion, with the characteristics of an EEIA, that permits complete transformation.

F. Management system

All the areas analysed have defined their own environmental programmes which however, except for that of the Piana di Talacchio industrial area, do not establish safety-related objectives: an aspect that encourages reflection on the need to dedicate greater attention to improving

aspects, such as those tied to safety, that can be considered imperative and essential, over and above compliance with laws.

If a public authority finances an EEIA and if the EEIA is considered, in the general opinion, as guaranteeing the eco-compatibility of the area, it is essential, not only for due control of the resources committed, to establish indicators that chart continuous improvement of environmental variables.

With regard to this issue, the Piana di Talacchio area has proposed specific indicators representing the expected minimum values identified and indicated for each topic examined in the environment management programme.

The other areas are taking steps to define indicators of this type for monitoring of environmental issues tied to their management and own performance.

G. Actions necessary for transformation into EEIA

The actions planned for transformation into EEIA are indicated in Table 9 for each case examined.

TABLE 9

ACTIONS NECESSARY FOR TRANSFORMATION INTO EEIA

Case examined	Actions necessary for transformation into EEIA
S.I.PRO Area (Region Emilia Romagna)	The actions planned for transformation of the area into EEIA are as follows: ➤ creation of a waste platform whose construction and management will be entrusted to a private entity other than S.I.PRO ➤ air quality monitoring network ➤ common logistics areas developed by private stakeholders (with a view to reducing traffic inside the area) ➤ monitoring of the quality of the waste water generated by the companies ➤ design and application of any industrial ecology actions

Case examined	Actions necessary for transformation into EEIA
Ponte Rizzoli (Region Emilia Romagna)	The following actions have been planned for transformation of the production area into EEIA: ➤ Energy production actions - Co-generation power plant and district heating network - Photovoltaic panels installed in public spaces and on the totem that characterises the EEIA on the motorway frontage, designed to house the photovoltaic panels ➤ Actions for regulation of flows of surface waters - Lamination tank - Buffer strip” with dense vegetation that contributes to creating a network of ecological corridors close to surface waters. ➤ Landscaped areas for insertion in the environmental in contact with the EEIA - design of the landscaped areas of the new settlement is divided into fronts; - for landscaping inside the area, the project proposes that this be conditioned by roads and parking spaces with the aim of characterising the parking areas with different trees from those of the internal roads. ➤ Other actions planned - Allocation of a specific minimum waste collection and disposal unit in which waste treatment activities must be located; - Setting up of new motorway tollgate and, in the long term, reorganization of links with strategic communication routes; - Construction of specific parking spaces and definition of specific stopping points for public transport; - Setting up of a new line to serve the area, for connection with the railway station; - Installation of storm water accumulation and recovery tanks with devices for exclusion of white waters; - Actions to guarantee the quality of internal environments (ventilation techniques, control of internal sources of pollution, control of internal humidity, control of diffusion of pollutants by adjacent external environments) - Works for adaptation of the area to electromagnetic pollution requirements; - Setting a Public Administrations network; - Private initiatives based on optical fibre backbones.

Case examined	Actions necessary for transformation into EEIA
ZIPA 4 (Marche region)	The following actions are planned for transformation of the production area in EEIA: ➤ Public parks and gardens; ➤ Dual aqueduct (drinking and industrial water); ➤ Separate sewage network (sewage and storm water).
Piana di Talacchio (Marche Region)	Actions planned for setting up of the EEIA are as follows: ➤ Creation of a waste platform; ➤ New roads; ➤ Cycle tracks and pedestrian connections; ➤ Landscaped areas; ➤ Requalification of existing intersections.

Some areas have focussed on actions on the road infrastructure while others have concentrated on the design of landscaped zones for insertion of the area in the environmental context. This depends on the objectives that the various areas aim to achieve in setting up an EEIA and the initial situation of the area.

This is why a territorial environmental analysis of the area, whose results will form the basis for definition of the environmental programme, must be carried out before establishing the EEIA.

Future prospects and main aspects about EEIA

A comparison of the solutions proposed by the public authorities that have already moved in this direction and the solutions effectively applied by the areas that have taken action to set up EEIA reveals a number of similarities and differences.

All the situations analysed represent existing industrial areas for which, in some cases, extension has been planned: this complies with the indications of the Guidance Documents of the Emilia Romagna Region and the provisions of Italian legislation which establishes that “the Regions and the Autonomous Provinces shall identify the areas set forth in paragraph 1, giving priority to already existing areas, zones or nuclei”.

As regards selection of the EEIA Area Manager, the proposals that emerged analysing the experiences considered do not comply completely with the solutions proposed at technical level by the SIAM Project (Table 2).

However, it can be noted that the legal status considered most suitable to assume the role of EEIA Manager and to carry out the activities entrusted to this is the consortium (private or public that operates as a private entity).

The areas analysed are characterised by common infrastructures and services included amongst the solutions indicated in the Guidelines of the Marche Region. More specifically, the services and infrastructures present in the areas analysed concern environmental aspects such as waste water, the supply of industrial and drinking water, waste management, the distribution of electricity and management of storm water. However, various shortcomings have been observed as regards environmental aspects such as the production of energy, management of mobility and logistics, management of atmospheric emissions and that of hazardous substances. However, the areas have planned specific actions, included amongst those necessary for transformation of the area in EEIA, in order to overcome these shortcomings.

It is also interesting to note that, as regards essential factors of EEIA management, all those who have answered the questionnaire stressed the need for attentive environmental monitoring based on definition of specific parameters to be verified during management of the area. This is considered essential in order to improve environmental performance and to prevent spill-over of the activities of the industrial area. It is also stressed that high quality infrastructures and services able to promote improved management of resources and the use of “clean” technologies are essential for sustainable management of the area. This complies with the provisions of national legislation which stresses that, to be defined as such, EEIA must be equipped with the “infrastructures and systems necessary to guarantee protection of health, safety and the environment”.

With regard to selection of the EEIA management model (systemic or supra-systemic), it can be noted that the design and application of possible industrial ecology actions, through the creation of a network of exchanges of materials and energy, is included amongst the actions to be adopted in only one of the areas analysed.

The difficulties inherent in application of industrial ecology principles are tied to both geographical scale and time horizon. As far as the first point is concerned, selection may vary according to whether reference is made to a precise site or to an Industrial area located in a broader environment. In this latter case, it will be possible to find a higher number of companies with which to operate and therefore to establish relations of

exchange. If this is not possible, a management mechanism could be used that defines a larger area with which to establish these relationships.

As regards time horizon, the difficulty lies in the fact that in the case of rapid turnover of the companies, their productions also change, both as regards effluents to be disposed of (possibly jointly) and also the possibility of interchange of material and energy. There, the flexibility of possible technical-organizational solutions that take into account these aspects must be assessed. This problem can be partially solved in the case in which most of the industrial areas are organized as EEIA: in this case, it is possible to achieve optimal allocation of a specific production in a larger zone rather than in the neighbouring area.

At the moment, considering the current state of application of EEIA principles, these considerations may seem premature; however, they could be important in view of the benefits ensuing from application of the systemic model, now widely adopted. Selection of the type of management cannot be postponed indefinitely and the complexity of other apparently more urgent problems highlighted in this work may obscure its undeniable advantages.

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