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Productive development and sustainability in environmental Tuscany policy in industrial areas: the APEA

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Summary

APEA is an acronym that means, "*Industrial area ecologically equipped*", and it expresses Public Administrations' purpose to join environmental policy and economical aspects. Tuscany Region, in cooperation with University of Florence and Scuola Superiore Sant'Anna di Pisa, promotes, through Regolamento R.T. 2 dicembre 2009, n. 74, this innovative model in relation to planning, design and promotion of industrial areas equipped with innovative technological infrastructure, which conform to current and future expected environmental standards. This will contribute towards ongoing business efforts to increase competitiveness in these areas. The direct beneficiaries of the project activities are: Local Public Authorities, to innovate and experiment new urban planning rules, and to support competitiveness in the respect of International rules, about environment and resources saving. SMEs obtain simplification and facilities, thanks to coordination and cooperation management, and to better their repute in local and International contest.

Keywords: Ecologically Equipped Productive Area, Industrial development, Eco-efficiency, Industrial ecology, Environmental Indicators

1. Introduction

The eco-efficient Industrial area is made by technical and management requirements that aims to minimize and manage, in integrated way, ecological footprint in order to start a knowledge process about legislation, economic and social aspects and technical and planning requirements, in order to identify a model of sustainable productive area compatible with the local industrial reality.
Below we describes the key component of APEA model in Tuscany Region, including information about planning, the main environmental challenges, creation of resources management plans, and provision of supporting policies. Moreover the document provides details on which industrial areas should be called APEA, with description of indicators and criteria to reach the Regional qualify of APEA.

2. Description of APEA Tuscany Regional model

APEA is an acronym that means *Industrial Areas Ecologically Equipped*, and it expresses Public Administrations' purpose to join environmental policy and economical aspects.
Industrial Areas Ecologically Equipped have to be planned, realized and managed on the basis of "ecoefficiency" criteria, in order to ensure an integrated system of management of environmental aspects, reduction and prevention of air, water and soil pollution, the protection of the health and safety as well as a widespread environmental improvement of territory.
The goal of an APEA is to improve the economic performance of the participating companies while minimizing their environmental impacts. Components of this approach include green design of area infrastructure and plants; cleaner production, pollution prevention; energy efficiency and inter-company partnering. An APEA also seeks benefits for neighbouring communities to assure that the net impact of its development is positive.
The *Industrial Area Ecologically Equipped* is characterized by common infrastructures and services,

managed by a single entity that pursues environmental performances, that positive influences final quality of total area. In this way the APEA concept enable real estate developers, industrialists, policy makers, regulators, investors, and communities to collaborate in the vital search for sustainable development.

3. A regulation for eco-industrial development in the Tuscany Region

Tuscan Region intend the APEA as an innovative productive area developed and managed as a real estate development enterprise and seeking high environmental, economic, and social benefits as well as business excellence. On the basis of these law information, a new Regulation (R.T. 2 Dicembre 2009, n. 74) clarifies and updates the APEA concept as: "*an industrial, craft and mixed use areas, included in multifunctional contests, equipped with pollution and emission control system; APEA are characterized by an integrated and unitary management of infrastructure, services to protect environment, security and health of operators and communities*" (Art. 2).
In this way, the Region promotes, through this new regulation, an innovative model in relation to planning, design and promotion of industrial areas equipped with innovative technological infrastructure, which conform to current and future expected environmental standards.
This legislative document, realized in scientific collaboration with University of Florence, (Department TAeD) and S.Anna Superior School of Pisa (SSSUP), enhances the relationships between different actors – including municipalities, businesses and the local community – and aims to optimize the sustainable use of resources in industrial areas.
This Regulation, in detail, offers a rich menu of individual facilities, and shared support services, design options, including ideas for site and infrastructure design; moreover also cover strategies for achieving environmental performance and management.
Several basic strategies are fundamental to developing an APEA so, the Tuscany Regulament identifies the following as key strategies: *Management Entity* and *Infrastructural envelope.*

4. The criteria to reach the Regional qualify of APEA

The Tuscany Regulation establishes requirements to qualify *Industrial Area Enviromentally Equipped* and foresee a score system points in order to evaluate them: each criteria have a specific score to add in order to reach the APEA qualify. There are two kinds of requirements:

1. Minimum requirements: their satisfation is necessary to obtain APEA status;
2. Flexible requirements: it's possible to choice requirements functional and compatible with the territory, to obtain threshold necessary to obtain APEA status.

Several basic strategies are fundamental to developing an APEA; individually, each adds value and together they form a whole greater than the sum of its parts so, the criteria of Tuscany Regulament to satisfy in order to reach APEA status are articulated in:

- urban, about planning and design of *Industrial Areas Ecologically Equipped*
- infrastructural about innovative technologies and services
- management about organizational requirements.

5. Conclusion

APEA model allows to organize productive settlements to facilitate single enterprises, economically and technically to reach their environmental goals. The work is the result of a sinergy between University, enterprises and public entity: this cooperation allow to demonstrate how scientific research contribution is necessary to definition of new models and mode of contemporary and future of lifestyle. In any case, this new approach has the presumption of encourage productive areas managers to improve their economic performance, environmental quality and social development.

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Keywords: Ecologically Equipped Industrial Area, Industrial development, Eco-efficiency, Industrial ecology, Environmental Indicators

1. Introduction

The European concept of new industrial competitiveness is expressed in *the economic abilities on a sustainable basis to ensure its population living standards and high growth and high employment rates* (Lisbon 2000). So an appropriate change in industrial policy is urgent in order to respect and protect the environment and the welfare and that still need to ensure economic growth.
The eco-efficient Industrial area is made by technical and management requirements that aims to minimize and manage, in integrated way, ecological footprint in order to start a knowledge process about legislation, economic and social aspects and technical and planning requirements, in order to identify a model of sustainable productive area compatible with the local industrial reality. It's believed that such eco-efficient industrial area initiatives could bring great environmental, economic and social benefits as a contribution to ecologically sustainable industrial local development [1].

According to Italian law, in force since 1998, an industrial ecology seeks to find the appropriate balance between environmental, economic, and social needs of a system, so the Tuscany Region have disciplined on that meaning the Ecologically Equipped Industrial Area (APEA - **A**ree **P**roduttive **E**cologicamente **A**ttrezzate) an innovative productive area developed and managed as a real estate development enterprise and seeking high environmental, economic, and social benefits as well as business excellence.
In detail some regional laws of Tuscany establishes as priority objective to develop a new concept of industrial areas, characterized by quality management systems and infrastructures for protection of health, safety and environment, obtained by local authorities assessment methods that integrate economical, social and environmental issues.

Below we describes the key component of APEA model in Tuscany Region, including information about planning, the main environmental challenges, creation of resources management plans, and provision of supporting policies. Moreover the document provides details on which industrial areas should be called APEA, with description of indicators and criteria to reach the Regional qualify of APEA.

2. Description of APEA Tuscany Regional model

APEA is an acronym that means *Ecologically Equipped Industrial Areas*, and it expresses Public Administrations' purpose to join environmental policy and economical aspects.
The APEA has been introduced in the Italian Legislative Order by D.Lgs. n. 112/1998, Bassanini law, which expects that *Italian Regions discipline, with their own laws, industrial areas and ecologically equipped areas, provided with infrastructures and systems necessary to ensure the protection of the health, safety and environment*.
Industrial Areas Ecologically Equipped have to be planned, realized and managed on the basis of "ecoefficiency" criteria, in order to ensure an integrated system of environmental aspects management, reduction and prevention of air, water and soil pollution, the protection of the health and safety as well as a widespread environmental improvement of territory. The question is to organize the productive site so as to favour the individual settled firms on realizing their own environmental objectives, both economically and technically.

Fig. 1 Experimental italian initiatives on the APEA Kilometro Rosso – Bergamo - Italy

The goal of an APEA is to improve the economic performance of the participating companies while minimizing their environmental impacts. Components of this approach include green design of area infrastructure and plants (new or retrofitted); cleaner production, pollution prevention; energy efficiency and inter-company partnering. An APEA also seeks benefits for neighbouring communities to assure that the net impact of its development is positive.
Some Regions together to planners and local communities have used the term APEA in a relatively loose fashion. To be a real *Industrial Area Ecologically Equipped* a development must be more than:

- A single by-product exchange or network of exchanges;
- A recycling business cluster;
- A collection of environmental technology companies;
- A collection of companies making "green" products;
- An industrial area designed around a single environmental theme (i.e., a solar energy driven area);
- An area with environmentally friendly infrastructure or construction.

Although many of these concepts may be included within an APEA, the vision for a fully developed of this model needs to be more comprehensive.

The main objectives of APEA model are:

1. The planning of new industrial estates, technologically and environmentally equipped in order to represent a strategic asset for local development.
2. The transformation and conversion of existing industrial estates, through technological and management's actions. This will contribute towards ongoing business efforts to increase competitiveness in these areas.

The *Industrial Area Ecologically Equipped* is characterized by common infrastructures and services,

managed by a single entity that pursues environmental performances, that positive influences final quality of total area. This new perspective, activated through cluster typical mechanism, allows combining a sustainable productive development with enterprises competitiveness improvement.
In this way the APEA concept enable real estate developers, industrialists, policy makers, regulators, investors, and communities to collaborate in the vital search for sustainable development.

3. A regulation for eco-industrial development in the Tuscan Region

Tuscan Region intend the APEA as an innovative productive area developed and managed as a real estate development enterprise and seeking high environmental, economic, and social benefits as well as business excellence.
The Tuscan Region is an important stakeholder in this commitment and plays key roles in promoting APEA development in its territory, through more aspects as decision making, creating policies, issuing laws and regulations, organizing pilot activities, providing financial incentives, encouraging innovations in technology and systems, fostering new markets and promoting both education and academic research partnership.
After national guideline (*Bassanini* Law n.112/1998), the regional law of Tuscany (since L.R. Toscana n. 61 22/12/2003) establishes as priority objective to develop a new concept of industrial areas, characterized by quality management systems and infrastructures for protection of health, safety and environment, obtained by local authorities assessment methods that integrate economical, social and environmental issues.

On the basis of these law information, a new Regulation (R.T. 2 dicembre 2009, n. 74) clarifies and updates the APEA concept as: "*an industrial, craft and mixed use areas, included in multifunctional contests, equipped with pollution and emission control system; APEA are characterized by an integrated and unitary management of infrastructure, services to protect environment, security and health of operators and communities*" (Art. 2).
In this way, the Region promotes, through this new regulation, an innovative model in relation to planning, design and promotion of industrial areas equipped with innovative technological infrastructure, which conform to current and future expected environmental standards.

This legislative document, realized in scientific collaboration with University of Florence, Architecture Technology Department (TAeD) and S.Anna Superior School of Pisa (SSSUP), enhances the relationships between different actors – including municipalities, businesses and the local community – and aims to optimize the sustainable use of resources in industrial areas.
The work, lasted three years, aims first of all to define the main features of APEA as follow:

- Sustainable urban planning and design of technological and mobility networks.
- Implementation of sinergies between enterprises, through a unit management of centralized technological systems, common spaces, and common services.
- Closed production cycle that aims at the re-use of waste streams, and industrial symbiosis.
- Provision of barriers and other systems for the reduction of any kind of pollution.
- Use of renewable or low impact energy sources.
- Setting up of ecological platforms for waste collection, for water treatment, etc.

The Regulation makes difference between new industrial areas, and restoration of existing ones and gives to decision making bodies (Region, Provinces and Municipalities) specific skills in APEA planning and management, including regional financings to promote APEA diffusion on Tuscany territory.
For existing area it's important reviews strategies that includes a baseline assessment for the area as a unit. The Regulation explores strategies and method through which managers of existing productive areas can gain the right to call their properties APEA. A complessive vision of area and a strategic planning process, drive site managers and their tenants to evaluate the benefits of participating in a regional APEA network and by product exchange as well as other means of improving their performance.
The team have elaborated guidelines of these processes and resources to support new industrial areas and existing ones, improving the environmental, social and economic performance of com-

panies at each scale, through new services offered by APEA management, like:

- An integrated resource recovery system
- A system for encouraging and managing the exchange of by-product between companies
- Training and services in all aspects of eco-industrial development
- A single management/coordinating unit
- Public sector support in R&D, policy development, access to investment, and information management.

Moreover the document explains also procedures for checks and acceptance and for performance assessment
This Regulation, in detail, offers a rich menu of individual facilities, and shared support services, design options, including ideas for site and infrastructure design; moreover also cover strategies for achieving environmental performance and management.
Several basic strategies are fundamental to developing an APEA so, the Tuscany Regulament identifies the following as key strategies:

Management Entity
An *Industrial Area Ecologically Equipped* encompasses two distinct but overlapping business entities: it is a real estate development property that must be managed to provide a competitive return to its owners. At the same time, an APEA is a community of companies that must manage itself to gain common benefits for its individual members so, in the APEA we will need to respond to the needs of both entities in designing a management system.
In detail, the APEA members will need a management system that maintains their cohesiveness without compromising their autonomy. Except where external regulation or property covenants are involved, the community will depend on voluntary participation in any common initiatives.
An effective management entity covers a role of primary importance in every productive industrial environment so, the Tuscan Regulation provides for the identification of a Legal Entity (named in the Regulament as *Soggetto Gestore*) with specific role and functions for the improvement of productive areas, intend as organisms that can grow with the needs and developments decided and implemented with the actors involved: users, operators of the settlement, local government, businesses and service of the municipality.

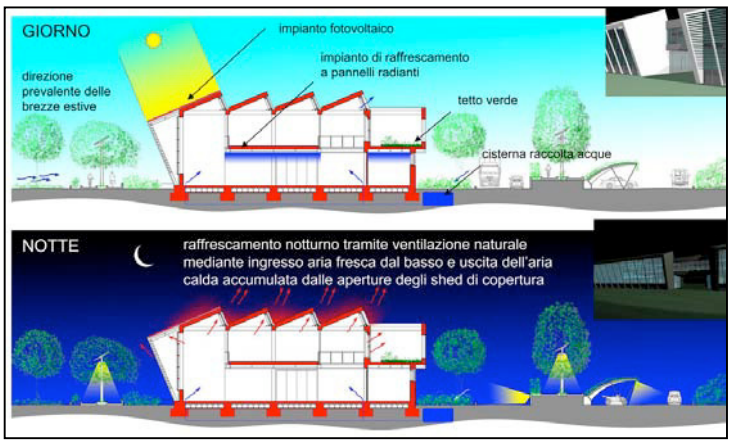

Fig.2 Energy saving strategies for an industrial building

Infrastructural envelope
The companies in an APEA need a range of general services indirectly related to their production systems. These include governmental relations, dining facilities, purchasing of common supplies, information access, and many others. By acting in common to procure these services, they can reduce indirect operation costs (especially important for smaller companies). By coordinating satisfaction of these tenant needs, the APEA management company can increase its revenues. Sharing services will increase opportunities for communication among employees of different companies and build the community spirit of APEA [2].

3.1 Benefits

3.1.1 Regional funding and facilities

The Tuscany Region down admission to financial benefits as a result of criteria and operating location that promote realization, regeneration or expansion of settlements and buildings for equipping, high services for enterprises, for innovation, information companies, for multimedia development, incubators, lab and service center, to improve APEA development process by community services and facilities, to obtain EMAS registration for the full settlement and single enterprises. Projects for new APEA, or APEA as generated by riqualification of existing ones, are way of rewarding for funding finalized to productive settlement, infrastructures or environmental services

4. The criteria to reach the Regional qualify of APEA

A full evaluation framework for an ecologically equipped area combines economic, technical, social, and environmental objectives into a whole system. This means that APEA project can seek a design that optimizes objectives in these four domains as a whole, not separately. Clearly articulated objectives in each area, agreed by project stakeholders, will be essential. With this clarity site managers, and public Administrations will be better able to determine the trade-offs among the objectives in all four domains, economic and environmental objectives, social and environmental, or any other pair of domains.
The Tuscany Regulation establishes requirements to qualify *Industrial Area Enviromentally Equipped* and foresee a score system points in order to evaluate them: each criteria have a specific score to add in order to reach the APEA qualify.

Fig.3 Experimental Tuscany APEA (Pianvallico)

There are two kinds of requirements:

1. Minimum requirements: their satisfation is necessary to obtain APEA status;
2. Flexible requirements: it's possible to choice requirements functional and compatible with the territory, to obtain threshold necessary to obtain APEA status.

Several basic strategies are fundamental to developing an APEA; individually, each adds value and together they form a whole greater than the sum of its parts so, the criteria of Tuscany Regulament to satisfy in order to reach APEA status are articulated in:

- urban, about planning and design of *Industrial Areas Ecologically Equipped*
- infrastructural, about innovative technologies and services
- management, about organizational requirements.

In detail, urban and infrastructural criteria provides with technical requirements directed to diminish and to manage the pressures on environment in an integrated way, applied to buildings, industrial facilities and common areas, bought in, have the ambition and the aim of transforming the entire area in a body to serve its users. A body, which is in its integration, becomes a tool for its users by creating and providing content for environmental sustainability: living healthy, active safety, passive safety, comfort, but also socialization and connection services. Infrastructures (for

sustainable mobility, energy saving and production, for water management, lighting, waste management, access control, the web server, WiFi access points, video surveillance, irrigation, etc.) will be centralized, and they are characterized by simplicity available to all actors involved.

The APEA planning aims that buildings and infrastructure are designed optimizing the efficient use of resources and minimizing pollution generation. It's essential to minimize ecosystem impacts by careful site preparation and environmentally sensitive construction practices. The whole area will be designed to be durable, maintainable, and readily reconfigured to adapt to change. At the end of its life, materials and systems can be easily re-used or recycled.
The realization of *Industrial Areas Ecologically Equipped* will be a tool for local governments and for the entire areas to support the economic and social development, which, since the implementation phases will generate jobs, and opportunities for the construction industry, and support socio-economic area.

4.1 The criteria adopted in the Tuscany Regulation

An APEA planning, calls for asking new questions within the context of traditional industrial development processes. Developing any *Industrial Areas Ecologically Equipped* requires several rounds of planning and design. The team should test project feasibility in greater detail with each stage. The project must satisfy financial, economic development, public planning/zoning, environmental, and technical criteria at each step. The APEA team will follow the traditional process, while considering new design options in each phase of project planning.

4.1.1 Urban criteria

Criteria for the APEA localization, are finalized to warrant a complete efficiency of urban and environmental systems, and they must:

- privilege reuse and fulfilment of existing industrial areas and buildings;
- evaluate insediative system efficiency and functionality, about standard infrastructures, social and economical local factors that can warrant actual and future stability of enterprises;
- evaluate accessibility to major communication routes, fostering rail transport and transport intermodality;
- realize urban and area programs in spite of single isolated initiatives;
- assess the presence of environmental, historical, and urban bond, monumental, archeological, geological constraints, protected areas like natural parks, etc.
- evaluate environment quality and liveability and promote innovative instruments.

Table 1 Urban criteria

Item	*No*	*Indicator*
Urbanization	1	-Sustainable Mobility infrastructures
	2	-Green system and ecological network connection
	3	-Soil permeability
	4	-Underground facilities network
	5	-Communication networks
	6	-Public Illumination system with innovative technologies
Habitat and landscape	7	-Strategies for settlement visual mitigation
	8	-Integration with landscape and buildings architectural quality
	9	-Colour planning
Energy	10	-Strategies for energy efficiency in industrial contest

4.1.2 Infrastructural criteria

APEA promotes environmentally improved performance, concerning industrial ecology and environmental sustainability [3].
In respect of energy and environmental aspects, APEA are:

- equipped with infrastructures and networks coordinating system, to improve integrated prevention by air, water and soil pollution, and suitable instruments to make a constant emission monitoring;
- realized in geological and environmental safety;
- provided with system to maximize energy efficiency (cogeneration systems, renewable energies use, heat waste recovery, etc.);
- equipped [5] by the presence of:

    a. environmental data station detection
    b. waste management systems
    c. water safe management systems
    d. collecting and treatment waste water system
    e. collecting and treatment emission system
    f. production and distribution energy system

Table 2 Infrastructural criteria

Item	*No*	*Indicator*
Water resource	11	-Collecting and reuse rainwater
	12	-Separate sewer systems
	13	-Industrial water system
Energy	14	-Renewable energies use
Logistic and Mobility	15	-Sustainable Mobility measures
	16	-Advanced logistic measures
Safety and security	17	-Area fire network
	18	-Mobility security measures
Soil and subsoil	19	-Area Cleaning vehicles

4.1.3 Management criteria

The management of an APEA entails both traditional and innovative responsibilities and generates potential new revenue streams for the property manager.
It's an APEA priority, accordance with regulations of Tuscany Region, the creation of a single entity, who represent complex industrial settlement enterprises, able to act as interface with Municipal Entity and other public stakeholders, to arrange actuative planning program, to promote contracted formulas with Municipality, to manage action settlement through infrastructural and services creation, and to arrange for maintenance and management of common services and facilities [4].
Management entity can be represented by Municipal Entity, Industrial Development Unions, mixed public-private societies, etc.

Table 3 Management criteria

Item	*No*	*Indicator*
Water resource	20	- Water consumption monitoring systems
Energy	21	-Energy management and energy monitoring
Waste	22	- Waste area management
Logistic and mobility	23	-Mobility Management
	24	-Logistic Management
Safety and security	25	-Security and emergency planning
Soil and subsoil	26	-Sustainable management of green areas
Aob	27	-Sustainable management of building yard

5. Conclusion

APEA model is compatible with Tuscan Region productive and industrial structure, characterized

by local systems highly specialized in production sector (paper mills, tanneries, steel, textile) and by small and medium enterprises presence. In fact the model:

- facilitates sme to reach an improvement of their own environmental performance, through common infrastructural and services equipment, characterized by high quality, impossible to achieve and to manage individually
- allows control and reduction of cumulative environmental impact, generated by all the enterprises of the settlement
- facilitates and exempts enterprise by obtaining environmental permission when issuing and renewing
- applies postulate of pollution prevention, precaution and reduction

APEA model allows organizing productive settlements to facilitate single enterprises, economically and technically to reach their environmental goals, both prescriptive ones (emission control, energy safe, reduction of their own pollution, etc.) and voluntaries ones (Emas or other environmental management systems adherence).
The work is the result of a synergy between University, enterprises and public entity: this cooperation allow to demonstrate how scientific research contribution is necessary to definition of new models and mode of contemporary and future of lifestyle.
With rapidly growing industrialization and urbanization, experiences gained from APEA demonstration projects are of critical importance for sustainable development in Tuscany Region. A big challenge facing decision makers however is how to evaluate the overall eco-efficiency of such projects. Public Administrations needs more sophisticated tools, and appropriate indicators, to feed information into decision making.
The direct beneficiaries of the activities are:

- Local Public Authorities, in order to innovate and experiment new urban planning rules, and to support competitiveness in the respect of International rules, about environment and resources saving.
- SMEs, to obtain simplification and facilities, thanks to coordination and cooperation management, and to better their repute in local and International contest.
- Communities involved in hearings conducted by planning agencies, to benefit by strengthening economic development planning, mobilizing educational resources to help the community's businesses and government operations increase energy efficiency and pollution prevention.

In any case, this new approach has the presumption of encourage productive areas managers to improve their economic performance, environmental quality and social development.

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