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Sustainable Manufacturing Through Creation and Governance of Eco-Industrial Parks

With the emergence of the concept of industrial ecology (IE) and the first discovery of its practice in an existent park in Kalundborg, the interest from the scientific community as well as from the public and private stakeholders has increased significantly. For more than a decade, a handful of national programs and private initiatives have been initiated worldwide to implement industrial ecology into existent or newly built industrial parks. To date, more than hundreds of eco-industrial parks (EIPs) have been established. However, the relationship between the context and the origin of EIP initiatives with its methodology of development and management is still not clearly defined. Therefore, the aim of this article is to contribute to filling this knowledge gap. The return of experiences of 19 EIPs worldwide, based on bibliographical and empirical research through literature review and field interviews, allows the definition of a trend in the creation and the management of EIPs according to the context of implementation. This investigation exposes the exclusive relationships between trigger factors to develop an EIP either economic, environmental, or a mix according to the bottom-up, top-down, or mixed approach of creation, respectively. Moreover, it highlights the association dependence between the natures of the approach with the coordination structure and consequently the influence of the social context and the presence of a certain gap of cohabitation of the two extreme systems, i.e., public and private. [DOI: 10.1115/1.4034438]

1 Introduction

Since 1989, the notion of industrial ecology (IE) has been popularized after the article published in Scientific American [1]. The authors have proposed the concept to perceive industrial system as an ecosystem similar to the one observed in Nature, where wastes from one entity would be considered as resources for another through a food-chain cycle, hence would minimize the overall system's impact on environment. These exchanges have been defined later on by Chertow as industrial symbiosis (IS), where their key success factors are collaboration and the synergistic possibilities offered by geographic proximity [2].

In recent years, the subject of synergy and symbiosis was given a specific attention within the eco-industrial park (EIP) development projects among the regional, national governments programs, and from private firms. The concept of EIP has been discussed as a springboard for the IE policy as it represents a special interest compared to the conventional industrial parks. Besides, in the literature, the term "eco-industrial park" is associated to a community of companies, where industrial or other local actors interact with each other through effective sharing of resources (water, heat, electricity, and waste) [3,4] in order to create both economic and environmental profits (for instance, reduce production costs, controlling and supervising the consumption of natural resources, and recycle/reuse waste). The EIP located in Kalundborg, in Denmark, is one of the most famous and most thoroughly discussed by the research community, such as Refs. [5] and [6]. This discovery and later on the evaluation of its beneficial effect on economic and environmental performances have certainly catalyzed the knowledge progress and the expansion of EIP development worldwide [7,8]. Since the uncovering with this concrete illustration, a significant increasing number of EIP experiences have been initiated worldwide, of which some are already in operation and many are in deployment or design phase. The example of the EIP development in China is, for instance, remarkable. The first EIP recognized has been the industrial area in Guangxi province led by the Guitang Group in 2001 [9] and by 2014, 64 EIPs out of thousands industrial parks have been officially nominated [10].

In parallel, the concept of "everything as service" which has been developed earlier in cloud computing sciences found its way into manufacturing sciences, and with the goal of designing networks and emphasize mutual uses, emerged the new concept of Cloud Manufacturing. From engineering design to machining [11], and to supply chain [12,13], and from service [14] to economic analysis [15], the advantages and limits of cloud manufacturing were described and discussed in the literature, and the challenges and future trends were addressed [16,17]. The concept of synergy and EIP joins the fundamentals of cloud manufacturing in resource sharing, waste to resource, and flexible process operating.

As a result, the last decade has witnessed a considerable number of academic publications based on empirical investigation, in which a significant portion highlights the lessons learned from IE deployment procedures of individual EIP (such as Refs. [5,6], and [18–20] or specific countries' program [7,21–23]). Nonetheless, only a handful of studies go further to explore what is behind the creation of industrial synergies and explore the mechanism, methodology, and theory to develop an EIP [7,24,25]. For instance, it is clearly emphasized that IS was either developed spontaneously or through a planning process. Moreover, the authors proposed in their contribution, the definition of a three-stage model hence a level of maturity of IS from random initiation to recognition and then intentional pursuit of IS benefits through institutionalization. However, the relationship between the context and the origin of EIP initiatives along with the methodology of development and management is yet to be investigated in research, to bring key information for the design and development of new EIPs.

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by three energy intensive industrial groups, some academic institutes, and a representative of the public state who are looking into the energy transition domain. The first research program of the institute was decided to be entitled as eco-industrial parks, focused on feasibility of creating an EIP in north of France. Therefore, it was the aim of the study behind this article to build a knowledge base to contribute to the decision-making process and to the development of a future local EIP. The mission given to PS2E was to develop an analytical framework based on the existing body of literature in order to provide an understanding of the EIP creation at macrolevel to the territorial and local industrial decision makers. To do that, a certain number of EIPs worldwide was chosen within the information accessibility and project deadline limits for the investigation. The research question is formulated as follows: Is there a trend of implementation for the creation and management of EIPs? The second and minor question is: How does the existing literature on the EIP creation reflects the reality?

In this respect, the present paper is organized as follows: Section 2 is dedicated to the description of the analytical framework and the criteria used in this investigation. Section 3 describes the EIP data gathering and uses the before mentioned framework for attributions and correlations. The results are discussed afterward, and the paper concludes with the findings of this study and its limitations.

2 Materials and Methods

The purpose of this paper is to investigate the creation of EIPs from a macroviewpoint, looking forward the following questions: What makes an EIP project interesting enough to start? How an EIP would be created and organized? and Who will take part in the development?

To answer these questions, we followed four steps explained below as the general methodology approach. After building a fact-sheet, it is necessary to identify and select key criteria for the analysis.

2.1 General Methodology Approach. An empirical analysis method to study the trend of creation and governance of EIPs is used in this investigation: (1) building fact sheets, including general information of the EIP, e.g., size, date of operation, industrial structure, etc.; the context where the EIP is developed, that is, economic, environmental, political, and so on; and IE deployment approach, for instance, bottom-up, top-down, and mixed; (2) selecting criteria of analysis: trigger factors, implementation mechanism approach, and of the management/coordination structure; (3) identifying EIPs according to relevance of industrial structure, geographic location, IE approach, and level of maturity; and (4) analyzing the EIPS using criteria.

2.2 Building Fact Sheets. The methodology used to build up fact sheets for each eco-industrial park selected could be found in supplementary information, which is available under the "Supplemental Materials" tab for this paper on the ASME Digital Collection. These consist in collecting information according to targeting criteria in this study, for instance, park size, activities, the nature of trigger factors, main stakeholders, and coordinating structure. The fact sheets were completed in a two-step process. First, data were collected through a literature review of research paper and open source reports specific to the parks. Second, additional data were collected through phone call or face-to-face interviews with the principal stakeholders of the eco-industrial park.

2.3 Definition of the Framework. At least three comprehensive literature studies are published recently, which analyze the existing body of literature looking for the dynamics of industrial symbiosis [24], conceptual knowledge largely from academia versus practice (on-the-ground experience) by Chertow and Park [25], and finally, the organizational perspectives of industrial symbiosis [4]. Being aware of these works and other bibliometric analysis of the scholarly works, we have identified some of the main criteria, with a focus on the analyses emerging from the real case studies, and build a simple framework, usable as a first approach toward the EIP we were going to investigate. The framework is constituted by three specific criteria, described below in details.

2.3.1 Key Trigger Motivations for Eco-Industrial Parks Development. Developing the IE concept within an industrial zone has been a focus of attention by the scientific community in the early age and has presented a great opportunity to conciliate both economic and environmental benefits [3,26,27]. For deeper and more thorough discussion on these benefits, readers are invited to refer to the articles previously cited. Shortly, in a first approach, economic and environmental benefits could be originated through resources efficiency (reduction of energy and materials costs) and waste reduction (in regards to amount and toxicity resulting to the reduction of treatment cost), which fall into the domain of cleaner production. In that case, every single firm in an industrial park can perform cleaner production in an independent manner. Whereas the other approach to generate benefits both environmental and economic in IE is defined as industrial symbiosis (IS), which includes sharing resources, infrastructures, and services or by creating exchanges between firms, with no classical buyer–supplier business relations, where traditional wastes of one firm are further used as inputs for another one. This approach to be efficient requires the cooperation of multiples actors, where subjects of trust and interdependency between firms are the predominant concerns.

However, as described in a majority of empirical investigations, the key trigger motivations to develop an eco-industrial park depend strongly on the context where the park is implanted. For instance, the well-documented EIP in Tianjin, China, namely, the Tianjin Economic and Development Area (TEDA), built on salt-pan has been highly motivated toward environmental preservation owing to water and usable land scarcity [18]. Evidently, economic motivations in TEDA were and are still existent, but it is believed that these were not the critical factors of EIP initiation, as without water and usable land, durable economic development could not occur. On the opposite, the EIP in Guangxi led by the Guitang Group [9], IS has been initiated to explore possibilities to extend its value chain and enable additional business line, hence govern toward economic improvement.

2.3.2 Nature of Implementation Mechanism. A significant number of scientific publications have investigated on the approach used for EIP development. As a result, one of the most accepted theory on IS development highlights that generally two distinct approaches occurred either through a bottom-up or top-down manner, which often are directly correlated according to the nature of IS initiation either from firms through self-organization (also called spontaneous) or through third-party planning, respectively [7]. For instance, the well-renowned EIP in Kalundborg, one of the most cited examples of bottom-up approach, IS was initiated between individual firms in a spontaneously manner without any governance from public entities. On the contrary, the TEDA EIP in China has been initiated and directed by central government through a top-down process. The question of which approach is the best fit to reach optimum EIP and IS development and performance between bottom-up or top-down approaches is still not clearly resolved and under debate. For instance, Lowe has in the early years of IE development argued that EIP is an interdependent and complex industrial system, which is governed by market versatility [3]. Therefore, for an EIP to match efficiently to the market, IS development should be flexible and respect the self-organizing nature of market process, hence be initiated by firms through a bottom-up approach. Moreover, a certain number of scientific researchers also argued that self-organized EIP is

Table 1 Attribution of the three specific criteria

Trigger factors	Economical	Mixed	Environmental
Implementation mechanism	Bottom-up	Mixed	Top-down
Management structure	Private	Mixed	Public

more appropriate and leads to more robustness owing to deeper embeddedness within firms compared to a central planned one [23,27,28]. Others on the contrary are in favor of an IS central-planning owing to advantages of a more organized system where IS related information would be collected and analyzed by a central organism hence would allow discovery, initiation, and management of IS in a more efficient manner [20,29].

Recently, it appears that reflection of both concepts allows to reach a near consensus where a more efficient IS development would be realized in a midpoint approach. In that model, initiation would be carried out by firms in a bottom-up manner where the public entities would create an appropriate context to stimulate collaboration networking between firms for IS to progress. In addition, the implementation and implication of a facilitator through a coordination structure to bridge both approaches have been proposed to be a suitable transition enabler [30].

2.3.3 Nature of Management Structure. The aims of a management and coordinating structure in an EIP are foster and establish connections among players, facilitate the implementation of projects, or to some extend support financially the projects [7]. This structure could include a specific or a variety of actors such as government, private firms, academic, or association of habitants. For instance, the coordination structure in Ulsan is directed by government-sponsored agencies such as Ulsan EIP Center and KICOX and for TEDA by the TEDA Eco-Center. In Rotterdam and Kwinana, manufacturers association is ensuring such activities through Deltalinqs and Kwinana Industries Council, respectively. In Les Sohettes, the structure is led by a private research center, i.e., Agro-Industry Research and Development (ARD). In Deux Synthe, Ecopal is an association of public–private entities leading this function, which includes manufacturers, public officials, and academic experts. An independent private company is ensuring this activity, such as Infraserv in Knapsack, Cimo in Monthey, and BASF in Verbund, or a company established by the municipality's industrial services, such as Ökopark Errichtungs at Hartberg Steiermark, Austria. Yet, implementation of such structure is not a prerequisite, as out of the 19 EIPs studied, three of them, i.e., Kymi, the Guitang Group, and Guayama, have not implemented a coordinating structure. Explanations of these particular experiences are discussed in Sec. 3.

2.4 Attribution of the Three Specific Criteria. The attributing of approach for each criterion is based on elements obtained either from literature review or interviews, as presented in Table 1

3 Analysis of 19 EIPS Worldwide

3.1 Selection of EIPs. To perform a significant representation of eco-industrial parks (EIPs), 19 EIPs are investigated in this study in order to gather a large diversity in geographic location and principal activities as illustrated in Fig. 1. As a result, integrated and specific EIPs in four different continents and more specifically in 13 countries are selected, which are: Kalundborg (DK), Ulsan (SK), Kwinana (AUS), Monthey (CH), Deux Synthe (FR), Central Gulf Coast Project (U.S.), Kawasaki (JAP), Terneuzen (NL), Les Sohettes (FR), Rotterdam (NL), Moerdijk (NL), TEDA (CHI), Guayama (U.S.), Kymi (FIN), Guitang (CHI), BASF Verbund (GER), Knapsack (GER), Norrköping and Linkping (SWE), and Ökopark Hartberg Steiermark (AUT).

The empirical investigation of the 19 EIPS through literature review and field interviews focuses on three criteria, i.e., the nature of initiation factors, the approach deployed, and the coordination structure formed. The principal elements and resulting approach attribution are presented in Table 2.

In regards to initiation factors, out of 19 EIPs, five developed EIPs have been motivated principally for economic reasons either to develop alternatives and emerging markets or to improve economic efficiency through notably cost reduction. Whereas four EIPs have been initially motivated by environmental factors such

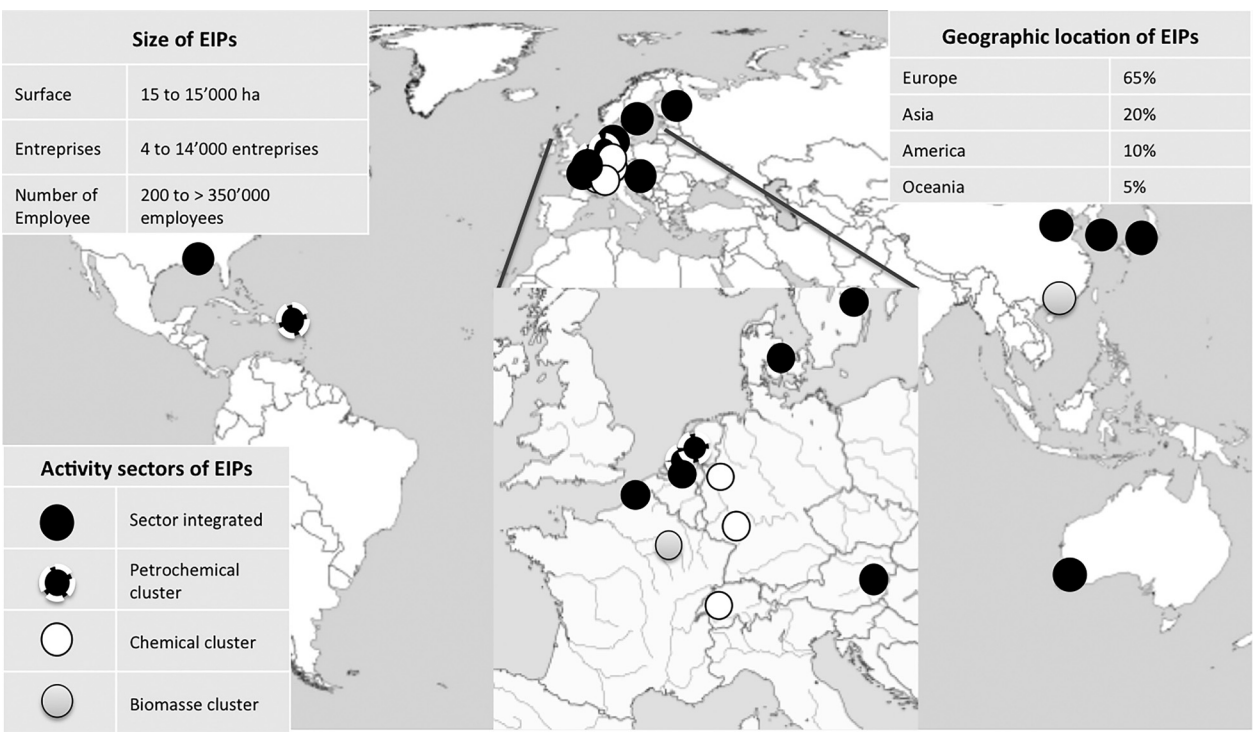

Fig. 1 Mapping of the 19 EIPs investigated according to the location and the sector of activities

Table 2 Attribution of three criteria to the 19 selected EIPs

		Trigger factors		Implementation mechanism		Management structure		
No.	EIP name	Attributing elements	App.	Attributing elements	App.	Attributing elements	App.	Refs.
1	KYMI	Search of efficient alternatives to support economic activity; economic interests have predominated IE implementation	Economic	Search of efficient alternatives to support economic activity; economic interests have predominated IE implementation	Mix	None	—	[31–33]
2	Biopark Terneuzen	Firms will to develop a market-based waste-exchange network	Economic	Three main bottom-up industrial projects, national and local governments will and initiatives, and collaboration between government and firms	Mix	Zeeland seaports are the main actor and comprise four entities, which are Zeeland Province, Borsele, Terneuzen, and Flissingue municipality	Public	[34–36]
3	Bioraffinerie les Sohettes	Emergence of bioeconomy; no indication of environment issue	Economic	Bottom-up from agriculture actors	Bottom-up	ARD: research center shared between industrial partners	Private	[37]
4	Monthey chemical park	Mostly economic with relatively little arguments on environment issue	Mix	Initiative comes from firms then later from government through economic chamber launched program ECHO (2008). Financial incentives from government 50%	Mix	JV between Sygenta and BASF	Private	[38–41]
5	Kwinana	Pressure of water and air quality and resources scarcity	Environmental	Government pressure in regards to water, air quality, and resources scarcity; hence, industrial association was formed; hence KIC collectively organizes the necessary air and water monitoring for the industries in the area in response to government pressure	Mix	Fully private funded, KIC, industrial association	Private	[42–46]
6	Guitang Group	Increase economic efficiency	Economic	Bottom-up from one anchor firm, which diversifies its activity	Bottom-up	None	—	[26,47]
7	Kalundborg	Cost reduction, revenue enhancement, business expansion, and securing long-term access to water and energy	Mix	Bottom-up	Bottom-up	Environment club and Symbiosis Institute	Private	[5,7,21]
8	Ecotown Kawasaki	Environmental motivations owing to industrial pollution and waste minimization but also a mean to revitalize economic activity	Mix	Ecotown Kawasaki project from government and firms initiatives toward green development	Mix	Liaison Center for Revitalizing Coastal Area composed of firms, academics, and political actors	Mix	[44,48]
9	Norrkoping and Linkoping	Adaptation to economic context; IE is to turn environmental problems into business opportunities by applying wide system boundaries, using resources efficiently and co-operate through resource sharing	Mix	Municipality has built infrastructure and utilities which have been sold to firms; the local authority is involved in many decision-making processes affecting economic activities and to ensure continuity	Mix	Cleantech Oüstergoütland: an organization comprising the municipalities of Linkoüping and Norrkoüping and 100 industrial organizations	Mix	[49]
10	Deux Synthe	Reorganizing economic activity and also motivating by waste management concerns	Mix	Initiation and funding from the city, region, country, and European union as well as the participation of private firms through the formation of Ecopal association	Mix	Ecopal is a nonbusiness association, which includes private and public partners	Mix	[50]

Table 2. *Continued*

No.	EIP name	Trigger factors		Implementation mechanism		Management structure		Refs.
		Attributing elements	App.	Attributing elements	App.	Attributing elements	App.	
11	Ulsan	Environmental motivations owing to industrial pollution	Environmental	Top-down initiated by the national program	Top-down	KICOX as the supervised organization is composed of public parties	Public	[19,51]
12	Knapsack chemical park	Foster resources efficiency and sustainability as well as innovation in environmental technologies	Economic	Bottom-up, initiated by private firms	Bottom-up	Private managed by InfraServ GmbH & Co. Knapsack KG	Private	[52,53]
13	Okopark Hartberg Steiermark	Foster sustainable economy and promote environmental preservation	Mix	European union, national, and regional program. Firms are also in close collaboration during initiation	Mix	Okopark Errichtungs GmbH and Okoplan Energiedienstleistungen GmbH	Private	[54]
14	TEDA	Environmental motivations owing to pollution leading to water and land scarcity	Environmental	Top-down initiated by the national program	Top-down	TEDA AC and TEDA eco-center: composed of public parties	Public	[18,55,56]
15	Central Gulf Coast	Increase economic efficiency as well as minimization of waste	Mix	Initiation from government but performed by firms	Mix	BPS Central Gulf Coast: US-BCSD, private firms, nonprofit organization, university, and commerce chamber Mobile Area	Mix	[23]
16	Rotterdam Port	Increase firms competitiveness and responsibility initiative of firms toward environmental management	Mix	Initiated by private firms; funds from public funds; 2010–2014: Program from Rotterdam climate initiative; INES mainport: private firms, public parties, and universities	Mix	Deltalinqs, private firms association, and Port and Municipality of Rotterdam	Mix	[22,49,57–60]
17	Guayama	Environmental reason due to water scarcity and pollution	Environmental	Initiation from government through USEPA and Public Utility Regulatory Policies Act	Top-down	None	—	[61,62]
18	BASF Verdun	Increase economic efficiency through vertical integration of supply chain	Economic	Initiations from firms, especially BASF	Bottom-up	BASF is leading the coordination of IE	Private	[53]
19	Moerdijk	Increase environmental management	Mix	National program for Clean Industrial Pilot Project	Mix	Sustainable Connections Moerdijk (Ministry of Infrastructures and Environment), local firms association, Province, and municipal	Mix	[22,34]

as increase of water and land scarcity as a result of increasing industrial activities, pollution, or a combination of both. The remaining ten EIPs, which are the majority of investigated ones, have been initiated by both economic and environmental purposes.

Concerning the nature of the approach, it has been reported that five EIPs have been initiated by firms through a bottom-up approach either through collaboration between firms or by mainly one firm owing to its economic domination on the park. Whereas three EIPs have been developed through a top-down approach mainly through national or regional programs toward IE deployment. Theses programs are notably popular in Asian countries such as in China, Korea, and also in the U.S. during the Clinton investiture.

As expressed by Chertow and Ehrenfeld [7], a possible theory of IS evolution in a complex system could be modeled in a three-stage phase from random and without particular order exchanges (defined as sprouting), to conscious recognition of IS benefits (defined as uncovering) and finally intentional pursuit of IS benefits through the formation of an institutional frame encompassing a multitude of actors (defined as embeddedness and institutionalization). However, in the investigation of 19 EIPs presented in this manuscript, it has been observed that three of them do not present any coordinating structure, which are in Kimy, in the Guanxi province lead by the Guitang Group, and in Guayama, albeit these are relatively mature EIPs. Therefore, the presence of a coordinating structure in an EIP does not appear to be mandatory to ensure effective and long-term viability of IS. The main and common similarity of these three EIPs that could argue on the absence of coordinating structure is the presence of a single and dominate anchor tenant combined with a relative low number of firms implanted (about ten firms). For instance, the case of the Kimy IP located in Finland, a typical Scandinavian forestry industry is dominated by paper production and relative low number of firms implanted accounting for 11. Therefore, the presence of a coordination structure is not essential to deploy IS as most of the industrial exchanges are related to paper activities. The EIP in the Guangxi province, this industrial zone is led by the Guitang Group, runs one of the largest sugar refineries and accounts at some point in time to more than 50% of sugar production in China [9]. IS was initiated by the Guitang Group to explore possibilities to extend its value chain and enable additional business lines, such as the production of paper, alcohol, cement, and a wide range of other products. As a result, new processing plants were implemented in order to reuse by-products of the sugar refinery, but all were controlled by a single firm, namely, the Guitang Group. Therefore, in this relatively newly developed complex industrial system, a coordination structure is not essential as most of generated flows and IS potential do not necessitate the involvement of multi-actors, but instead could be initiated by a single company.

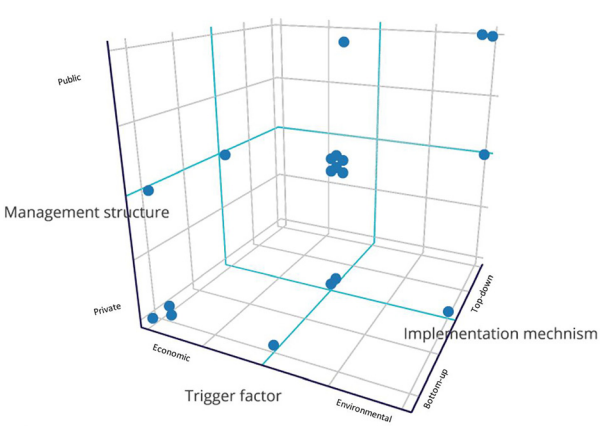

Fig. 2 Representation of 19 EIPs under three criteria

The EIP located in Guayama encompasses nine firms, of which two major ones are an oil refinery and a cogeneration power plant.

As for the remaining 16 EIPs that have implemented a coordination structure, the nature of the management is relatively balanced between private firms (7), public entities (3), or a mix of both (6).

In order to define what are the triggering elements that guide the approach and the involvement of specific actors in the settlement and development of EIPs, three tables that aim at correlating motivations to the nature of approach and the nature of coordination structure have been arranged, which includes the 19 EIPs as illustrated in Table 2.

4 Results and Discussion

A preliminary observation that could be enounced is the presence of a trend in the association between first environmental motivations and top-down approach; second economic motivations and bottom-up approach; and third mixed motivations and mixed approach; where solely five EIPs (26% of selected EIPs) are not included within this trend. Moreover, the absence of EIPs, which associate both environmental motives and a bottom-up approach, suggests that if environmental issues are major factors to develop an EIP, the implication of public entities is essential. On the contrary, if economy purposes are the principal trigger elements then it is necessary that private firms are involved in the process of EIP development as illustrated by the absence of EIP, which combines both economic motives and top-down approach. Moreover, comparing TEDA and the EIP led by the Guitang Group is an opportune case as these are located in China, which is generally known to apply a top-down approach for EIP development. While IS in TEDA follows a top-down approach, IS in the Guitang Group is initiated by a bottom-up approach. The difference between these two EIPs is that IE developments in TEDA and the Guitang Group are triggered by environmental and economic factors, respectively. Therefore, even in a relative rigid, central and top-down political system such as the Chinese one, it appears that the context directs the nature of EIP development approach.

Applying the same analysis between triggers and the management, a similar trend is less pronounced as illustrated in Fig. 2. Indeed, within this case, a number slightly higher than half of EIPs investigated follow this trend, 11 EIPs out of 19. However, as three EIPs do not present any structure; therefore, if these three are not taken into account, then the proportion of EIPs that follow the trend is elevated to 11 out of 16 equivalent to 69% of EIPs investigated. Moreover, the presences of EIPs, which associate, on the one hand, environmental trigger and private coordination structure and, on the other hand, economic trigger and public coordination structure, suggest that the trigger factor has no exclusive effect onto the nature of coordination structure.

However, the nature of approach (top-down and bottom-up) suggests an exclusive effect on the nature of the management structure as illustrated in Fig. 2. Indeed, the presence of EIPs combining, on the one hand, both top-down approach and private coordinating structure and, on the other hand, both bottom-up approach and public coordinating structure could not be observed. Moreover, in 12 EIPs out of 19 (or 12 out of 16 excluding EIPs without coordination structure), the existing tendency between management structure and implementation approach highlights the influence of the social context and the presence of a certain gap of cohabitation of the two extreme systems, i.e., public and private.

Finally, on the triggers, six EIPs were developed after economic drivers. Of these, four EIPs, namely, Bioraffinerie Les Sohettes, Guitang Group, Chemiepark Knapsack, and BASF Verdun, were initiated through a bottom-up approach, whereas Kymi and the Biopark Terneuzen result from a mix approach. On the opposite side, four EIPs were developed owing to purely environmental motivations. Of these, three EIPs, which are Ulsan, TEDA, and

Guayama, were initiated through a top-down approach, whereas Kwinana results from a mixed approach. Finally, out of nine EIPs that present both economic and environmental motives, only Deux Synthe and Kalundborg present solely a top-down and a bottom-up approach, respectively, whereas the seven remained EIPs present a mix of top-down and bottom-up approaches.

5 Conclusion

How an EIP is created and developed? The answer to the this question opened a special focus of researchers in the area of suitable design and manufacturing, and the different issues from political and strategic point of view to the narrowed down technical and engineering problem. Yet, the creation of an EIP remains the big question for the territorial and industrial decision makers, because of the gratitude of the required investment and the huge impact of the EIP on the zone.

The process through which EIPs are established is highly idiosyncratic and unpredictable and is therefore often described in considerable detail by researchers. In this paper, we chose to look for a rather common trend, to provide an aide to the local decision makers.

Although this paper conducted an empirical investigation of 19 EIPs which according to the majority of studies being single case is valuable for the general trend analysis, the contribution of this study to the vast body of literature in the area of EIP is narrow.

The gathered elements and analysis methodology used in this study suggest, with a 74% correlation, that the context translated by the trigger factors either environmental, economic, or a mixed of both has a significant effect on the approach to create an EIP either top-down, bottom-up, or mixed approach, respectively. This result is valid for the chosen sample and not necessary conductive to all the cases. Moreover, it is found that an exclusive effect of the context on the nature of approach occurs. Indeed, in the 19 investigated EIPs, when environmental motivations exist it necessarily implies public entities, whereas the presence of private firms is not always essential. This observation on the studied sample emphasizes the importance of the participation of public authority to foster EIP development when environmental concerns are involved and its preservation is needed.

Moreover, it is perceived that public coordination structure could not be induced by a bottom-up approach, and inversely a private coordination structure is not associated with a top-down approach. This phenomenon highlights the influence of the social context and the presence of a certain gap of cohabitation of the two extreme systems, i.e., public and private, which would require to be filled to improve the implementation and the durability of the EIPs.

However, to confirm this preliminary trend of EIP creation and management, the extension of the quantity of studied EIPs to a more significant number is necessary and is under investigation in the research program of the institute. Moreover, to define a best practice model in EIP development, investigation of the effect of EIP creation and management models on key performance indicators or on the maturity level of the EIP through number of symbiosis would be of a great interest. One expected outcome would be a guideline to show the adaptability of an EIP structure in particular regions, assuming the environmental policies and influence from the government and private sectors.

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