OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

FAIR USE POLICY

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

ECONOMIC ZONES IN THE ASEAN

INDUSTRIAL PARKS, SPECIAL ECONOMIC ZONES, ECO INDUSTRIAL PARKS, INNOVATION DISTRICTS AS STRATEGIES FOR INDUSTRIAL COMPETITIVENESS

UNIDO COUNTRY OFFICE IN VIET NAM

(Working Document 2015)

AUGUST 2015

Overview

Economic zones (industrial parks, special economic zones, eco-industrial parks, technology parks, and innovation districts) have been promoted as cornerstone strategies for economic development in countries around the world.

Competitive strategies depend on the country's stage of economic development. Industrial Parks and Special Economic Zones will foster a catch-up strategy in less developed countries, while innovation districts will accelerate innovation in already developed economies. The countries in the ASEAN have widely adopted economic zones. It is estimated in this paper that there are more than 1,000 economic zones in the ASEAN (893 industrial parks, 84 special economic zones, 2 eco-industrial parks, 25 technology parks, and 1 innovation district). The study paper will first focus on understanding the different type of economic zones that have been used as competitive strategies before providing the country profile for each ASEAN member as well as a detailed profile for Viet Nam.

Acknowledgements

This paper was prepared by Mr. Arnault Morisson, UNIDO Country Office in Viet Nam, under the overall guidance and direction of Mr. Patrick J. Gilabert, UNIDO Representative in Viet Nam. More information can be obtained at office.vietnam@unido.org. Writing this study paper would not have been possible without the help of Dr. Nguyen Quang, Representative of UN-Habitat in Viet Nam; Ms. Vuong Hieu, Ministry of Planning and Investment in Viet Nam; Mr. Nguyen Viet Anh, CEO Vietnam Invest Network; Ms. Shireen Chen, JTC Corporation; Mr. Jérôme Stucki, UNIDO Headquarter and the Indonesian Industrial Estates Association.

List of Abbreviations

A*STAR	Agency for Science Technology and Research
AEC	ASEAN Economic Community
AEZA	ASEAN's Economic Zones Authority
AMPO	Pacific Asia Resource Center
APEC	Asia-Pacific Economic Cooperation
APSC	ASEAN Political Security Community
ASCC	ASEAN Socio-Cultural Community
ASEAN	Association of Southeast Asian Nation
CARICOM	Caribbean Community
DHTP	Danang Hi-Tech Park
DNA	Deoxyribonucleic Acid
EBD	Economic Development Board
EC	Economic Community
EIED	Eco-Industrial Estates Development
EIP	Eco-Industrial Park
EPZ	Export Processing Zones
ESSEC	École Supérieure des Sciences Économiques et Commerciales
EU	European Union
EZ	Economic Zone
FDI	Foreign Direct Investment
FP	Freeport
FTZ	Free Trade Zone
GEF	Global Environment Facility
GHG	Greenhouse Gas
GIS	Geographic Information System

GTZ	German Technical Cooperation Organization
HDI	Human Development Index
IASP	International Association of Science Park
ICT	Information and Communication Technology
ID	Innovation District
IEAT	Industrial Estate Authority of Thailand
INSEAD	Institut Européen d'Administration des Affaires
IP	Industrial Park
ISID	Industrial and Sustainable Industrial Development
ISO	International Organization for Standardization
IZ	Industrial Zone
KM	Kilometer
MERCOSUR	Mercado Común del Sur
MNC	Multinational Corporation
MPI	Ministry of Planning and Investment
MRI	Magnetic Resonance Imaging
MTI	Ministry of Trade and Industry
NAFTA	North American Free Trade Agreement
NO_X	Nitrogen Oxides
PCSD	President's Council on Sustainable Development
PDR	People's Democratic Republic
POP	Persistent Organic Pollutant
PPP	Purchasing Power Parity
PRIME	Private Sector Participation in Managing the Environment
QI	Quartier de l'Innovation
R&D	Research and Development
RMB	Renminbi
SECO	State Secretariat for Economic Affairs
SEZ	Special Economic Zone

SFADCo	Shannon Free Airport Development Company
SME	Small and Medium Enterprise
SO^2	Sulfur Dioxide
SPRING	Standards, Productivity and Innovation Board
TP	Technology Park
UNCED	United Nations Conference on Environment and Development
UNCTAD	United Nations Conference on Trade and Development
UNIDO	United Nations Industrial Development Organization
USA	United States of America
USD	United States Dollars
USEPA	United States Environmental Protection Agency
USSR	Union Soviet Socialists Republic
WCED	World Commission on Environment and Development
WTO	World Trade Organization

Table of Contents

List of Boxes

List of Figures

List of Tables

1. Introduction

The Association of Southeast Asian Nations (ASEAN) is emerging as a powerful trading block in the world. 2015 is an important milestone for the ASEAN with the establishment of the ASEAN Community on the 31st of December 2015. The three pillars of the ASEAN Community are: (1) ASEAN Political Security Community (APSC); (2) ASEAN Economic Community (AEC); and (3) ASEAN Socio-Cultural Community (ASCC). Among those three pillars, economic zones play an important role in the AEC, which stated goals, are to foster an "integrated and highly cohesive economy, a competitive, innovative and dynamic ASEAN, a resilient, inclusive, people-oriented, people-centered ASEAN, enhanced sectoral integration and cooperation, and a global ASEAN."

Economic zones, namely Industrial Park (IP), Special Economic Zone (SEZ), Eco-Industrial Park (EIP), Technology Park (TP), and Innovation District (ID), are promoted by national, regional, and local governments to spur economic growth and competitiveness. The stage of development of a specific region will however, determines the most appropriate economic zone and competitive strategy. Indeed, countries or regions that have a low stage of competitive development will adopt a technological catch-up strategy by attracting as much Foreign Direct Investments (FDIs) as possible whereas countries or regions that have achieved a higher stage of economic development will focus to attract innovative and knowledge-intensive activities.

The countries of the ASEAN have achieved different level of competitive development. The members have thus adopted different economic zones' strategies to strengthen their competitiveness. Viet Nam has widely relied on industrial parks to attract FDIs. Singapore has designed one-north Singapore, the first innovation district in the ASEAN. It is estimated in this paper that there are more than 1,000 economic zones in the ASEAN (893 industrial parks, 84 special economic zones, 2 eco-industrial parks, 25 technology parks, and 1 innovation district). The study paper gives three recommendations to policymakers and public organizations: (1) to retrofit existing industrial parks and special economic zones into eco-industrial parks and eco-special economic zones; (2) to move-up the value chain by creating innovation districts in large cities; and (3) to create a not-for-profit organization within the ASEAN - the ASEAN's Economic Zones Authority (AEZA) - to monitor economic zones in the ASEAN.

2. Competitiveness and Economic Zones

Competitiveness:

Michael Porter has pioneered the use of economic analysis to investigate issues relating to the competitiveness at the organizational, industrial, and national levels. In his seminal book, *The Competitive Advantage of Nations,* Porter (1990) discusses the idea that not only companies, but also countries, compete. The World Economic Forum (2015) that was greatly influenced by the work of Michael Porter defines competitiveness as "the set of institutions, policies, and factors that determine the level of productivity of a country. The level of productivity, in turn, sets the level of prosperity that can be reached by an economy. The productivity level also determines the rates of return obtained by investments in an economy, which are harbingers of its GDP growth rates. In other words, a more competitive economy is one that is likely to grow faster over time" (World Economic Forum, 2015: p.4).

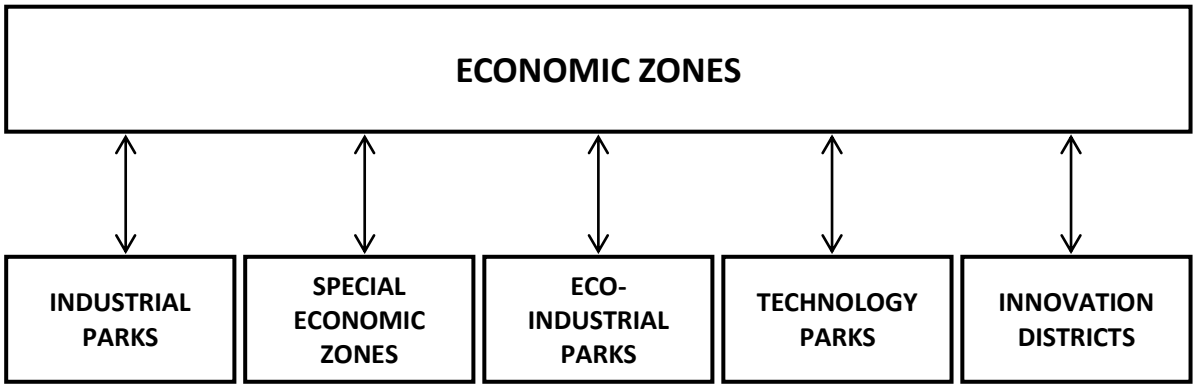
The World Economic Forum also publishes each year, *The Global Competitiveness Report*, a ranking of the most competitive nations in the world. Competitiveness, however, is not a "zero-sum game." In other words, an increase in competitiveness in one country does not come at the expense of another. On the contrary, gains in productivity and efficiency in different countries can and must be integrated and mutually reinforcing. Competitiveness has to be understood as an all-encompassing concept that underlies a country's source of prosperity. A nation's prosperity is determined by the productivity of its economy - which is measured by the value of goods and services that are produced per unit by the nation's human, capital, and natural resources. Productivity is the prime determinant of a nation's standard of living in the long run; it is the main determinant of a nation per capita income (Porter, 2008).

Economic zones are promoted by local, regional, and national governments as strategies to foster economic growth and to improve a location's competitiveness.

Economic Zones:

There are five types of economic zones, which are: Industrial Park (IP), Special Economic Zone (SEZ), Eco-Industrial Park (EIP), Technology Park (TP), and Innovation District (ID). An economic zone is a top-down selected estate that provides non-monetary and/or monetary advantages to companies located within its area, which goal is to foster the economic competitive development of a country, a region, or an urban area.

Figure 1. The different type of economic zones.



Source: own design.

Industrial Park (IP): UNIDO (1997) defines industrial parks as "a tract of land developed and subdivided into plots according to a comprehensive plan with provision for roads, transport and public utilities with or without built-up (advance) factories, sometimes with common facilities and sometimes without them, for the use of a group of industrialists."

Special Economic Zone (SEZ): the SEZ is a designated estate where trade laws such as tariffs, quotas, or duties differ from the rest of the country.

Eco-Industrial Park (EIP): The United States Environmental Protection Agency (USEPA) defines an EIP as "a community of manufacturing and service businesses seeking enhanced environmental and economic performance by collaborating in the management of environmental and reuse issues including energy, water, and materials. By working together the community of businesses seeks a collective benefit that is greater than the sum of the individual benefits each company would realize if it optimized its individual performance only" (as cited in Tudor, Adam & Bates, 2007).

Technology Park (TP): the International Association of Science Parks (IASP) defines a science park as "an organization managed by specialized professionals, whose main aim is to increase the wealth of its community by promoting the culture of innovation and the competitiveness of its associated businesses and knowledge-based institutions. To enable these goals to be met, a Science Park stimulates and manages the flow of knowledge and technology amongst universities, R&D institutions, companies and markets; it facilitates the creation and growth of innovation-based companies through incubation and spin-off processes; and provides other value-added services together with high quality space and facilities"

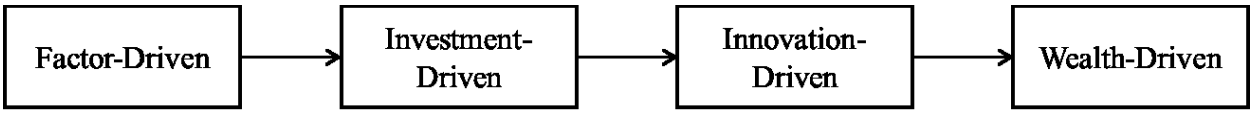
Innovation District (ID): Innovation districts are urban technology parks. In the knowledge-intensive paradigm, urban areas are more suitable for fostering innovations that suburban technology parks. Innovation districts based on the 22@ Barcelona's model can be defined as "top-down urban innovation ecosystems designed around four multilayered and multidimensional models of innovation: urban planning, productive, collaborative, and creative, all coordinated under a strong leadership, with the ultimate objectives of accelerating the process of innovation and of strengthening the locations' competitiveness" (Morisson, 2014).

Local, regional, and national governments use economic zones to strengthen the competitiveness of their cities, regions, and countries.

Stage of Development:

A nation's standard of living depends on the capacity of its companies to achieve high levels of productivity, and it, also, depends on the nation's ability to increase productivity over time (Porter, 1990). Porter (1990) suggests that there are four distinct stages of national competitive development: factor driven, investment driven, innovation driven, and wealth driven. The first three stages involve the successive upgrading of a nation's competitive advantages and will normally be associated with progressively rising economic prosperity. The fourth stage is one of decline (Porter, 1990). A sustained productivity growth requires that an economy continually upgrade itself (Porter, 1990). As nations develop, they progress in terms of their competitive advantages and modes of competing (Porter et al., 2007). National prosperity is created, not inherited. A nation's competitiveness depends on the capacity of its industry to innovate and upgrade its economy (Porter, 1990).

Figure 2. The four stages of national competitive development.



Source: Michael Porter (1990).

The first stage of national economic development is the factor-driven stage. In this stage, companies draw their advantage almost solely from basic factors of production - whether they are natural resources, favorable growing conditions for certain crops or an abundant and inexpensive semi-skilled labor pool (Porter, 1990). Firms produce commodities or relatively simple products that are designed in other, more advanced countries (Porter et al., 2007).

The second stage of national economic development is the investment-driven stage, in this stage; the national competitive advantage is based on the willingness and ability of a nation and its firms to attract foreign investments and to invest aggressively. There are several factors that can allow major improvements in productivity; examples of these factors are: heavy investment in efficient infrastructure, business friendly government administrations, strong investment incentives, and better access to capital (Porter, 1990). Porter (1990) has noted that the investment-driven model requires a national consensus that favors investment and long-term economic growth over the current consumption and income distribution. The competitive advantage of the nation comes from the efficient production of standard products and services.

The third stage of national economic development is the innovation-driven stage. In this stage, firms not only appropriate and improve technology and methods from other nations, but they also create them (Porter, 1990). The ability to produce innovative products and services in the global technology frontier, using the most advanced methods, has become the dominant source of competitive advantage (Porter et al., 2007).

The fourth stage of national economic development is the wealth-driven stage. In the last stage, firms no longer innovate, but they aim to sustain the wealth that has already been achieved (Porter, 1990). As a result, the wealth-driven stage ultimately leads to decline.

Table 1. Subindex weights and income thresholds for stage of development.

	STAGE OF DEVELOPMENT				
	Stage 1 Factor-driven	Transition from stage 1 to stage 2	Stage 3 Efficiency-driven	Transition from stage 2 to stage 3	Stage 5 Innovation-driven
GDP per capita (US$) thresholds	<2,000	2,000-2,999	3,000-8,999	9,000-17,000	>17,000
Weight for basic requirements	60%	40-60%	40%	20-40%	20%
Weight for efficiency enhancers	35%	35-50%	50%	50%	50%
Weight for innovation and sophistication factors	5%	5-10%	10%	10-30%	30%

Source: World Economic Forum (2014).

In the ASEAN Economic Community, there is a wide disparity in the member's competitive development. According to the World Economic Forum's framework, Brunei and Singapore have reached the last stage of competitive development while Cambodia, Lao PDR, and Myanmar are still in the first stage. Viet Nam has reached the transition stage 1 from stage 2 in 2015.

Figure 3. The stage of development of each ASEAN country.

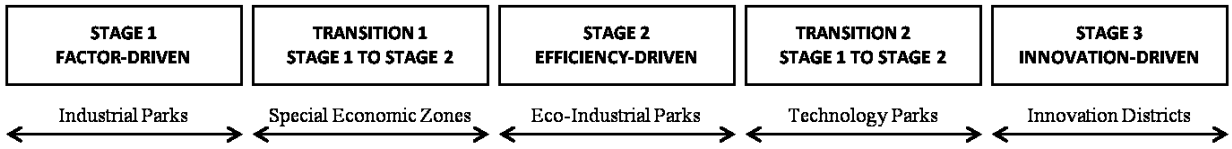
Source: own design.

Government Role:

Nations are positioned on different stages of competitive development and face different challenges. Successful economic development is a process of successive upgrading, and a nation's business environment evolves to support and encourage increasingly sophisticated and productive ways of competing by its firms (Porter et al., 2007). The stages represent a way of abstracting the upgrading process in a national economy (Porter, 1990). In the process of moving upward in the stages of competitive development, activities in less advanced, lower productivity segments are lost. As a result, economic development is a sequential process, and to achieve an increase in productivity, an economy must be constantly upgrade itself (Porter, 1990). Nations have to deal with different priorities at different stages of competitive development. The priorities can range from having the correct infrastructures to the institutional and incentive structure that is used to create and sustain innovations. Therefore, the microeconomic economic challenges are constantly evolving.

Porter (1990) stresses the role of the government to encourage the upgrade of the economy to a higher stage of competitive development. The governments' roles are seen as a catalyst and enabler; it is to encourage – or even push – companies to raise their aspirations and increase their levels of competitive performance, even though this process may be inherently unpleasant and difficult (Porter, 1990). Nation's governments have a crucial role to play in establishing macroeconomic stability and providing stable political, legal, sound macroeconomic policies, and social institutions. These prerequisites create the potential for improving national prosperity.

Figure 4. Economic zones and stage of competitive development.



Source: own design.

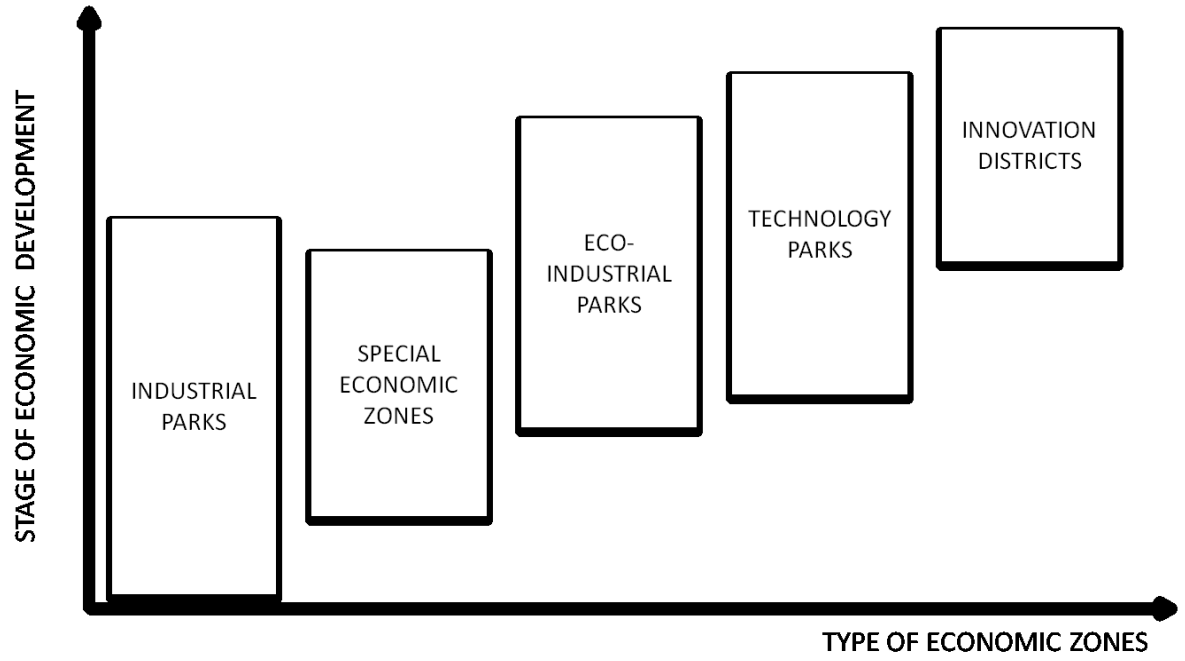
The appropriate growth strategy for any country, region, or city depends on where it is located relative to its stage of competitive development. Technological catch-up by building industrial parks and Special Economic Zones are easy solutions for low-income countries to deliver rapid economic growth. Once a country has achieved middle-income status however, the competitive priority has to move on innovation and sustainability in order to efficiently compete in the knowledge economy. Technological catch-up is much easier than building the infrastructures and creating the policies to compete in the knowledge-economy. Industrial parks are the simplest form of planned estates and will appeal to countries that are at a low stage of economic development.

Special Economic Zones are more difficult to put in place and require appropriate infrastructures such as airports and ports, and an efficient legal regulatory framework for customs and duties. SEZs are successful when countries are not well integrated in the global trade.

As countries developed however, they are more and more integrated within trade blocks and multi-national organizations, which as a result make the benefits stemming from SEZs dissipate. Eco-Industrial Zones are the next economic zone for countries to implement when reaching higher stages of economic development.

As countries achieve a higher stage of economic development, there are also stronger environmental regulations, which make eco-industrial zone not only necessary to comply with environmental regulations but also financially profitable for the industries. Technology parks are the economic zones adopted as economic strategies by urban and regional leaders to compete in the knowledge economy. Innovation districts are the most sophisticated economic zones in which the production of new knowledge and the concept of sustainability are central elements to their successes. The most advanced countries have eco-industrial parks, technology parks, and innovation districts (e.g. Singapore, Switzerland, the United States, and so on), while the lowest income countries have only industrial parks or SEZs (e.g. Cambodia, Ethiopia, Kenya, and so on).

Figure 5. Economic zones and stage of economic development.



Source: own design.

3. The Five Economic Zones

3.1. Industrial Parks

Overview:

The planning of industrial parks is the outcome of the Alfred Marshall's theories on industrial districts. Trafford industrial park, which opened in 1896 near Manchester in the United Kingdom, is the first planned industrial park in the world (World Bank, 1992). It is estimated that there are around 15,000 industrial parks around the world (UNIDO, 2012). Planned industrial estates were popular in developed countries until the late 1950s. Today, the majority of new industrial parks' development is located in Asia and Africa.

Definition:

UNIDO (1997) defines industrial parks as "a tract of land developed and subdivided into plots according to a comprehensive plan with provision for roads, transport and public utilities with or without built-up (advance) factories, sometimes with common facilities and sometimes without them, for the use of a group of industrialists."

Industrial parks are the simplest form of planned estates, which goal is to foster local economic development. Industrial parks range in sophistication from barely providing physical infrastructures such as roads and public utilities to providing a wide-range of soft infrastructures such as common facilities, and support services such as consulting, financial services, training, technical guidance, information services, joint research facilities, and business support services. In developing countries, the sophistication of industrial parks varies widely. Indeed, some industrial parks lack water and sewage treatment systems while other industrial parks are highly sophisticated. There are differences between the industrial parks' core functions in the developed and the developing countries. In the developed economies, warehouses and distribution facilities make up the most of the tenants in industrial parks. In the developing and emerging economies however, industrial parks are dominated by manufacturing activities (King Sturge, 2002).

Objectives:

The objectives of industrial parks vary between developing and developed economies. The main rational to build an industrial park is to reduce transaction-costs and risks for the industries located within the park (UNIDO, 2012).

For developing countries, the three main objectives of industrial parks are:

(1) To foster economic growth and employment at the national, regional, and local level.
(2) To attract Foreign Direct Investments (FDIs).
(3) To spur an industrial dynamic.

Industrial parks in the developed economies however, are planned to cluster warehouses and distribution centers together on a planned estate in order to minimize the negative externalities such as pollution and congestion incurred upon the local communities. In the developed countries, industrial parks in some cases have been reconverted into Eco-Industrial Parks, in most cases however, industries have been plainly outsourced to developing countries.

History:

The first industrial parks were established in Western Europe and the United States in the late nineteenth- to early twentieth- century. Trafford industrial park, which opened in 1896 near Manchester in the United Kingdom, is the first planned industrial park in the world (World Bank, 1992). The first planned industrial park in continental Europe was founded in Naples, Italy in 1904 (World Bank, 1992). The first planned industrial park in the USA, the Clearing Industrial District, was founded in 1907 near Chicago (World Bank, 1992). In 1951, the first Asian industrial park was founded in Singapore (World Bank, 1992). Planned industrial parks are aiming to replicate the spontaneous growth of industrial districts as described by Alfred Marshall (1896). The establishment of industrial parks was popular in Western Europe, in the USSR, and in the United States in the 1950s until the end of the 1970s. The first generation of industrial parks were driven by public sector development and operated with government subsidies.

The industrial parks were fairly basic, offering basic infrastructure and facilities, compared to the diversity in sophistication of modern parks. Indeed, over the decades the scope of services and facilities provided by industrial parks became more sophisticated and holistic. In the 1970s, structural changes, namely the oil crisis, information and communication technology and globalization, led industries in developed countries to outsource their production to developing and emerging countries. Industrial parks became a successful development strategy for developing and emerging countries to attract FDI and foreign industries. UNIDO is very active in promoting industrial parks in developing countries. UNIDO has published several studies and has hold conferences on industrial estates as instruments for economic development (Falcke, 1999). As pointed out by UNIDO (1997), industrial estates are important tools for stimulating industrial growth, providing cost-effective infrastructure and communal services. UNIDO has published guidelines for the establishment of estates in 1978 as well as guidelines and specifications for the construction of small-scale industry estates in 1988. In 1978, the organization has provided direct assistance to the establishment of industrial estates in many developing countries (UNIDO, 1997). The establishment and management of industrial estates have many technical, economic, and policy aspects. UNIDO, through its multidisciplinary staff and wide network of outside experts can offer an integrated approach to successful estate development (UNIDO, 1997).

Alfred Marshall and industrial districts:

In 1890, the British economist Alfred Marshall published *The Principles of Economics*. In his seminal book, the author described the concept of industrial district and localization economy, in which Marshall showed how an agglomeration of small- and medium- sized firms - such as the ones in Lancashire and Sheffield - fosters the development of external economies (Belussi & Sedita, 2010). Alfred Marshall observed that “the mysteries of the trade become no mysteries; but are as it were in the air, and children learn many of them unconsciously” (Marshall, 1890). Marshall laid the foundations to further investigate externalities, returns to scale, economics of agglomeration, and spillovers.

While industrial districts were spontaneous localizations of industries through market forces in a delimited area, industrial parks are nothing more than its planned counterparts. Marshall identified three distinct reasons for localization, in other words, why a firm finds it profitable to locate near similar companies.

The three reasons suggested by Marshall are:

(1) the availability of specialized input providers, (2) the access to a large pool of similar and specialized workers, (3) the production of new ideas.

The three reasons taken together form the scale economies that are external to the firms (Fujita & Thisse, 1996). Those externalities are crucial in the formation of economic agglomerations and can generate a lock-in effect.

First, localization allows firms to enjoy inputs in greater variety and at lower cost. The large number of similar industries implies that specialized suppliers will have a benefit to locate in the same region as producers (Wolman, 2014). Indeed, reduced transportation and distribution costs will give input suppliers a competitive edge to locate within the same region as their customers. As a result of those cumulative forces, the attractiveness of the location will be reinforced.

Second, a concentration of firms implies a pooled market of workers with specialized skills. This pooled market benefits both workers and firms. Firms will find it easier to recruit competent employees, and the workers will spend less time unemployed. The ability for companies to have access to a skilled, diverse, and specialized labor force is a reason for localization.

Third, geographic proximity facilitates the spread of information, and the exchange of information through face-to-face communications (Fujita, Krugman, & Venables, 2001). Knowledge spillovers result from the concentration of many people working on problems in similar or related set of industries, skill sets, and processes. The result is greater innovation, and it generates greater productivity for firms in the regions (Wolman, 2014). The type of knowledge circulating in the industrial districts is mainly tacit, which is rooted in practice and technical know-how. The degree of codification is very low, and the experience of more skilled workers is passed on to new generations by word of mouth, which makes outsourcing ludicrous (Belussi & Sammarra, 2009).

Industrial parks and economic development:

An industrial park is for many countries a tool to foster economic development. The development of industrial parks is particularly attractive for countries on the lowest stages of competitive development. For those countries, industrial parks offer a major advantage in that it provides an institutional framework, modern services and a physical infrastructure that may not be available in the rest of the country (UNIDO, 2012). An industrial park is however, competing on two levels - national and international. At the national level, the park must be competitive enough relative to its national peers. At the international scale, the park must be competitive enough relative to its international peers (UNIDO, 2012). The high number of industrial parks (15,000) around the world makes the competition fierce among industrial parks. Industrial estates may serve as a step towards more advanced industrial infrastructure such as export processing zones (EPZs) or science and technology parks (UNIDO, 1997). The motivation to develop an industrial park can be developmental, promotional, or dispersal (factories to move away from urban centers) (UNIDO, 1997).

According to UNIDO (1997), the contributions of industrial parks to national industrial and economic development are numerous. Countries promote industrial parks:

(1) To promote more rapid industrialization of the country.
(2) To increase national and local employment.
(3) To achieve a more balanced regional distribution of employment and production.
(4) To attract private investment, both national and foreign.
(5) To promote the development of small domestically owned industries.
(6) To bring industries and industrial employment to rural areas.
(7) To induce structural changes in production and employment, especially diversification.
(8) To encourage more effective use of resources through the development of large scale industrial complexes, airports, ports, power plants and so on.
(9) To improve product quality and increase productivity.
(10) To train labor and increase its productivity.
(11) To achieve economies in investment in public infrastructure.
(12) To reduce the cost of capital investment to the industries.
(13) To eliminate delays for the industries in obtaining a suitable site, utilities, and buildings (UNIDO, 1997).

Industrial parks contribute to urban and regional economic development:

(1) To promote decentralization by preventing or checking excessive concentration in or growth of single urban areas, especially large metropolitan areas.
(2) To increase the economic, productive, and employment base of urban communities.
(3) To regulate the inflow of industry and to guide its orderly location on the most suitable land within the metropolitan areas.
(4) To strengthen the economic base of small and medium sized towns.
(5) To provide a healthier and more attractive urban environment by separating non-industrial and industrial areas.
(6) To minimize distance to work and to reduce load on the transport system.
(7) To maximize efficient land usage and reduce the cost of land and land development.
(8) To integrate urban marginal population into productive industrial activities.
(9) To provide sites to relocate industries displaced by urban renewal projects.
(10) To achieve economies in the provision of urban services and utilities (UNIDO, 1997).

Success factors:

The success of an industrial park depends on many factors. There are however, key factors that need to be taken into consideration when planning an industrial park. Indeed, industrial parks are the simplest form planned estate to foster economic development. They also are the most appropriate tool for countries or regions at the lowest stages of competitive development. The six key factors that determine the success of an industrial park are:
(1) its location; (2) the presence of lead companies; (3) a stable and advantageous fiscal system; (4) a large labor forces; (5) the physical and institutional infrastructures; and (6) a good management board.

Location:

Location, location, location… As any real estate venture, location is a key determinant of the future success of an industrial park. The size and pricing of an industrial park must be planned according to business and market needs and expectations. The industrial parks need to be easily accessible (proximity to a port or an airport, and road/railway infrastructure). There also should be a large supply of human resources available at a reasonable cost (UNIDO, 2012).

Infrastructure and service provision:

The industrial parks must provide its tenants with hard and soft infrastructures. Hard infrastructures include roads, wastewater, sewage treatment, telecommunications, stable and efficient energy supply, and common facilities. Through industrial parks, firms benefit from economies of scale in terms of land development, construction, and common facilities such as tool rooms; testing, quality control and heat treatment; and security service (UNIDO, 1997). Soft infrastructures relate to the estate's management capacity.

Management capacity:

The success of industrial parks depends on efficient and responsive management. A park's management board must provide guidance and support to its tenants. This includes marketing, information, procedural support, and quick and effective responses to customer needs (UNIDO, 2012). The high numbers of industrial parks, around 15,000 in the world, mean that the competition among them is fierce. The management board of an industrial park must continuously promote to sustain the attractiveness of an industrial park.

The management board must also develop links with other organizations and build a network. The management body should not only limit itself to maintenance of the facilities but also play a dynamic role, promoting the services offered by the estate among local entrepreneurs, suppliers, and companies in order to create backward linkages that can potentially yield innovations.

Incentives:

The role of the authority developing industrial parks has moved from a passive role where governments were only providing the infrastructures for companies to settle in newly build industrial parks to an active role where generous incentives are offered. The incentives can come from national or/and regional or/and local government bodies.

The incentives include but are not limited to:

(1) Long and short-term credit at preferential rates
(2) Remission of taxes and duties
(3) Built factories, subsidized rents
(4) Low cost land/rents
(5) Subsidized tariffs for water and electricity
(6) Preferential rates for telecommunications services
(7) Simplification of procedures/one-window service for administrative issues
(8) Use of common production facilities and services
(9) Workers' housing/industrial townships (UNIDO, 1997).

Conclusion:

Industrial parks are the simplest form of planned estates to foster local economic development and new industrial dynamics. The sophistication of industrial parks varies widely from the ones providing the most basic infrastructures such as roads, basic utilities, to the ones providing complex soft infrastructures such as networking events and shared spaces. The development of industrial parks is a compelling strategy for countries at a low to medium stage of competitive development. Indeed, the high numbers of industrial parks around the world, more than 15,000, make the competition fierce among countries. When designing industrial parks, governments should constantly aim to upgrade the competitive structure of the economy by creating backward linkages, promoting local suppliers, supporting training, and so on.

3.2. Special Economic Zones

Overview:

In 2015, there were roughly 4,500 Special Economic Zones (SEZs) in 140 countries employing around 66 million people in the world (The Economist, 2015). 30 million of those workers are employed in China (El Shimy, 2008; Tejani, 2011). SEZs account for more than US$ 200 billion in global exports (Akinci and Crittle, 2008). The first SEZ was implemented in Shannon, Ireland (Amirahmadi and Wu, 1995). The concept was massively adopted by developing countries as an economic development strategy in the 1970s and in the 1980s. The total number of SEZs in the world has increase from 9 at the end of the 1960s to 107 in 51 developing countries at the end of 1987 (Amado, 1989).

The first Asian Special Economic Zones was opened by the Indian government in Kandla in 1965. The next year Taiwan established its first EPZ in Kaohsiung (Amirahmadi and Wu, 1995). In the ASEAN, Singapore, Malaysia, and the Philippines started their Special Economic Zones in 1968, and 1972 respectively (World Bank, 1992).

Definition:

The first modern SEZ was created in Shannon Airport, Ireland, in 1959. A Special Economic Zone (SEZ) is a generic term that includes Free Trade Zones (FTZs), Export Processing Zones (EPZs), Enterprise Zones, and Freeports (FPs). The SEZ is a designated estate where trade laws such as tariffs, quotas, or duties differ from the rest of the country.

Objectives:

A Special Economic Zone has the four following objectives:

(1) To attract Foreign Direct Investments (FDIs)
(2) To create employment opportunities
(3) To be the stepping stone of wider reforms
(4) To act as a laboratory for new policies and economic development approach (Farole, 2011).

History:

The concept Special Economic Zones, as custom-free zones, has existed in international trade for about 2,500 years, first in ancient China, then Carthage and in the Roman Empire (World Bank, 1992). Special Economic Zones are a modern adaptation, for development objectives, of the age-old concept of free ports (FPs). Free ports served as entrepôt and trade outpost among international merchants. The oldest Free Port was established in the Roman customs-free port of Delos to promote trade (Amado, 1989). FPs were also established along international trade routes such as Gibraltar (1704), Singapore (1819), and Hong Kong (1848) (Amado, 1989).

In 1888, Hamburg became the first port to be granted the special privilege of manufacturing, on the condition that it did not compete with the hinterland and remain export-oriented (Amado, 1989). The first modern SEZ as we know them today, was established in Shannon, Ireland, in 1959 (see box 1.). The Shannon Free zone located near the airport, was the first industrial zone created expressly for customs-free export-oriented manufacturing while providing regular industrial park's facilities. The Shannon Free Zone model was immediately adopted as an economic development strategy in developing countries such as Puerto Rico and Spain in the early 1960s (World Bank, 1992). The concept of SEZs was supported in developing countries by development organizations such as UNIDO, UNCTAD, and the Japanese organization AMPO (Amado, 1989).

In the 1980s, UNIDO passed a resolution encouraging developed countries to establish and to strengthen policies for the redeployment of relatively less competitive industries to developing nations (Amado, 1989). The relocation of industrial activity to developing countries, fostered by globalization process, involving the fragmentation of the global value chain and offshore assembling and vertical integration, is done in large part in industries located in SEZs (Amado, 1989).

Box 1. Shannon SEZ: the first SEZ.

In the 1930s to the end of the 1950s, Shannon airport in Ireland was used as a stopover for commercial trans-Atlantic flights from Europe to North America. With the introduction of the commercial jetliners in the 1950s, airlines were able to fly from Europe to North America without making any stopover. Shannon SEZ had the objective to boost the depressed economic fabric from the loss of revenues. In 1959, SFADCo, Shannon Free Airport Development Company, the managing company in charge of the redevelopment of the zone into a SEZ, was created. The SEZ is conveniently located to offer investors secure access to European markets and first focused on providing airport-related services. Shannon SEZ development was guaranteed by (1) a highly integrated and coordinated approach to development; (2) a focus on learning: direct training programs were provided by SFADCo; (3) a pragmatic approach; and (4) an innovative milieu. Today, there are 120 companies employing over 7,500 persons within the zone.

(Sources: Akinci and Crittle, 2008; White, 2011)

From Import-Substitution to Export Promotion Strategies:

In the 1960s, many developing countries began to move their economic development strategies from import-substitution to export-oriented growth strategies. Import-substitution entails the country to protect national industries through trade restrictions while export promotion provides tariff and custom incentives to manufacturers. Both strategies have the objective to promote industrialization. The Export Processing Zone (EPZ) is the mechanism that has been commonly used to implement the export-oriented strategy (Amirahmadi and Wu, 1995). In 1965, Taiwan inaugurated Kaohsiung Export-Processing Zone, and became the first Special Economic Zone coined Export-Processing Zone (World Bank, 1992).

Kaohsiung EPZ has four objectives:

(1) become a showcase project to attract investment in export-oriented industries;

(2) serve as a guide for simplifying procedures outside the EPZ;

(3) have a stable foundation for a future science park

(4) be home to a teaching institution promoting international cooperation (World Bank, 1992).

Kaohsiung EPZ was an immediate success and by the year 1970, the estate consisted of 162 firms and 40 000 workers (World Bank, 1992). Kaohsiung became a model of economic development for other East Asian and Southeast Asian countries to replicate, the most celebrated example being China with its Special Economic Zones (SEZs), which were created in 1979 (Amirahmadi and Wu, 1995).

Box 2. China SEZs.

The Third Plenum of the 11th Congress of the Chinese Communist Party adopted the Open Door Policy, and in July 1979, China began to develop SEZs to experiment "special policies and flexible measures." The SEZ experiment has transformed China into one of the largest FDI recipients, exporters, and foreign exchange reserve holders in the world. The SEZs success can be attributed to the following policy packages for foreign investors:

(1) Private Property Rights Protection - the SEZs encourage foreign citizens, overseas Chinese, compatriots from Hong Kong and Macau and their companies and enterprises to open factories and companies. SEZs guarantee to protect their assets. This is a very important commitment by the Chinese government since there was no constitutional protection of private property rights outside SEZs until recently (the 2004 constitutional amendment).

(2) Tax incentives - foreign investors can enjoy a reduced rate (15-24%) of corporate income tax compared to 33% paid by domestic firms. SEZs have zero custom duties and foreigners enjoy income tax exemptions.

(3) Land use policy - under Chinese law, all land is under state ownership. Foreign investors may lawfully obtain the rights for land development, use and business. They may also transfer and lease land rights, or put them up for mortgage in accordance with the law within the stipulated purposes and terms of the use. (4) Liberal economic and labor laws - foreign invested firms have the right to hire and fire their employees.

(Sources: Wang, 2013; Yeung, Lee, and Kee, 2009)

The Competition to Attract FDIs:

Following the success of Kaohsiung EPZ - Malaysia, the Philippines, and Indonesia - adopted the EPZs' model as a growth strategy (World Bank, 1992). EPZ strategy has become attractive to many developing countries in Asia because it is the fastest and the second best method, after free trade regime, to attract FDI and export-oriented industries (Amirahmadi and Wu, 1995). With the rapid creation of EPZs, countries started to compete to lure FDIs and export-oriented industries. Newer EPZs started to not only provide infrastructures and facilities but also incentives such as tax exemption, lax labor laws, financial assistance, and subsidies. Traditional zones were developed to spur regional growth in remote areas such as Bataan EPZ in the Philippines, incentives that were given served to compensate for the lack of infrastructures (Akinci and Crittle, 2008). Countries see EPZs as potential opportunities to move up the value chain and produce higher-value added manufactured exports. It is within this frame that countries offer generous incentive packages. It has been noted however, that a number of successful zones, such as some EPZs in the Philippines, offer no tax concessions at all, suggesting that long tax holidays may be overly generous. There is a concern that such incentives create a "race to the bottom." The competition to attract industries by offering fiscal incentives hinders the potential benefits that the zone brings to the country (Amado, 1989). Countries using incentives and subsidies delay the need for structural reforms and thus hinder their future competitiveness.

The Determinants for Attracting FDIs:

The Foreign Directs Investment Survey (2002) highlights the 20 most influential determinants for attracting FDIs. To be attractive to foreign investors, SEZs must be located in a country or a region that includes the following determinants.

Table 2. Determinants in the Foreign Directs Investment Survey.

Factor / Determinant	Most Influential in %
Market access	77
Stable socio-political environment	64
Ease of doing business	54
Reliability and quality of infrastructure and utilities	50
Ability to hire technical professionals	39
Ability to hire management staff	38
Level of corruption	36
Cost of labor	33
Crime and safety	33
Ability to hire skilled labor	32
National taxes	29
Cost of utilities	28
Roads	26
Access to raw materials	24
Availability and quality of university and technical training	24
Available land with all services in place	24
Local taxes	24
Access to suppliers	23
Labor relations and unionization	23
Air service	23

The most important determinant for the success of a SEZ is its location. Indeed, an SEZ located next to an urban area has easier access to firms, capital, and skilled labor and can integrate itself with local firms more easily (White, 2011). The SEZ should be within relative reach of a large market and have the necessary infrastructures such as ports, airports, highways, and so on. Foreign investors are particularly keen to invest in SEZ that have an abundant and a low-cost work force (Amirahmadi and Wu, 1995).

The capacity of a SEZ to lure FDI also depends on four endogenous determinants:

(1) **Incentive Framework** - corporate tax reductions or exemption; duty-free importation of raw material, capital goods, and intermediate inputs; no restrictions or taxes on capital and profits repatriation; exemption from foreign exchange controls (where applicable); no charges on exports; exemption from most local and indirect taxes; and so on (Akinci and Crittle, 2008).
(2) **Regulatory Framework** - simplification and streamlining of investment approvals, expatriate work permits, removal of required import and export licenses, and so forth, as well as accelerated on-site customs inspection procedures and automatic foreign exchange access (Akinci and Crittle, 2008).
(3) **Institutional Framework -** the autonomy and effectiveness of the body charged with regulating zone operations, adequate funding; customer orientation and ethos; powers over other government ministries; partnerships with private zone operators and enterprises; and maximizing the role of the private sector in service provision (Akinci and Crittle, 2008).
(4) **Physical Development and Management** – implementation of land use planning and zoning efforts in defined areas for industrial and commercial development, regulations to ensure that private zones are conveniently located (Akinci and Crittle, 2008).

Box 3. Shenzhen: from tabula rasa to economic miracle.

In 1980, China formally established four Special Economic Zones in Shenzhen, Zhuhai, Shantou, and Xiamen. The term Special Economic Zone was selected after considerable semantic discussion and intellectual debate. The SEZs were deliberately located far from the center of the political power in Beijing in order to minimizing potential social and political unrests. Among the four initial SEZs, Shenzhen was the most "special" one, with the greater freedom to experiment policy innovations. Shenzhen was in 1980 a fishing village of 30,000 inhabitants, a 'tabula rasa' strategically located across a river from Hong Kong. The policies specific to Shenzhen included for instance, the exemption from submitting tax revenues to the central and provincial governments in its first 10 years of operation, labor and social protections. From 1980 to 1984, China national average annual GDP rate grew at a rate of 10 percent per year in comparison Shenzhen grew at an exceptional 58 percent average annual rate. By 1989 more than one million temporary workers already had converged to Shenzhen. Shenzhen's leaders recognized early on that the tax-breaks and policy measures applied to firms in the SEZ conferred only a temporary advantage and that over the long term, structural transformation and technological learning were key in order to transform Shenzhen into a prosperous city. Shenzhen's objective was "learning by doing," and creating forward and backward linkages with a multitude of local suppliers. As of 1998, high-tech industries accounted for almost 40 percent of the industrial output within Shenzhen SEZ. In 2008, Shenzhen has registered more patents than any other city in China, with 2,480 new patents. Between 1978 and 2014, Shenzhen's GDP per capita grew from RMB 606 to RMB 149,500 (around $24,000 USD), a dizzy 24,569%. The population in turn grew from a mere 30,000 to a world city of more than 10,000,000 inhabitants.

(Sources: Litwack and Qian, 1998; Wong, 1987; Yeung, Lee, and Kee, 2009)

The Objectives of SEZs:

SEZs have an impact on three players, namely the developing country, transnational corporations, and national investors. The objectives of implementing SEZs differ depending on the perspective of developing countries, transnational companies, and national investors.

The aims of SEZs from the perspective of developing countries are:

(1) Export-promotion objectives
(2) Foreign Exchange Generation
(3) Employment Objectives
(4) Attraction of Foreign Direct Investment

(5) Exploitation of Natural Resources
(6) Industrialization Objectives
(7) Regional Development
(8) Export Industries Deregulation
(9) “Open Market” policy testing
(10) Political Objectives
(11) Technological Innovation
(12) Tax Revenues
(13) Sector Diversification
(14) Specialization

From the perspective of transnational investors:

(1) Access to low-cost labor
(2) Duty-free Imports Regime
(3) Access to Markets
(4) Home Market competitiveness
(5) Vertical integration
(6) Product life-cycle Extension

From the perspective of Domestic Investors:

(1) Duty-free regime
(2) Special incentive
(3) International competitiveness
(4) Dual economy operation (Amado, 1989; Farole and Akinci, 2011).

SEZs have played an important role in diffusing new technology and stimulating innovation as the example of East Asian countries has shown. SEZs can increase the sophistication and facilitate opportunities to climb up the value added chain (White, 2011). The transmission of foreign knowledge takes place through trade, the acquisition of foreign technologies and licenses, and FDI.

Trade spurs the adoption of higher standards and new specifications, fosters contact with more demanding consumers, and exposure to new ideas, can constitute a "learning by exporting" effect that may drive domestic innovation (White, 2011).

The acquisition of technology licenses grants a licensee the right to utilize specific technologies, patents, software, know-how, or product designs to produce them commercially. Licensing enables the rapid acquisition of product and process know-how, also allowing local adaptation and modification (White, 2011).

FDI is a major source of process technology and learning by doing opportunities for individuals in developing countries. FDI can have important knowledge spillovers in the domestic market. Spillovers can occur through imitation from domestic firms, employees' circulation, locally sourced inputs that foster backward linkages (White, 2011).

Box 4. China's Overseas SEZs.

In 2006, as part of the implementation of its 11th five-year plan, the Chinese government announced that it would establish up to 50 overseas economic and trade cooperation zones. Although until recently the Chinese government focused on attracting FDIs, the central government began to stress the importance for Chinese companies of going global in order to find new markets for Chinese goods and services, and build up Chinese brand names. The objectives of overseas economic zones are: (1) to increase demand for Chinese-made machineries and equipment; (2) to bypass European and North American's trade barriers imposed on imports from China; (3) to boost its own domestic restructuring and move up the value chain at home; (4) to create economies of scale for overseas investment and to assist Chinese SMEs to venture overseas; (5) to transfer one of the elements of China's own success (the SEZs) to other developing countries. In 2006, the Chinese government selected 19 overseas zones in 15 countries. Seven of these projects are in countries in Africa, namely Zambia, Mauritius, Egypt, Ethiopia, Nigeria (2 zones), and Algeria. The overseas economic zones Chinese mostly aim to attract Chinese investors. The Chinese government aim to have up to 80 percent of Chinese enterprises in the cooperation zones. The regulation on labor rights in the overseas zones is relatively lax, and Chinese labor is widely used during the construction and operating phases. The Chinese government aims to stimulate overseas investment by US$2 billion coming from some 500 Chinese companies.

(Source: Brautigam and Xiaoyang, 2011)

Critics of SEZs:

In *No Logo,* Naomie Klein (2000) describes the labor relations and working conditions in an Export Processing Zone in the Philippines, where labor is kept under tight control in sweatshop conditions. Critics argue that SEZs:

(1) increase value-activities with low value-added activities
(2) perpetuate low-skill
(3) delay structural reforms
(4) pay low wages, especially to women
(5) hold back basic labor rights
(6) have poor health and safety working conditions
(7) have lax environmental standards
(8) bring more costs (incentives, subsidies…) than benefits
(9) pose the problem extra-territoriality and trade triangulation when the country enters regional trade agreements, it creates a country within a country, with two legal framework (Akinci and Crittle, 2008; Amado, 1989; Farole, 2011; Koyama

Box 5. Gender Issues and SEZs.

Women represent more than 50 percent and in some cases 90 percent of employment in SEZs in developing countries. The share of women employment is particularly high in light, labor-intensive manufacturing industries such as textiles, clothing, leather, and footwear. According to Tejani (2002), the feminization of labor in SEZs is due to the lower wages, the increased international competition, and the gender stereotypes attributed to women such as dexterity, docility, and submissiveness, which are traits that employers consider desirable for labor-intensive work. One of the objectives in the first two countries to have implemented SEZs, namely Ireland and Puerto Rico, was to reduce male unemployment. Ireland for instance legally required at least 75 percent male employment in all new investments. Ironically, these SEZs became highly female-intensive. SEZs in developing countries have provided women the opportunities to exit the sphere of familial control, to gain financial independence, and to expand their personal autonomy and life choices. The share of men employment is particularly high in heavy manufacturing industries such as metal products and chemicals. Those industries represent health hazards for the persons working in SEZs, especially the ones in developing countries with lax safety standards.

(Source: Tejani, 2011)

Conclusion:

The concept of Special Economic Zone has been implemented in more than 140 countries around the world in various forms and with different objectives. Although the concept of SEZs is a popular one, failed SEZ exists (Amado, 1989). The failure or success of a zone depends on its policy and incentive frameworks, its location, and its management board (Akinci and Crittle, 2008). There is a trend that offering generous incentive packages to attract FDI in order to offset inherent disadvantage is ineffective due to the "race of the bottom" between countries. SEZs should appeal to the inherent advantages that the country enjoys.

As pointed out by Akinci and Crittle (2008), the most common obstacles to success for SEZs are: poor site locations, uncompetitive and reliance on policy package, poor labor policies and practices, poor zone development practices and design, high maintenance and promotion costs, inadequate administrative structures, and lack of effective coordination between the different actors.

The development of a successful SEZ takes time. Even the impressive success stories in SEZ in China and Malaysia started slowly and took at least 5 to 10 years before becoming the success that it is considered today (Farole and Akinci, 2011). SEZs have contributed to the rapid economic growth and massive FDIs' accumulation known in Southeast Asia and East Asia, namely, in China, Singapore, Malaysia, the Philippines, and Taiwan (Ishida, 2009). The development of a SEZ however, isn't the economic development panacea that it once was. For many ASEAN countries, and lower-middle income countries the main growth opportunities are now in the service sectors, especially information and communication technology (ICT), business services, and knowledge-intensive activities. This requires a strong focus on fostering innovation, which implies the development of technology-parks and innovation districts, as well as the development of specific skills associated with the knowledge economy (Farole, 2011).

3.3. Eco-Industrial Parks

Overview:

The concept of Eco-Industrial Park (EIP) became increasingly popular in the 1990s. The first modern EIP is Kalundborg in Denmark and is a reference for planners and industrial estates' leaders. While the EIP of Kalundborg emerged from a bottom-up approach in the 1970s, most EIP are planned from a top-down approach. The concept of EIP was popular in the United States in the 1990s and is now increasingly popular in East and Southeast Asia (Lowe, 2001). The concept of Eco-Industrial Parks is the by-product of two powerful ideas: sustainability and industrial ecology.

Definition:

The United States Environmental Protection Agency (USEPA) defines an EIP as "a community of manufacturing and service businesses seeking enhanced environmental and economic performance by collaborating in the management of environmental and reuse issues including energy, water, and materials. By working together the community of businesses seeks a collective benefit that is greater than the sum of the individual benefits each company would realize if it optimized its individual performance only" (as cited in Tudor, Adam & Bates, 2007).

Objectives:

The three objectives of an EIP are to:

(1) Improve the economic performance of the participating companies
(2) Minimize the companies' environmental impacts
(3) Contribute to the economic and environmental well-being of the community (Lowe, 2001).

An Eco-Industrial Park (EIP) has different objectives and functions in comparison to traditional industrial parks. An EIP has several versatile functions that should be planned to integrate most of the following points:

- Define the community of interests and involve that community in the design of the park.
- Reduce environmental impact or ecological footprint through substitution of toxic materials, absorption of carbon dioxide, material exchanges and integrated treatment of wastes.
- Maximize energy efficiency through facility design and construction, co-generation, and cascading.
- Conserve materials through facility design and construction, reuse, recovery and recycling.
- Link or network companies with suppliers and customers in the wider community in which the eco-industrial park is situated.
- Continuously improve the environmental performance by the individual businesses and the community as a whole.
- Have a regulatory system, which permits some flexibility while encouraging companies to meet performance goals.
- Use economic instruments, which discourage waste and pollution.
- Employ an information management system, which facilitates the flow of energy and materials within more or less advanced closed-loop manufacturing.
- Create a mechanism, which seeks to train and educate managers and workers about new strategies, tools and technologies to improve the system.
- Align its marketing to attract companies which fill niches and complement other businesses (Côté & Cohen-Rosenthal, 1998; Lowe, 2001).

The benefits that come from developing EIPs are:

For the industries:

(1) Maximize profits.
(2) Minimize costs through increased materials and energy efficiency, waste recycling, and elimination of practices that incur regulatory penalties.
(3) Improve industries competitiveness.
(4) Become familiar with new technologies and knowledge.
(5) Foster collaboration.
(6) Improve access to finance (Lowe, 2001).

For the environment:

(1) Reduce many sources of pollution and waste.
(2) Decrease demand for natural resources.
(3) Achieve cleaner air, land, and water, major reductions in waste, and a generally more attractive environment (Lowe, 2001).

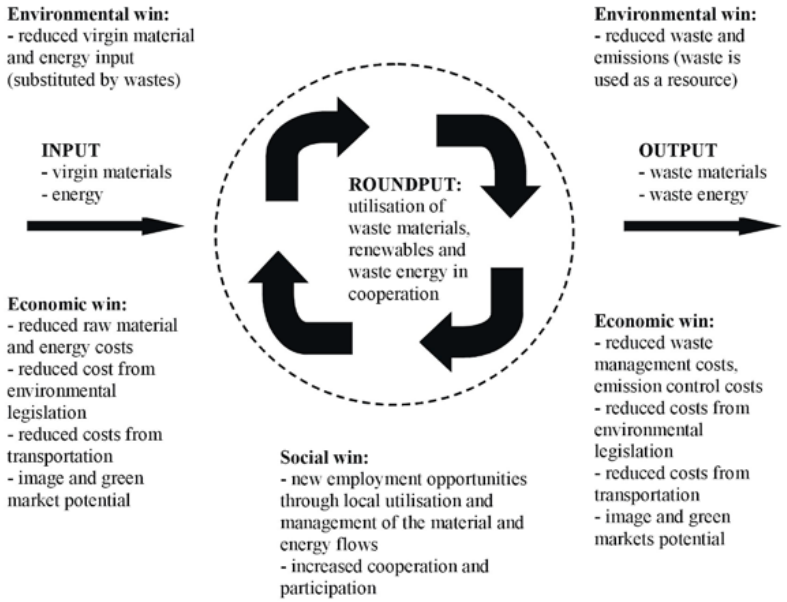
For the government:

(1) Be a laboratory for creation of policy and regulations that are more effective for the environment while less burdensome to business (Lowe, 2001).
(2) Diversification and the creation of new industries (Lowe, 2001).

For the community:

(1) Bring new employment opportunities, green jobs…
(2) Realize healthier lives, less air pollution, groundwater, water, and seawater pollution.
(3) Higher quality agriculture and fisheries.

Figure 6. Benefits from inputs and outputs for an industry located on an EIP.



(Source: Saikkuu, 2006).

History:

In the beginning of the 1990s, the USEPA, consultants and professors from the United States designed frameworks and introduced the concept of Eco-Industrial Parks (Lowe, 2001). The concept of EIPs stems from industrial symbiosis, that is, the exchanges of by-products between firms. Industrial symbiosis has existed for a very long time. Industrial symbiosis for instance, existed in the United States between liquor producers and farmers, where swine were fed on the mash, a by-product of distilleries (Desrochers, 2001). Many examples of industrial symbiosis abound in the history of industrial development. Industrial symbiosis was pushed to the extreme in the city of Kalundborg in Denmark. It began to evolve in the 1970s as several of the core partners, trying to reduce costs and meet regulatory demands, sought innovative ways of managing waste materials (Desrochers, 2001). The industrial symbiosis in Kalundborg happened over time without any top-down planning or funding from consultants or the government (Desrochers, 2001). EIP enthusiasts in North America were using Kalundborg as a model and were aiming to encourage industrial symbiosis in new or existing industrial estates. EIP enthusiasts claim that public planners and estate managers can outperform private agents whose priority is to maximize profit rather

than promote sustainable development (Desrochers, 2001). Eco-Industrial Parks' projects are currently under development in many countries around the world. In Asia, particularly China and ASEAN countries, many Eco-Industrial Parks are under development. The United Nations Industrial Development Organization (UNIDO) for instance, has launched an ambitious project in Viet Nam to retrofit three existing industrial parks into EIP.

Sustainability:

The concept of Eco-Industrial Park was developed at a time of rising concerns by international organizations, national, and local governments, and the general public on climate change. The emphasize on sustainable development that was elaborated in the Brundtland Report (WCED, 1987) and during the Rio Earth Summit (UNCED, 1992), highlighted the need to reconcile economic with environmental interests. The focus was on preserving existing natural resources amid rising commodity price and rapid resources depletion (Tudor, Adam & Bates, 2007). UNIDO began to develop cleaner production projects: "Cleaner production is the continuous application of an integrated preventive environmental strategy applied to processes, products, and services to increase overall efficiency and reduce risks to humans and the environment" (Lowe, 2001). At the same time, EIPs have been touted as one approach through which development and sustainable objectives could be aligned **(**Tudor, Adam & Bates, 2007). Additionally, the model of Kalundborg and other mutually advantageous relationships between industries proved the objectives to be achievable. In the United States, the President's Council on Sustainable Development (PCSD) saw EIPs as one element of building a sustainable economy. In 1994, the PCSD designated four communities as demonstration sites for EIPs: Baltimore, Maryland; Cape Charles, Virginia; Brownsville, Texas; and Chattanooga, Tennessee (Cohen-Rosenthal, McGalliard, & Bell, 1997).

Industrial Ecology:

Eco-Industrial Parks follow the idea of industrial ecology. Industrial ecology is an emerging field of thought that models industrial systems after ecological systems. In natural systems, very little is wasted: plants transform water, carbon dioxide, and sunlight into sugars, and these sugars are broken down by other species…

Industrial ecology describes a system where one industry's wastes (outputs) become another's raw materials (inputs). Within this "closed loop" fewer materials would be wasted. Many industries however, have long had symbiotic relationships where wastes and materials are transformed internally or by others (Cohen-Rosenthal, McGalliard, & Bell, 1997).

Industrial Ecology is an approach to managing human activity on a sustainable basis by:

(1) Seeking the essential integration of human systems into natural systems;
(2) Minimizing energy and materials usage;
(3) Minimizing the ecological impact of human activity to levels natural systems can sustain.

Its objectives are:

(1) Preserving the ecological viability of natural systems.
(2) Ensuring acceptable quality of life for people.
(3) Maintaining the economic viability of systems for industry, trade and commerce (Lowe, 2001).

Box 6. Kalundborg EIP.

Kalundborg in Denmark is an industrial park founded in 1959 that transformed itself spontaneously into the first much- praised and studied modern Eco-Industrial Parks. It developed entirely through market forces. In a span of 30 years, plant managers by simply striking deals, one to one, have created a complex exchange network system. The motivation of the managers was financial; they aimed to gain new revenues by energy or materials sales and to avoid the costs of waste disposal in a country with restrictive environmental regulations and high environmental standards. The actors are, Kalundborg Municipality, Asnæs Power Station, plasterboard factory BPB Gyproc A/S, pharmaceutical plant Novo Nordisk A/S, enzyme producer Novozymes A/S, oil refinery Statoil A/S, Bioteknisk Jordrens Soilrem A/S, waste company Noveren I/S. Industrial symbiosis involves steam, heat, water, gas and gypsum, ash, fertilizer, yeast slurry, sludge, and other waste. For instance, Novo Nordisk's insulin production produces yeast slurry as a by-product, which is fed to 800 000 pigs. Statoil's desulphurization plant creates a by-product, ammonium-thio-sulphate (around 20,000t/year) that is used as a liquid fertilizer.

Environmental outcomes: waste exchange comprises some 2.9 million tons of materials each year, collective water consumption has been reduced by 25% and the power station has reduced its water use by 60% through recycling. Economic outcomes: it is estimated that by early 2001, the industries had gained a US$160 million return on an investment of $75 million in infrastructure for conveying by-products from one plant to another. It is estimated that annual savings for the industries located on Kalundborg are around $15 million. Other benefits for industries include, sharing of personnel, equipment, and information.

(Sources: Lowe, 2000; Saikkuu, 2006)

Types of EIP:

Although eco-industrial projects encompass Eco-Industrial Park, by-product exchange, and eco-industrial network, this paper investigates eco-industrial projects in a defined industrial estate. By-product exchange refers to a set of companies seeking to utilize each other's by-products (energy, water, and materials) rather than disposing of them as waste (Lowe, 2001). Eco-industrial network refers to a set of companies collaborating to improve their environmental, social, and economic performance in a region (Lowe, 2001).

We distinguish three types of Eco-Industrial Parks:

(1) Top-down EIPs refer to planned Eco-Industrial Parks from scratch by a private, nongovernmental, or public authority; some EIPs in China are Top-down EIPs.
(2) Bottom-up EIPs refer to industrial parks that have independently transformed themselves into EIPs. Kalundborg in Denmark is the most famous bottom-up EIP.
(3) Retrofitted EIPs refer to industrial parks that were transformed into EIPs thanks to the actions of a private, nongovernmental, or public authority. Retrofitted EIPs are the most common types of EIPs. UNIDO is currently involved in retrofitting industrial parks into EIP in Viet Nam.

Retrofitted EIP:

The large number of existing industrial parks around the world makes their transformation into EIP, a desirable option that would potentially yield many positive externalities. The improvement of environmental, social, and economic performance of existing industrial parks could have a tremendous positive impact on sustainability, the community, and the environment at large.

The benefits from retrofitting industrial parks into Eco-Industrial Parks are:

(1) For companies: to reduce the costs of inputs, to sell by-products, and thus increase profits
(2) For the EIP management: to add new services and yield new revenue streams
(3) For the community: to reducing the negative externalities associated with pollution.
(4) For the companies, EIP, and community: regional and national notoriety of being associated with leading sustainable practices.

A good start for existing industrial parks wishing to be converted into Eco Industrial Parks is to obtain ISO 14001 certification or another form of environmental management system (Lowe, 2001). The industrial parks will become a point of leadership and a reference in the region that could attract sustainable-conscious industries wishing to take advantage of the positive notoriety that come with being associated with eco-industrial parks. The industrial community could realize innovations larger than a park's management could undertake, such as an integrated resource recovery system or by-product exchange. Retrofitting existing industrial parks has the advantage of limiting the development of Greenfield EIPs, which contribute to urban sprawl, diminishes natural resources, and leaves the community with obsolete properties (Cohen-Rosenthal, McGalliard, & Bell, 1997).

The EIP Systems - Smart Eco-Industrial Parks:

Eco-Industrial Parks have to be designed in order to minimize pollution and maximize the return on investments for the companies located in the EIP. The framework aims to rationalize resources, improve efficiency, and integrate services in order to make the companies operating in the EIP more efficient and streamlined.

An efficient Eco-Industrial Parks will include the following systems:

- ***Information Technologies:*** the aim is to become a Smart Eco-Industrial Parks by using state of the art Geographic Information System (GIS) in order to monitor in real-time energy, water, environmental consumptions and emissions (Cohen-Rosenthal, McGalliard, & Bell, 1997).
- ***Water:*** reuse and efficient use of water offer substantial benefits to participants in an EIP. The potential systems to incorporate in an EIP are: collective water treatment, water retention, and sewage treatment (Cohen-Rosenthal, McGalliard, & Bell, 1997; Lowe, 2001).
- ***Energy:*** maximize energy efficiency through facility design or rehabilitation, when possible use renewable energy sources, three energy technologies seem most appropriate for EIPs: cogeneration systems, energy recovery processes, and alternative sources of energy such as solar panels, wind turbines and so on (Cohen-Rosenthal, McGalliard, & Bell, 1997; Lowe, 2001).
- ***Recovery***: Recycling, Reuse, and Substitute waste. The development of those new processes for reusing wastes and byproducts are central to EIPs (Cohen-Rosenthal, McGalliard, & Bell, 1997).

- ***Transportation:*** the transportation sector is a major contributor to a number of environmental problems, new means of moving people and goods throughout and beyond an EIP are essential to lowering the overall environmental impact of an EIP. Examples might include using clean burning alternative to fuel vehicles, electric vehicles, or the application of sophisticated logistics management systems such as Just-in-Time delivery of goods and services (Tudor, Adam & Bates, 2007).
- ***Effective EIP Management and construction practices:*** the management should foster collaboration between the stakeholders, maintains the mix of companies needed to use each others' by-products, support continuous improvement in environmental performance, give guidance and inform on best practices, follow best environmental practices in materials selection and building technology, and ultimately seek to benefit the local economy and social systems through training and education programs, community business development, building of employee housing, and collaborative urban planning (Lowe, 2001).
- ***Exchange byproducts among industries:*** this is central; industries have to collaborate to exchange byproducts in order to achieve industrial symbiosis.

Success factors:

According to Tudor, Adam, and Bates (2007), an Eco-Industrial Park will be more likely to succeed and more efficient when there are:

- Cooperation between firms and between firms and local government.
- The initiative coming from the firms rather than governments.
- Active participation from a range of stakeholders including public sector, representatives from local companies, labor, community and environmental organizations and industry, and experts in various fields such as architecture, engineering, ecology, and environmental management.
- The presence of a large firm which acts as a 'magnet' for other enterprises.
- The organizations should not be in direct competition with each other.
- A level of trust should exist between participants.
- Regular monitoring to ensure ecological goals.
- Strategies should ensure full integration of environmental, ecological and spatial concepts.
- An association of the firms should be created.

- A widespread support system should be created.
- Good public relations are essential.
- Participating firms should be located near to each other.
- A diverse range of firms with complementary materials needs should be involved.
- Sound financial planning.
- The existing management systems should be utilized as much as possible.
- Information gathering on a number of issues (e.g. basic company information, resource streams, employees, future plans, and markets) is required.
- The active participation of the firms involved, thus ensuring continuity and networking.
- Initially, the focus should be on utility sharing, followed by energy, water and material waste exchanges and once established more company specific and economically challenging projects can be promoted (Tudor, Adam & Bates, 2007).

Challenges:

Eco-Industrial parks' projects face three major challenges:

(1) Dependence on few industries: an EIP that relies on one large company can jeopardize the project if the company leaves or look elsewhere for its sourcing. A diverse system with strong inter-sectoral cooperation is more sustainable (Tudor, Adam & Bates, 2007).

(2) Information asymmetries: the different industries have all diverse priorities and are separate entities, difficulties in information dissemination and communication can often arise primarily related to incomplete or imperfect information (Tudor, Adam & Bates, 2007).

(3) Fluctuation: 'Loop-closing' (recycling of materials and energy) can be affected by fluctuations in the price of a given input or its substitute or by changes in technology or by the political climate (Tudor, Adam & Bates, 2007). EIPs have to be large enough to be resilient to external shocks and adapt themselves.

Conclusion:

The concept of Eco-Industrial Parks emerged in the 1990s in the United States as a development tool amid concerns on resource depletion and environmental concerns. The concept re-emerged in Southeast Asia and East Asia due to the outsourcing and displacement of polluting activities from the developed economies to the developing economies (Lowe, 2001).

The concept of Eco-Industrial Park is the by-product of two powerful ideas: sustainability and industrial ecology. However, even though EIPs are supposed to be primarily based on an environmental and social agenda, the primary driver for eco-industrial parks is financial benefits (Tudor, Adam & Bates, 2007). The success of an EIP lies on the interactions of many factors but as the Kalundborg case-study shows, the active participation of companies striving for financial gains on a long period of trials and errors seem to be a requisite for success.

3.3. Technology Parks

Overview:

Technology parks are also known as science parks, research parks, innovation centers, and technopoles. In 2015, the International Association of Science Parks (IASP) has 399 members in 73 countries (http://www.iasp.ws/facts-and-figures). It is estimated that there are between 700 to 850 science and technology parks worldwide that fulfill IASP criteria for science park (Anttiroiko, 2004). The concept of technology parks as a tool for fostering innovation is often modeled on the Silicon Valley.

Definition:

Technology parks are also known as science parks, research parks, innovation centers, and technopoles. The International Association of Science Parks (IASP) defines a science park as "an organization managed by specialized professionals, whose main aim is to increase the wealth of its community by promoting the culture of innovation and the competitiveness of its associated businesses and knowledge-based institutions. To enable these goals to be met, a Science Park stimulates and manages the flow of knowledge and technology amongst universities, R&D institutions, companies and markets; it facilitates the creation and growth of innovation-based companies through incubation and spin-off processes; and provides other value-added services together with high quality space and facilities" (http://www.iasp.ws/knowledge-bites).

Although the definitions between science parks, research parks, and so on, vary to some extent. Several basic elements are present in all of the estates such as:

(1) the existence of managerial staff;
(2) the provision of physical infrastructure and services
(3) the orientation to small high-tech firms as the main tenants
(4) the facilitation of technology transfer as one of the main tasks (Coulon, 2004).

Objectives:

Technology parks are a rapidly growing phenomenon and a popular tool for national and regional economic development. The objectives of technology parks are threefold:

(1) To reindustrialize a region by being an enclave for technology. It implies moving up the skill-learning curve into more sophisticated products that are made in more sophisticated ways (Castells & Hall, 1994).

(2) To act as a catalyst for regional economic development or revitalization, and to promote economic growth regional development (Castells & Hall, 1994).

(3) To create synergy. Synergy can be best regarded as "the generation of new and valuable information through human interaction" (Castells & Hall, 1994).

The ultimate objective of technology parks is to foster innovation as defined by the European Commission (1996):

> "The commercially successful exploitation of new technologies, ideas or methods through the introduction of new products or processes, or through the improvement of existing ones; innovation is a result of an interactive learning process that involves often several actors from inside and outside the companies (EC DG XIII and XVI, 1996, p. 54)."

The technology parks are designed to:

(1) Facilitate cooperation in order to generate higher returns on existing investments in R&D and large scale research facilities
(2) Meet the needs of knowledge-intensive industries for infrastructures and associated services. (3) Achieve the critical mass in terms of co-located research facilities and staff (Wessner, 2009).

History:

The technology parks phenomena was initiated in 1951 when the Stanford Research Park was created, which later became the cornerstone of the Silicon Valley. The idea originates in the linear model of innovation, which led to the creation of scientific communities to generate innovation. The technology parks were in a framework of "science-push" model of innovation (Coulon, 2004). In 1959, Research Triangle Park in North Carolina was established as a strategy to foster economic growth in a depressed region (Phillimore & Joseph, 2003). Until the 1970s, technology parks were an American phenomenon, designed to serve the needs of entrepreneurially minded academics and the promotion and utilization of university-industry linkages (Anttiroiko, 2004). The idea spread over the United States after Stanford Research Park became the standard for science-based industrial development. The Japanese took the concept of technology parks a little bit further by developing Science-cities in the 1970s, with for instance Tsukuba Science City. The first technology parks were created in Europe in 1972 with Sophia-Antipolis in France and the science parks at Cambridge University in England (Anttiroiko, 2004; Quintas, Wield, & Massey, 1992). Since the 1980s, technology parks are a trendy economic development strategy to foster new dynamics in developed and emerging countries.

Silicon Valley and the first technology parks:

Although the Silicon Valley is an innovative milieu that grew spontaneously through market forces, the growth was triggered when Stanford University in 1951 under Dean Frederick Terman, developed and leased university land for start-ups, which later became the Stanford Research Park (van Winden et al., 2013). Stanford Research Park was the core of the agglomeration that later came to be known as Silicon Valley, the world's leading high-tech center in the world (Anttiroiko, 2004). Dean Frederick Terman unleashed a new economic development strategy that aims to attract and foster high-technology companies - the technology parks. Silicon Valley is the model for many development or redevelopment strategies around the world, from Singapore One-North to Paris-Saclay in France. It is often said as a catchphrase that the only high-technology cluster in the world not trying to imitate the Silicon Valley is the Silicon Valley.

The success of Silicon Valley can be attributed to a number of competitive advantages that has supported its self-sustaining growth:

(1) A large pool of technical talent.

(2) Availability of preexisting infrastructure and large network of suppliers.

(3) Access to venture capital.

(4) Access to excellent educational facilities and research institutions.

(5) Well-developed information networks (Koh, Koh, & Tschang, 2005).

The Research Triangle Park was established in 1959 to foster economic growth in a depressed region of the United States. Although the Research Triangle Park is considered today as a success, it was still look at as a failed experiment as late as 1987 (Miller & Coté, 1987). It is important to highlight that building innovative or creative cities is a long and slow process, and that all have uncertain fates (Hall, 2004). In Europe, Trinity College of Cambridge University initiated the Cambridge Science Park in the United Kingdom in 1972.

Box 7. Sophia-Antipolis.

Sophia-Antipolis is a technology park that was established in 1972 by Pierre Laffitte in the South of France. The objective of Sophia-Antipolis was to recreate the excitement of the *Quartier Latin,* in a privileged environment. The technology park was created ex-nihilo by bringing together companies, universities, residential and research facilities on a same estate. Specific industries such as computing, biotechnologies, ICT, electronics are targeted. The park was modeled to foster cross-fertilization among its different actors and activities. Pierre Laffitte understood the importance of synergy between diverse individuals with different background in order to generate innovations. The park opened a foundation to promote culture and cultural events, associations to strengthen international networks and the sense of community inside the park. According to 2008 census, Sophia-Antipolis has a surface of 2,400 hectares, 1,414 companies of which 10% are foreign-owned and 40% have a R&D activity, 30,000 jobs, 5,000 students, and 4,000 researchers. The park's success is attributed to five factors:

(1) Its policy-driven focus on R&D that attracted global companies early.

(2) The design and quality of the physical infrastructure.

(3) The strong public support and investment by the state and local authorities.

(4) The park is linked to a range of education and research institutions.

(5) A single park management authority.

(Sources: UNIDO, 2012; http://www.sophia-antipolis.org/)

The Cambridge Science Park took a long time to get going. By 1978, two years after its official launch, it had only 7 tenants and only 20% of the total area devoted to the science park was developed (Koh, Koh, & Tschang, 2005). The development of a new cluster or technology park takes a long time and is a risky endeavor.

Technopoles of the World:

In *Technopoles of the World,* Castells and Hall (1994) offer a comprehensive and extensive research on the development of planned estates dedicated to fostering knowledge-intensive activities, which are labeled by the authors as technopoles. Technopoles are usually top-down planned developments by the national, regional, or local governments. The basic function of the technopole is to generate the tools for cities to compete in the informational or knowledge economy (Castells & Hall, 1994). The underlying assumption is that regions and cities can only prosper if they have some level of linkage to the production of innovation (Castells & Hall, 1994). Regions and cities are more flexible than countries when adapting to changing conditions of markets, technology, and culture. Indeed, cities have a greater response capacity to generate "targeted development projects, negotiate with multinational firms, foster the growth of small and medium endogenous firms, and create conditions that will attract new sources of wealth, power, and prestige" (Castells & Hall, 1994).

The authors distinguish between three types of technopole. The first type of technopole consists of industrial complexes of high-technology firms that are built on the basis of the innovative milieu (Castells & Hall, 1994). These technopoles arise without deliberate planning; although, governments and universities play a crucial role in their development. Technopoles are most often deliberate institutional efforts try to replicate the success of spontaneous growth through market forces of innovative milieux (Castells & Hall, 1994).

The second type of technopole is science cities. The intended goal is to reach a higher level of scientific excellence through the synergy that they are supposed to generate in their secluded scientific milieux (Castells & Hall, 1994). The Siberian city of Akademgorodok, Tsukuba in Japan and Taedok in South Korea are examples of such intended science cities (Castells & Hall, 1994). While science cities usually depart from the intended goal, they introduce new dynamics - both in the regional and local environments.

Science cities began to sprout in the 1950s; during this time, the state had more control over research, industry, and spatial location. This first case of a science city was Akademgorodok - near Novosibirsk in the USSR - the city was planned by Khroutschev in order for the USSR to achieve communism through science and technology (Castells & Hall, 1994). In the 1960s, Japan massively developed the concept of science cities - such as Kansai and Tsukuba Science City (Castells & Hall, 1994). Kansai Science City added in complexity because the city brought together public and private organizations, and they moved away from the old locality-based concept of scientific city (Castells & Hall, 1994).

The third type of technopole, the technology parks, also referred as research parks and science parks, are the most commonly used development projects to foster new industrial growth - in terms of jobs and production - by attracting high technology manufacturing firms to a privileged space (Castells & Hall, 1994). Innovation functions are not excluded from such projects, but they are mainly defined in terms of economic development. The technology parks are created when there is the right environment and support from the local, regional, or national authorities. The right environment entails the presence of "research and training institutions, favorable tax and credit incentives, availability of industrial land, a local labor market with quality engineers and technicians, a good transportation system, and adequate telecommunications" (Castells & Hall, 1994, p.110). Environmental quality, bureaucratic flexibility, and a good locational image also enhance the attractiveness of technology parks (Castells & Hall, 1994). The role of governments and universities seem to be crucial for the establishment and growth of technology parks. The Silicon Valley is often the template that technology parks around the world aim to replicate.

The capacity of a technopole to generate synergies depends on the degree of involvement of institutions and extensive networks that allow for the informal exchange of technological information and for interpersonal support of an entrepreneurial culture. The role of universities, especially quasi-autonomous ones with extensive private linkages, is critical in helping the growth of technology parks (Castells & Hall, 1994). In the 70s and 80s, the desired atmosphere for a science park was seen in opposition to the polluted and congested urban centers of the time. In the early 1970s, the vision to develop Sophia-Antipolis Science Park was based on building a *Quartier Latin* in the countryside (van Winden et al., 2013).

Success factors:

As compiled by Coulon (2004), from Nijkamp et al. (1994); Amirahmadi and Saff (1993); Westhead and Batstone (1997); Castells and Hall (1994: 248-249), the success factors include:

Strategic planning

(1) Harmonious collaboration between the promoters and founders including long term commitment
(2) Flexible and creative planning practices
(3) Early establishment of formal links with high quality research institute
(4) Appropriate state or local policies promoting science parks

Organizational

(1) Parties with complementary resources must cooperate
(2) The organization structure must be chosen in accordance with the strategy of the founders
(3) Friendly atmosphere among tenants
(4) Key founder must live locally

Financial

(1) Substantial financial support of government authorities
(2) Long-term commitment of all financiers
(3) Willingness by financiers to absorb significant losses in the initial stages of a park development
(4) Availability of venture capital

Design

(1) A prestigious location and imaginative architecture
(2) Flexible and low cost buildings which are appropriate for innovative activities
(3) Prestige and overall image of the park

Management

(1) Provision of services consistent with the science park's profile
(2) Strict orientation of management strategies towards the park needs
(3) Attraction of some key firms or some 'anchor' firms
(4) Develop a long term vision
(5) Develop synergies
(6) Sources of innovation must be identified
(7) Networks must be established early on
(8) Identify new niches

External Environment

Economic factor

(1) Risk/venture capital
(2) Skilled labor force
(3) Presence of related industries
(4) Presence of spin-offs of existing firms

Socio-cultural factors

(1) Local support groups
(2) Entrepreneurial spirit
(3) Pre-existing culture of innovation
(4) Job mobility and flexibility

Environmental factors

(1) Desirable living
(2) Proximity of high-quality residential environment

Location factor

(1) Proximity with existing urban agglomeration
(2) Proximity with at least one major university or research lab
(3) Proximity to firms in similar industrial sectors
(4) Communication and transportation infrastructure

The role of the government:

The national, regional, and local governments have each an important role to play in the creation of new technology parks. They have to become facilitators and provide supports. According to Anttiroiko (2004), there are three important roles that must be undertaken by the government. They are:

(1) Public undertaking of part of the R&D to lower transaction costs due to external R&D and technology transfer, through incentive programs and intermediaries that offer support, especially to SMEs (Anttiroiko, 2004).

(2) Urban regeneration programs that aim at making the innovation or high-tech industrial site well functioning and attractive to all those involved in the development of the area (Anttiroiko, 2004).

(3) To stimulate new industry, system-areas and districts, through local integration, networks, and inter-firm alliances (Anttiroiko, 2004).

Conclusion

Technology parks have emerged as a popular strategy for government to promote knowledge-intensive activities. The trend of technology parks has followed the success of the Silicon Valley. Most often than not, Technology parks communicate in their promotional campaigns the ambition of becoming the next Silicon Valley. Technology parks are planned estates for knowledge-intensive companies that aim to replicate Silicon Valley's spontaneous growth. Technology parks are however, the adequate strategy for regions and cities that have an already critical mass of knowledge-intensive companies, a sufficient number of international linkages, and large universities. The lapse of time to grow a self-sufficient and self-sustaining technology center takes time as the examples of the Research Triangle Parks and Cambridge Science Park demonstrate.

3.5. Innovation Districts

Overview:

The first innovation district was established in Barcelona in 2000 dubbed 22@ Barcelona. Innovation districts aim to replicate the spontaneous growth through market forces of urban innovative milieux such as the Silicon Alley (Manhattan), the Cyber district (Boston), or the Silicon Sentier (Paris). As of 2015, there are 15 innovation districts around the world and many more in development. The concept of innovation districts is catching-up quickly in the United States since the inauguration in 2010 of its first innovation district in Boston.

Definition:

Innovation districts are urban technology parks. In the knowledge-intensive paradigm, urban areas are more suitable for fostering innovations that suburban technology parks. "Innovation districts based on the 22@ Barcelona's model can be defined as top-down urban innovation ecosystems designed around four multilayered and multidimensional models of innovation: urban planning, productive, collaborative, and creative, all coordinated under a strong leadership, with the ultimate objectives of accelerating the process of innovation and of strengthening the locations' competitiveness" (Morisson, 2014).

Objectives:

Innovation districts are initiatives taken at the urban level. The cities' objectives when implementing innovation districts are:

(1) to develop or redevelop an unproductive part of the city;

(2) to attract, create, or retain talents and innovative companies;

(3) to become or remain an innovation hub (Morisson, 2014).

Box 8. 22@ Barcelona – The First Innovation District.

In 2000, the city of Barcelona unveiled its most ambition project since the 1992 Olympic Games, 22@ Barcelona also known as the innovation district. The objective was to transform the old industrial areas of Poblenou into Barcelona's knowledge and innovation hub. In the nineteenth century, the Poblenou district was the industrial hub of Barcelona. The Poblenou was such an important industrial center that it was known as the 'Manchester of Catalonia.' In the 1970s and 1980s, many industries left the Poblenou, which became a district full of abandoned warehouses. 22@ Barcelona occupies an area of 198.26 ha (about 115 blocks of the Example), and it has a potential occupancy 4,000,000 m2, of which 3,200,000 m2 is intended for productive activities and 800,000 m2 is intended for other uses - such as housing and public facilities. The 22@ project aims to create 4,000 new social housing units, to regularize 4,614 homes, to build 114,000 m2 of green spaces, and 145,000 m2 of new public facilities

(Sources: Barceló, 2005; Battaglia & Tremblay, 2012; Molas & Sabata, 2011).

From technology parks to innovation districts:

The development of innovation districts as a strategy for local economic development is a recent phenomenon. The first innovation district, which was founded in 2000, is 22@ Barcelona. The concept of innovation districts caught-up in the United States when Boston launched its innovation district in 2010. Cities are organic phenomena that have to adapt to new economic and technological paradigms in order to flourish. As Peter Hall (1988) pointed out, 20th century urban planning "represents a reaction to the evils of the nineteenth-century city." 21st century urban planning with its deep urban locus is thus a reaction of the evils of the 20th century, which included congestion, accidents, urban sprawl, and pollution. A new technology has a strong influence on urban planning. Indeed, in the 1950s, the functionalist cities were built around the automobile, while the smart cities of today are built around the ICT (e.g. Songdo in South Korea). From the 1970s to the 1990s, local and regional governments were building technology parks outside cities, such as Sophia-Antipolis in France or the Research Triangle Park in North Carolina (Castells and Hall, 1994).

The strategy of those initiatives was to create scientific clusters and to recreate the excitement of the city and in the case of Sophia-Antipolis, a *Quartier Latin*, far from the structural chaos and inefficiencies of cities (Castells and Hall, 1994; van Winden et al. 2013).

In the beginning of the 21st century, the rise of the global economy and the revolutionary nature of ICT caused innovation to flow back to urban areas. The highly localized nature of knowledge-intensive activities and a large number of converging factors helps to explain the renewal of urban areas and the relative decline of the suburbs. The paradigm-shift from mass production to knowledge-intensive, which was initiated by technological innovations, has deeply modified the socio-economic urban structures (Castells, 1989). The shift to the knowledge economy is ending the boundaries that once separated innovation from production, the laboratory from the factory, and is reshaping the whole organization of production (Florida and Kenney, 1993). The rise of new industries and the decline of old industries are transforming the economic landscape of the United States and other developed countries (Castells, 1989). The new world economy suggests that the transformation led to a renewed importance of major cities as places for certain activities and functions (Sassen, 1994).

It is accepted that cities compete among themselves for a wide array of markets (Begg, 1999; Camagni, 2002; Porter, 1990; Turok et al., 2004). In the past few decades, policy-makers and academic scholars have taken a renewed interest in urban matters. Competition among cities has intensified due to deep structural changes at the country level. On the global scale, new constituted networks of economic activity - such as finance, trade, foreign direct investment, international joint ventures, are beginning to be regulated by a system of international contractual regimes, understandings, and organizations (Braun and van Winden, 2014). On the pluri-national scale, newly formed multinational trading blocs and free-trade areas - such the EU, NAFTA, ASEAN, APEC, CARICOM, and MERCOSUR - are limiting the power of the sovereign nation state, and its economic and political independence (Braun and van Winden, 2014). On the national scale, the dismantlement of the welfare state and structural labor-reforms imply that countries are converging on an economic and policy standard (Clark et al., 2004). At the heart of urban competitiveness strategies are urban regeneration policies, which became popular in the European Union at the turn of the 21st century (Smith, 2002).

The great recession that started with the financial crisis in 2008 has accelerated the policies in favor of competitiveness in the developed economies (Clark, 2011). In this scheme, cities are heavily investing in urban policies to attract industries in growth and innovative sectors since innovation is the most critical component of competitiveness and prosperity (Braun and Van Winden, 2014; Ni and Jie, 2014; Rogerson, 1999).

Along with the intensified competition between cities, there is a preference shift from suburban to urban in lifestyle and consumption. Indeed, the rise of the experience economy, changing family structures, disinterest in the automobile, and the blurring line between work and leisure remake inner city living an exciting and transformative experience. Pine and Gilmore (1998) explained the shift from consumption of material goods to the consumption of experiences. While the consumption of material goods was a suburban phenomenon, the consumption of experiences is an urban phenomenon. The inner city facilitates the experience economy to the extent that experiences become more accessible in cities than in the suburbs. Eric Klinenberg (2011) demonstrated that the renewed interest for living downtown is closely related to changing demographics and family structures. Retiring baby-boomers, young professionals, the rise of the single parent, and one-person dwellings want to live downtown and thus contribute to a renewed urban appeal (Klinenberg, 2011). The percentage of millennials—persons born between 1980 and 2000—driving, possessing a driver license, or owning a car is relatively lower than for the previous generation (Neff, 2010). Not owning a car is seen by many millennials as a path to greater flexibility, choice, and personal autonomy. City residents, especially millennials, prefer communities with street life (Speck, 2013). People are paying three times as much per square foot for apartments in walkable neighborhoods as compared to suburban homes, and the demand for walkable urbanism far outpaces the supply (Speck, 2013). The new economy, which requires networking and flexibility are blurring the frontier between work and personal life. Indeed, after-work happy hours for socializing and networking, business meetings in informal locations, start-up weekends, business events, coffee places where venture capitalists and start-ups meet, and casual encounters where advice is exchanged are some of the reasons why young creative professionals choose to live and work in urban centers.

Policy-makers are thus adopting urban strategies to facilitate the transition from mass-production to the knowledge-intensive economy along with the converging transition from suburban to urban preferences in order to strengthen their cities' competitiveness. In the city of Barcelona, the most ambitious urban project to mark the transition towards innovative and knowledge-based economic activities is 22@ Barcelona - also known as the innovation district - which was designed by a multidisciplinary team of economists, urban planners, and urban leaders (Barcelona, 2000; Oliva, 2003). 22@ Barcelona aims to secure Barcelona's competitive advantage in the next decades. The emergence of the ICT has changed the way innovation is produced to the extent that traditional technology parks have become obsolete. 22@ Barcelona is the 21st century technology parks due to its much needed urban features to produce innovations (Duarte and Sabaté, 2013).

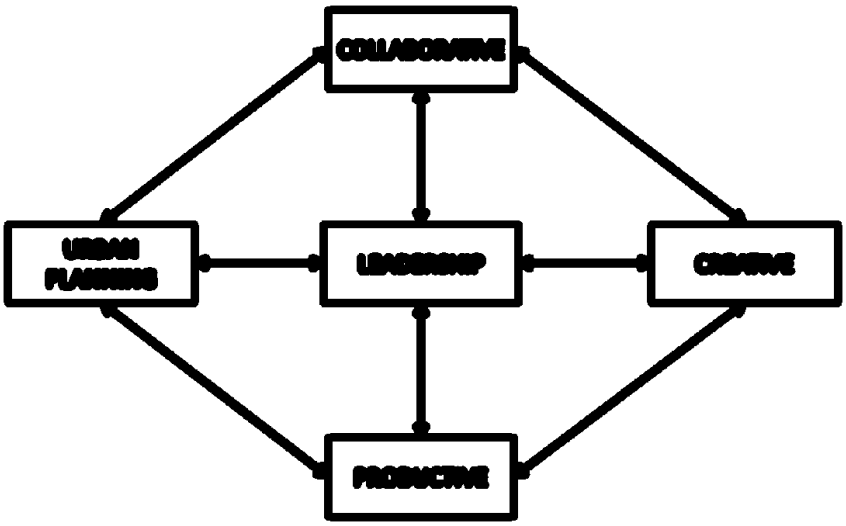
22@ Barcelona participate in a reflection on how innovation is created at the urban level. 22@ Barcelona is an innovation ecosystem whose "functional goal is to enable technology development and innovation" (Jackson, 2012). The project combines different theories and models of innovation that complement each other in order to foster innovation. 22@ Barcelona is articulated around four layers of innovation, which derive from theories that have been discussed as beneficial to innovation in the knowledge economy. The first discussion involves urban planning theories, the second involves productive theories, the third involves collaborative theories, and the fourth involves creative theories. The layers of innovation are coordinated under a strong municipal leadership. The 22@ Barcelona's conceptual framework assumes that by combining these different innovation models, the district will have a better chance to produce innovations. Moreover, these innovation models are somewhat insidiously linked together.

The framework:

The framework involves four layers of innovation, urban planning, productive, collaborative, and creative, all coordinated under a strong leadership. In the innovation district's framework, each of the layers of innovation interacts upon themselves, creating feedback loops that reinforce a location's innovative capacity. Feedback loops reinforce the innovative capacities of the firms located in and the individuals living in the innovation district. An innovation districts is a multidimensional innovation ecosystems in which the different layers of innovation interact upon each other. This self-reinforcing innovative capacity of the firms located in the innovation district can be conceptualized as an innovation

district diamond. Local governments developing innovation districts can in turn affect the sophistication of the framework, and thus their cities' innovative capacities, by upgrading the different processes in any of the five layers of innovation.

Figure 7. The innovation district's framework.



(Source: Morisson, 2014).

Leadership:

Innovation districts are the results of a strong municipal leadership. Mayors and municipal departments play a decisive role in initiating innovation districts. Joan Clos in Barcelona, Thomas Menino in Boston, and Alonso Salazar in Medellin are the key instigators of innovation district's projects in their respective cities. Municipal leadership appears to be the key feature in implementing and sustaining innovation districts. Indeed, municipal companies such as the Boston Redevelopment Authority, 22 ARROBA BCN S.A. in Barcelona, and Ruta N Medellin in Medellin, or non-profit organization such as Quartier de l'Innovation in Montréal are necessary governance structures to oversee and eventually adjust the development of their cities' innovation districts.

Urban Planning:

Innovation districts follow similar urban planning model. Innovation districts emphasize on urban planning that promote mixed-use zoning, diversity, density, old buildings, innovative and sustainable infrastructures, compactness, and iconic buildings. In innovation districts, urban planning has the objectives to foster the innovative capacity while promoting quality of life. Innovation emanates from serendipitous encounters, intellectual synergies, proximity, and the spread of tacit knowledge. Those elements are intensified when an area has density, diversity, and mixed-use zoning. Quality of life is enhanced through sustainable and intelligent infrastructures, multimodal transportation systems, green areas, and cultural and entertainment facilities.

Productive:

Innovation districts acknowledge the importance of knowledge-intensive activities, entrepreneurs, spin-offs, and startups to foster innovation. There is a strong focus from innovation districts to participate in the so-called "creative destruction." Innovation districts aim to facilitate the rise of new productive activities through spinoffs, new ventures, and entrepreneurships that will sustain the city's competitiveness in the long run.

Collaborative:

The ultimate objective of innovation districts is to create an atmosphere that stimulates collaboration. To do so, innovation districts are building collaborative spaces to promote proximity and the spread of tacit knowledge. The spaces can be administrated by the city (e.g. the Mediatic building or landing platforms in Barcelona, the landing platforms in Medellin, or the District Hall in Boston) or non-profit organizations (QI in Montréal) or by private entities (e.g. co-working spaces, startup accelerators). In Boston, the District Hall is the cornerstone of the city's initiative to promote collaboration. In Barcelona, the 7@ amenities provide spaces facilitating the spread of tacit knowledge among individuals and companies. Innovation districts are also promoting events to facilitate the spread of new ideas (e.g. 22@ Breakfast in Barcelona, and lectures at Boston's District Hall).

Creative:

Innovation districts aim to attract the creative. Innovation districts aim to create 24/7 neighborhoods with urban amenities prized by the creative class in order for them to live, work, and play in the district. The urban amenities include nightlife, restaurants, coffee places, "third places," green areas, walkable neighborhoods, cultural events, and museums. The urban planning layer is at the service of the creative city.

Success factors:

The innovation district is more likely to be successful when:

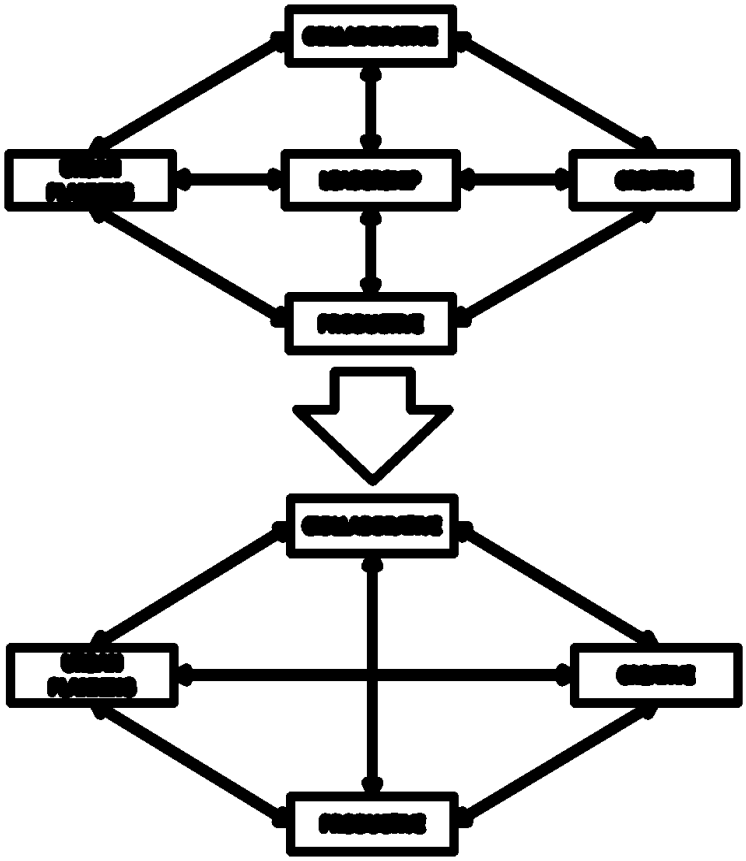
(1) An independent body is created to overlook the development of the innovation district and secure independent funding for an extended period of time.
(2) The city has a large population (>400,000 inhabitants) and the necessary critical mass (Gross Metropolitan Product > USD 20 billion) to foster knowledge-intensive activities.
(3) The framework is complete and well integrated, elements of each layers are present.
(4) The independent body aims to constantly upgrade the framework.
(5) The innovation district is resilient to change and open to new concepts and outsiders.

Innovation districts are urban development strategies that are endorsed by municipal leaderships. An Innovation district is not a spontaneous occurrence in that the city always plays a strong leadership. Spontaneous innovation districts are however, spontaneous innovation ecosystems that have emerged through market forces without any formal planning from the city. The Silicon Alley in New York City and the Silicon Sentier in Paris are such examples of spontaneous innovation districts. Spontaneous innovation districts are self-sustaining and versatile innovation ecosystems. In the innovation district's framework, municipal leadership will pilot the development of the district for 10 to 15 years in order to transform the innovation district into a self-sustaining innovation district.

Box 9. Silicon Alley – a spontaneous innovation district

The Silicon Alley is located around the Flatiron district in Manhattan, New York City. In the 1990s, Internet startups began to cluster themselves in the Flatiron district, which was later dubbed the Silicon Alley. The district appealed to Internet startups due to the entrepreneur's pioneering spirit to locate in downtown Manhattan as well as low rents and high urban amenities. The Silicon Alley grew spontaneous without any government action. The Silicon Alley as other spontaneous innovation districts served as blueprints for 22@ Barcelona.

Figure 8. From innovation districts to self-sustaining innovation districts.



Conclusion:

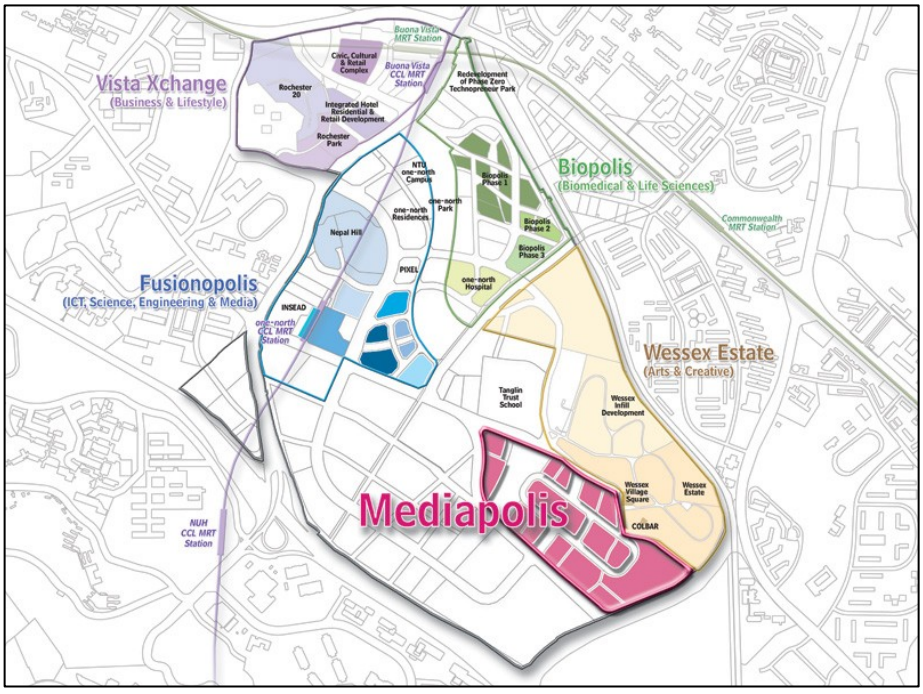
Innovation districts are the local governments' response to the renewed urban appeals in the production process. In the developed countries' urban centers, innovation districts have the potential to become the next urban development strategy. Indeed, urban development strategies are becoming increasingly popular for knowledge initiatives (van Winden et al., 2013). The potential success of innovation districts lies in its scalability and duplicability. Large cities can easily devote a district to an urban project that focuses on innovation. The industrial restructuring taking place in developed economies creates new opportunities for urban projects such as innovation districts. It signals as a consequence, a strong commitment from urban leaders to innovation and to improve the location's prosperity. Moreover, it is a project with perceived benefits for the city's inhabitants.

Indeed, an innovation district is an openly visible initiative for the city's residents, whereas a suburban technology park is not. The trend toward collaboration and open innovation is more fruitful in inner cities than in suburban technology parks, which are designed from an entirely top-down approach on Greenfield land as closed systems. Urban projects must be open and grow organically in order to foster innovation.

CASE STUDY – one-north Singapore – ASEAN's first innovation district.

Singapore is a city-state that gained independence from Malaysia in 1965. From 1965 to 2015, the population has grown from 1.6 million to 5 million, while its economy has grown a hundredfold. Singapore moved quickly through major stages of economic development from labor-intensive in the 1960s and 1970s, to skill intensive in the 1980s, to technology-intensive in the 1990s, to knowledge-intensive in the 2010s. GDP per capita has grown from US$512 in 1965 to US$55,000 in 2014. In 1997, Singapore was hit hard by the Asian financial crisis. Singapore had to transform itself into a knowledge hub in order to become resilient to future economic crises. One-north was at the center of the government strategy to Singapore's transition toward the knowledge economy. One-north was launched in 2001, comprises a total area of 182 hectares, and is a US$ 8.6 billion project. One-north has the characteristics of an innovation district in that the area combines leadership, urban planning, productive, collaborative, and creative layers of innovation.

Figure 9. one-north Singapore master plan.



Source: JTC Corporation

Leadership - in 2000, the JTC Corporation, a statutory board under the Ministry of Trade and Industry (MTI), was appointed to lead the development of one-north. The Agency for Science Technology and Research (A*Star), the Economic Development Board (EDB), the Standards, Productivity and Innovation Board (SPRING), the Urban Redevelopment Authority, the Singapore Land Authority are the main agencies that are participating in the development of one-north. One-north was launched under Deputy Prime Minister Dr. Tony Tan Keng Yam who stated during the opening speech that one-north had three objectives: (1) to be a magnet for talent; (2) to integrate, synergize, and encourage cross-disciplinary research; (3) to bridge the private sector and public sector research work by creating an environment that fosters exchange of ideas and close collaboration.

Urban Planning - one-north is strategically located next to the National University of Singapore, the National University Hospital, Singapore Science Park, and the Ministry of Education. The master plan was designed by the starchitect Zaha Hadid. One-north is a compact, dense, walkable, and mixed-use district. The comprehensive mixed-use approach is promoted as a live-work-play-learn community. Indeed, one-north includes offices, laboratories, universities, schools, residences, condominiums, a shopping mall, restaurants, bars, and nightlife. The different clusters are interconnected with a central green corridor. One-north is easily accessible with three metro stations located within the district. On Portsdown Road, black-and-white houses that were formerly living quarters for British military personnel were preserved as heritage sites.

Productive - one-north has three clusters, Biopolis, Fusionopolis, and Mediapolis. The three clusters are dedicated to biomedical, ICTs, and media activities respectively. In Biopolis for instance, the buildings have names indicating the kinds of activities supported. Genome houses the Genome Institute of Singapore; Nanos has the Institute of Bioengineering and Nanotechnology; and Proteos houses the Institute of Molecular and Cell Biology. Biopolis aims to become the biomedical hub of Asia. There is a strong focus on entrepreneurship in one-north with the Launchpad, a space strictly dedicated to startups. The Launchpad will house around 500 startups and 35 incubators. The government has also adopted a liberal immigration policy to attract entrepreneurs.

Collaborative - one-north has adopted the Triple-Helix model of innovation, and has built spaces for collaboration within the district. In Biopolis for instance, research institutes, universities, and private companies collaborate to foster innovations. The public agency A*STAR fosters collaboration between research institutes, MNCs, SMEs, start-ups, as well as with other agencies, such as the Economic Development Board and SPRING Singapore. One-north was designed to bring people together and encourage serendipitous encounters. Sky bridges connect the buildings so people can walk from one research institute to another; there are also many spaces in common. Biopolis has an auditorium, lecture theatres, and meeting room. Spaces for collaboration have been designed to be shared by scientists and engineers in related disciplines, including the Zebra fish facility, bioreactor, electron microscopy, proteomics, MRI, histology, x-ray crystallography, DNA sequencing, lab supplies, media preparation, and glassware washing. Business schools such as ESSEC and INSEAD, corporate universities such as Unilever are located in Nepal Hill at the center of one-north.

Creative - one-north proclaims itself as a place for knowledge workers and the creative class. On its promotional brochure, one-north is marketed as a place to "live-work-play-learn," which directly appeal to the creative class. One-north aims to attract the creative class by offering top amenities such as bars, clubs, and coffeehouses; creating "little bohemia" with heritage black-and-white colonial bungalows; offering cultural activities with the performance center; and offering one-north residents a great quality of life.

(Sources: Koh, 2006; Koh, & Tschang, 2005; Waldby, 2009; Wong & Bunnell, 2006; Wessner, 2009).

4. ASEAN's Economic Zones – An Overview

Figure 10. Map of Southeast Asia.

Source: United Nations Cartographic Section

Overview:

The Association of Southeast Asian Nations (ASEAN) was formed on 8 August 1967 in Bangkok, Thailand, with the signing of the Bangkok Declaration (http://www.asean.org). It is a political and economic organization whose aim is to achieve greater economic and political integration among its members. The ASEAN comprise a total area of 4,479,201.5 Km2, a population of 620,438,505, and a total GDP (nominal) of US$ 3,574 billion (2014). The country members are Brunei, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Viet Nam.

As set out in the ASEAN Declaration, the aims and purposes of ASEAN are:

1. To accelerate the economic growth, social progress and cultural development in the region through joint endeavors in the spirit of equality and partnership in order to strengthen the foundation for a prosperous and peaceful community of Southeast Asian Nations;
2. To promote regional peace and stability through abiding respect for justice and the rule of law in the relationship among countries of the region and adherence to the principles of the United Nations Charter;
3. To promote active collaboration and mutual assistance on matters of common interest in the economic, social, cultural, technical, scientific and administrative fields;
4. To provide assistance to each other in the form of training and research facilities in the educational, professional, technical and administrative spheres;
5. To collaborate more effectively for the greater utilization of their agriculture and industries, the expansion of their trade, including the study of the problems of international commodity trade, the improvement of their transportation and communications facilities and the raising of the living standards of their peoples;
6. To promote Southeast Asian studies; and
7. To maintain close and beneficial cooperation with existing international and regional organizations with similar aims and purposes, and explore all avenues for even closer cooperation among themselves (http://www.asean.org).

Table 3. An overview of the ASEAN Country Members.

Country	Capital	Area (Km2)	Population	GDP per capita (PPP)	HDI	Accession to ASEAN
Brunei	Bandar Seri Begawan	5,765	401,890	54,389	0.855	1984
Cambodia	Phnom Penh	181,035	13,388,910	2,402	0.543	1999
Indonesia	Jakarta	1,904,569	237,556,363	4,977	0.629	1967
Lao PDR	Ventiane	236,800	6,477,211	3,011	0.543	1997
Malaysia	Kuala Lumpur	329,847	27,565,821	16,922	0.769	1967
Myanmar	Naypyidaw	676,578	58,840,000	1,405	0.498	1997
Philippines	Manila	300,000	101,833,938	4,430	0.654	1967
Singapore	Singapore	707	5,076,700	60,410	0.895	1967
Thailand	Bangkok	513,115	66,720,153	10,126	0.69	1967
Viet Nam	Hanoi	331,690	90,549,390	3,548	0.617	1995

Foreign Direct Investment in ASEAN:

Foreign Direct Investments (FDIs) have surged in the recent years, which show the attractiveness of the region to foreign investors. Japanese companies are really active in the region and have invested around $ 23 billion in 2013 (ASEAN, 2014). FDI flows into ASEAN in 2013 are about on par with those of China. FDI inflows in 2013 were around $122 billion and the total inward FDI stock is up to $1.6 trillion (ASEAN, 2014).

Table 4. Top ten investors in ASEAN in 2013.

Top 10 Investors in ASEAN in 2013		
Country	Amount (USD millions)	Share in FDI in ASEAN (%)
Japan	22,904	19
ASEAN	21,321	17
Netherlands	10,486	9
United Kingdom	10,443	9
China	8,643	7
Hong-Kong	4,517	4
United States	3,757	3
South Korea	3,516	3
Belgium	2,489	2
Luxembourg	2,310	2

Sources: ASEAN, 2014.

There is a high economic diversity among the different members of the ASEAN. In the ease of doing business index published every year by the World Bank for instance, in 2014 among the 189 countries surveyed, Singapore ranks 1 while Myanmar ranks 177.

Table 5. Economic indicators for each ASEAN Country Member.

Country	Ease of doing business	FDI inward flow 2013 (millions USD)	FDI stock 2013 (millions USD)	Exports Value 2014 (% of GDP)
Brunei	101	895	14,212	76,2
Cambodia	135	1,396	9,398	65,7
Indonesia	114	18,444	23,344	23,7
Lao PDR	148	296	2,779	37,2
Malaysia	18	12,306	144,705	81,7
Myanmar	177	2,621	14,171	
Philippines	95	3,860	32,547	27,9
Singapore	1	63,772	837,652	190,5
Thailand	26	12,946	185,463	73,6
Viet Nam	78	8,900	81,702	83,9

Sources: UNCTAD, 2014; World Bank, 2015.

In the ASEAN, the sophistication of the exportations and their destinations vary widely. Malaysia has the highest trade value with a total value for its exportation of $240 billion. On the other hand, Lao PDR has the lowest trade value with a total value for its exportation of $2.13 billion.

Table 6. Trade indicators for each ASEAN Country Member

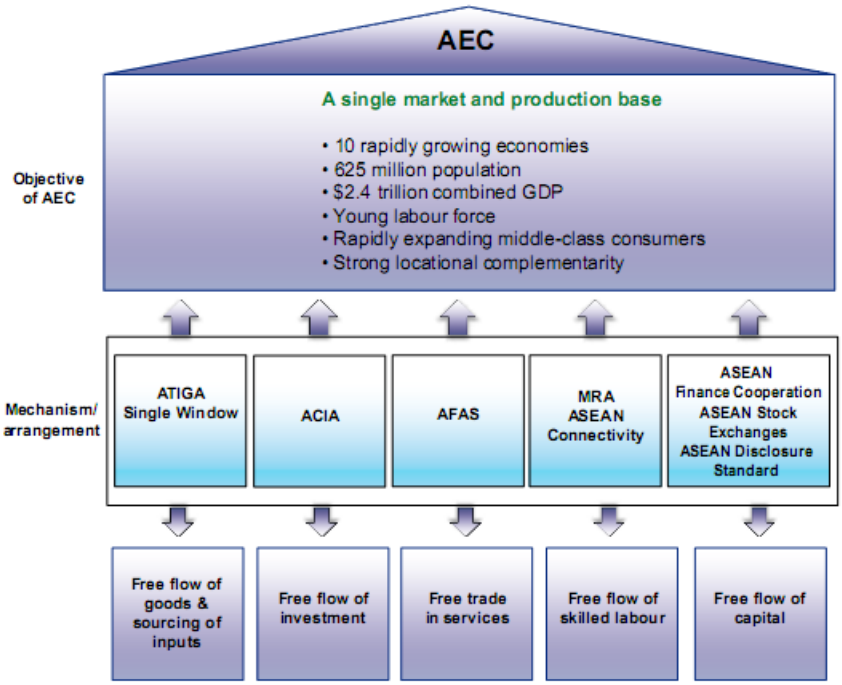
Country	Total Country Trade in 2012 (USD billions)	Main exports in 2012 (% of total exports):	Main destinations for exports in 2012 (% of total exports)
Brunei	12.9	Crude Petroleum (48,7);Petroleum Gas (47,32).	Japan (45,48); South Korea (15,35); Australia (7,39); India (7,34); New Zealand (6,52).
Cambodia	12	Postage Stamps (31,64); Knit Sweaters (12,13); Knit Women's Suits (7,65); Non-Knit women's Suits (5,53).	United States (27,69); Hong Kong (14,35); United Kingdom (7,91); Germany (7,88); Canada (5,22)
Indonesia	212	Coal Briquettes (11,61); Petroleum Gas (9,29); Palm Oil (8,3); Crude Petroleum (5,86); Rubber (4,05).	Japan (15,15); China (12,3); Singapore (9,08); United States (8,43); South Korea (7,2).
Lao PDR	2.13	Refined Copper (28,58); Copper Ore (21,46); Rough wood (6,24); Non-Knit Men's Suits (4,21); Sown Wood (3,83).	China (34,74); Thailand (31,07); India (6,33); Japan (5,62); United Kingdom (4,84).
Malaysia	240	Refined Petroleum (9,99); Petroleum Gas (8,4); Palm Oil (6,67); Integrated Circuits (5,56); Computers (5,15).	Singapore (12,94); Japan (12,36); China (12,35); United States (7,29); Thailand (5,09).
Myanmar	7.39	Petroleum Gas (41,51); Rough Wood (11,41); Dried Legumes (10,03); Non-Knit men's coats (2,89); Rubber (2,84).	Thailand (44,01); India (16,6); China (14,63); Japan (8,98); South Korea (4,73).
Philippines	72.2	Integrated circuits (23,43); Computers (9,99); Semi-conductor devices (4,71); Office Machine Parts (3,44); Electrical	China (23,04); Japan (13,12); United States (12,26); Hong Kong (9,75); Singapore (5,37).
Singapore	226	Refined Petroleum (27,64); Integrated Circuits (7,91); Computers (4,26); Oxygen Amino Compound (3,24); Packaged	China (12,14); Malaysia (10,14); South Korea (8,37); United States (7,11); Japan (6,33).
Thailand	218	Computers (8,78); Rubber (4,17); Delivery truck (3,47); Refined Petroleum (3,31); Gold (2,97).	China (14,18); Japan (10,33); United States (9,75); Indonesia (5,22); Malaysia (5,04).
Viet Nam	112	Broadcasting equipment (10,30); Crude Petroleum (7,41); Leather Footwear (4,01); Computers (3,4); Coffee (3,121).	United States (15,83); Japan (12,56); China (12,28); Germany (5,69); South Korea (5,03).

Source: atlas.media.mit.edu.

Integration:

Transnational companies are attracted to countries in the ASEAN due to their growing integrations within the ASEAN Economic Community. Economic zones are trying to leverage on this integration to attract FDIs and foster the local economic development of their respective regions.

Figure 11. The ASEAN Economic Community.

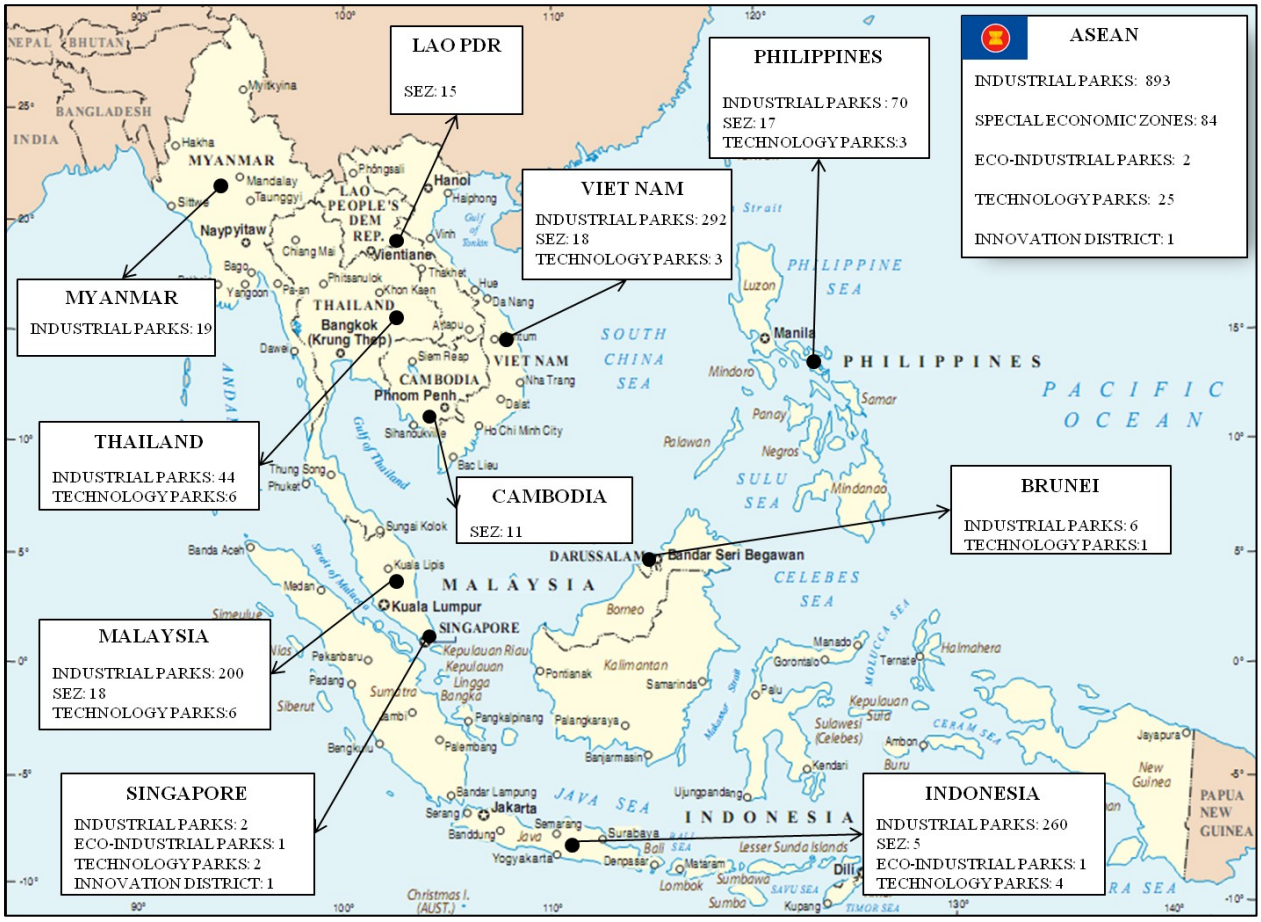


Source UNCTAD (2014).
AEC = ASEAN Economic Community, ATIGA = ASEAN Trade in Goods Agreement, ACIA = ASEAN Comprehensive Investment Agreement, AFAS = ASEAN Framework Agreement on Services, MRA = Mutual Recognition Arrangement.

Economic Zones in the ASEAN:

As of May 2015, there are approximately 1,000 economic zones (893 industrial parks, 84 special economic zones, 2 eco-industrial parks, 25 technology parks, and 1 innovation district) in the ASEAN. It is however difficult to estimate the accurate numbers of economic zones in the ASEAN since two countries, namely Malaysia and Indonesia, don't take a systematic approach in monitoring the numbers of economic zones in their respective countries and have no government body in charge of economic zones. Other countries such as for instance, Thailand and Viet Nam, have government bodies, the Industrial Estate Authority of Thailand (IEAT) in Thailand and Department of Economic Zones at the Ministry of Planning and Investment in Viet Nam, in charge of monitoring and promoting economic zones in their respective countries. Additionally, the difficulty to rigorously compile the data lies in how the different agencies apply the concept of industrial parks and technology parks. Indeed, some agencies use the concept of technology parks and business parks interchangeably or include tourism zones as industrial parks. In this context, the ASEAN EC should set up an independent organism in order to monitor and catalog Economic Zones, which would facilitate foreign investors when looking to invest and establish themselves into an economic zone in the ASEAN. In turn, it will give the ASEAN members, a greater visibility to foreign investors.

Figure 12. Economic Zones in the ASEAN Economic Community (estimations as of May 2015).



Source: own design.

Brunei:

Total number of Economic Zones in Brunei: 6

Number of Industrial Parks: 5
Number of Special Economic Zones: 0
Number of Eco-Industrial Parks: 0
Number of Technology Parks: 1 (Rimba Digital Junction)
Number of Innovation districts: 0

First Economic Zone founded in Brunei in: 2007

For more information on Economic Zones in Brunei, please contact:

Agency: The Brunei Economic Development Board

E-mail: info@bedb.com.bn
Website: http://www.bedb.com.bn/

Cambodia:

Total number of Economic Zones in Brunei: 11

Number of Industrial Parks: 0
Number of Special Economic Zones: 11
Number of Eco-Industrial Parks: 0
Number of Technology Parks: 0
Number of Innovation districts: 0

First Economic Zone founded in Cambodia in: 2005
Total number of hectares of Economic Zones in Cambodia: 3,675

For more information on Economic Zones in Cambodia, please contact:

Agency: Council for the Development of Cambodia, CIB & CSEZB
E-mail: info@cambodiainvestment.gov.kh
Website: http://www.cambodiainvestment.gov.kh/

Box 10. SEZs in Cambodia

Cambodia Vision 2030 and Rectangular Strategy Phase III have set directions for Cambodia's transformation toward a middle-income economy that emphasizes the role of industry as key driver of its economic development. In 2005, the Royal Government of Cambodia has introduced the industrial development policy (IDP) to provide overall guidance and systematic solutions to developing a competitive industrial sector in Cambodia and to achieving its full integration into regional and global value chain. The SEZs are cornerstones in the economic transformation into a middle-income nation. SEZs are an important part of the country's economic development because they bring infrastructure, jobs, skills, and enhanced productivity. Since 2005, the Royal Government of Cambodia has approved a total of 21 SEZs. Of the 21, only 11 have commenced operations. (Source: White, 2011)

Indonesia:

Total number of Economic Zones in Indonesia: 270

Number of Industrial Parks: 260
Number of Special Economic Zones: 5
Number of Eco-Industrial Parks: 1 (Makassar Industrial Park)
Number of Technology Parks: 4
Number of Innovation districts: 0

First Economic Zone founded in Indonesia in: 1973
Number of persons working in Economic Zones in Indonesia: 4 million workers
Total number of hectares of Economic Zones in Indonesia: 35,000

For more information on Economic Zones in Indonesia, please contact:

Agency: Indonesian Industrial Estates Association
E-mail: hkipusat@hki-industrialestate.com
Website: http://www.hki-industrialestate.com/

Lao PDR:

Total number of Economic Zones in Lao PDR: 15

Number of Industrial Parks: 0
Number of Special Economic Zones: 15
Number of Eco-Industrial Parks: 0
Number of Technology Parks: 0
Number of Innovation districts: 0

First Economic Zone founded in Lao PDR in: 2010
Number of persons working in Economic Zones in Lao PDR: 46,000

For more information on Economic Zones in Lao PDR, please contact:

Agency: Lao National Committee for Special and Specific Eco. Zones Secretariat Office
E-mail: NCSEZ@laotel.com
Website: *www.sncsez.gov.la*

Malaysia:

Total number of Economic Zones in Malaysia: 226

Number of Industrial Parks: 200
Number of Special Economic Zones: 18
Number of Eco-Industrial Parks: 0
Number of Technology Parks: 6
Number of Innovation districts: 0

First Economic Zone founded in Malaysia in: 1971

For more information on Economic Zones in Malaysia, please contact:

Agency: Economic Planning Unit (EPU)
Website: http://www.epu.gov.my/en/study-on-industrial-estates-development-in-malaysia

Myanmar:

Total number of Economic Zones in Myanmar: 19

Number of Industrial Parks: 19
Number of Special Economic Zones: 0
Number of Eco-Industrial Parks: 0
Number of Technology Parks: 0
Number of Innovation districts: 0

First Economic Zone founded in Myanmar in: 1990
Total number of Economic Zones in Myanmar: 19

For more information on Economic Zones in Myanmar, please contact:

Agency: Myanmar Industries Association
Website: http://myanmarindustries.org/

Philippines:

Total number of Economic Zones in the Philippines: 90

Number of Industrial Parks: 70
Number of Special Economic Zones: 17
Number of Eco-Industrial Parks: 0
Number of Technology Parks: 3
Number of Innovation districts: 0

First Economic Zone founded in the Philippines in: 1969
Number of persons working in Economic Zones in the Philippines: 735,000 workers

For more information on Economic Zones in the Philippines, please contact:

Agency: Investment Assistance Center
Website: http://investphilippines.gov.ph/

Box 11. From US Airbase to Special Economic Zone.

Clark airbase was a strategic United States military airbase during World War II, the Viet Nam war, and the Cold war. Clark Airbase has remained under the jurisdiction of the United States until 1991. The government of the Philippines decided to turn the airbase into one of the largest Special Economic Zone in Asia to offset the loss of revenues coming from the United States. Clark Special Economic Zone was established in 1995. Clark Special Economic Zone covers an area of 29,365 hectares, the area has generated in 2012, $ 4 billion exports revenue and give employment to 70,000 workers. The majority of the companies operating in the SEZ are from South Korea (26%) and from the US (21%). The SEZ offers fiscal incentives such as preferential tax rate of five percent (5%) based on Gross Income Earned provided that seventy percent (70%) of products are to be exported, exemption from taxes and duties on imported spare parts, exemption from wharfage dues and export tax, duty, impost and fees…

(Source: http://www.clark.com.ph/)

Singapore:

Total number of Economic Zones in Singapore: 6

Number of Industrial Parks: 2
Number of Special Economic Zones: 0
Number of Eco-Industrial Parks: 1
Number of Technology Parks: 2
Number of Innovation Districts: 1 (one-north Singapore)

First Economic Zone founded in Singapore in: 1951

For more information on Economic Zones in Singapore, please contact:

Agency: Singapore Economic Development Board (EDB)
Website: https://www.edb.gov.sg/

Thailand:

Total number of Economic Zones in Thailand: 50

Number of Industrial Parks: 44
Number of Special Economic Zones: 0
Number of Eco-Industrial Parks: 0
Number of Technology Parks: 6
Number of Innovation districts: 0

First Economic Zone founded in Thailand in: 1972
Number of persons working in Economic Zones in Thailand: 513,332 workers
Total number of hectares of Economic Zones in Thailand: 24,279

For more information on Economic Zones in Thailand, please contact:

Agency: Industrial Estate Authority of Thailand (IEAT)
Website: http://www.ieat.go.th/

Box 12. Industrial Estate Authority of Thailand: example of best environmental practice.

The Industrial Estate Authority of Thailand (IEAT) is a public organization founded in 1972. IEAT is responsible for the development and management of industrial estates in Thailand. All new industrial estates must be granted authorization to operate from the IEAT. In 2000 for instance, IEAT has launched the initiative project of Eco-Industrial Estates Development (EIED). IEAT has been technically supported by the German Technical Cooperation Organization (GTZ). The IAET is authorized to control industrial operations and the quality of the environmental in industrial estates. There are specific environmental standards set by IAET for industrial parks to respect. The IAET is in charge of wastewater, air pollution, and hazardous waste monitoring. The IAET offers incentives to industrial estates such as an annual awards for the park with the best environmental performance and promote ISO 14001 certification in order to enhance environmental compliance.

(Source: http://*www.ieat.go.th)*

4.1. Economic Zones in Viet Nam

Viet Nam - Key Dates:

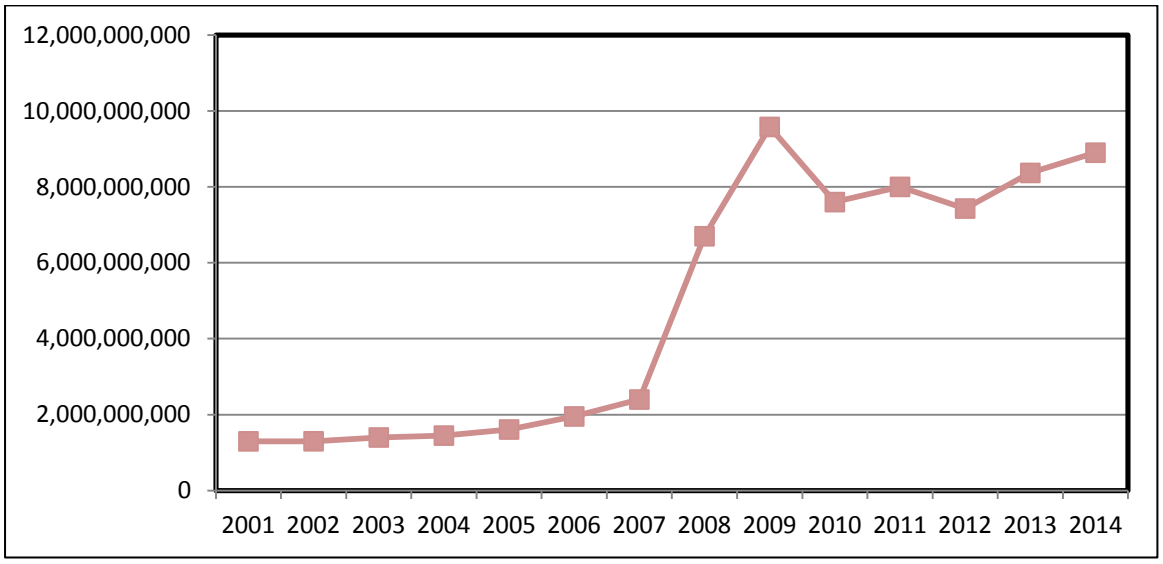
1986	The government of Viet Nam initiated a set of reforms, known as Đổi Mới or renovation in English, aiming to modernize and liberate economic policies.
1991	The first industrial park opens in Ho Chi Minh City. Industrial parks will play a key role in Viet Nam's economic transformation.
1995	Viet Nam becomes a member of the ASEAN.
2007	Viet Nam becomes a full-member of the WTO.

Foreign Direct Investments in Viet Nam:

Since 1986, Viet Nam has chosen to internationalize its economy in order to transform its economy. The attraction of Foreign Direct Investments (FDIs) is thus central in this strategy of internationalization. Industrial Parks, Special Economic Zones, and Technology Parks are the main recipients of FDIs and are thus central to Viet Nam's transformation. The recent multiplication of trade agreements and bilateral free trade agreement demonstrate the willingness of the Government of Viet Nam to integrate Viet Nam's economy with the rest of the world. Trade has been the engine of Viet Nam's growth during the last two decades; the total trade volume grew from USD 5 billion in 1990 to USD 298 billion in 2014. The presence of Samsung in Viet Nam provides a good example of a foreign company that contributes greatly to exports.

The company has chosen to transfer a large part of its Smartphone production from China to Viet Nam. Samsung has since 2011 invested a total of $ 11 billion in Viet Nam and aims to make 40% of world production by the end of 2015 (Fouqui, 2015). FDIs have surged between 2007 and 2009 (c.f. figure 14).

Figure 13. Foreign direct investment, Viet Nam's net inflows (BoP, current US$).

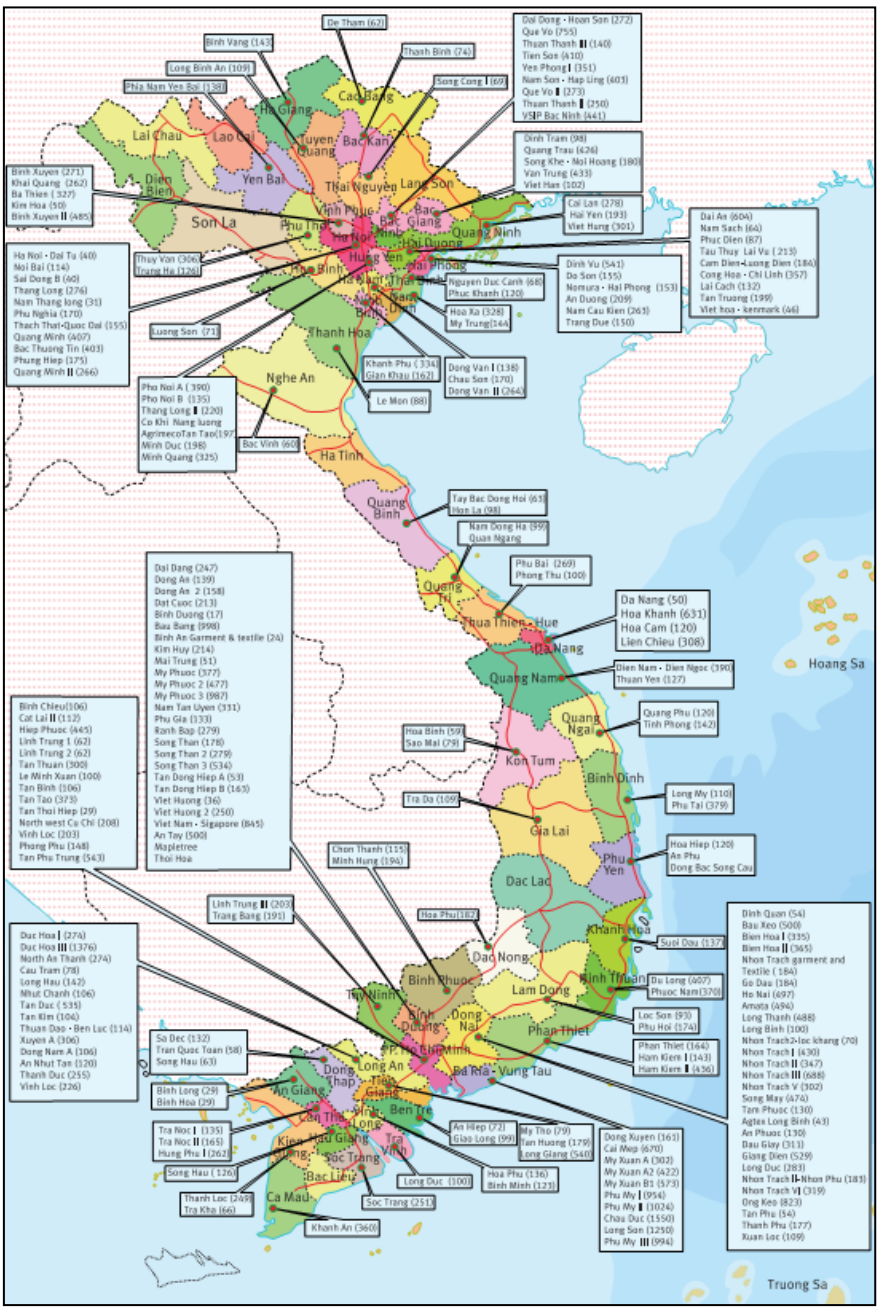


Source: World Bank - http://data.worldbank.org/

Facts and Figures on Economic Zones in Viet Nam:

There are 313 economic zones in Viet Nam (292 industrial parks, 18 special economic zones (3 of which are referred to as export-processing zones and 15 of which are referred to as economic zones) (personal communication, MPI, 2015). There are around 2,500,000 persons working in Economic Zones in Viet Nam, representing around 2.5 % of the total workforce. The first economic zone was built in Ho Chi Minh City in 1991. The concept of industrial park was widely adopted since 2000 as a strategy for economic development. There was 61 industrial zones built or in construction in 2000, 293 industrial zones built or in construction in 2010, and 324 industrial zones built or in construction in 2013. By the end of 2014, EZs and IPs nationwide attracted more than 5,500 foreign direct investment projects and a total registered capital of $85.5 billion, 59 per cent of which was disbursed (Viet Nam news, 2015). The total revenue EZs and IPs pulled together in 2014 was $ 118 billion, a 18 per cent increase since 2013 (Viet Nam news, 2015). The import-export turnover was $ 73.4 billion, a 43 per cent increase in one year. Trade surplus from enterprises in EZs and IPs in 2014 was $5.8 billion, contributing to VND 87 trillion (approximately $ 4 billion) to the State budget (Viet Nam news, 2015). Economic zones in Viet Nam amount to 40% of Viet Nam's total exports.

Figure 14. The Map of Viet Nam with Industrial Parks and Special Economic Zones.



Source: MPI

Viet Nam divides economic zones into industrial zones, which comprise industrial parks and Export-Processing Zones, economic zones, which are large Special Economic Zones, and technology parks. Most economic zones in Viet Nam are located in the South East part of the country near HCMC and the Red River Basin near Hanoi.

Table 7. Industrial Zones in Viet Nam (as of 2014).

INDUSTRIAL ZONES IN VIET NAM (2014) (Industrial Zones comprise industrial parks and Export-Processing Zones)	
Number of Industrial Zones	292 industrial parks 3 Export-Processing Zones
First Industrial Zone	Tan Thuan EPZ (1991) in Ho Chi Minh City
Number of Employees	2.28 million
Number of Companies	Domestic projects: 5,464 FDI projects: 5,593
Average Occupation Rate	65%
Total FDI Attracted (2000-2014)	USD 85.993 billion
Largest Industrial Zone	Phuoc Dong - Boi Loi IP (Tay Ninh province): 2,190 ha

Source: personal communication, MPI

Some Special Economic Zones are referred to as Economic Zones in Viet Nam. They are defined as a "zone which has an economic area separated from the investment and business environment with geographical boundaries and especially favorable conditions for investors, and established in accordance with regulations of the government in the Decree No. 29/2008/ND-CP." (MPI, 2009).

They have the following features:

- The area has the potential to become an industrial hub
- They cover an area of more than 10,000 hectares
- They consist of free-tax zone and other functional areas such as: IP, EPZ, port, residential complex, commercial areas…
- They enjoy a strategic location (proximity to seaports, airports)
- They host key projects and investment
- They are established under a Decision of the Prime Minister.

Table 8. Economic Zones in Viet Nam (as of 2014).

SPECIAL ECONOIMIC ZONES IN VIET NAM (2014) (Referred to as Economic Zones in Viet Nam)	
Number of Economic Zones	15
First Economic Zone	Chu Lai EZ (2004), Quang Nam province
Number of Employees	116,000
Number of Companies	Domestic projects: 777 FDI projects: 247
Total FDI Attracted (2000-2014)	USD 36.98 billion
Largest Economic Zone	Van Phong EZ: 150.000 ha

Source: personal communication, MPI

There are three technology parks in Viet Nam. They are respectively located in Hanoi, HCMC, and Danang. The first technology park was established in 1998 in Hanoi.

Table 9. Technology Parks in Viet Nam (as of 2014).

TECHNOLOGY PARKS IN VIET NAM (2014) (Technology Parks)	
Number of Technology Parks	3
First Technology Park	Hoa Lac High Tech Park (1998) in Hanoi
Number of Employees	26,836
Number of Companies	141
Total FDI Attracted (2000-2014)	USD 6,959 million
Largest Technology Parks	Hoa Lac High Tech Park: 1,586 ha

Source: personal communication, MPI

Viet Nam's Industrial Parks and Export-Processing Zones – Environmental Impact:

Although industrial parks in Viet Nam have positively contributed to Viet Nam's rapid economic transformation, they have also widely contributed to Viet Nam's environmental degradation. Around 1/3 of all industrial zone in Viet Nam, don't have a centralized waste water treatment or sewage system. Additionally, industrial zones consume lots of energy due to inefficient production methods. Most companies in industrial zones have not adopted strict environmental standards and release toxic emissions such as dust, SO_2, NO_x, GHG, UP-POP contributing to the air quality degradation.

Case Study - UNIDO Eco-Industrial Parks' Project in Viet Nam.

UNIDO Country Office in Viet Nam is involved in a project on "the implementation of eco-industrial park initiative for sustainable industrial zones in Viet Nam." The project's main objective is to retrofit three existing industrial parks into eco-industrial parks. The project will last three-years and is funded by the Global Environment Facility (GEF) and the Swiss Development Agency (SECO) and implemented by UNIDO and the Ministry of Planning and Investment (MPI). The three industrial parks, namely IZ Khanh Phu in Ninh Binh, IZ Hoa Khanh in Danang, and IZ Tra Noc 1&2 in Can Tho, were chosen due to their diverse industrial base and their proximity to unique ecosystems such as the Red River Basin and Mekong delta. The three industrial parks are also located in three distinct regions, North, Center, and South, so that industrial parks around Viet Nam can easily get familiar with the concept of Eco-Industrial Park.

Table 10. The Three Industrial Parks chosen for the project.

Name/City	IZ Khanh Phu / Ninh Binh	IZ Hoa Khanh / Danang	IZ Tra Noc1&2 / Can Tho
Year of operation	2004	1998	1968 (renovated 1995)
Total surface area (ha)	366	396 (298 leased)	320
Number of companies	27	139	187
Number of employees	6800	28070	17267 (Tra Noc 1)
Industrial sectors	Iron&steel processing, chemical industry, communication devices, construction material, glass, garment, plating	Iron&steel processing, chemical industry, energy generation, construction material, food&beverage, textile, garment, electronics, pharmaceutical, plastics, paint manufacture, pulp&paper, packaging, plating	Iron&steel processing, chemical industry, energy generation, food&beverage, garment, electronics, leather, pharmaceutical, plastics, ceramics, construction material, packaging
Environmental features nearby	Day River (distributary of red river)	Bau Tram lake (water supply for agriculture and aquaculture), sea coast	Adjacent to Mekong river (Song Hau)
Settlement areas	Residential areas of Khanh Phu commune nearby	Residential area adjacent	10 km from Can Tho city
Industrial waste water (m^3/d)	5000 (treated)	2000-3000 (treated)	12,000 (no central treatment)
Hazardous waste (kg/d)	N/A	>1000	100
Environmental issues	Gaseous emissions (dust, SO_2, NO_x, GHG, UP-POP)	Waste water quality (COD), groundwater contamination, gaseous emissions (GHG, UP-POP)	Waste water quality (SS, COD, BOD), gaseous emissions (dust, GHG, UP-POP)

The project revolves around five axes:

(1) Policy Review – i.e. provision in the planning of future industrial parks, improving the IZ policy and regulatory framework.
(2) Capacity-building – i.e. raising awareness among managers on energy efficiency funding mechanisms.
(3) Energy Efficiency – i.e. pushing companies to adopt energy efficient production methods.
(4) Water – i.e. efficient centralized wastewater and sewage treatment management systems.
(5) Byproduct-exchange – i.e. promote the exchange of byproducts among the different industries, advocate for industrial symbiosis,

The project has three objectives:

(1) bring financial benefits for the industries
(2) provide better living conditions for the local communities
(3) and improving the state of the environment (targets: 182,000t of CO2 per year of estimated saving, reducing wastewater by six million cubic meters per year, reducing Persistent Organic pollutants (POPs))

Case Study - Technology Park - Danang Hi-Tech Park (DHTP).

The Danang Hi-Tech Park (DHTP) comprises a total area of 1,129.8 hectares of which functional areas represent 673.9 hectares (60%) and the mountains, water surface, and green belt represents 455.9 hectares (40%). The functional areas are divided into a residential area (37.12 ha); sports facilities (72.53 ha); R&D, training, and incubation area (94.51 ha); hi-tech production area (208.08 ha); administrative area (39.39 ha); land for supporting industries (39.26 ha); technical infrastructure area (7.07 ha); and the logistics and hi-tech services area (29.79 ha).

The total investment capital is estimated to USD 419 million and the technology park will be completed in 2020. The government has prioritized 46 high-technology sectors for investment.

Table 11. Incentives and Supports offered within the DHTP.

<table>
<tr><td colspan="4">INCENTIVES</td></tr>
<tr><td rowspan="3">LAND RENTS</td><td rowspan="2">Exempt 100% for 11 years</td><td>Land is used for construction of condominiums for workers in DHTP</td><td rowspan="3">Price
5,250 -10,500 VND/m2/year</td></tr>
<tr><td>Land is used for projects on the list of domains entitled to special investment</td></tr>
<tr><td>Exempt 100% for 3 years</td><td>Land is used for projects on the list of domains entitled to investment preferences</td></tr>
<tr><td rowspan="2">CORPORATE INCOME TAX</td><td>Tax rate</td><td colspan="2">From the first year the enterprises are generating revenues, applying a tax rate of 10% for a period of 15 years</td></tr>
<tr><td>Tax reduction and exemption periods</td><td colspan="2">From the first year the enterprises are generating taxable income, they can get exemption for 4 years, 50 % reduction of payable tax for the next 9 years</td></tr>
<tr><td rowspan="3">INFRASTRUCTURE USE FEE
4,200 VND/m2/year</td><td>Projects in R&D, incubation and training</td><td>Off 100% for the first 2 years</td><td>Off 50% for the next 3 years</td></tr>
<tr><td>Projects in the list of high-tech products and technologies encouraged to invest</td><td>Off 100% for the first 2 years</td><td rowspan="2"></td></tr>
<tr><td>Projects in supporting industries</td><td>Off 50% for the first 2 years</td></tr>
<tr><td colspan="4">SUPPORT</td></tr>
<tr><td>One-stop service</td><td>Immigration and Residence Procedures</td><td>Attraction of Hi-tech Human Resources</td><td>Loan Support</td></tr>
</table>

There are many incentives and supports offered within the DHTP (c.f. table 11.). The strategy is to make DHTP as a potential new city center to live, work, and play; to be a place for knowledge-based industries, and to be an eco-friendly city in order to attract FDIs while at the same time encouraging the local innovative capacity. The visions as laid out in the DHTP consulting paper is for DTHP and Danang to become a gateway city of Southeast Asia for all, have an innovative base of knowledge industry combining hi-tech and industry, and be a sustainable value-oriented green city.

5. Recommendations

5.1. Retrofitting Existing Economic Zones into Eco-Economic Zones

UNIDO Country Office in Viet Nam is involved in a project on "the implementation of eco-industrial park initiative for sustainable industrial zones in Viet Nam." The project's main objective is to retrofit three existing industrial parks into eco-industrial parks. The project will last three-years and is funded by the Global Environment Facility (GEF) and the Swiss Development Agency (SECO) and implemented by UNIDO and the Ministry of Planning and Investment (MPI). The three industrial parks, namely IZ Khanh Phu in Ninh Binh, IZ Hoa Khanh in Danang, and IZ Tra Noc 1&2 in Can Tho, were chosen due to their diverse industrial base and their proximity to unique ecosystems such as the Red River Basin and Mekong delta. The three industrial parks are also located in three distinct regions, North, Center, and South, so that industrial parks around Viet Nam can easily get familiar with the concept of Eco-Industrial Park.

Table12. The Three Industrial Parks chosen for UNIDO's project.

Name/City	IZ Khanh Phu / Ninh Binh	IZ Hoa Khanh / Danang	IZ Tra Noc1&2 / Can Tho
Year of operation	2004	1998	1968 (renovated 1995)
Total surface area (ha)	366	396 (298 leased)	320
Number of companies	27	139	187
Number of employees	6800	28070	17267 (Tra Noc 1)
Industrial sectors	Iron&steel processing, chemical industry, communication devices, construction material, glass, garment, plating	Iron&steel processing, chemical industry, energy generation, construction material, food&beverage, textile, garment, electronics, pharmaceutical, plastics, paint manufacture, pulp&paper, packaging, plating	Iron&steel processing, chemical industry, energy generation, food&beverage, garment, electronics, leather, pharmaceutical, plastics, ceramics, construction material, packaging
Environmental features nearby	Day River (distributary of red river)	Bau Tram lake (water supply for agriculture and aquaculture), sea coast	Adjacent to Mekong river (Song Hau)
Settlement areas	Residential areas of Khanh Phu commune nearby	Residential area adjacent	10 km from Can Tho city
Industrial waste water (m^3/d)	5000 (treated)	2000-3000 (treated)	12,000 (no central treatment)
Hazardous waste (kg/d)	N/A	>1000	100
Environmental issues	Gaseous emissions (dust, SO_2, NO_x, GHG, UP-POP)	Waste water quality (COD), groundwater contamination, gaseous emissions (GHG, UP-POP)	Waste water quality (SS, COD, BOD), gaseous emissions (dust, GHG, UP-POP)

The project revolves around five axes:

(1) Policy Review – i.e. provision in the planning of future industrial parks, improving the IZ policy and regulatory framework.
(2) Capacity-building – i.e. raising awareness among managers on energy efficiency funding mechanisms.
(3) Energy Efficiency – i.e. pushing companies to adopt energy efficient production methods.
(4) Water – i.e. efficient centralized wastewater and sewage treatment management systems.
(5) Byproduct-exchange – i.e. promote the exchange of byproducts among the different industries, advocate for industrial symbiosis,

The project has three objectives:

(1) bring financial benefits for the industries

(2) provide better living conditions for the local communities

(3) and improving the state of the environment (targets: 182,000t of CO2 per year of estimated saving, reducing waste water by six million cubic meters per year, reducing Persistent Organic pollutants (POPs))

One of the project's objectives is that it will deliver financial benefits to industries. The primary driver, for adopting environmentally friendly production methods for industries, is financial benefits. If the project is successful, it will give a strong incentive to other industrial zones in Viet Nam to adopt the eco-industrial park model in order to reap financial benefits. Additionally, the Ministry of Planning and Investment (MPI) could as the IEAT does in Thailand, offer each year the award of the most environmentally friendly industrial zone in the country, which will encourage industrial parks to adopt sustainable practices. Geographic Information System (GIS) monitoring in real-time the energy consumption, CO2 emissions, water consumption, and waste production of industrial zones, could also be a successful strategy to influence industrial zones to adopt more environmentally friendly production methods by publishing the GIS data online.

UNIDO's Eco-industrial park project can become a sustainable benchmark for industrial zone. Public institutions and international organizations have to promote environmental competition among industrial zones in Viet Nam by doing the following:

(1) Communicate to Viet Nam's industrial zones the financial and environmental benefits for the industries, industrial zones, and communities of the EIP model.

(2) Create an annual ceremony awarding the most environmentally conscious industrial zone in Viet Nam. Ideally, the award comes with financial benefits for industries as well as media exposure. The award can be used by the industrial zone to attract investors, suppliers, customers, and workers, and so on.

(3) Adopt a GIS at the level of industrial zones that will deliver real-time rankings per sector/number of employees/output on a daily basis.

In the ASEAN, three countries could learn from UNIDO's eco-industrial parks' project in Viet Nam, namely, Indonesia, the Philippines, and Thailand.

In Thailand and Indonesia, the German Technical Cooperation (GTZ), a Federal owned limited liability company, has been involved in conducting feasibility studies and promoting the concept of eco-industrial parks for the Industri Zona Manis in the outskirts of Jakarta, and industrial parks in Thailand (Fleig, 2000). GTZ has assisted the Industrial Estate Authority of Thailand (IEAT) to retrofit 28 industrial estates into eco-industrial parks in the early 2000.

In the Philippines, the project PRIME in 1999, an acronym for Private Sector Participation in Managing the Environment, aimed at encouraging by-product exchanges in few selected industrial parks. The project was under the guidance of United Nations Development Programme and the Board of Investments - Department of Trade and Industry (Lowe, 2001).

- **Recommendation 1:** Retrofit in priority existing industrial parks and special economic zones into eco-industrial parks and eco-special economic zones. Use UNIDO's project in Viet Nam as a benchmark.

5.2. Saïgon's Innovation District – Viet Nam's first innovation district.

Ho Chi Minh City is a bustling and emerging global metropolis. The city however, doesn't have a strong brand and has not sufficiently differentiated itself against other ASEAN emerging metropolis. The city has the capacity to build a strong brand while participating to Viet Nam's economic transformation toward a more innovative a sustainable future. Indeed, Viet Nam has recently reached the status of middle-income country and has experienced in the last years a slow economic growth. It is important to highlight that in order to bridge the "middle-income country trap;" Viet Nam has to focus on innovation and sustainability in order to achieve its target of reaching the level of an advanced economy by 2050.

Viet Nam's economic capital, Ho Chi Minh City is ready to build its innovation district and has the potential to transform itself into a more knowledge-based city. The municipal Department of Planning and Investment is currently reviewing the proposal of Korean real estate companies to invest into Ba Son Shipyard. During my trips to HCMC, I envisioned an innovation district in Ba Son Shipyard with startups and entrepreneurs in co-working spaces in the old wharf, new high-rise buildings that will enhance HCMC skyline, bike lanes along the Saigon River, a design museum, a luxurious vegetation with coffee shops and restaurants.

We suggest that the municipal Department of Planning and Investment seriously consider working along with the Korean real-estate companies to build Viet Nam's first innovation district in Ba Son Shipyard. Instead of building conventional offices, shopping malls, and residential towers that are places of passive consumption, the area could become a place for innovations. Indeed, the area is perfectly located next to downtown where residents can enjoy a great quality of life with the park and the Saigon River. Additionally, the area possesses few colonial buildings that could be transformed into spaces for collaboration where entrepreneurs, incubators, seed accelerators, public institutions, and innovative companies could locate. The model of collaborating with real-estate companies to infuse innovative elements to the district master plan, was adopted in 2010 when the city of Boston decided to create Boston's Innovation District. The city of Boston gave additional land permits to the real estate companies, namely Gale International, Morgan Stanley, and W/S Development Associates, that have allowed the companies to build spaces for collaboration (http://districthallboston.org/) among many other innovative features.

Figure 15. Viet Nam's first innovation district.

Source: own design.

- **Recommendation 2:** Establish innovation districts in large cities in order for Viet Nam (and other middle-income countries) to accelerate its transformation and to reach a higher stage of competitive development.

5.3. ASEAN's Economic Zones Authority (AEZA)

The members of the ASEAN have achieved different level of economic development, and each member has strengths and weaknesses that differentiate a country against the other members. Investors and transnational companies however, lack a clear picture of investment opportunities in the ASEAN. Most countries in the ASEAN lack the promotional structures and critical mass to promote themselves overseas. Foreign investors as a result, will invest in economic zones in India or China and bypass the ASEAN because of its lack of coordination in promoting economic zones. In order to remediate to this issue, I propose the establishment of the ASEAN's Economic Zones Authority (AEZA), which will monitor economic zones in the ASEAN, promote ASEAN's economic zones overseas, and guide economic zones to adopt best practices. In light of the ASEAN agenda post-2015 and the further integration within the creation of the ASEAN Economic Community that has the objectives to enhance competitiveness through closer economic integration, a platform such as AZEA will give a strong signal to foreign investors on ASEAN's capacity to work toward greater integration while enhancing competitiveness.

AZEA's three objectives:

(1) to monitor economic zones (per country, per type, per industry, and so on)

(2) to promote economic zones overseas (AZEA investment offices, advertising, website)

(3) to adopt best practices (master plans, one-stop service, bring international experts)

AZEA could finance itself with consultancies offered to private companies when they decide to locate in an economic zone.

- **Recommendation 3:** Establish the ASEAN's Economic Zones Authority as a not-for-profit organization under the guidance of the ASEAN EC.

6. Conclusion

Economic zones are likely to remain in the foreseeable future, strategic instruments used by governments to foster economic growth. The paradigm-shift from mass-production to knowledge intensive along with the relentless process of globalization implies however, that governments will have to carefully ponder on which type of economic zones to implement. Competition, between industrial parks, between special economic zones, or between technology parks, is stronger every passing year since it becomes easier for companies to outsource and to relocate. Countries risk a race to the bottom by relying only on comparative advantages such as low labor costs, or on incentives such as tax-breaks, to attract new companies.

This smokestack chasing strategy in which countries offer more and more and receive less and less has been replaced in high-income economies by competitive strategies. The emergence of India and new entrants with cheap and abundant workforces in Africa, such as Ethiopia, Kenya, and Senegal for instance, will disrupt the emergence of other countries relying on manufacturing for their economic development.

Competitive strategies appeal to companies and industries to relocate because of genuine interest to do so, such as access to talented professionals, institutional supports, quality infrastructures, improved innovative capacities, and so on. The paper argues that the strategy of developing industrial parks, special economic zones, eco-industrial parks, technology parks, or innovation districts, is contingent upon the countries' stage of economic development. Low-income countries have to follow a technological catch-up strategy while higher income countries have to focus on the creation of new knowledge. Economic zones are one of the tools that can be adopted to reach a higher stage of competitive development.

Economic zones have been widely adopted in countries of the ASEAN. It is estimated that there are in the ASEAN around 1,000 economic zones, representing around 5 percent of the total economic zones in the world (20,000). There are great economic disparities among countries of the ASEAN, those differences are reflected on the strategies adopted by countries to foster competitiveness. Cambodia, Lao PDR, and Myanmar have recently embarked in the strategy of building industrial parks and special economic zones.

Singapore has designed one-north, ASEAN's first innovation district, to better compete in the knowledge economy. Viet Nam has massively invested in industrial parks, which have contributed to the economy rapid internationalization while at the same time jeopardizing the country's rich environmental resources.

UNIDO's project in Viet Nam to retrofit existing industrial parks into eco-industrial parks confirms the international organization's expertise in developing sustainable and innovative economic zones in emerging and developing countries in light of its mandate in Inclusive and Sustainable Industrial Development (ISID).

References

A. S. E. A. N. (2014). *ASEAN Investment Report 2013-2014: FDI Development and Regional Value Chain*. ASEAN Secretariat.

Akinci, G., & Crittle, J. (2008). Special economic zones: Performance, lessons learned, and implications for zone development. *Washington DC: The World Bank*.

Amado, J. D. (1989). Free Industrial Zones: Law and Industrial Development in the New International Division of Labor. *U. Pa. J. Int'l Bus. L.*, *11*, 81.

Amirahmadi, H., & Wu, W. (1995). Export processing zones in Asia. *Asian Survey*, 828-849.

Anttiroiko, A. V. (2004). Editorial: Global competition of high-tech centres. *International journal of technology management. Vol 28. No 3/4/5/6*. Pp. 286-323.

Barceló, M. (2005). *Barcelona; 22@ Barcelona: A New District for the Creative Economy*. Making Spaces for the Creative Economy.

Barcelona. (2000). *Modificación del PGM para la renovación de las zonas industriales del Poblenou - Districte d'Activitats 22@bcn*. Barcelona, Ayuntamiento de Barcelona. Retrieved from www.22barcelona.com/content/blogcategory/39/125/lang,ca.

Battaglia, A., & Tremblay, D. G. (2012). 22@ and the Innovation District in Barcelona and Montreal: a process of clustering development between urban regeneration and economic competitiveness. *Urban Studies Research,* 2011.

Begg, I. (1999). Cities and competitiveness. *Urban studies*, *36*(5-6), 795-809.

Belussi, F., & Sammarra, A. (Eds.). (2009). Business networks in clusters and industrial districts: the governance of the global value chain. Routledge.

Belussi, F., & Sedita, S. R. (2010). Localized and distance learning in industrial districts. Business Networks in Clusters and Industrial Districts. The Governance of the Global Value Chain, 24-51.

Bontje, M., & Musterd, S. (2009). Creative industries, creative class and competitiveness: Expert opinions critically appraised. *Geoforum*, *40*(5), 843-852.

Brautigam, D., & Xiaoyang, T. (2011). China's Investment in Special Economic Zones in Africa. *Special Economic Zones*, 69.

Camagni, R. (2002). On the concept of territorial competitiveness: sound or misleading?. *Urban studies*, *39*(13), 2395-2411.

Castells, M. (1989). *The informational city: information technology, economic restructuring, and the urban-regional process*. Oxford: Blackwell.

Castells, M., & Hall, P. (1994). *Technopoles of the World: The Making of the 21st Century Industrial Complexes*. London: Routledge.

Clark, G. (2011). ¿Es necesario que las ciudades globales tengan distritos del conocimiento?. *Revista Económica de Cataluña*, (64), 158-174.

Clark, G., Hutchins, M., Simmie, J., & Verdonk, H. (2004). *Competitive European cities: where do the core cities stand?*. London: Office of the Deputy Prime Minister.

Cohen-Rosenthal, E., McGalliard, T., & Bell, M. (1997). Designing eco-industrial parks.

Côté, R. P., & Cohen-Rosenthal, E. (1998). Designing eco-industrial parks: a synthesis of some experiences. *Journal of cleaner production*, *6*(3), 181-188.

Coulon, F. (2004). Regional Systems of Innovation–A case study of four Science Parks in Belgium and Sweden.

Desrochers, P. (2001). Eco-industrial parks. *The case for private planning, The Independent Review*, 345-371.

Duarte, F., & Sabaté, J. (2013). 22@ Barcelona: Creative Economy and Industrial Heritage–A Critical Perspective. *Theoretical and Empirical Researches in Urban Management*, *8*(2), 5-21.

El Shimy, N. (2008). From Free Zones to Special Economic Zones–The UAE Case Study. OECD

Erkman, S. (1997). Industrial ecology: an historical view. *Journal of cleaner production*, *5*(1), 1-10.

European Commission. (1996). DG XIII and XVI RITTS and RIS Guidebook. *Regional Actions for Innovation*. Brussels: EC.

Falcke, C. O. (1999). Industrial Parks Principles and Practice. *Journal of Economic Cooperation Among Islamic Countries*, *20*(1), 1-10.

Farole, T. (2011). Special economic zones: What have we learned?. *World Bank-Economic Premise*, (64), 1-5.

Farole, T., & Akinci, G. (Eds.). (2011). *Special economic zones: progress, emerging challenges, and future directions*. World Bank Publications.

Fleig, A-J. (2000). ECO-Industrial Parks A Strategy towards Industrial Ecology in Developing and Newly Industrialised Countries. GTZ.

Florida, R., & Kenney, M. (1993). The new age of capitalism: innovation-mediated production. *Futures*, *25*(6), 637-651.

Fouqui, M. (2015, March 11). Vietnam : le choix de l'internationalisation. Cepii. Retrieved from http://www.cepii.fr/BLOG/bi/post.asp?IDcommunique=362

Fujita, M., & Thisse, J. F. (1996). Economics of agglomeration. Journal of the Japanese and international economies, 10(4), 339-378.

Fujita, M., Krugman, P. R., & Venables, A. J. (2001). *The spatial economy: Cities, regions, and international trade*. MIT press.

Hall, P. (1988). *Cities of tomorrow*. Oxford: Basil Blackwell.

Ishida, M. (2009). Special economic zones and economic corridors. *ERIA Discussion Paper Series, ERIA-DP-2009-16*.

Jackson, D. J. (2012). What is an Innovation Ecosystem. Arlington, VA: National Science Foundation.

King Sturge. (2002). Global Trend in industrial Parks. King Sturge.

Klein, N. (2009). *No logo*. Macmillan.

Klinenberg, E. (2012). *Going solo: The extraordinary rise and surprising appeal of living alone*. City of Westminster: Penguin.

Koh, F. C., Koh, W. T., & Tschang, F. T. (2005). An analytical framework for science parks and technology districts with an application to Singapore. *Journal of Business Venturing*, *20*(2), 217-239.

Koh, F. C., Koh, W. T., & Tschang, F. T. (2005). An analytical framework for science parks and technology districts with an application to Singapore. *Journal of Business Venturing*, *20*(2), 217-239.

Koh, W. T. (2006). Singapore's transition to innovation-based economic growth: infrastructure, institutions and government's role. *R&D Management*, *36*(2), 143-160.

Koyama, N. (2011). SEZs in the Context of Regional Integration: Creating Synergies for Trade and Investment. *Special Economic Zones*, 127.

Litwack, J. M., & Qian, Y. (1998). Balanced or unbalanced development: special economic zones as catalysts for transition. *Journal of Comparative Economics*, *26*(1), 117-141.

Lowe, E. A. (2001). Eco-industrial park handbook for Asian developing countries. *Report to Asian Development Bank*.

Marshall, A. (1890). Principles of economics: an introductory volume.

Molas, O., & Sabata, M. P. (2011). 22@: 10 anys de transformació econòmica. *Revista econòmica de Catalunya*, (64), 13-21.

Morisson, A. (2014). *Innovation districts: an investigation of the replication of the 22@ Barcelona's Model in Boston*. Sao Paulo: FGV-EAESP. Master Thesis.

Neff, J. (2010). Is Digital Revolution Driving Decline in US Car Culture. *Advertising Age*, *31*.

Ni, P., & Jie, Z. Q. (Eds.). (2014). *Urban Competitiveness and Innovation*. Cheltenham: Edward Elgar Publishing.

Oliva, A. (2003). 22@ BCN Activities District. *Aula Barcelona Management Booklets*, *15*.

Phillimore, J., & Joseph, R. (2003). Science parks: A triumph of hype over experience. *The international handbook on innovation*, 750-757.

Pine, B. J., & Gilmore, J. H. (1998). Welcome to the experience economy. *Harvard business review*, (*76)*, 97-105.

Porter, M. E. (1990). The Competitive Advantage of Nations. *Harvard Business Review*, *68*(2), 73-93.

Quintas, P., Wield, D., & Massey, D. (1992). Academic-industry links and innovation: questioning the science park model. *Technovation*, *12*(3), 161-175.

Rogerson, R. J. (1999). Quality of life and city competitiveness. *Urban studies*, *36*(5-6), 969-985.

Saikkuu, L. (2006). Eco–Industrial Parks: A Background Report for the Eco-Industrial Park Project at Rantasalmi. *Finland: Publications of Regional Council of Etela–Savo*.

Sassen, S. (1994). *Cities in a world economy* (Vol. 3). Thousand Oaks, CA: Pine Forge Press.

Smith, N. (2002). New globalism, new urbanism: gentrification as global urban strategy. *Antipode*, *34*(3), 427-450.

Speck, J. (2013). *Walkable city: How downtown can save America, one step at a time*. London: Macmillan.

Tejani, S. (2011). The Gender Dimension of Special Economic Zones1. *Special Economic Zones*, 247.

The Economist. (2015, 4 March). Special Economic Zones: No so Special. *The Economist.*

Tudor, T., Adam, E., & Bates, M. (2007). Drivers and limitations for the successful development and functioning of EIPs (eco-industrial parks): A literature review. *Ecological Economics*, *61*(2), 199-207.

Turok, I., Bailey, N., Atkinson, R., Bramley, G., Docherty, I., Gibb, K., ... & Paddison, R. (2004). Sources of city prosperity and cohesion: the case of Glasgow and Edinburgh. In Boddy, M., & Parkinson, M. (Ed.), *City matters: Competitiveness, cohesion and urban governance*. Bristol: Policy Press.

UNIDO. (1997). Industrial Estates Principles and Practice. Technical Report. United Nations Industrial Development Organization.

UNIDO. (2012). Europe and Central Asia Regional Conference on Industrial Parks as a tool to foster local industrial development. Baku, Azerbaijan.

Van Winden, W., De Carvalho, L., van Tuijl, E., van Haaren, J., & van den Berg, L. (2013). *Creating knowledge locations in cities: Innovation and integration challenges*. London: Routledge.

Vietnam News. (2015, 20 March). Ministry urged to destroy ineffective IZs. Retrieved from http://vietnamnews.vn/economy/267827/ministry-urged-to-destroy-ineffective-izs.html

Waldby, C. (2009). Singapore Biopolis: bare life in the city-state. *East Asian Science, Technology and Society*, *3*(2-3), 367-383.

Wang, J. (2013). The economic impact of special economic zones: Evidence from Chinese municipalities. *Journal of Development Economics*, *101*, 133-147.

Wessner, C. W. (Ed.). (2009). *Understanding Research, Science and Technology Parks: Global Best Practice: Report of a Symposium*. National Academies Press.

White, J. (2011). Fostering innovation in developing economies through SEZs. *Special Economic Zones*, 183.

Wolman, H. (2014). 14. Economic competitiveness, clusters, and cluster-based development. Urban Competitiveness and Innovation, 229.

Wong, K. W., & Bunnell, T. (2006). New economy' discourse and spaces in Singapore: a case study of one-north. *Environment and Planning A, 38*(1) 69-83.

World Bank. (1992). Export Processing Zone. Industry and Development Division.

World Economic Forum. (2015). *The Global Competitiveness Report 2014-2015: Full Data Edition*. Geneva: World Economic Forum.

Yeung, Y. M., Lee, J., & Kee, G. (2009). China's special economic zones at 30. *Eurasian Geography and Economics*, *50*(2), 222-240.

UNIDO VIET NAM
Address: Green One UN House (GOUNH) - 304 Kim Ma, Hanoi, Viet Nam
Telephone: +84 4 3822 4490 - Fax: +84 4 3942 2484
Email: office.vietnam@unido.org
Web: www.unido.org – www.un.org.vn