



CTCI Foundation 2007 Fall Environmental and Energy International Conference
中技社96年度秋季環境與能源國際研討會-工業區再造暨產業升級

台灣工業區再造符合產業升級需求？有足夠誘因嗎？

Does the Incentive Scheme and Government Efficiency of Taiwan's Industrial District Regeneration Meet the Demand of Industrial Upgrading?

陳麗瑛（中經院研究員）
Lee-in Chen Chiu, Research Fellow
Chung-hua Institution For Economic Research
Taipei, Taiwan
Oct. 23, 2007



中華經濟研究院
Chung-Hua Institution for Economic Research

Preface (I)



Vision of newly set up or regeneration of industrial district in 21st century

- a. Background of industrial development policies in Taiwan
- b. Fostering industrial cluster effect
- c. Classification of industrial districts
- d. Fostering innovative milieu
- e. Enhance innovative capacity
- f. Encourage energy saving and environment protection (green industry)

- Relevant studies by third Italian party has drawn academic attention (Lee, Liu and Stafford, 2000; De Propriis, 2005; Balloni and Iacobucci, 2004)
- Studies of industrial districts focus on small and medium business.
- The concept of innovative milieu was proposed by GREMI organization in west Europe. It highlights reduction of cost and uncertainty during innovation process, enhance innovative capacity and is the key element for sustainable development in the region.

Preface (II)



Basic research and local practical issues for the regeneration of industrial districts in Taiwan

- a. Lack of international comparative study on industrial regional shift-share analysis
- b. Lack of basic survey on local demands for industrial upgrade or international technology niche

- a. Issues on **institution transformation** and **incentive scheme** for industrial district regeneration
- b. **Location factors** on industrial district regeneration
- c. **Incentive scheme** for **energy saving** and **environment protection** on industrial district regeneration

I. Industrial development policy in Taiwan



- 1950s-Land reform and import substitute
- 1960s-Export expansion and and open inbound FDI
 - 1960 / **Statute for Promoting Investment**/ Export Processing Zone set up/tax exemption warehouse and factory system
 - 1964 /” Statute for Managing EPZ” passed
- 1970s-second phase of import and export expansion
- 1980s-High-tech industry and economy liberalization
- 1990s- abolish statute for promoting investment and replaced with statute for industrial upgrading/large amount of FDI toward China and south east Asia

- At the moment “the statute of industrial upgrading” is going to expire in 2009, during this half century long process of industrial development, the performance of industrial upgrade just make it barely. Nevertheless, relevant regulations on development R&D and industrial district (or incubation bed) regeneration to nurture the strength of industry never shown matching progress.
- Therefore, the task to promote restructure and upgrade of industrial district has become the imperative issues for the government.

II Definition of industrial districts



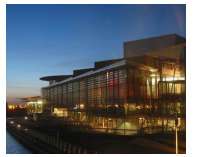
- A region formed naturally or historically, based on a group of people or company with substantial social entities (Becattini , 1990)
- A large space cover trade oriented economic activities which focus on manufacture or service specialization and pertinent to local resources (Markusen , 1996)
- Industrial territory located on a designated geographic region engaged in specific products under various process stages by small and medium companies (Albino, Garavelli and Schiuma , 1999)
- Certain number of professional small companies consecutively distributed on the space horizontally linked and vertically dispersed cluster (Tappi , 2003)
- Marshalian style Italian industrial territory is a local production system which focus on a designated region by large amount of small production companies (Cainelli & De Liso , 2005)

II. Industrial cluster effect -types



- Four different types of industrial districts (Markusen, 1996)
 - (1) **The Marshallian industrial districts**: SMEs specialize in the same sector and have forged an intensive set of backward, forward, and horizontal linkages.
 - (2) **The hub and spoke district**: dominated by one or more large externally oriented companies around which the SMEs are clustered. (the strength of hub depend on core competence of leading companies)
 - (3) **The satellite platform**: an assemblage of unconnected branch plants embedded in external organization links. (market and non-market trade on product, service, information and knowledge can not be implemented)
 - (4) **The State-anchored district** : a major public sector institution around which the rest of the firms are grouped.

II. Fostering industrial cluster effect - types



- Gordon and McCann(2000) by adapting a transaction cost approach classify industrial clusters into:
 - Pure agglomeration
 - Industrial complex
 - Social network
- * In the pure agglomeration type inter-firm relations are inherently transient (passenger attitude) , In contrast, in an industrial complex the inter-firm linkages are long-term, stable and predicable. Access to the complex is severely restricted by spatial clustering is to minimize inter-firm transaction costs via proximity (McCann and Mudambi, 2005)
- * It is rather “network based” than “cluster based” factors that initiate the formation of industrial clusters.
- * Pulling firms well embedded in global production networks is a core aspect of a successful FDI-based development strategy.



Competition of Hi-tech industry across the strait

◎IC industry in Taiwan - cluster and supply chain

Distribution of IC industry in Taiwan

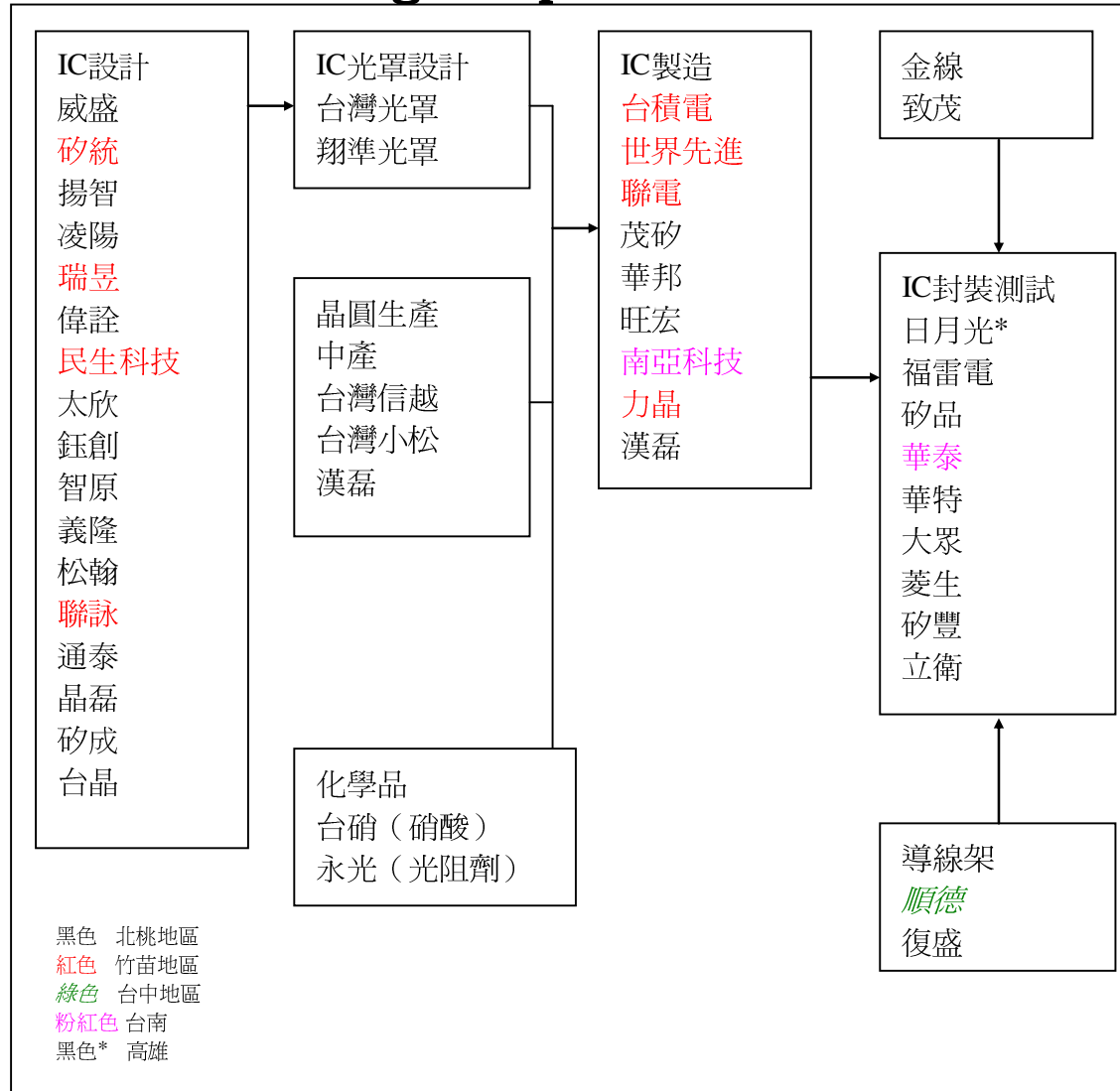
	台北 桃園	新竹 苗栗	台中 地區	台南	高雄	合計
IC 設計	70	142	1	2	1	216
IC 設計服務	7	16				23
IC 封裝測試			2		6	8
光罩		4				4
晶圓代工及 IC 製造	18	17				35
封裝測試及相關材料		36				36
零組件代理、通路	38	3				41
半導體設備、導線架	9	19	2	5	2	37
分離式元件	15	3	1	1	1	21
記憶體模組製造銷售	10	2				12
合計	167	242	6	8	10	433

Source : Directory of semiconductor industry -2005

Competition of Hi-tech industry across the strait —location cluster effect



◎ location of leading IC producers in Taiwan

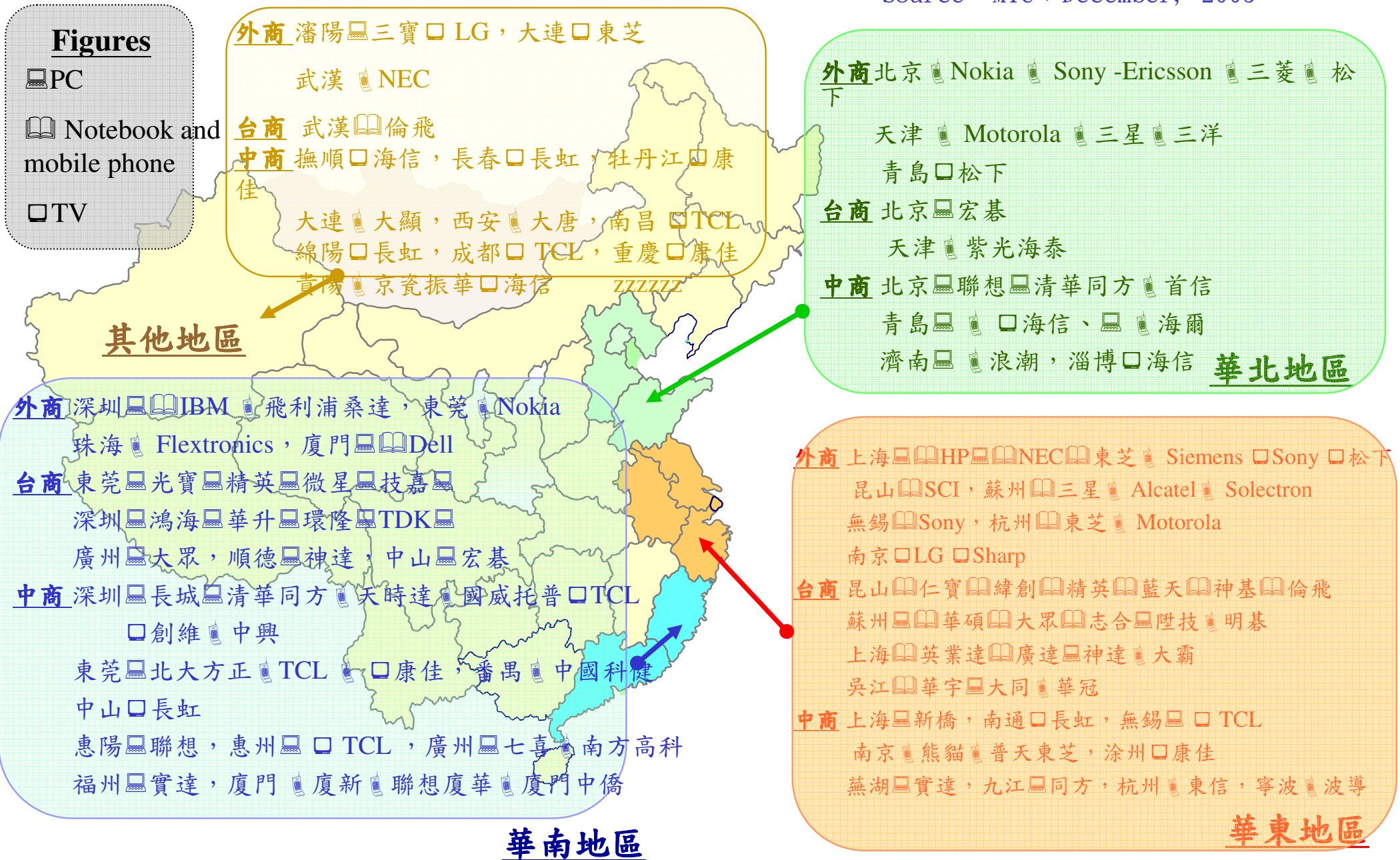


Competition of Hi-tech industry across the strait – location cluster pattern



◎Supply chain of IC and 3C across the Taiwan strait

Source: MIC; December, 2005

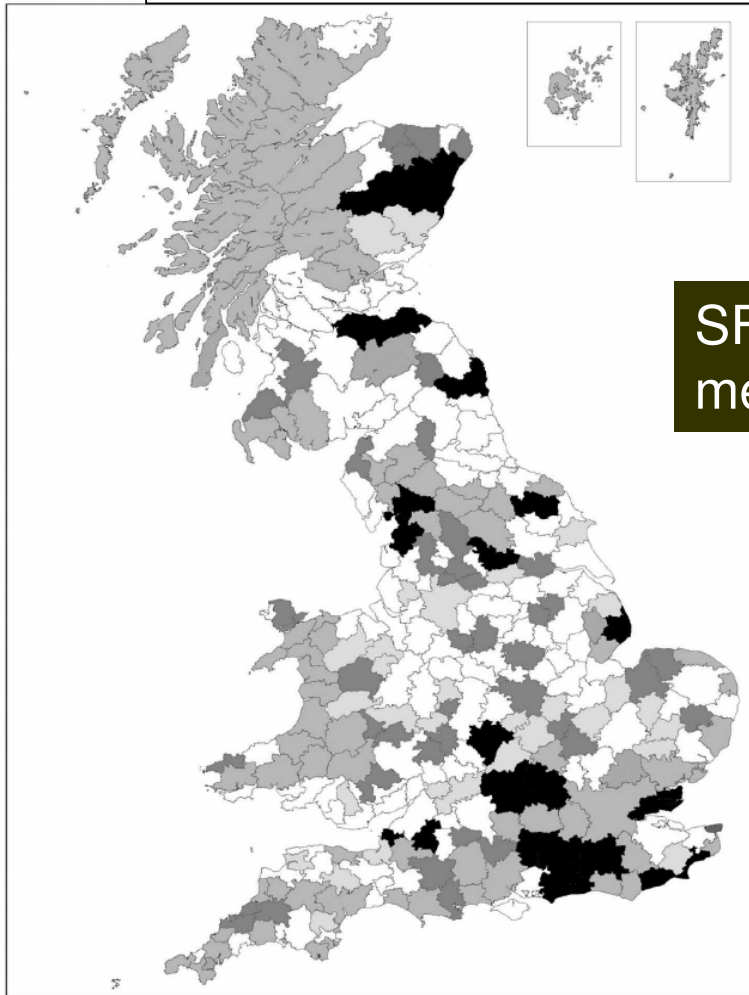


III. Classification of industrial district/territory – analysis methods



Use commuting circle as unit to divide basic analytical unit

1. employment ratio for manufacturer sector
2. Scale of company
3. Industrial specialization
4. Industry profession and company scale

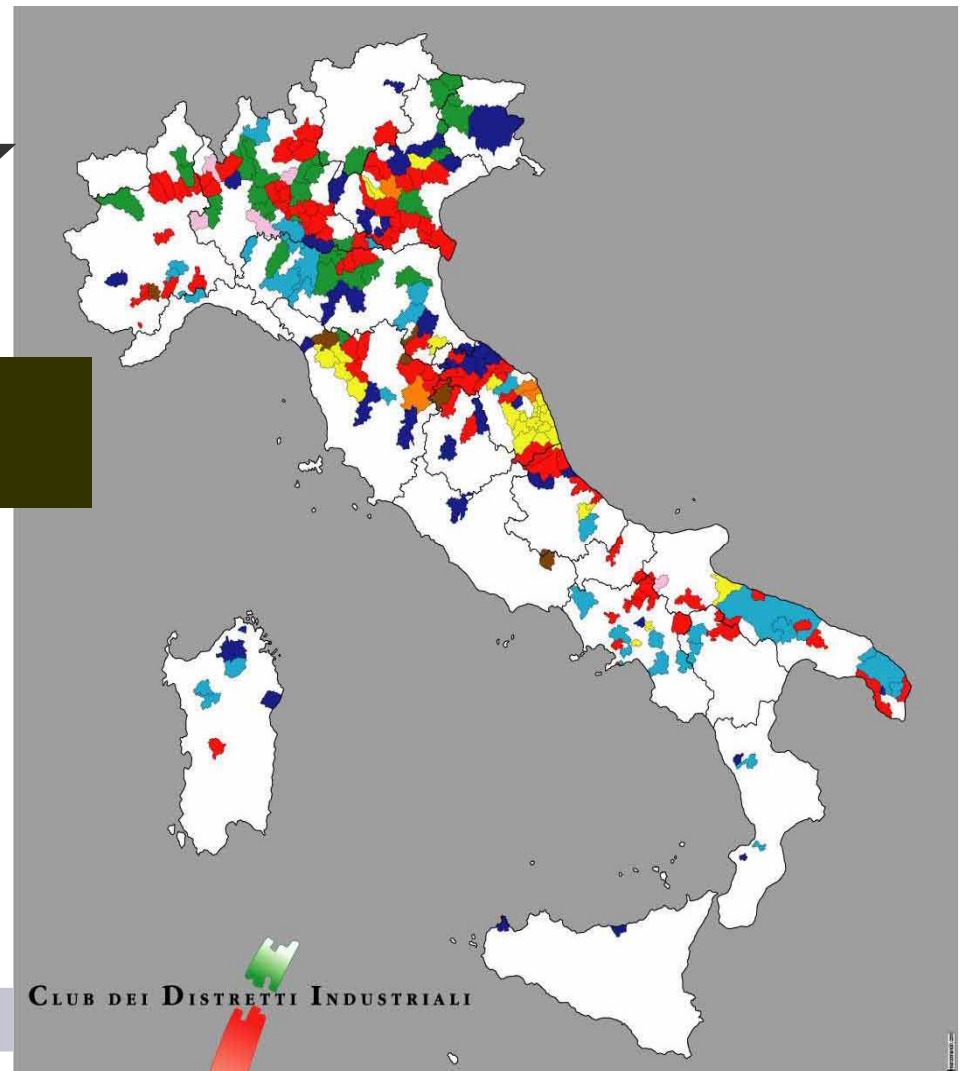


UK

SFORZI-ISTAT method

Use commuting level to divide 784 local labor systems

1. Ratio of employees in LLS industry to total non-agriculture employees is higher than national mean
2. LLS specialization is focused on one specific sector
3. The ratio of companies with employees less than 250 in LLS is higher than national mean



Italy

CLUB DEI DISTRETTI INDUSTRIALI





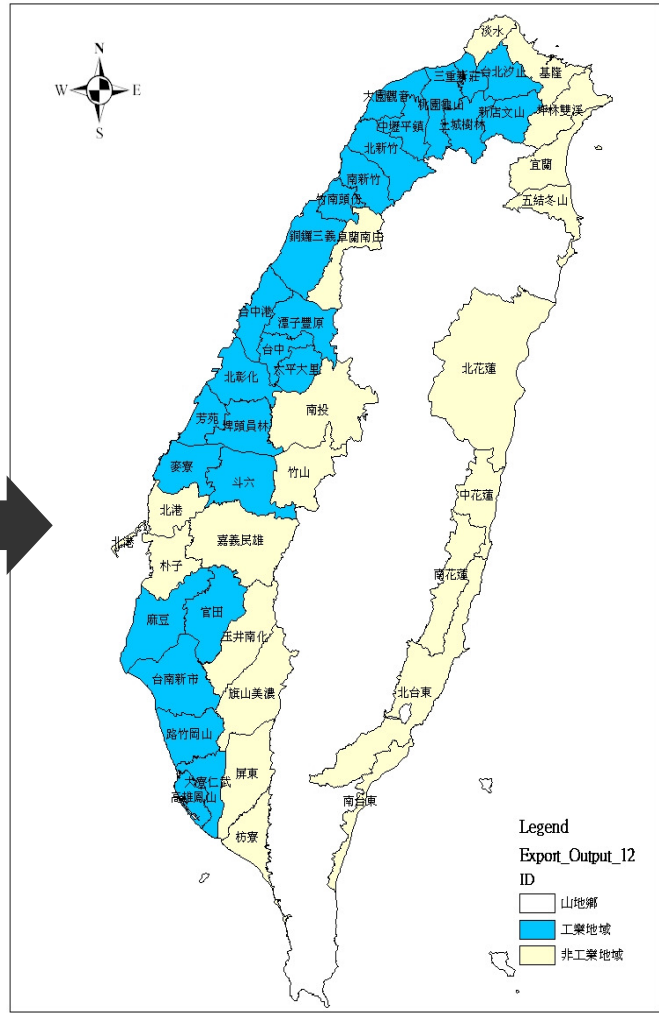
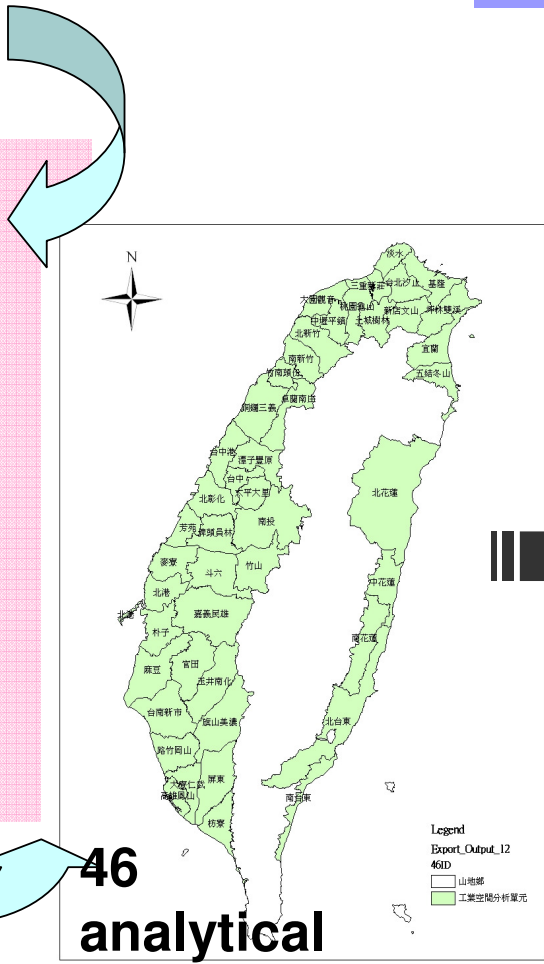
III. Classification of industrial territory in Taiwan

Purpose : statistic analysis and basic research

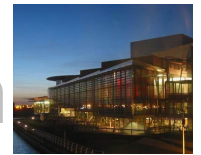
Principles

The division
1、LQ of manufacturer is greater than 1
2、Employee from manufacturer is over 50000

- 1、Exclude 28 mountain townships
- 2、Incorporate concept of live circle
- 3、Use following principles (integrate city as unit)
 - space allocation
 - transportation distribution and river borders
 - labor resources
 - administrative borders



III. Four types of industrial territory in Taiwan

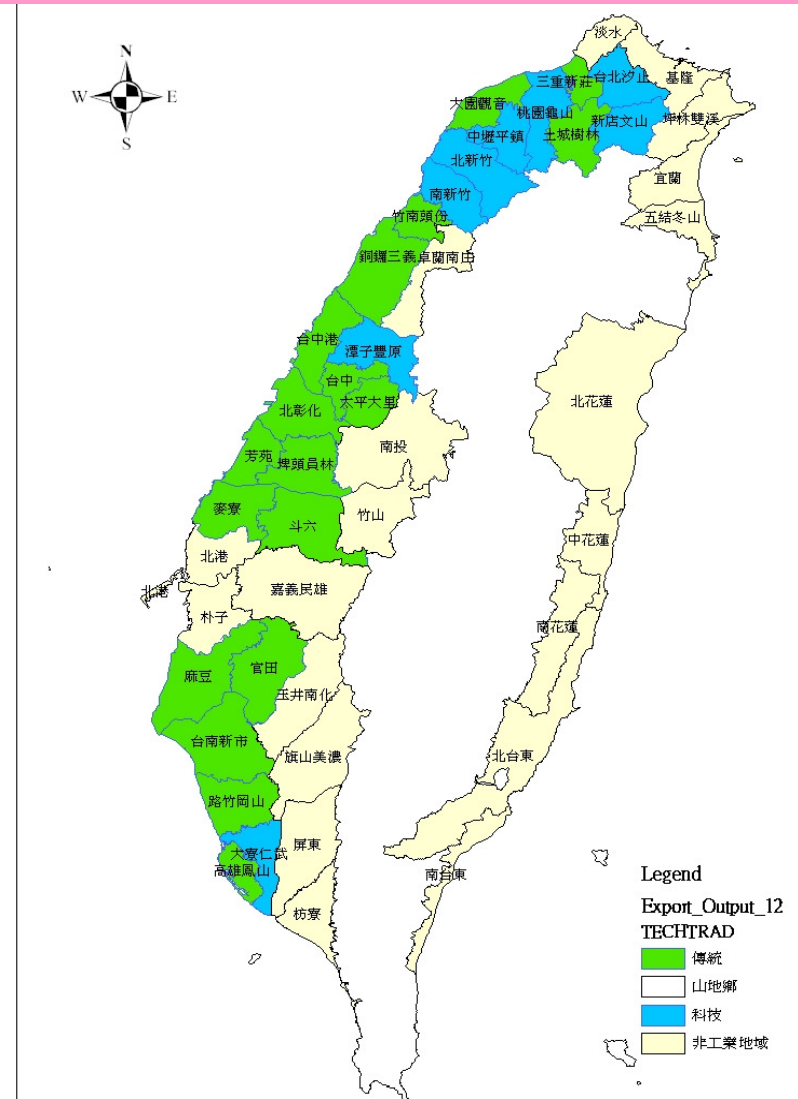
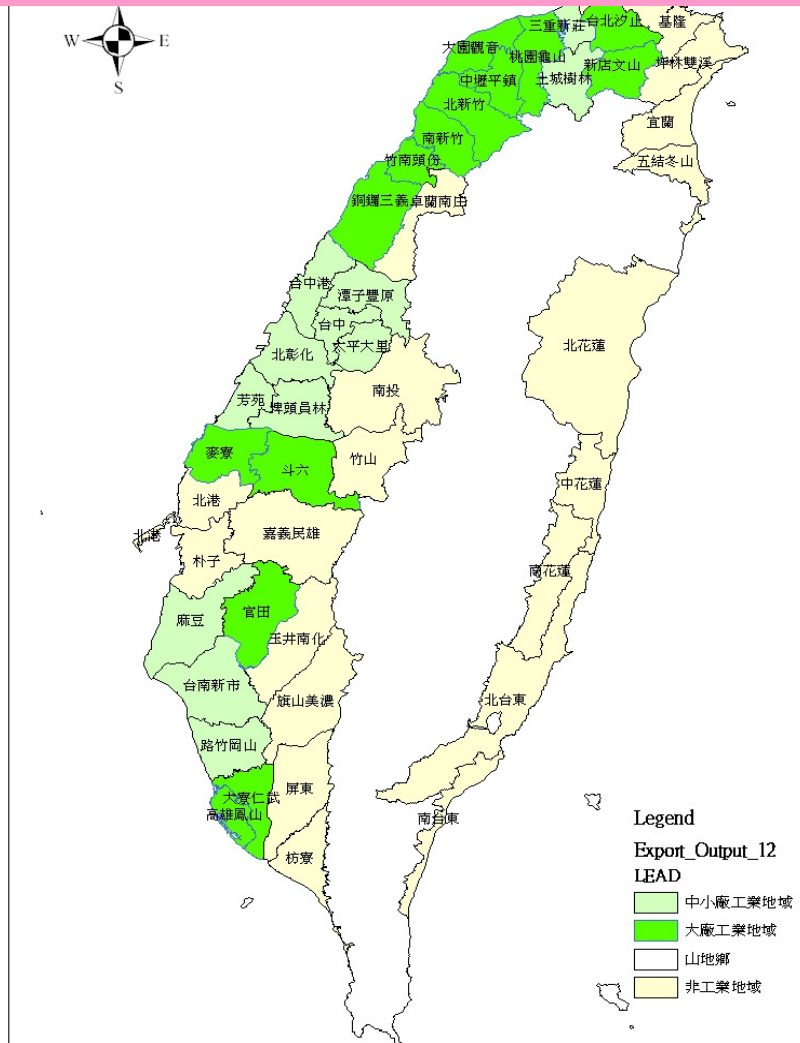


Classification :

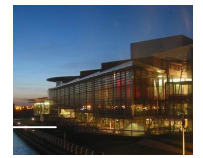
1. Employee number in large company $LQ > 1 \Rightarrow$ large IT
2. Employee number in small and medium company $LQ > 1 \Rightarrow$ Small and medium IT

3. Employee number in hi-tech sector $LQ > 1 \Rightarrow$ hi-tech IT

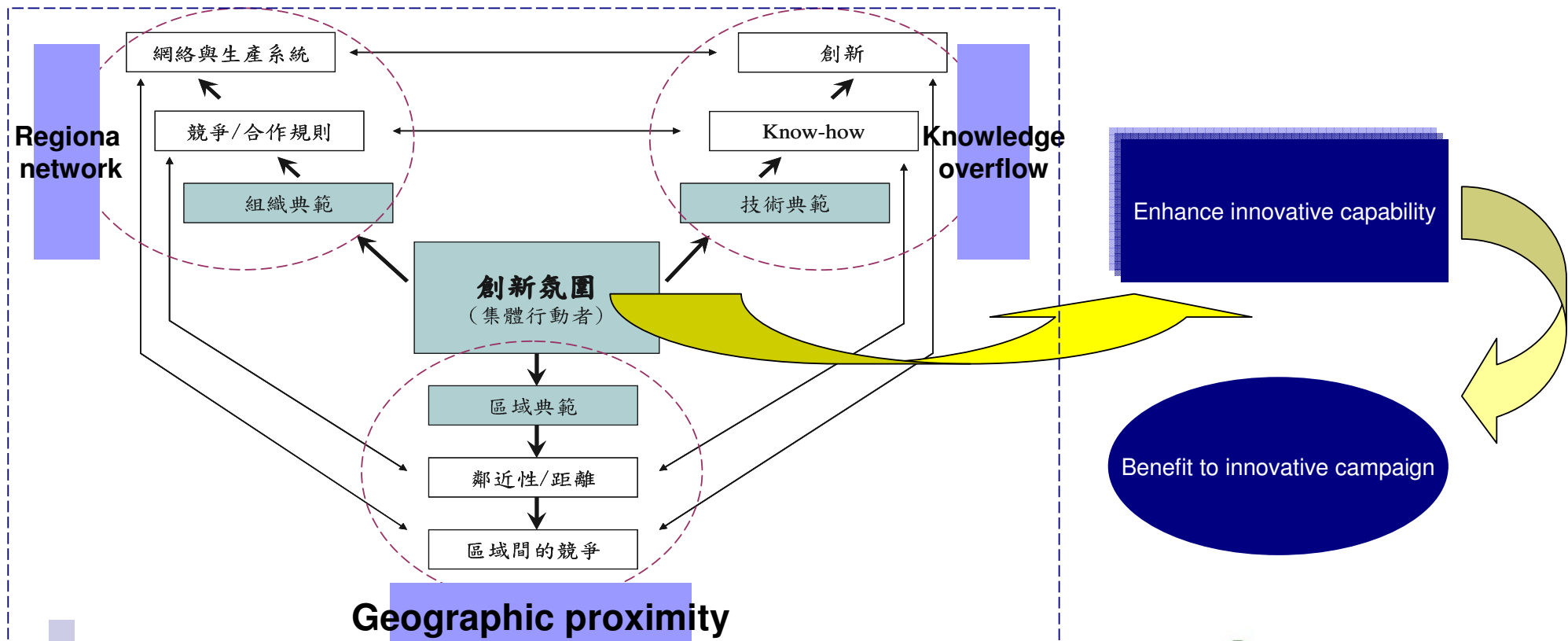
4. Employee number in traditional sector $LQ > 1 \Rightarrow$ traditional IT



IV. Fostering innovative milieu- meaning and theory



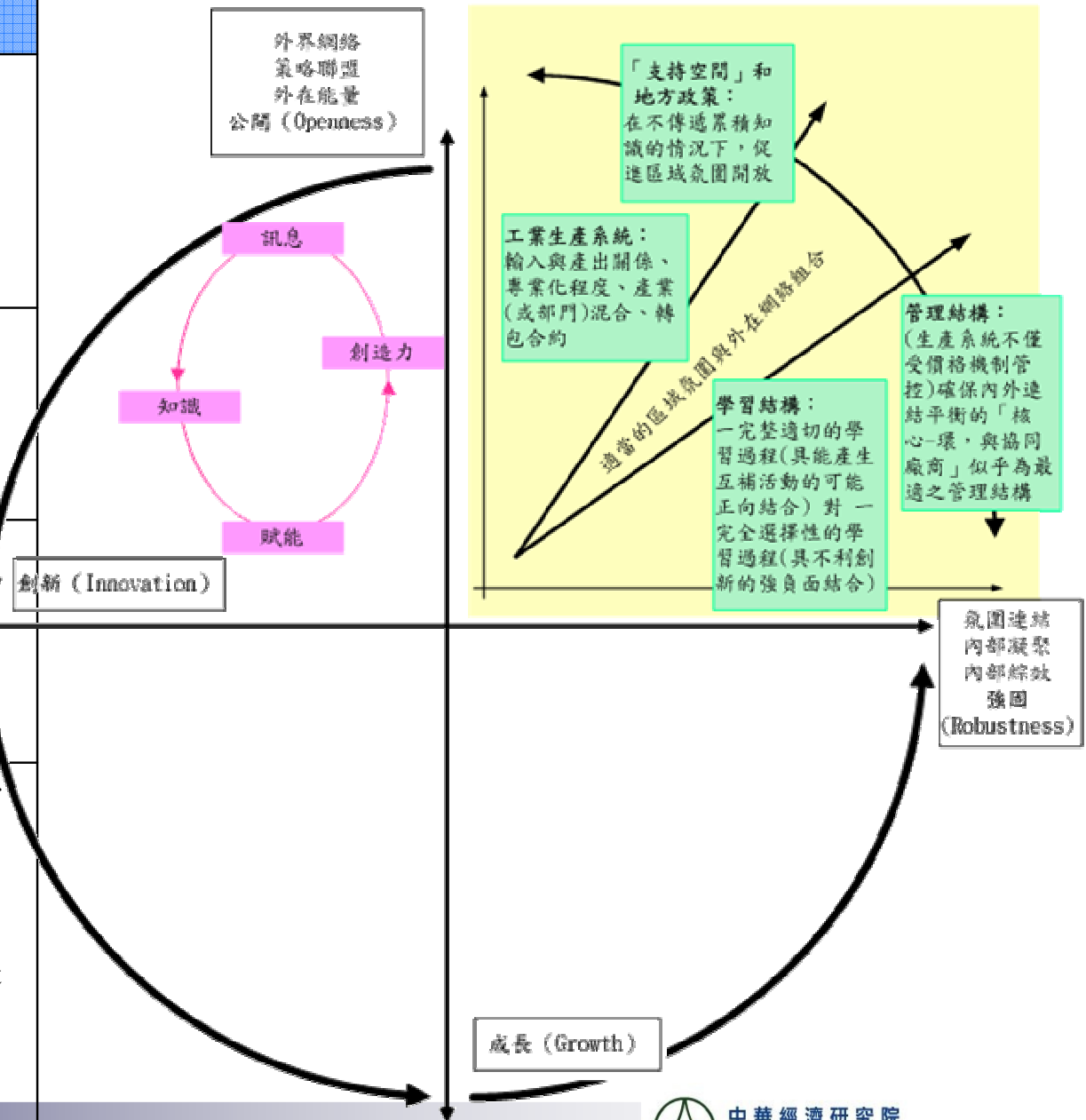
- Proposed by GREMI from west Europe in 1991
- A series of territorial relationship in a designated geographic area, all entities, social interactions and unique cultures in respective sectors (GREMI, 1997); with the interactions from above dimensions to generate cumulative dynamic learning effect and drive the innovation and knowledge for respective companies (Keeble & Wilkinson, 1999)
- The essential element also include mobility of talent pool, duplicated innovation, collaboration, common regulation and custom, and sense of belonging (Camagni, 2002)



IV. Fostering innovative milieu- - evolution



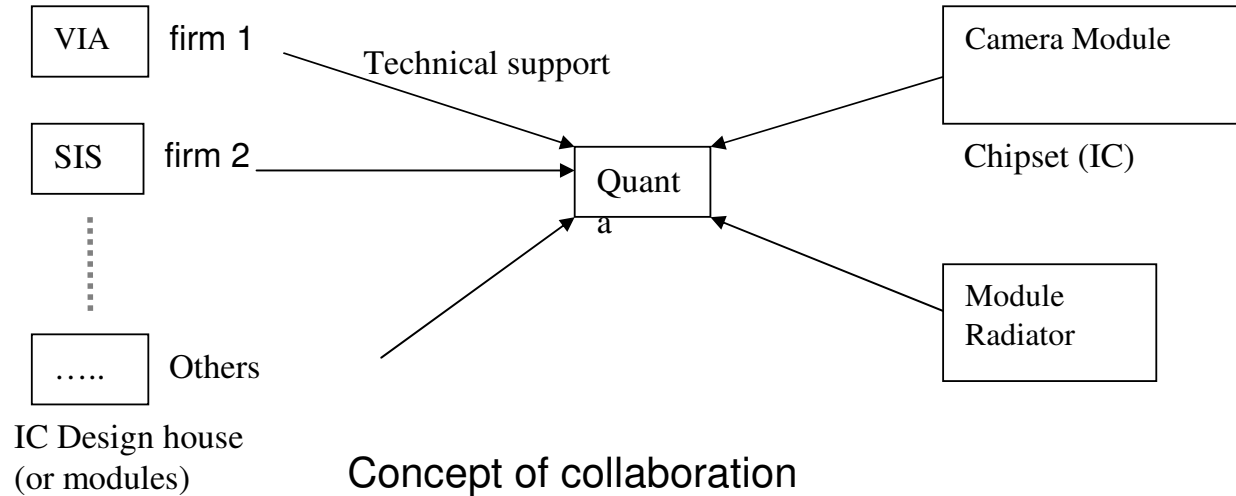
Stage	Content
GREMI 1	Aydalot proposed localized "something" to understand the hypothesis of why some area have more potentials. Aydalot(1986)
GREMI 1&2	Reveal the role of firms in the process of investment, innovation Aydalot(1986) Maillat and Perrin (1992)
GREMI 3	Explore innovative network, and its utility on space, inter and intra regional functions. This stage defined the principle concept of innovative milieu. Maillat, Quevit and Senn(1993)
GREMI 4	Focus on different production areas (with similar production system such as shoe, watch and textile); with same technical and market background but through different evolution process, the productivity growth and innovation outcomes not only influenced by technology, but also by local innovative milieu. Ratti, Bramanti and Gordon(1997)





Domestic flagship case study- R&D Supply chain in Quant Corp

- R&D Supply chain in Taiwan, has not extended to China or SE Asia



Ratio of R&D staffs

Items	ratio
Notebook	40%
Wireless communication	20%
TV	5 %
Server	25%
Others	10%

※ Significant issues on IP from major multi-national company

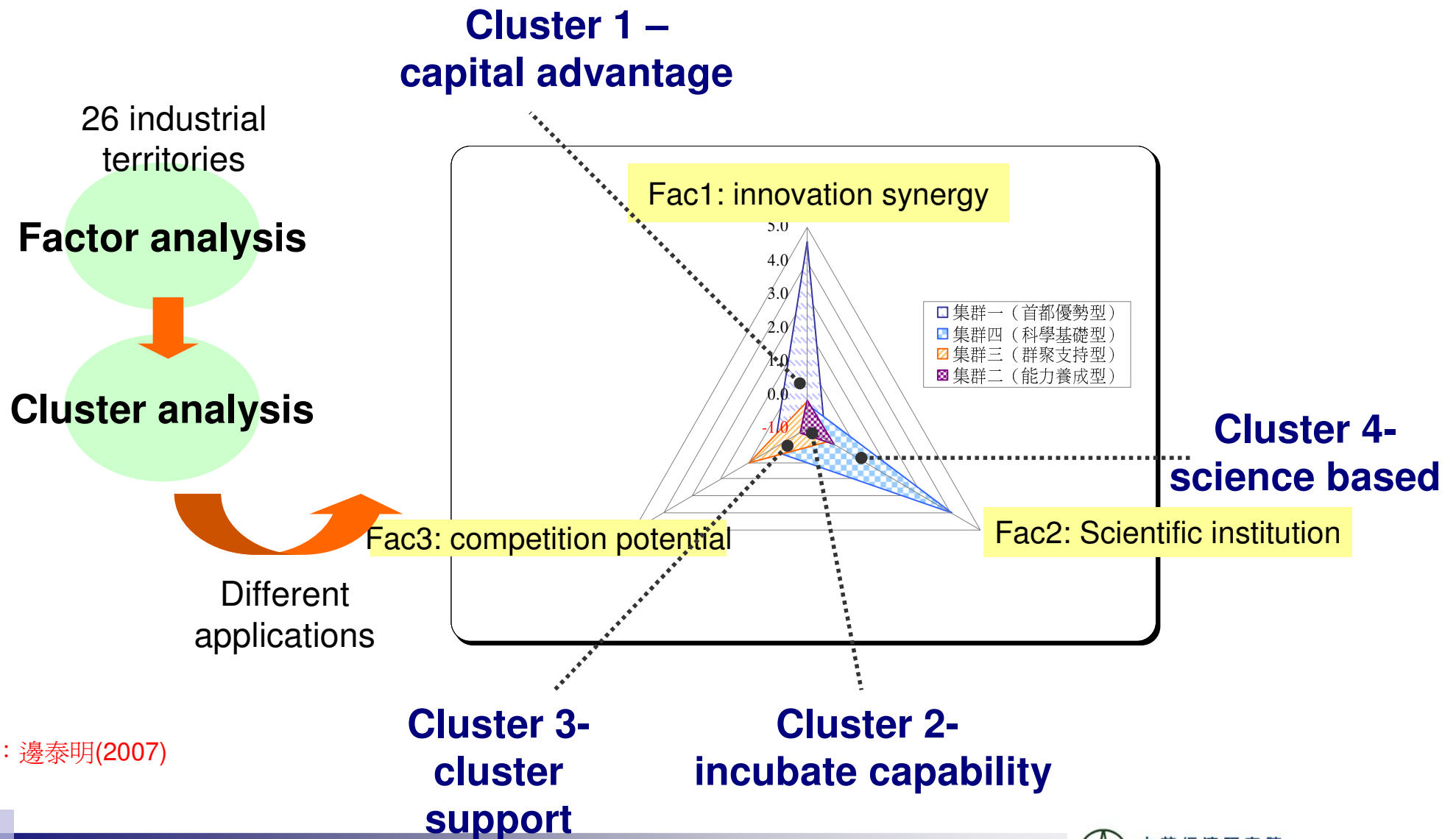
- IP protection: Taiwan can not compete with big global company
- Take CD-driver as an example, when Taiwan company in still primitive, they ignore it, when it became potential threat, they asked for patent fee with retrospect.
- CD-ROM → DVD-ROM → Combo → DVD-RW (→ BLU-RAY)

Resource: 陳麗瑛、陳信宏 (2005) , 兩岸高科技產業之競爭與合作策略, 陸委會委託中經院



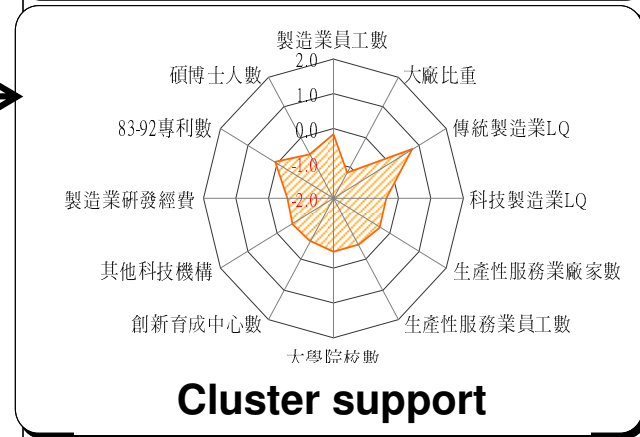
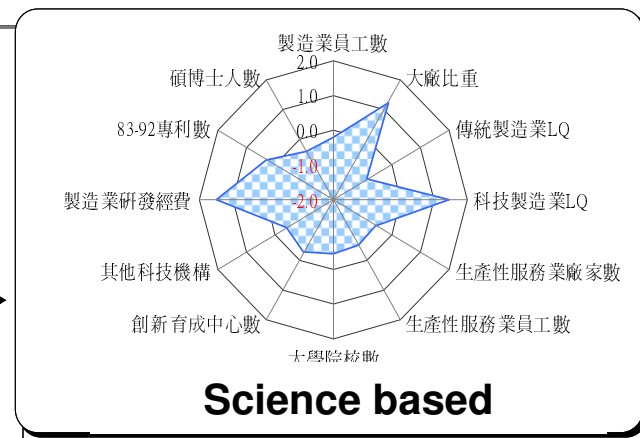
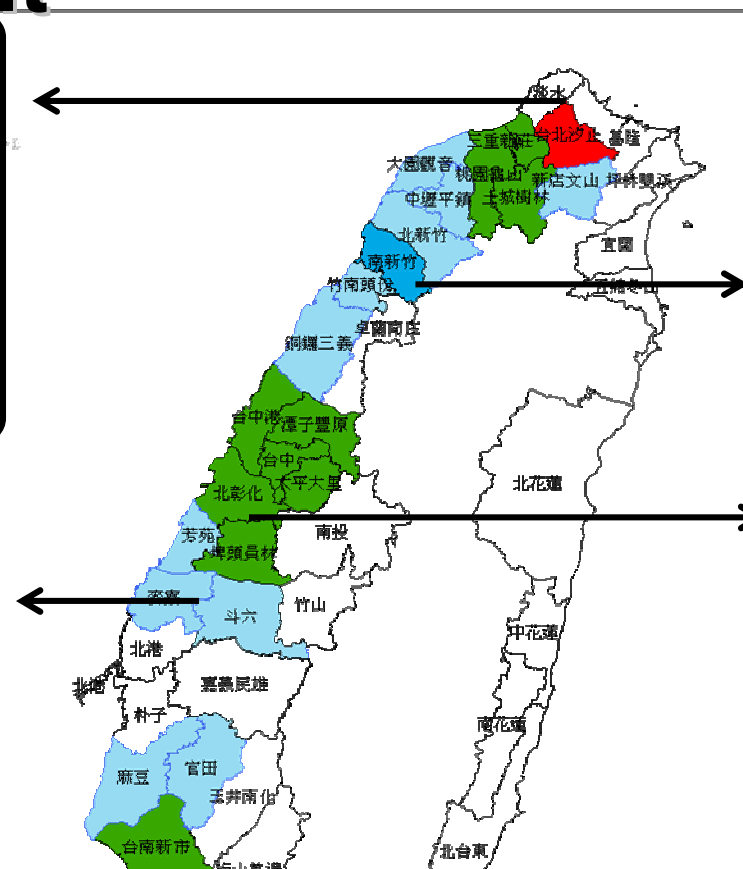
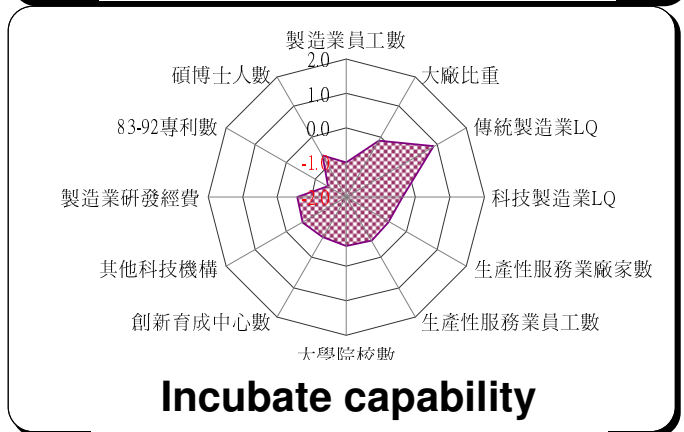
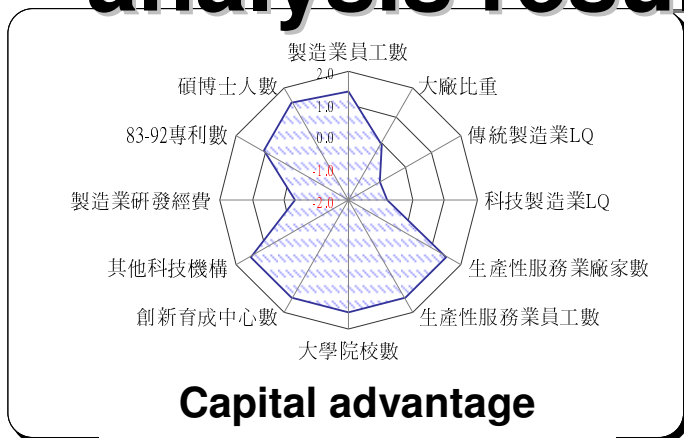
IV. Fostering innovative milieu- -Macro quantitative analysis

Types of innovative milieu in Taiwan



Source : 邊泰明(2007)

IV. Fostering innovative milieu- - analysis result



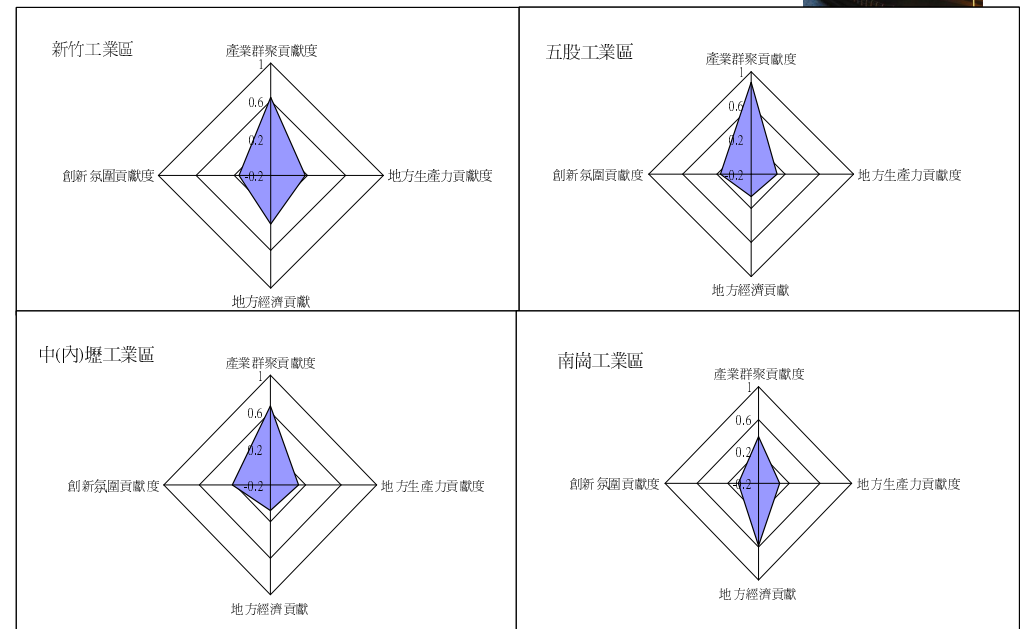
Cluster	Industrial territory	Number
Capital advantage	台北汐止	1
Incubate capability	新店文山、大園觀音、中壢平鎮、北新竹、竹南頭份、銅鑼三義、芳苑、麥寮、斗六、麻豆、官田、路竹岡山、高雄鳳山、大寮仁武	14
Cluster support	三重新莊、土城樹林、桃園龜山、台中港、潭子豐原、台中、太平大里、北彰化、埤頭員林、台南新市	10
Science based	南新竹	1

V. Enhance innovative capability- (input indicators)



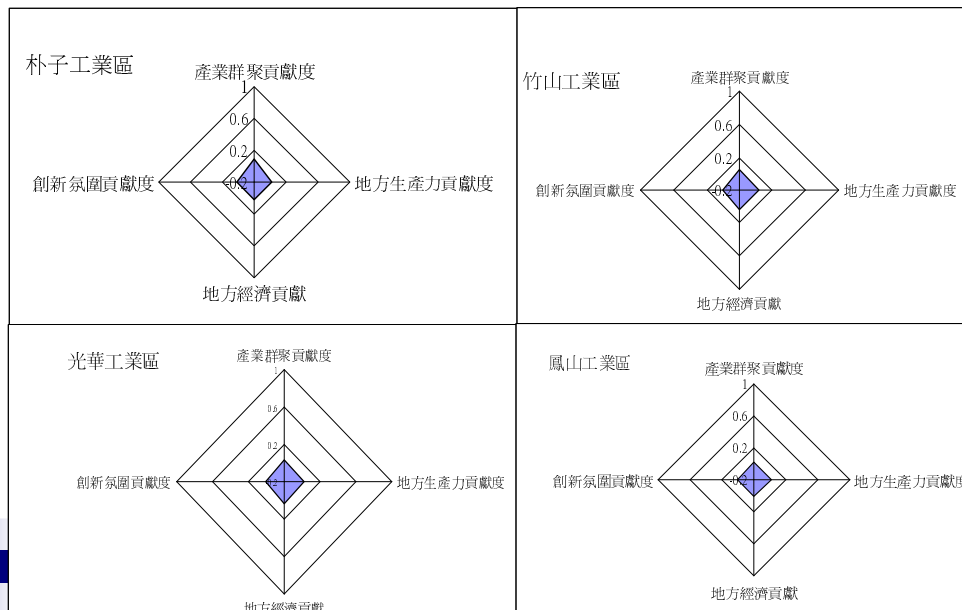
High innovative capability IT

Name	Index	Cluster effect	Productivity	Economy	Innovative atmosphere here
新竹工業區	1.262	0.639	0.161	0.320	0.141
五股工業區	1.206	0.873	0.110	0.066	0.156
中(內)壠工業區	1.087	0.666	0.120	0.078	0.222
南崗工業區	1.082	0.371	0.080	0.579	0.051



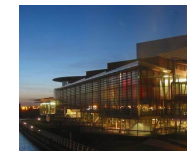
$$\text{Index} = f(C, P, E, N)$$

Low innovative capability IT



Name	Index	Cluster effect	Productivity	Economy	Innovative atmosphere here
朴子工業區	0.154	0.094	0.023	0.013	0.024
竹山工業區	0.109	0.050	0.029	0.031	0
光華工業區	0.088	0.039	0.018	0.030	0
鳳山工業區	0.039	0.016	0.016	0.007	0

V. Enhance innovative capability- (output indicators)



工業區名稱	獨立廠 商專利	總公司 專利數
土城工業區	8598	19203
五股工業區	4925	6098
台中工業區	2016	13861
大園工業區	2002	2146
安平工業區	1472	1822
新竹工業區	804	5145
中(內)壠工業區	773	5024
臨海工業區	761	1752
南港軟體園區	566	19431
南崗工業區	505	3293

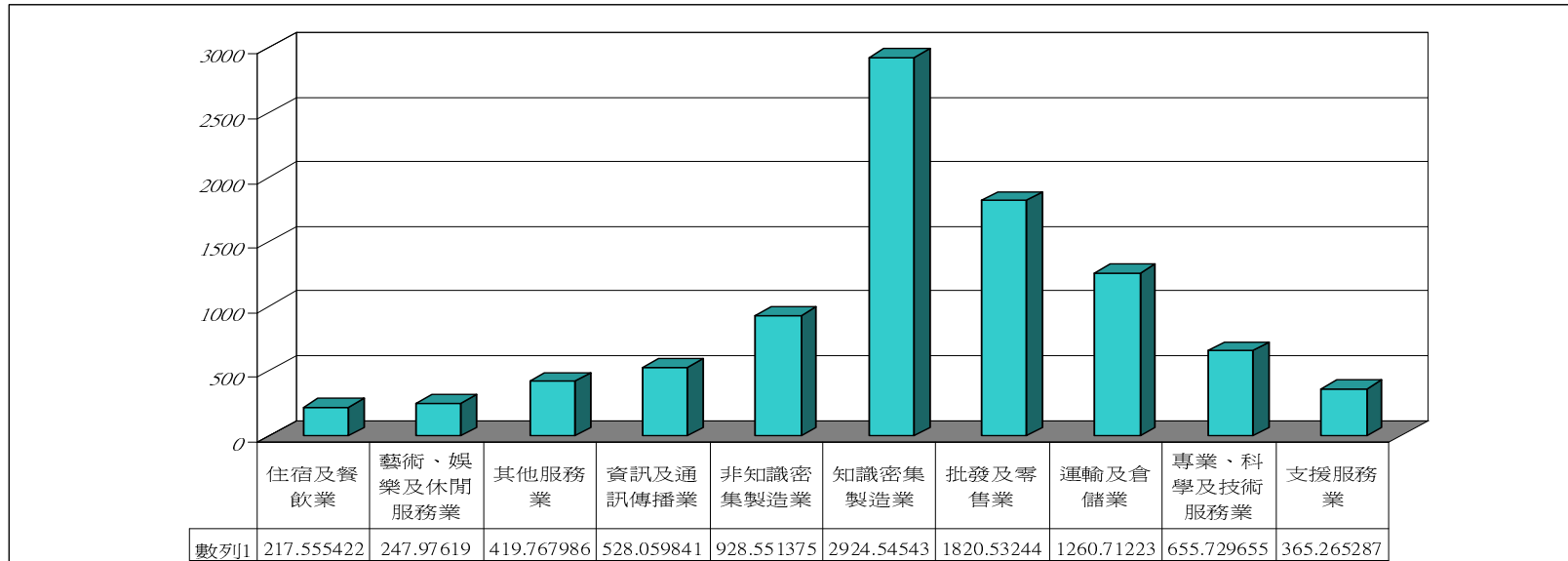
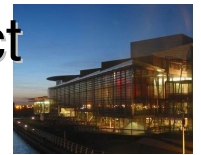
This study use data from IP office, MOEA between 1986-2007.

Patent count by individual company

Total company patent count by patents under same company name

觀音工業區	8	4
元長工業區	7	6
豐田工業區	5	57
豐樂工業區	4	0
義竹工業區	3	17
林園工業區	2	178
頭份工業區	0	194
和平工業區	0	90

Quantitative analysis – strategic recommendation for cluster effect



	Non knowledge intense service				Non labor intense manufacturer										Knowledge intense manufacturer					Knowledge intense service					
	住宿及餐飲業	藝術、娛樂及休閒服務業	其他服務業	資訊及通訊傳播業	木竹製品製造業	非金屬礦物製品製造業	食品及飲料製造業	紡織相關製品業	紙漿、紙及紙製品製造業	印刷及其輔助業	其他製造業	石油及煤製品製造業	橡膠、塑膠製品製造業	金屬製品相關製造業	化學材料、製品製造業	電子零組件製造業	機械設備製造業	精密器材製造業	運輸工具製造修配業	電力機械器材及設備製造業	電腦通信產品製造業	批發及零售業	運輸及倉儲業	專業、科學及技術服務業	支援服務業
Capital advantage	■	■	■	■					▲					△	△	△				■	■	■	■	■	■
Science based			△	▲							△		▲	△	■	▲	▲	△	■	■	△	■	■	△	△
Cluster support		△	△	△	△		△	■		△		■			■	■	■	■	▲	△	△	▲	△	△	△
Incubate capability	△		△	△	▲	▲	▲	■	▲		▲	▲	■	▲	▲			△	▲	△	△	△			

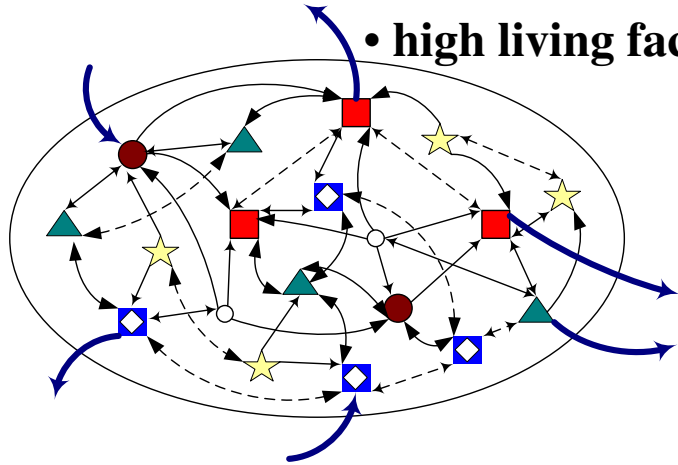
Quantitative analysis – local synergy policy



Capital advantage

maintain local policy

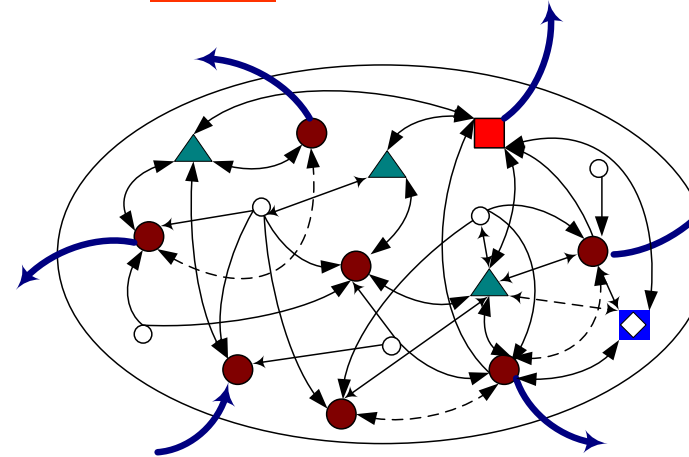
- Financial service
- high living facility



Science based

Enhance integration

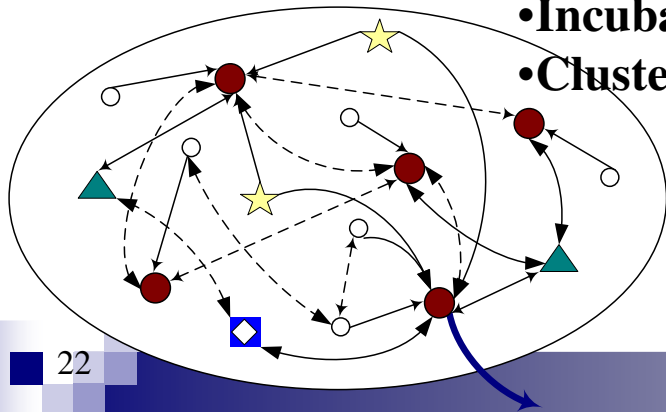
- R&D facility
- infrastructure
- cluster impact
- assist small and medium business



Incubate capability

Enhance integration

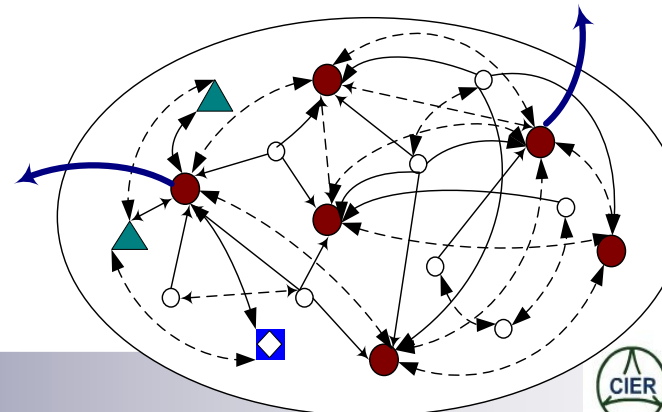
- infrastructure
- assist small and medium business
- Incubation center
- Cluster workshop



Cluster support

Maintain local policy

- R&D facility
- Academic collaboration
- R&D collaboration
- business alliance
- industrial cluster



Quantitative analysis – policy recommendation

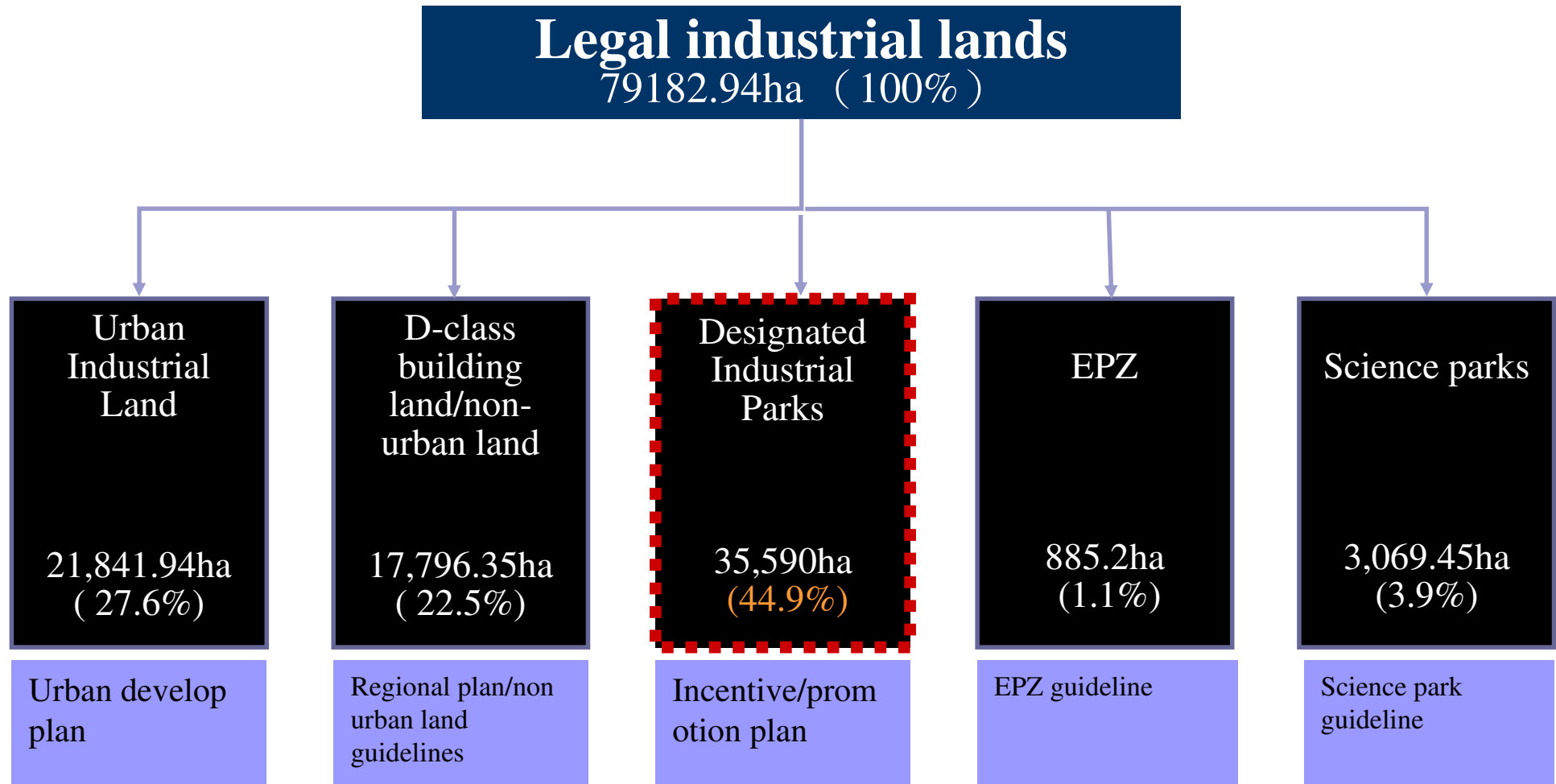


	Low innovation IT	High innovation IT
High innovation IY	<p>Enhance local integration</p> <ul style="list-style-type: none"> ● R&D facility ● Infrastructure ● Cluster impact ● Small and medium business <p>Maintain IT innovation</p> <ul style="list-style-type: none"> ● Link with global supply chain ● Attract big company investment ● Integrate small and medium business 	<p>Maintain local integration</p> <p>Financial service</p> <ul style="list-style-type: none"> ● High quality living standard <p>Maintain IT innovation</p> <ul style="list-style-type: none"> ● Attract Multinational company ● Link with global supply chain ● Flagship firms investment
Low innovation IT	<p>Enhance local integration</p> <ul style="list-style-type: none"> ● Infrastructure ● Assist small and medium business ● Incubation center ● foster cluster effect <p>Enhance IT innovation</p> <ul style="list-style-type: none"> ● Provide SMEs services ● Subsidy SMEs ● On-job training ● Integrate production network vertically 	<p>Maintain local integration</p> <ul style="list-style-type: none"> ● R&D facility ● Academic collaboration ● Industrial R&D collaboration ● Business alliance ● Cluster effect regeneration <p>Enhance IT innovation</p> <ul style="list-style-type: none"> ● Innovative network link ● Informal social network ● Incubation center ● Develop market for SMEs ● Integrate horizontal production chain ● Inter-IT broker

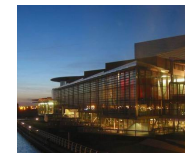
2. Local basic study and practical issues



Legal Industrial Land Supply System

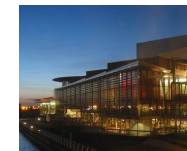


1. Information gap on international industry shift-share analysis



- Lack of information on international industrial shift-share effect analysis
- Utilize UNIDO data to conduct regional shift-share analysis to understand :
 - Possibility of global industrial transition to Asia (especially neighboring countries such as China, Viet Nam, Thailand, Malaysia, and Myanmar) ?
 - Possible service sectors to future market ?

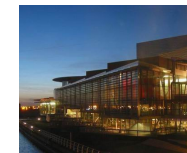
2. Information gap on the demand for industrial competitiveness and industrial upgrade



- Priority goes to large scale companies that keen to technical development and integration and own or need large areas for science park
- Encourage strategic sectors designated by government to reform or regenerate their industrial districts (i.e. science parks for thin film photovoltaic chips, glass membrane & relevant technical supply chains)
- Incentives to convert old factory to green building
(Encourage single building or whole district regeneration based on the incentive scheme and classification of green building by Ministry of Interior)
- Incentive scheme for high tech industrial district regeneration, with or without foreign investment

Source : 國內龍頭廠商座談紀錄2007/08/15

3. Institutional and incentive mechanism for the transformation of industrial district



- (1) Feedback, motivation and regulation
- (2) Environmental friendly public infrastructure
- (3) Incompatible existing urban or local development plan -- re-evaluation to cope with the improvement
- (4) Establishing financial support/sharing system between central and local government
- (5) Consolidating responsibility of public sector/ issue on government cost transfer to the industry

Institutional factors of industrial district regeneration (I)



(1) Feedback, motivation and regulation

- Construction land ratio, total floor size ratio and tax incentive (i.e. **land tax and building tax deduction**)
- How to engage land owners proactively (i.e. consideration of uncertain **time cost**)
- Happy neighbors

(2) Environmental friendly public infrastructure

- Ratio of green areas
- Skip zoning logic to find alternatives ? (i.e. priority utilities and public sanitary rather than zoning priority for landlords)
- Central water supply and sewage system (planning and construction cost allocation)
- Maintenance incapability and replacement of old public facilities (**implemented by public sector vs. private land developers**)

Institutional factors of industrial district regeneration (II)



- (3) Incompatible existing urban or local development plan -- re-evaluation to cope with the improvement
 - overall vision (**strategic planning**)
 - Coordination of surrounding environment & infrastructures
 - (i.e. : conflict with farm lands, whether to conduct “baseline survey” on targeting farm land and industrial district – COA, BID, EPA) (i.e. : Comments from Dutch expert regarding guidelines for county scenic plans)
- (4) Financial support from central and local government (**including assessment of segmented time and zone development plan**)
- (5) Consolidating responsibility of public authority/ issue on government cost transfer to the industry

Issues of urban renewal combining regeneration of industrial districts



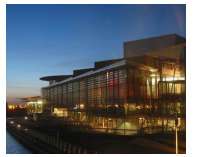
- Both urban renewal and industrial district regeneration need to consider the demand of "land owners"
 - Regeneration to upgrade residential and commercial ratio should cover allocated size and ratio
 - Future usage of old industrial districts should be classified by continuing manufacture or not; For example : (1)continue industrial usage ; (2) Partial industrial usage and partial waiver (based on international experience: allow to convert to office building to provide rental space and public facility for relevant live and service to meet financial incentive for green building) ; (3)completely waived and incorporated into urban renewal system
- Also need to consider segmented time and zone and other alternatives to match ownership transition
- Enforcement of government authority in urban renewal and regeneration of industrial district

Policy recommendation :

1. Follow market mechanism as much as possible
2. Encourage private sector with over 5 acres to apply (case by case)
3. Implement overall assessment on economic demand of industrial district and urban renewal plans (every five years)

資料來源：鍾國輝訪談力冠丰都市規劃公司(2007/8/22)

Recommendations for the incentive scheme on industrial district regeneration



1. Encourage regeneration

→ Maintain 1% land tax within 2 years after factory closed.

- (Current industrial land tax is 5.5% after factory closed)

2. Accept resale of the land within 2 years after regeneration plan approved

→ first three years tax exemption and 50% deduction on the fourth to sixth year

3. Purchase of regenerated industrial district

→ tax deduction on land value-incremental tax and land tax

4. Land owner who integrate urban development and industrial district regeneration

→ tax exemption on land incremental tax and land tax

4. Location factors on the transition of industrial district- idled industrial district

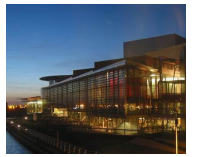
City (No of ID)	Idled	Intention to continue	No intention to continue	Total idled area (note2)	Ratio of idled area to sold/rental area
屏東縣(3)	13	12	1	61.0	59.8%
花蓮縣(3)	32	32	0	32.5	43.0%
雲林縣	8	7	1	7.2	25.0%
彰化縣(6)	19	14	5	61.4	22.8%
桃園縣(7)	59	56	3	37.7	21.9%
台北縣(5)	26	20	6	9.5	16.1%
嘉義縣(5)	11	9	2	8.4	14.3%
宜蘭縣	22	22	0	7.2	8.8%
基隆市	7	2	5	1.6	7.0%
苗栗縣(3)	1	1	0	5.5	6.7%
台南縣(3)	19	7	12	5.9	5.7%
台東縣	7	7	0	0.7	5.1%
南投縣(2)	10	10	0	4.1	3.1%
高雄縣(6)	7	5	2	1.4	2.5%
新竹縣	13	13	0	7.3	1.9%
台南市	4	4	0	1.5	1.1%
台中縣(3)	1	0	1	1.0	0.7%
高雄市	5	5	0	0.6	0.0%
台中市	0	0	0	0.0	0.0%
總計59工業區	244	211	33	248.5	2.9%

4. Location factors on the transition of industrial district- analysis of idled industrial districts



- Highest ratio of idle area to sold/rental area
 - Pintong County (59.8%) , Hualien County (43.0)
- Largest idle area (unit: ha)
 - Chunhwa(64), Pintong(61), Taoyuan(37.7), Hwalien(32.5)
- Largest number of idled factory
 - Taoyuan(59), Hwalien(32), Taipei(26), Elane(22),
Chunhwa(19), Tainan(19)
- Least idled city
 - Taichung city, Koushun city, Taichung county, Taitung
county

Location factors on the transition of industrial districts



- Implement assessment on economic demand of industrial district and urban development plans
 - (1) Industrial districts with good location
 - What are the other demands for industrial, commercial, residential, or entertainment in nearby city (county) ?
 - Combining urban renewal with assessment of industrial district transition (e.g. designated industrial districts; industrial districts in urban plan area; scattering industrial districts/type D)
 - (2) Industrial districts with bad location
 - Consider the intention of land owner for transition/assess cross county land demand
- Encourage private sector with 5 hectares and more to apply individually changes of land usages.

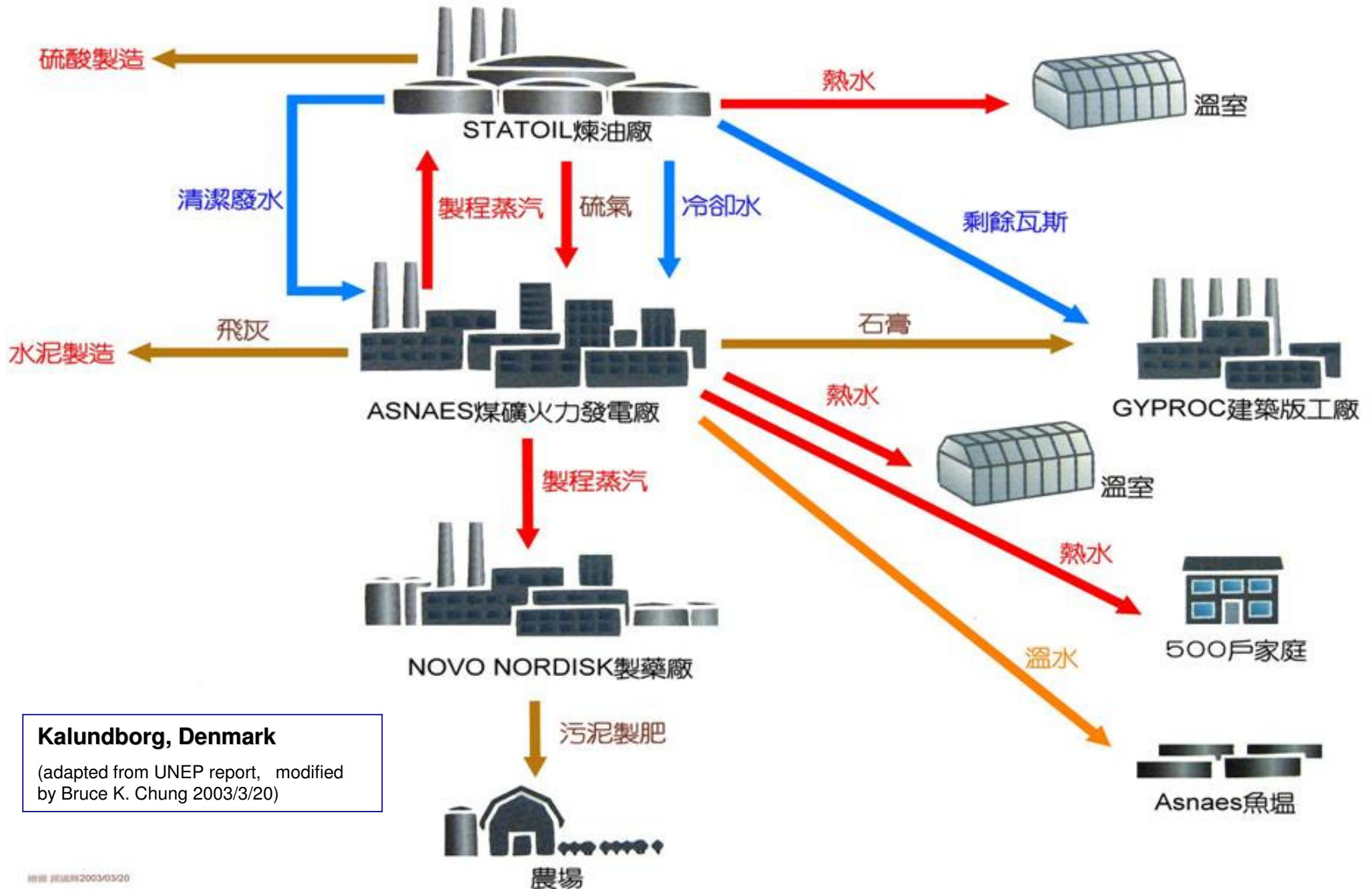
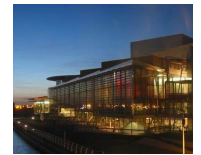
5. Mechanism of the Transformation of Industrial Districts to Eco-Industrial Parks



- Biomimicry (Bionics)- Application of methods and systems found in nature to the study and design of engineering and technology system.

Scale of Regeneration		Examples
Building	building reconstruction	<ul style="list-style-type: none"> ■ Combined with hypothesis of biomimicry and religion thoughts/ Metabolism by Kisho Kurokawa (黒川紀章)
Industry	industrial district vs. industrial district regeneration	<ul style="list-style-type: none"> ■ Eco-industrial park/development/industrial symbiosis ■ Paradigm : Kalundborg (Denmark)
City	urban regeneration	<ul style="list-style-type: none"> ■ Experimental proposal by urban design : metaphor of human body and medical healthcare ■ Bonsai City and urban regeneration

Prototype of Eco-Industrial Development (Kalundborg)



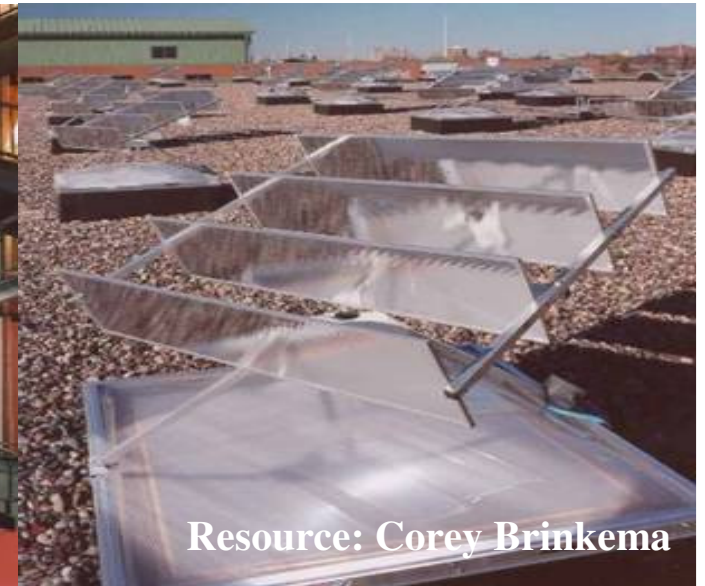
Kalundborg, Denmark

(adapted from UNEP report, modified by Bruce K. Chung 2003/3/20)

Industrial district regeneration in USA



- Promotion through the cooperation within stakeholders from global public and private sectors (e.g. “*Eco-Industrial Council*”)
- A Famous case awarded by the American Institute of Architects (AIA) on green building → A case of industrial district regeneration in nature (developed by E4 Partners)



Potential Transformation of Industrial Districts



(1) Green factory building

- Implement mechanism to convert factory buildings in industrial districts into green buildings
- Platform for environmental information and investment recruiting from various governing authorities

(2) Eco-Industrialized industrial Development / eco-industrial network plan

- Enhance the integration of existing EPA projects with the other public sectors' plans (*Industrial Development Bureau in particular*)
- Match existing projects with the concept of industrial district regeneration (*e.g. Review on planning system with environmental science and technology park (ESTP) / circular sustainable urban and rural development plan*)

(3) Integration of Taiwan's competitive advantage on manufacturing and image design capability

- Platform for cross-industry alliance
- Possibility to integrate with cultural creative industries.

Do these initial incentives enough ?



Three subsidy plans for ESTP

Subsidy	Content
Real Estate Subsidy	Up to 50 % of the leasing cost up until 2011
Production Subsidy	<ul style="list-style-type: none"> ■ Up to 10 % of the total capital investment, with a maximum of \$25 million NTD ■ As manufacturer's output more than 80 % of its production capacity, a maximum subsidy of \$5 million NTD until 2011
Research Subsidy	<ul style="list-style-type: none"> ■ Up to 50% of its research budget ■ Maximum amount for novel research is five millions NTD for lab-scale research and ten millions NTD for pilot-scale research

Six focus industries at ESTP

Item	Sectors
1	Industries related to cleaner production technology
2	Industries that recover waste resources
3	Industries that recover and convert resources into new products
4	Industries involved in emerging and strategic environmental technologies
5	Industries in production of equipment and system of renewable energy
6	Industries that deal with solutions for key aspects of environmental protection

Source : Global Views Magazine



End of presentation

Thanks for your attention



中華經濟研究院

Chung-Hua Institution for Economic Research