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Spatial Planning and High-tech Development

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‘To my grand parents, parents, and Dejung’

Contents (concise)

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Wei-Ju HUANG (Astor), Amsterdam, July 2013

Summary

High-tech development—which lies at the very heart of the processes of economic growth—has been recognised by many developed and developing countries as a strategic instrument to enhance and sustain their competitiveness in the global economic network. Although the concept of high-tech development differs between countries, many share the underlying assumption that the core of high-tech development is to create a sound environment where innovation thrives. This ideology implies a definite spatial dimension. As a result, various spatial strategies have been formulated and implemented to support high-tech development. This has had intentional and unintentional effects on the economy, society and space.

Numerous studies have been devoted to exploring, analysing and theorising this global phenomenon. However, there has been less attention given to the role spatial planning may play in the process of high-tech development and to the factors that shape the spatial planning approaches to high-tech development in a particular place. The major objectives of this research are to advance the knowledge of the role of spatial planning in the process of high-tech development, and to establish an analytical framework that helps reveal the major institutional factors that shape spatial planning mechanisms for dealing with the spatial issues of high-tech development in different places. This contributes to the field of high-tech spatial policies transfer and lesson-drawing.

In order to explore the major factors that shape the practices of spatial planning in high-tech development, a comparative approach is applied in this research. The Eindhoven city-region in the Netherlands and the Hsinchu city-region in Taiwan are selected as case study areas. Both city-regions can be recognised as success stories of high-tech development not only on a national scale but also on a global scale, despite the fact that they apply different approaches. In the Eindhoven city-region, the governments act as supporters and governors. High-tech development in the city-region is a result of close collaboration between different levels of government and other parties. In contrast, in the Hsinchu city-region the governments act as providers in high-tech development.

By critically reviewing relevant literature, the research begins with the identification of principal components of high-tech development and their spatial dimensions, and with the establishment of a set of comparative frameworks, which are built upon the concepts of institutionalism and previous comparative studies of spatial planning systems. On the basis of the frameworks, the comparative study is conducted. Four major conclusions are drawn in this research.

First, R&D capital, relational capital and human capital can be identified as the principal components of high-tech development, but the conception of the principal components

is not static. It may change through time and space, and be influenced by contemporary technological development and dominant discourses about high-tech development. Additionally, how governments in a particular place conceptualise the principal components will influence the content of their strategies for high-tech development.

Second, how governments in a particular place use their spatial planning system and tools to conduct, facilitate and/or coordinate the development of high-tech spaces is influenced by the socio-political context (e.g. model of society, administration system and conceptualisation of rights in land), conceptualisation of the principal components, dominant style of spatial planning, but also by their historical roots and contemporary technological capacities. At the city-regional level, the particular culture characteristics and historical experience of a city-region also have effects on the approach to spatial governance.

Third, it is common that governments recognise the necessity of collaborating with knowledge institutes and high-tech firms in the process of high-tech spatial development, because they have access to a wide range of know-how and crucial resources. The creation of new institutional arenas to invite institutes and firms to participate in the process of decision-making is a good strategy for governments, although they must assure that the decision-making process is transparent and accountable, and meets the principles of social justice.

Finally, the two cases have shown that a successful high-tech spatial development would have spatial effects on the surrounding areas, such as traffic congestion, imbalance between land supply and demand for housing and/or industrial land, and so on. It is necessary to anticipate and monitor continuously the externalities of the development from a more comprehensive perspective and to leave room for adjustment to the spatial planning and governance approaches.

The analytical framework built upon the institutional concepts of Ostrom and Scharpf worked well in this research, but in the process of conducting the empirical study I found that the framework of institutional analysis I established for the empirical study implied a temporarily fixed situation for analysis. Such a framework did create an easier situation for analysis, but proved difficult to use to investigate and explain the dynamic interrelationships between the changing institutional contexts and the decision making of high-tech spatial planning at a specific place and time.

While considering this limitation, I adopted a diachronic approach to complement the empirical study of part three, in order to understand the influences of prior institutional developments and specific episodes on later policy/decision making and action taking. In the future, if other studies consider applying the frameworks of this research, the effect of historical path dependency has to be taken into consideration.

Samenvatting

De ontwikkeling van high-tech vormt het hart van processen van economische groei. Die ontwikkeling wordt erkend als een strategisch instrument voor een sterke internationale concurrentiepositie in zowel ontwikkelde en ontwikkelingslanden. Hoewel het concept high-tech ontwikkeling verschillend wordt gedefinieerd, staat het creëren van een omgeving waarin innovatie tot bloei kan komen in veel landen centraal. Dit concept heeft ook impliceert een duidelijke ruimtelijke dimensie. Verschillende ruimtelijke strategieën zijn geformuleerd en in de praktijk gebracht, met zowel bedoelde als onbedoelde effecten op economie, maatschappij en ruimte.

Een groot aantal studies is gewijd aan het verkennen, analyseren en theoretiseren van dit wereldwijde verschijnsel. Maar minder aandacht is tot nu toe besteed aan de rol van ruimtelijke planning in het proces van high-tech ontwikkeling, alsmede aan de institutionele factoren die inhoud en proces van deze planning mede bepalen. De belangrijkste doelstellingen van dit onderzoek zijn bijdragen aan kennis van de rol van ruimtelijke planning in het proces van high-tech ontwikkeling, en het formuleren van een analytisch kader van institutionele factoren die de mechanismen van deze ruimtelijke planning in verschillende plaatsen vorm geven. Dit zal aan het overdracht en het lessen trekken aan het high-tech ruimtelijk beleid bij te dragen.

Om de belangrijkste factoren die de praktijk van ruimtelijke planning in high-tech ontwikkeling vorm geven te verkennen, is in dit onderzoek een vergelijkende benadering toegepast. Daartoe zijn case studies uitgevoerd in de regio's Eindhoven in Nederland en Hsinchu in Taiwan. Dit zijn twee stadsregio's die kunnen worden beschouwd als succesvolle voorbeelden van high-tech ontwikkeling, niet alleen op nationaal niveau maar ook op wereldschaal, ondanks verschillen in benadering. In de stadsregio Eindhoven fungeert de overheid als een ondersteuning en een bestuurder: high-tech ontwikkeling is daar dus het resultaat van nauwe samenwerking tussen de verschillende overheidsniveaus en andere partijen. In Hsinchu City heeft de overheid een veel sterkere rol in high-tech ontwikkeling als aanbieder van vrijwel alle inputs.

Het onderzoek start met het identificeren van de belangrijkste componenten van high-tech ontwikkeling en hun ruimtelijke dimensies op basis van een kritische evaluatie van relevante literatuur. Vervolgens is een reeks van vergelijkende kaders opgebouwd conform de concepten van institutionalisme en aan de hand van eerdere vergelijkende studies van ruimtelijke planningssystemen. Deze kaders vormen de basis van de vergelijkende studie. In dit onderzoek worden vier belangrijke conclusies getrokken.

Ten eerste kunnen R&D–, relationeel– en menselijk kapitaal worden geïdentificeerd als de belangrijkste componenten van high-tech ontwikkeling. Maar de conceptualisering van

deze componenten zijn niet statisch: zij kunnen veranderen in tijd en ruimte, en worden beïnvloed door technologische ontwikkeling en de dominante discoursen over high-tech ontwikkeling. Daarnaast zal de manier waarop de overheid in een bepaalde plaats die componenten conceptualiseert invloed hebben op de inhoud van haar strategieën voor high-tech ontwikkeling.

Ten tweede wordt de wijze waarop de overheid in een bepaalde plaats gebruik maakt van haar ruimtelijk planningsysteem en de middelen die zij inzet om high-tech ontwikkeling te realiseren, te vergemakkelijken of te ondersteunen beïnvloed door de sociaal-politieke context (bv. maatschappijmodel, bestuurlijk systeem en grondgebruiksrechten), door de conceptualisering van de belangrijkste componenten, door de dominante stijl van ruimtelijke planning, en niet in de laatste plaats ook door historische wortels en technologische capaciteit. Op stedelijk-regionaal niveau oefenen ook de specifieke cultuur en historische ervaringen effecten uit op de aanpak van ruimtelijke governance.

Ten derde is het gebruikelijk dat in het proces van high-tech ontwikkeling de overheid streeft naar samenwerking met kennisinstituten en high-tech bedrijven omdat die beschikken over een breed scala aan kennis en cruciale hulpbronnen. De creatie door de overheid van nieuwe institutionele arena's waarin die instituten en bedrijven deelnemen aan het proces van besluitvorming is een goede strategie, maar de besluitvorming moet transparant en verantwoordelijk zijn en aan de beginselen van sociale rechtvaardigheid voldoen.

Tenslotte tonen de twee bestudeerde casussen aan dat een succesvolle high-tech ontwikkeling ruimtelijke effecten heeft op omliggende gebieden, zoals verkeerscongestie, onevenwichtigheid tussen vraag en aanbod van grond voor woningen en bedrijventerreinen enz. Het is noodzakelijk om continu te anticiperen op externe effecten van high-tech ontwikkeling, te controleren vanuit een breed gezichtspunt en genoeg ruimte te laten voor aanpassing aan ruimtelijke planning en governance.

Het analytische kader dat is gebaseerd op de institutionele concepten van Ostrom en Scharpf heeft haar waarde bewezen in dit onderzoek. Maar tijdens de uitvoering van het empirisch onderzoek bleek die een tijdsdoorsnede te impliceren en problemen op te leveren voor onderzoek en verklaring van de dynamische relaties tussen veranderende institutionele situaties en besluitvorming van high-tech ruimtelijke planning op een bepaalde plaats en tijd. Om die beperking ongedaan te maken heb ik een complementaire diachrone benadering toegepast in het empirisch deel van het onderzoek. Met die benadering bleek de invloed van voorafgaande institutionele ontwikkelingen en bepaalde sociaal-economische en politieke episodes op later beleid en latere besluitvorming en interventies te begrijpen. Het is daarom aan te bevelen om in toekomstige studies waarin men gebruik wil maken van dezelfde kaders als in dit onderzoek rekening te houden met de effecten van path dependency.

Contents (extensive)

Acronyms and Abbreviations

AMvB Ruimte	Netherlands General Regulation on the Management of Spatial Planning
APICA	Science Park and Innovation Centre Association
BZW	Brabant-Zeeuwse Employers Association
CEPD	Taiwan Council for Economic Planning and Development
CPAMI	Taiwan Construction and Planning Agency, Ministry of Interior
CTSP	Central Taiwan Science Park
DPP	Democratic Progressive Party, the second largest political party in Taiwan
DAF	Van Doorne's Automobile Factory
DATAR	France Inter-ministerial Delegation for Territorial Planning and Regional Attractiveness
EFRO	European Regional Development Fund
EL&I	Netherlands Ministry of Economic Affairs, Agriculture and Innovation
EPZ	Export processing zone
EU	European Union
HSC	Hsinchu Science City
HSP	Hsinchu Science Park
HUDB	Taiwan Housing and Urban Development Bureau
IC	Integrated circuits
ICT	Information and communication technology
IOB	Dutch Interdepartmental Policy Research
IT	Information technology
ITRI	Taiwan Industrial Technology Research Institute
KMT	Kuomintang, the largest political party in Taiwan
KvK	Netherlands Chamber of Commerce
MEZ	Netherlands Ministry of Economic Affairs
MIRT	Netherlands Multi-year Plan for Infrastructure, Spatial Planning and Transport
MITI	Japan Ministry of International Trade and Industry
NCTU	National Chia Tung University in Taiwan
NTHU	National Tsing Hua University in Taiwan
NLG	Dutch guilder
NSC	Taiwan National Science Council
NV REDE	An economic development agency for the Eindhoven Region
OECD	Organisation for Economic Co-operation and Development
PBL	Netherlands Environmental Assessment Agency
PCC	Taiwan Public Construction Commission
R&D	Research and development
RDEC	Taiwan Research, Development and Evaluation Commission
SMEs	Small and medium-sizes enterprises

SPA	Taiwan Science Park Administration
SRE	Eindhoven City Region
STPs	Science and technology parks
STSP	South Taiwan Science Park
SVIR	Netherlands National Policy Strategy for Infrastructure and Spatial Planning
TKFP	Taiwan Knowledge-based Flagship Park
TNO	Netherlands Organisation for Applied Scientific Research
TPG	Taiwan provincial government
TSMI	Taiwan Semiconductor Manufacturing Corporation
TU/e	Eindhoven University of Technology
UMC	United Microelectronics Corporation
UNDP	United Nations Development Programme
UPC	Urban Planning Commission in Taiwan
URBACT	A European exchange and learning programme promoting sustainable urban development
VROM	Netherlands Ministry of Housing, Spatial Planning, and Environment Administration
WRO	Dutch Spatial Planning Act in 1962
Wro	Dutch Spatial Planning Act in 2008
WRR	Netherlands National Scientific Council for Government Policy
WTO	World Trade Organisation

PART 1 Introduction


PHILIPS

1 Introduction

§ 1.1 Emergence of High-tech Spatial Development

High-tech development has had strategic importance for economic policy for a long time, because it has been broadly accepted that technological change 'lies at the very heart of the processes of economic growth and development' and innovation is key to promoting technological change (Dicken 2003, 85). After the Second World War, when other countries struggled to rebuild their damaged economies, the USA continued its rise in economic performance by consolidating its science and high-tech industry to trigger economic growth (Coopey 2004). The economic success of the USA influenced other countries to consider the promotion of technology as a main strategy to reconstruct their economy and establish their technology policy according to their own conditions.

Advanced by government intervention and market-driven forces, since the 1970s information and communication technologies (ICTs) have been rapidly evolving and broadly applied to 'flexible integrated production and management systems', which support an internationally decentralised mode of production both functionally and spatially (Castells 1989, 12). Following the continuing evolution of ICTs and the dynamic process of decentralising production modes, an informational and global economy has emerged. In this new economic system, technological capacity is one of the main factors that determine the outcome of global competition—a capacity that 'refers to the appropriate articulation of science, technology, management, and production' (Castells 1989, 103).

Under such global conditions, since the 1970s both developed and developing countries have established technology policies to harness the potential of ICTs and other new technologies, aiming to enhance and sustain competitiveness in the global economic network. One commonly used strategy is to initiate and/or promote the development of high-tech spaces—such as technology parks, science parks, science cities, and technopolises—where technologically advanced industries and/or research and development (R&D) firms and institutes gather to trigger economic growth at the national, regional and/or local level. According to Science Park and Innovation Centre Association's (SPICA) Directory, by the end of 2010 there were more than 395 science and technology parks (STPs) and 1,664 business incubators in 102 countries. While these figures are provisional and do not claim to be exhaustive, they give an impression of the extension of this global phenomenon.

The concept and scale of high-tech spatial development varies according to time and place. Differences may result from the particular socio-economic, political and historical context of a place, but also from the way the initiators of a development understand and perceive the notion of high-tech development, which may be influenced by contemporary discourse and technological developments. For example, the French term 'technopole' combines two key ideas, technology and city (polis in Greek), so in their well-known book, *Technopoles of the World*, Castells and Hall (1994) chose technopole as a generic name for high-tech spaces. They define technopole as a planned place gathering technologically advanced, knowledge-intensive industries and R&D activities for the purpose of promoting technologically innovative, industry-related production. They further identify four types of technopoles, including new techno-industrial complexes, technology parks, science cities and the Technopolis programme in Japan.

However, they exclusively select cases from industrialised and newly industrialised countries, within a period leading up to the beginning of the 1990s. Some of the case areas arose without significant planning by government (e.g. Silicon Valley and Boston Highway 128 in the US, Cambridge in the UK, etc.), others were the outcome of more specific, deliberate political decisions (e.g. Taedok Science Towns in Korea, Tsukuba Science City in Japan, Hsinchu Science Park in Taiwan, etc.). Their definition of technopole does not include current high-tech spatial developments, which have received an additional impetus since the rise of ICTs and the advent of the Internet in the mid-1990s, such as the more recently established IT City and IT Corridor in India (Centre, van Westen, and Prasad 2008).

Moreover, in the past two decades many countries—including the countries where the cases are located—have been influenced by the doctrine of neoliberalism and/or huge financial burden, gradually changing the role of the public sector from a provider to an enabler, facilitator, or supporter. Ways of formulating and implementing technology policy and approaching high-tech spatial development have also been shifting from government to governance. For example, Etzkowitz and Leydesdorff (2000) proposed a triple helix model of innovation governance. In this model, government focuses on the development of hybrid organisations and trilateral networks that overlap and connect government, academia and industry in order to build a tight interrelation and collaboration among the three sectors and to encourage the creation of an innovative milieu. The Brainport Eindhoven development is a good example of the triple helix model, presenting a more collaborative way to conduct high-tech spatial planning and development.

The experience of developing countries and the changing role of the public sector in industrialised and newly industrialised countries must be considered, because these situations might offer alternative perspectives to understand the relationship between high-tech development and its effects on the organisation of space. On the basis of the previous studies, there is a pronounced need to reinvestigate high-tech spatial

development. In light of this, this research focuses on the changing role of government in high-tech spatial development. I understand high-tech spaces to be places that gather technologically advanced industries and/or R&D firms and institutes, that have been specifically selected by technology policies—in developed or developing countries—and implemented to enhance high-tech development and trigger economic growth at the national, and/or regional level. This includes government led initiatives without, or with different degrees of private sector involvement, private-led initiatives with different degrees of public sector support, or the result of partnerships between the public and private sector.

§ 1.2 Problem Statement

A large number of studies have explored relationships between technology policy, economy, society and space. Many of the studies focus on how to achieve economic success through technology policy and high-tech spatial development. Although the main focus differs across the studies, they share the same underlying assumption that knowledge and technological innovation not only contribute to economic growth, but also can be stimulated and induced by well-focused policy in combination with certain spatial mechanisms.

For example, Castells and Hall (1994) explored the development and success of global high-tech spaces in different parts of the world. Giarratana and Torrisi (2006) focused on the links between universities and industry in order to generate benefits for the economy. Carter (1989), Joseph (1989), Keeble (1989) and Annerstedt (2006) found that the development of technology-oriented complexes (TOC) contributes to growth of the local economy. Sternberg (1996b) evaluated several economic growth theories in relation to technology-based regional growth and proposed a theoretical approach to analyse the factors governing the genesis and development of high-tech regions in order to clarify the role of technology policy. Etzkowitz and Leydesdorff (2000) and Lagendijk and Boekema (2008) explored mechanisms to govern discursive relations among government, academia, and industry in forming territorial innovation systems.

Two issues have to be addressed in relation to the previous studies: neglect of the role of spatial planning and a questionable assumption of easy high-tech policy transfer. First, some studies have recognised that the development of high-tech industries 'has very definite spatial dimensions, with far reaching consequences for the future of cities and regions' (Castells 1989, 33), and examined how and to what extent high-tech spaces intentionally or unintentionally impact the surrounding areas. For example, Massey (2008) highlighted the 'enclave' character of certain high-tech spaces, which

are significantly problematic and may increase social polarisation and geographic inequalities. Lin (2000) also showed that if a high-tech spatial development succeeds, in the long term it might expand into surrounding areas because the agglomeration and spin-off effects of high-tech industries may raise the rent of industrial land and edge out traditional industries.

According to the agglomeration theory of new economic geography, if the development of a high-tech space succeeds, it will create a circle of causation leading to growing varieties of goods and workers/people and thus form agglomeration forces (Fujita 2008). At the same time, land demands to accommodate the various new activities will be triggered. This leads to competition over the limited supply of land and public investment among different sectors. Spatial planning, on the other hand, is argued to be a means of mediating the tensions and contradictions among sectoral policies (United Nations Economic Commission for Europe 2008) and to provide sound space and place qualities for economic and socio-cultural purposes (Healey 2010). Although the scope of spatial planning differs, in most countries the key function of contemporary spatial planning is managing spatial development and organisation in a particular place (Dühr, Colomb, and Nadin 2010; Healey 2006; Healey et al. 1997; United Nations Economic Commission for Europe 2008). In other words, spatial planning not only can play a role in coordinating other sectoral policies to provide sound space and place quality for high-tech development, but also may need to anticipate and mediate the spatial consequences and agglomeration effects of the high-tech development, because spatial planning must take into consideration other socio-cultural and environmental needs.

Second, there is a questionable assumption underlying some of the previous studies, which aimed to identify the successful elements of high-tech development. They often assume that 'there are ways of understanding the problem and finding solutions that work can be applied in different places and can be broadly expected to have the same effect.' (Booth 2011, 14) However, what works in one place may not necessarily work in another place. Policy transfer is difficult for a number of reasons, including a variety of local circumstances, a natural resistance to change, a lack of detailed knowledge and information of the so-called 'good practices' for application elsewhere (OECD 2001, 34; Stead 2012).

Local circumstances are characterised by certain institutional variables, such as cultural attributes, socio-economic conditions, technology capacity, administration system, policy style, spatial planning system, and other sectoral policies. This implies that 'success factors and good practices may vary between areas' (OECD 2001, 34). In order to avoid this questionable assumption, before lesson-drawing it is necessary to acknowledge the differences of institutional context between places and to recognise advantages and disadvantages of practices applied in particular circumstances. This helps to clarify how certain success factors are created in some places but not in others, and to learn from other cases in a more cautious, effective and comprehensive way.

§ 1.3 Research Aims and Questions

On the basis of the problems stated in the previous section, this research has two main aims. The first is to advance knowledge regarding the role of spatial planning in the development process of high-tech city-regions. The second is to provide an analytical framework that helps to reveal the major factors that shape high-tech oriented spatial planning practices of particular high-tech city-regions. This will contribute to the field of high-tech spatial policy transfer and lesson-drawing. According to the research aims, I formulate a set of research questions that guide the research process as follows:

1. What are the principal components of high-tech development? What are the spatial dimensions of the identified components?
2. What are the factors that shape the form and the means of spatial planning in a particular place?
3. How do governments conduct, facilitate and/or coordinate the provision of the spatial elements that can contribute to high-tech development in a particular place?
4. How do governments use the systems and tools of spatial planning and governance to mobilise resources and actors to deal with the spatial issues generated in the process of high-tech development?
5. What are the major institutional factors that shape how governments formulate and employ spatial planning and governance mechanisms to conduct, facilitate, and/or coordinate high-tech spatial developments in a particular place, and deal with the spatial issues generated in the development process?

The first two research questions lead to the establishment of the theoretical framework of this research. The third, fourth and fifth research questions guide the empirical study of the research.

§ 1.4 Methodological Approach

In the past two decades, there has been a growing concern in the research field of spatial planning and development about the issues of policy transfer and lesson-drawing from good practices. According to this thinking, spatial planning is considered to be a social construction and the characteristics of planning systems and practices are recognised to vary widely among nations. Even within a country, differences between regions and cities can be found, because the characteristics are rooted in and restricted to the wider socio-economic, political and cultural context (Sanyal 2005; Nadin and Stead 2008a; Knieling and Othengrafen 2009a; Booth 2011; Nadin 2012; Ernste 2012; Getimis 2012).

On the basis of this understanding, I employ two complementarily methodological approaches: comparative research and institutionalism. Comparative research can reveal implicit assumptions and other institutional factors, which shape the systems and practices of spatial planning in particular places but are often taken for granted or overlooked (Booth 2011; Nadin 2012; Nadin and Stead 2008a, 2012). On the other hand, institutionalism provides a sophisticated way of viewing the interrelationships between structure and decision-making. This helps to explore the institutional factors that have shaped the practice of planning. I discuss the values and challenges of comparative research and introduce key concepts of institutionalism in the following sections.

§ 1.4.1 Values and Challenges of Comparative Research

There is a growing interest in comparative research of spatial planning systems and cultures. The value of comparative research is manifold. It not only encourages systematic examination of the transferability of good practices and deepens understanding of the nature and operation of spatial planning, but also contributes to planning theory-building and to mutual understanding and learning between nations, regions and cities. High-tech spatial development is a 'global' phenomenon. The underlying logic and mechanisms of technology policy differ from country to country and high-tech spaces themselves show place-specific differentiation (Ramachandraiah, Westen, and Prasad 2008). It is reasonable to employ comparative analysis in this research to explore the factors that shape the means and practices of spatial planning when carrying out high-tech spatial development. However, there are three interrelated methodological challenges, namely the risk of misinterpretation, the validity of comparative research findings and the issue of cultural sensitivities.

First, the risk of misinterpretation may occur when conducting international comparative research. This refers to the fact that 'not all concepts are commonly understood across different cultures' (Nadin and Stead 2012, 4) The *EU Compendium of Spatial Planning Systems and Policies* (Commission of the European Communities 1997, 23–25) notes that many terms are used in the EU member states to describe particular activities that are closely related to the idea of spatial planning, such as *ruimtelijke ordening* in the Netherlands or *aménagement du territoire* in France, but each term represents a specific meaning in its own national context. It is inappropriate to suggest that the meanings are the same. 'Translations are often fraught with unacknowledged cultural associations and words that are ostensibly direct translations may carry quite different overlays of meaning.' (Booth 2011, 25) The *EU Compendium* proposes two useful ways to reduce the risk of misinterpretation. The first is to italicise 'home language terms' when they have specific meaning, and to explain the terms when they are first mentioned. The second

is to develop common categories for comparison. The terms used in the categories are supposed to be neutral.

Second, the validity of comparative research findings is another important issue. Nadin and Stead (2012, 3) remind that 'comparison requires some common scale of measurement but various characteristics of planning systems are difficult to compare directly.' In other words, it is necessary to study the particular phenomenon in its own context and setting. There are two useful approaches to learn from previous comparative studies towards overcoming this methodological issue, including the systematic classifications of planning systems applied in Davies et al. (1989), Newman and Thornley (1996) and Janin Rivolin (2008), and the use of 'ideal types' in the *EU Compendium* (Commission of the European Communities, 1997).

Both approaches are helpful to position and characterise particular planning systems, but the latter approach may provide more fruitful analytical findings, because it can not only be used to appraise each planning system individually but also to measure their trends and directions of change (Nadin and Stead 2012). However, although the four planning traditions proposed by the *EU Compendium* claim to be 'ideal types', it is not set out explicitly how the four traditions relate to the seven criteria they select, including the scope of the system, the extent and type of planning, the locus of power, the relative roles of public and private sectors, the legal framework, the maturity or completeness of the system, and the distance between expressed objectives and outcomes. Further, the typology was developed according to the knowledge of the 'old' EU Member States. Hence, it is not easily employed by other cross-national comparative studies, especially when the country being studied is not one of the 'old' EU member States.

The systems and objectives of spatial planning are not an independent phenomenon. Spatial Planning is culturally embedded and considers numerous variables, seemingly too many to explain easily (Booth 2011). It is common that researchers *selectively* choose variables to classify systems or create ideal types. Therefore, the main question is how to construct a methodological approach that can result in meaningful comparisons and avoid a bias, as Gullestrup (2009, 3 emphasis in original) argues '"reality" will always be perceived and understood through one's own culture…[and] constructed on the basis of one's own cultural background and experience'. The criteria and the principles of measurement, which are developed to classify planning systems or to create ideal types, have to not only correspond with the purpose of the research but also be underpinned by a theoretical stance. Both the research purpose and theoretical stance have to be explicitly explained in order to allow others to review.

Finally, on the basis of previous comparative studies, many reflections have been developed, mainly addressing aspects of historical evolution and planning cultures. They are grounded in the understanding that spatial planning systems and practices are embedded in a wider socio-economic, political, cultural and historical context. Most of the

criticism follows that the previous comparative studies focus too much on the description of formal institutions at one point in time and cannot characterise how spatial planning systems and tools actually operate in practice and how the systems and practices constantly evolve to respond to internal and external challenges (Knieling and Othengrafen 2009a; Booth 2011; Nadin 2012; Ernste 2012; Getimis 2012). The issue of planning cultures and their dynamics are thus being addressed in recent methodological discussions.

However, there is no widely accepted definition of planning culture. For example, while Sanyal (2005, 3) considers planning culture as 'the collective ethos and dominant attitude of professional planners in different nations toward the appropriate roles of the state, market forces, and civil society in urban, regional, and national development', Knieling and Othengrafen (2009b, xxiv) refer to planning cultures as 'the different planning systems and traditions, institutional arrangements of spatial development and the broader cultural context of spatial planning and development. It consists of more than planning instruments and procedures; it is the aggregate of the social, environmental, and historical grounding of urban and regional planning'. The former definition implies the influence of assumptions and values of planners on the systems and practices of planning in a particular place, but does not explicitly indicate the influence of the broader cultural context on the assumptions and values of planners.

The latter definition, on the other hand, includes not just the formal systems, real practices and traditions of spatial planning but also the broader cultural context where spatial planning is embedded and operates. Following this definition, Knieling and Othengrafen (2009c, 55–58) further propose a culturised-planning model to expose culture and its impact on spatial planning and development practices. The model consists of three analytical dimensions, including 'planning artifacts', 'planning environment' and 'societal environment'. Planning artifacts consist of the elements that can be easily observed and understood, such as visible planning products, structures and processes. Planning environment refers to the shared assumptions, values and cognitive frames that are taken for granted by planners. Societal environment describes the underlying unconscious, taken-for-granted beliefs, thoughts and feelings that affect planning.

However, the model proposed by Knieling and Othengrafen does not present a dynamic perspective on planning cultures nor does it offer analytical strategies to uncover the shared assumptions, values, beliefs, thoughts and feelings hidden in the planning environment and societal environment, although they do claim that the hidden assumptions and values 'have strong impact on the specific occurrence of cultural manifestations in planning models and practices.' (Knieling and Othengrafen 2009a, 58) In other words, they do provide rich theoretical reflections on the issue of planning cultures, but the model they propose is too abstract to operate directly. The value of comparative analysis—in revealing taken-for-granted factors and their impact on spatial planning practices in a particular territory—is not explicitly addressed in their research. In light of cultural sensitivity, the most essential methodological questions for this

research are: What are the major structural and cultural factors that shape specific spatial planning practices? How can the use of comparative analysis expose these factors systematically and result in learning from the comparisons? How can a generic analytical framework be established that is not tied to specific places? Moreover, many comparative studies do not make a clear distinction between the institutional variables influencing the spatial planning system and the spatial planning system itself, and between the spatial planning system (structure) and planning practices (decisions/actions). Such studies mix these elements when they conduct empirical research. This may be a reason why sometimes the analytical frameworks or classification/categorisation of the systems established in previous comparative studies are difficult to apply in other comparative research.

The major purpose of comparison in this research is to reveal implicit assumptions and institutional factors that shape the practices of high-tech spatial planning and development, and that are often taken for granted in their own context. This will increase mutual understanding and learning between different cases but also will contribute to theory-building with regard to high-tech spatial planning and development in different cultural contexts. Since the focus of this research is the practices of high-tech spatial planning and development, planning systems become one of the institutional factors that shape the practices. It is necessary to distinguish a planning system and its institutional variables from its practices. In order to overcome this issue in the process of analysis, an institutional approach may help to establish a more comprehensive and operational framework for comparative research.

§ 1.4.2 Concepts of Institutionalism

Institutionalism concerns the interrelationships between structure and decision-making/action-taking. It offers a sophisticated way for this research to explore the interrelationships among spatial planning systems, other institutional factors and high-tech spatial planning practices, while comparisons help to reveal the major institutional factors that shape planning practices.

The definition of 'institution' varies in different studies. Two meanings have been distinguished:

One refers to the broader norms and practices which frame the ways in which, for example, conflicts are dealt with, resources are allocated and, action are taken in the realm of public affairs. In other words, how things get done! The other refers to specific configurations of agencies and organisations which operate within the parameter of the above wider norms. (Sturzaker et al. 2009, 7)

In order to map the changing nature of the interrelations between structure and agency, it is necessary to distinguish institutions, actors and action arenas analytically. Hence, this research follows the definition proposed by Ostrom (Ostrom 2008, 822 emphasis in original) that '[t]he term "institution" is used to refer to many different types of entities including organizations as well as the rules, norms, and strategies used to structure patterns of interaction within and across organizations.' Specifically, the focus of the institutional analysis is on the patterns of interactions within and among institutions and action arenas, and how the decisions are made, but not the decisions *per se* (Healey 2007).

Another important concept of institutional analysis is that decisions that are made at one level are constrained by the institutions at that level and deeper levels. 'Changes in deeper-level rules usually are more difficult and more costly to accomplish, thus increasing the stability of mutual expectations among individuals interaction according to the deeper set of rules.' (Ostrom 2005, 58) For comparative analysis, this concept of multiple institutional layers is especially useful for enhancing mutual learning but also for systematically examining the transferability of good practices between places.

Based on the understanding, I recognise that the two concepts of institutionalism—the interrelationships between institutions and actors, and the multiple institutional layers—are very instrumental in establishing analytical frameworks for comparative research. I further explain the two theoretical concepts in the following sections.

A The interrelationships between institutions and actors

Ostrom (2005; 2008) suggests a general framework that helps to recognise the universal elements in the institutional analysis and the relations among these elements (see Figure 1). The first step in using this framework is to identify 'action arenas', which include an 'action situation' and the actors in that situation. This identification can help to analyse and explain the behaviour of the actors. She further addresses the importance of nested-levels of rules, which consist of physical and material conditions, attributes of community and rules-in-use. The attributes of physical and material worlds determine what actions are physically possible. This may also involve the availability of technology. The attributes of community refer to values that are shared within a community. The nested-levels of rules deeply influence the action agenda, because 'the rules of the game…structure the game itself' and the rules are embedded in the physical, social and cultural environment (Ostrom 2008, 831). Rules-in-use refer to 'shared understandings by participants about enforced perceptions concerning what actions (or outcomes) are *required, prohibited, or permitted*' (Ostrom 2005, 18, emphasis in original). The shared understandings are learned on the ground and may not exist in any written document as rules-in-form do.

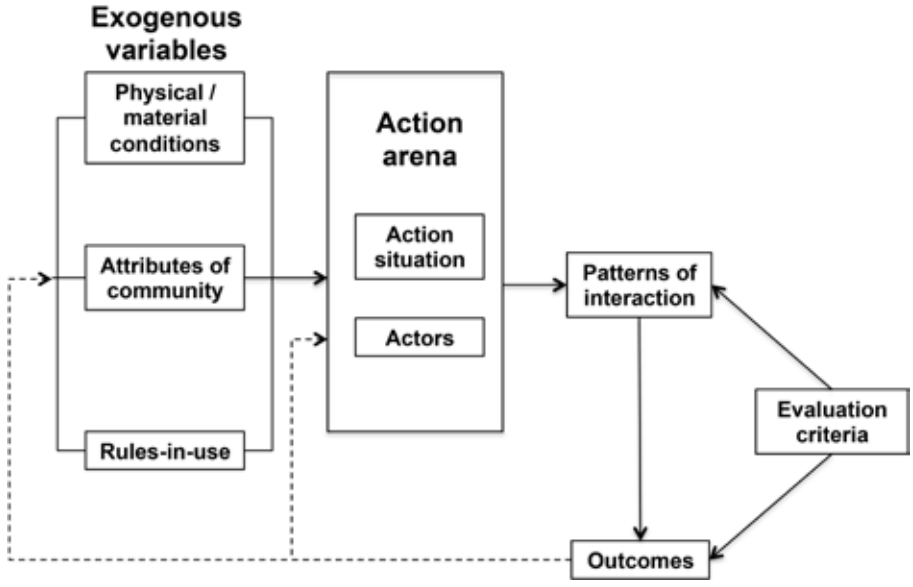

Figure 1
A general framework for institutional analysis (source: Ostrom 2008, 829)

As Timmermans (2001, 317) argues, 'a finite set of rule types allows institutions to be compared.' Ostrom (1986; 2005; 2008) divides the nested-levels of rules into seven types of interrelated rules. These are, scope rules, access rules, position rules, payoff rules, competence rules, information rules, and decision rules. Together they shape the patterns of interactions. As shown in Table 1, I summarise definitions of the seven types of rule. The classification of rules helps to link the nested-levels of rules to the action arenas in the analysis process, but the concept of rules-in-use rather than rule-in-form has to be pointed out at the same time..

Type of rule	Definition
Scope rules	Scope rules delimit the range of potential externalities created by the decision out-comes.
Access rules	Access rules affect the number of participants and their attributes.
Position rules	Position rules define the role an actor is supposed to play.
Payoff rules	Payoff rules prescribe the distribution of benefits and costs for actors while actions and outcomes are made.
Competence rules	Competence rules give participants jurisdictions and conditions for using resources within arenas.

Table 1
Actor-centred institutionalism (Source: Scharpf 1997, 44)

Type of rule	Definition
Decision rules	Decision rules influence the procedures for decision-making and the level of control for participants when they exercise the decision function at a particular node.
Information rules	Information rules authorise channels of communication among participants in positions.

Table 1
Actor-centred institutionalism (Source: Scharpf 1997, 44)

Different from the general framework proposed by Ostrom, which focuses more on how the institutions structure action situations, Scharpf (1997) proposes an alternative approach to explore how actors with their *orientations, capacities, actor constellations* and *modes of interaction* influence policy-making to cope with particular political issues, presenting an actor-centred institutionalism (see Figure 2). He recognises policy is 'intentional action by actors who are most interested in achieving specific outcomes.' (36) The term actor is used to describe an individual or an aggregate of individuals. In other words, in this approach policy-making is considered as an outcome of interactions among *intentional actors*—'Games real actors play'.

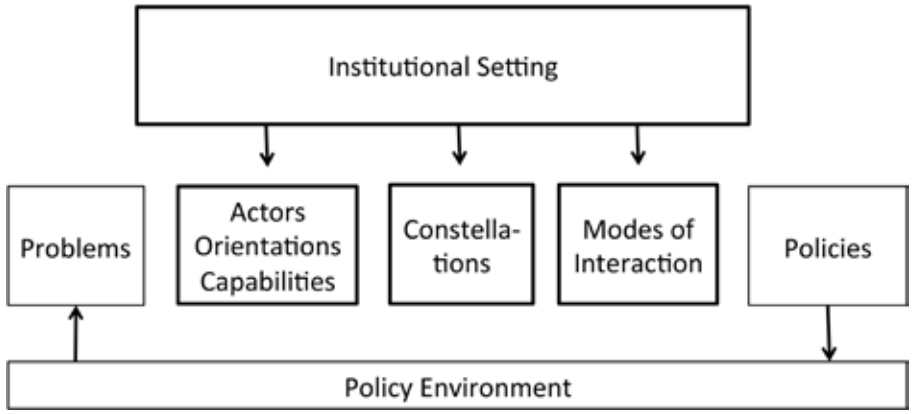

Figure 2
Actor-centred institutionalism (Source: Scharpf 1997, 44).

In order to link actor's action orientations to institutionally determined or empirically observable indicators, Scharpf (1997) disaggregates the notion of actor orientation into three major components: *unit of reference*, *cognitive orientations* and *preferences*. The most important unit of reference for empirical research is the *role of positions* that are associated with role-specific norms, expectations and identity. He argues that in most cases the normative expectations of a role are a more useful predictor of role-

related action than individual self-interest, because the willingness of individuals to assume such a role is assured through benefits of membership, position, and career opportunities that cannot be otherwise obtained. However, this does not mean that the role self-interest plays in affecting the preference of actors' choice can be ignored.

Regarding cognitive orientations, Scharpf (1997, 62) 'start[s] from the working hypothesis that actors' perceptions of directly observable facts will be empirically correct and that their hypotheses about what they cannot observe as well as about causal linkages will be shaped by theories prevailing at the particular time and in the particular institutional setting.' The specific combinations of knowledge, ignorance and theories tend to be shared among actors in institutionalised interactions. Collective learning plays an important role in the knowledge sharing process, which implies communication and public debate. Thus, the cognitive orientations of the specific actors can be obtained relatively easily for researchers from public documents, interviews, or participant observation.

Scharpf (1997) divides preferences into four simpler components—basic self-interest, normative role orientations, identity, and interaction orientations. 'Basic self-interest' describes the basic preference of actors for self-preservation, autonomy, and growth. In terms of corporate actors, their self-interest can be identified with the conditions of organisational survival, autonomy and growth, so the specific requirements associated with the self-interest of collective actors and corporate actors are relatively transparent to researchers. 'Normative role orientations' are shared expectations among participants based on antecedent conditions of particular actions or the purposes to be achieved. However, actors have the possibility to emphasise selectively certain aspects of interest, rules and normative purposes according to the specific 'identity' they define for themselves. If only individual or corporate actors have a clearly defined identity, the uncertainty of their preference can be reduced for other actors as well as for researchers.

In short, both analytical frameworks, respectively proposed by Ostrom and Scharpf, try to create a linkage between structure and actors, although their main focuses are very different. The former focuses more on the analysis of action arenas and on how the nested-levels of rules shape action situations and influence collective actions. Alternatively, the latter focuses more on the analysis of the interaction among intentional actors, which are structured by particular institutional settings. Indeed, these two frameworks do not conflict, but complement each other. Figure 3 illustrates the linkage between these two frameworks. Access rules determine the constellations of actors in the action arenas. Scope rules, competence rules, decision rules and information rules together structure the capacities of involved actors. Position rules and payoff rules affect action orientations of involved actors regarding their role of positions and action preference. Cognitive orientation is shaped by the theories prevailing at the particular time within a specific problem-field. In this research, the cognitive orientation especially relates to the theoretical concepts of high-tech development, which are discussed in the next chapter.

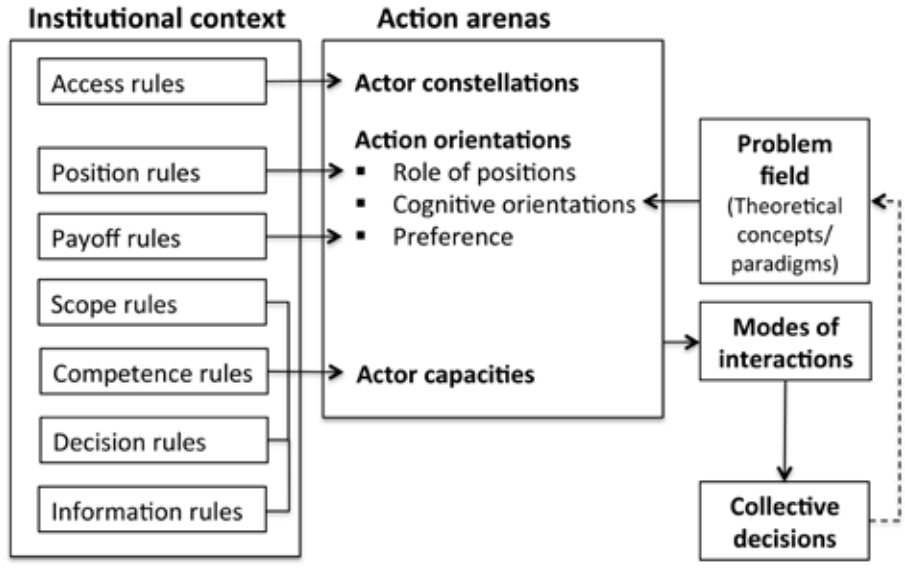

Figure 3
A combinative framework of action arenas.

B Multiple levels of analysis and institutional change

Ostrom's framework also addresses the concept of multiple levels of action situations and decisions, which has a twofold meaning. First, policy decisions that are made at a higher level need to be implemented by lower tier actions. Second, what can be done at one level is defined by the rules at that level and deeper levels. Ostrom (2008, 842) distinguishes four levels of rules, including operational, collective-choice, constitutional-choice, and meta constitutional levels of rules, which 'cumulatively affect the actions taken and outcomes obtained in any operational setting' (see Figure 4). On the other hand, Ostrom (2005, 58) explains that '[f]or most practical applications, three levels are enough.' According to her opinion, the point of identifying layers is to 'hit rock bottom—the biophysical world' (58), so there is no theoretical justification regarding how many levels should be identified in an institutional analysis. Despite a lack of theoretical justification, this structure does demonstrate the concept of multiple levels and provide an useful outline for multiple levels of analysis.

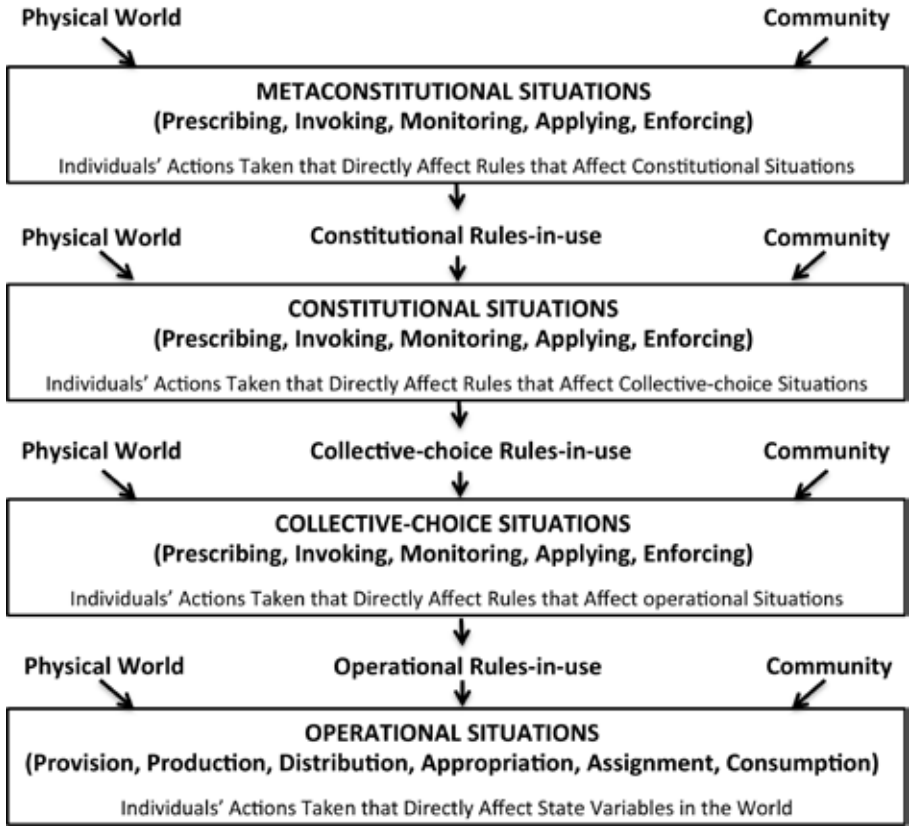

Figure 4
Levels of analysis and outcomes (Source: Based on Ostrom 2008, 843)

However, the analytical frameworks discussed above all assume a temporary fixed situation for analysis. This assumption can create an easier situation for analysis, but cannot help to explain dynamic interrelationships between structure and agency, an interactive process of social construction that should be emphasised. The dialectic of 'path dependency' and 'path shaping' may provide a way to explore the process of social construction. 'Path dependency implies that the prior development of an institution shapes current and future trajectories', while path shaping conveys an idea that 'social forces could intervene in current conjunctures and actively rearticulate them, so that new trajectories become possible.' (Jessop 2001, 1229) Both situations can be explained in a relational perspective.

§ 1.5 Research Design

In the following sub-sections, I explain the criteria of case selection and briefly introduce the two cases. Then, I explain the analytical approach and methods of this research.

§ 1.5.1 Case Selection

In the first year of this research I established a database, which consists of the information of 217 high-tech parks in the 25 most technology-advanced European and Asian countries. The data are mostly from the International Association of Science Park, World Alliance for Innovation, Science Park and Innovation Centre Association's Directory, and the national science park association in each country, such as Korean Technopark Association, Finnish Science Park Association (TEKEL), *Associazione Parchi Scientifici e Tecnologici Italiani* (APSTI), and so on. This database collects information regarding each high-tech park's major industries, activities, shareholders, planned area, year established, and number of employees and tenants. However, the database does not claim to be exhaustive, but offers a foundation for this research to choose cases for in-depth case studies.

Considering the research questions, there are four criteria that help in selecting the two case study areas. Firstly, the case study areas have been specifically selected by national/regional technology policies to trigger economic growth at the national and/or regional level. In other words, both cases are the outcome of very specific, deliberate political decisions. But according to the role of government, two modes of formulating and implementing the policy of high-tech spatial development can be recognised in the database. In the first mode, the government dominates the development of the high-tech space as a provider. In the second mode, the development of the high-tech space is a result of close collaboration between the government and other parties, such as universities. In the process, the government acts as a supporter and a governor rather than a provider. In light of this recognition, the two cases have to present respectively these two development modes. This helps to explore the relationships between the role of government in high-tech spatial development and its implications for the practices of spatial planning and the organisation of space.

Secondly, high-tech industrial clustering has formed in the two case study areas. The economies of the chosen areas both have to rely mainly on high-tech industries. This gives an easier approach to explore how government uses spatial planning and tools to promote and deal with the issues of high-tech development in the particular city-regions. Thirdly, the scale of the chosen areas in terms of population and physical size

has to be comparable. Finally, data accessibility plays a major role in the process of case selection.

Based on the database and the criteria, the Eindhoven city-region, the Netherlands and the Hsinchu city-region, Taiwan have been selected as the case study areas in this research (see Figure 5). The former case is well known since the end of the 2000s for its triple helix model in high-tech development, while the latter has been widely studied as one of the most successful examples of state–led high-tech spatial development. As shown in Table 2, both of them exhibit high levels of performance in the national high-tech economy and are characterised as the technology and innovation hot spots in their own country. Their specialised industries are similar and their scale in terms of population and physical size are comparable as well.

Figure 5
Hsinchu city-region and Eindhoven city-region (Source: Based on google map 2011).

Also of primary importance, I have relatively easy access to data about these two areas. This research is mainly conducted in the Netherlands and is related to the research on knowledge-based development carried out by A. M. Fernández-Maldonado in the Department of Urbanism, Faculty of Architecture, TU Delft. There are some connections between the university and the Brainport Eindhoven. On the other hand, I am originally from Taiwan and used to be involved in urban planning practice in the Hsinchu area. I remain well connected with the local governments and the Hsinchu science park administration. In the following sections, I briefly introduce the two cases.

City region	Hsinchu	Eindhoven
Area (km2)	578	1,370
Population in 2012	1,054,000	742,000
Output value (Million Euro) in 2004	27,148 (only within the Hsinchu Science Park; share in the GNP of Taiwan is 9.3 %)	21,199 (Share in the GNP of the Netherlands is 4.3%)
Specialised Industries	ICT, Electronics, and Life Tech industries	ICT, Mechatronics, Life Tech, and automotive industries
Local Political Entities	The Science Park Administration, Hsinchu city government and county government	Noord-Brabant Provincial Government, SRE, and 21 municipalities
City-region Strategic Plan	Hsinchu Science City Development Plan (1993)	Stimulus programme (1995), Horizon programme (2002), Brainport Eindhoven (2005)

Table 2

Information about Hsinchu region and Eindhoven region (Source: Based on 2009 HSP Annual Report; National Statistics of Taiwan (http://eng.stat.gov.tw/point.asp?index=1); Eindhoven Region 2008, Facts & Figures)

Eindhoven city-region

In 2004 the Dutch central government appointed the Eindhoven high-tech city-region as the national 'Brainport', the most innovative region in the Netherlands (Ministry of Economy Affairs 2004) (see Figure 6). In the city-region, government has a role, together with the private sector, in strengthening regional innovation. This was triggered by the crisis in the late 1980s and the early 1990s. At that time, the Eindhoven City Region (SRE), business, knowledge institutions and public authorities joined forces to recover from the economic downturn. The SRE is a regional organisation made up of the city of Eindhoven, the city of Helmond, and another 19 surrounding municipalities, which created a joint fund to strengthen the economic structure of the region and set up the Stimulus programme. This cooperation laid the foundation for the Brainport of today (SRE 2009).

Figure 6
Dutch national strategic planning and Eindhoven city-region (Source: based on Ministry of Economic Affairs 2004, 10; Brainport Foundation 2009, 32).

After two decades of efforts, the city-region has shifted from a manufacturing centre to an important innovation hot spot not only at the national scale but also at the European scale. According to *Eurostat Regional Yearbook 2011* (European Union 2011, 208), in Europe the Eindhoven city-region ranks highest in terms of patents per population, more than 2, 000 patents per million inhabitants.

Hsinchu city-region

The Hsinchu high-tech city-region was formed due to the development of Hsinchu Science Park (HSP), which has been in operation since 1980. In order to acquire the land and create a sound industrial environment for the HSP, the HSP Special District was planned and established under the supervision of the National Science Council. The major aim of the HSP development is to foster the development of high-tech industry in Taiwan. As shown in Figure 7, the Hsinchu city-region is not an administrative division but rather a functional city-region, which consists of Hsinchu city, one county-controlled city and six townships of Hsinchu county and two townships of Miaoli county.

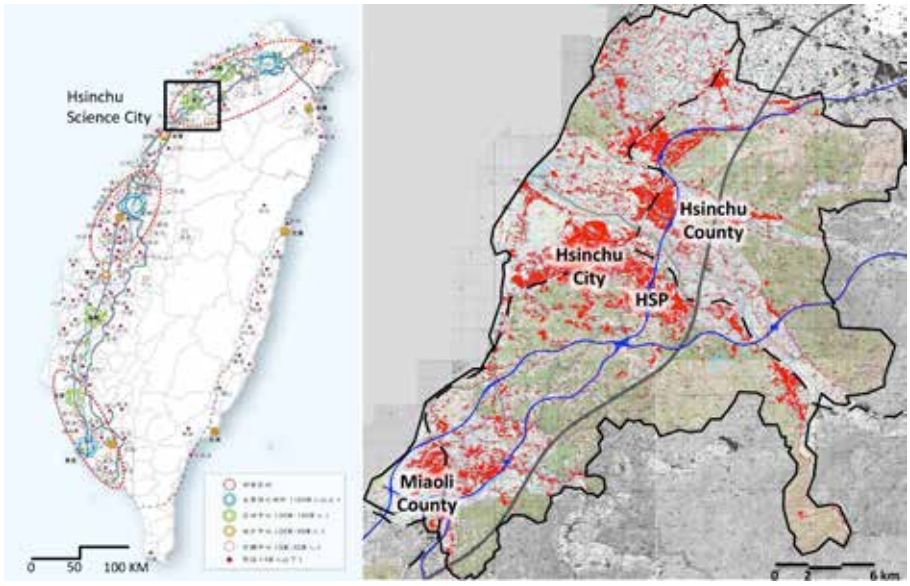

Figure 7
Taiwan national spatial planning and Hsinchu city-region (Source: based on CEPD 2010; SPA and TPC 1993).

The Science Park Administration (SPA) was funded by the central government under the supervision of the National Science Council as an independent authority to manage the park. The SPA even has a prevailing position in deciding the masterplan and detail plans of the HSP Special District, which is supposed to be under supervision of local governments. This has created huge tensions between the SPA, Hsinchu city government and Hsinchu county government, because the development of the HSP has serious environmental impacts on the surrounding area, but the earnings of the HSP go directly to the central government rather than the local governments (Chou 2007).

§ 1.5.2 Analytical Approach and Research Methods

There are two major concerns in this research—the role of spatial planning and the factors that shape the practice of spatial planning in the development process of a high-tech city-region. After the general introduction to the research problems and methodological approaches, I develop a theoretical framework of the research to understand the spatial dimension of high-tech policy and to recognise the variables at different institutional levels that may cumulatively affect the practice of spatial planning by reviewing literature in relation to economic geography, high-tech policy, innovation systems, regional study, science park development, and spatial planning and governance. This forms a theoretical base to guide the empirical study of this research (see Figure 8).

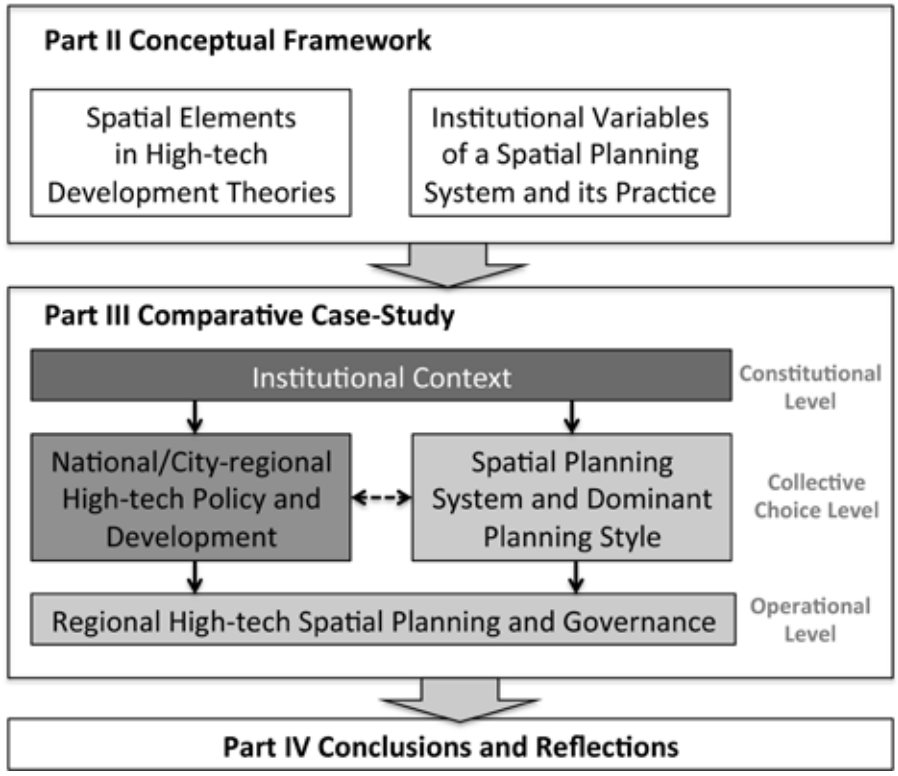

Figure 8
Research structure.

According to the institutional concept of multiple levels of analysis, I build a scheme to conduct comparative case study research. As shown in Figure 9, the scheme consists of four comparative analyses. I first explore and compare certain institutional variables in the two countries at the constitutional level as grounds for understanding what causes the significant differences between them regarding their spatial planning systems and dominant planning styles. Then, I review high-tech spatial policies in the Netherlands and Taiwan from 1980 to 2012 as a base to investigate and compare the high-tech spatial developments in 2012 in these two city-regions. In this part, I focus more on the major similarities and differences between their mechanisms to provide particular high-tech spatial elements that have been identified in the theoretical framework.

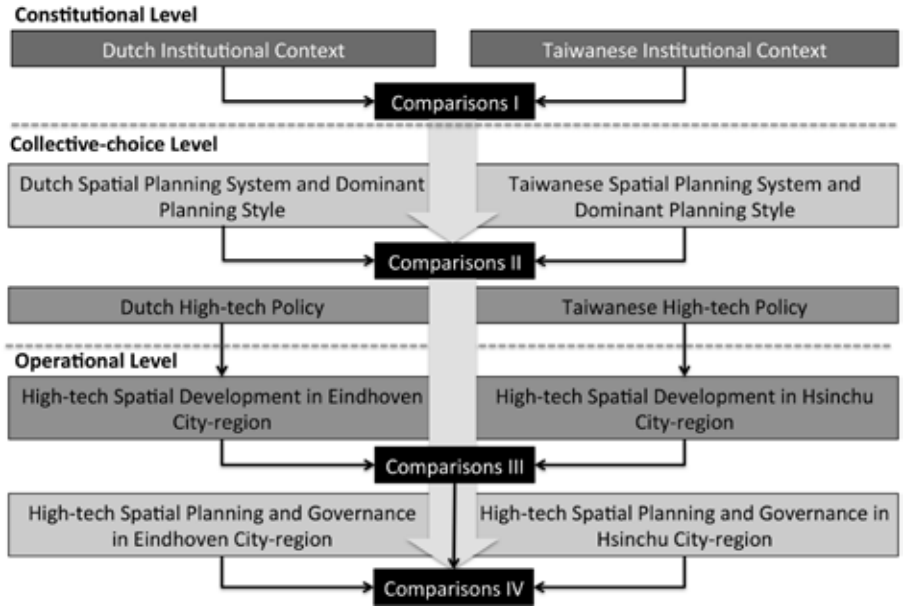

Figure 9
Scheme of comparative case study.

In the first three comparative analyses, I investigate the socio-political context, high-tech spatial planning policies and development in these two countries mainly through a desk study based on secondary data and internet searching, including relevant literature, reports, laws, regulations, official documents and statistics. The findings of the first three comparative analyses are helpful to explore the major institutional factors that have shaped the means and practices of spatial planning and governance for developing a high-tech city-region and led the planning practices of these two city-regions to have significant differences.

In the final part of the empirical study, I address the role of spatial planning and governance in the development process of the high-tech city-regions. Since the degree of spatial coherence and the quality of place are expected to be the fundamental concerns of spatial planning, the emphasis is put on whether and how the governments in the two city-regions use spatial planning and governance instruments to coordinate other sectoral policies to provide a sound environment for the purpose of high-tech development, to mediate the spatial impacts of high-tech development on surrounding areas, and/or to deal with complex spatial issues generated in the development process. In order to have better understanding of the spatial planning and governance practices in these two city-regions, I respectively select three and two high-tech oriented spatial planning projects in the Eindhoven and Hsinchu city-regions to conduct in-depth case studies to investigate whether, and how the governments use spatial planning instruments and govern the complex relationships among various stakeholders to achieve the goal of high-tech development in practice. Most of the projects I choose are in progress and thus few studies have been done in relation to the projects, so except reviewing a large number of official documents, articles in magazine and (on-line) newspapers and relevant literature, the in-depth case studies also rely on field observation and in-depth personal interviews with key persons in relation to the formulation and/or implementation of the selected planning projects (for the interviewee list please see the Appendix).

In order to avoid misinterpretation resulting from cultural differences, I have had discussions with Dutch peers (planners) during the research process and have asked interviewees to provide second opinions about my findings in relation to the first draft of the dissertation.

§ 1.6 Structure of the Dissertation

The thesis has eight chapters. In addition to the introduction, I organise the thesis in three parts. The second part of the thesis consists of chapter two and three. In chapter two, I first identify principal components of high-tech development. Together they underlie the core of high-tech development—innovation capacity. I then explore the *spatial dimension* of the identified components in order to make the connection between high-tech development and spatial planning more explicit. In chapter three, I recognise several institutional variables of spatial planning systems and practices that have been discussed in the previous comparative research of spatial planning systems. These two chapters together form the theoretical framework of the research to guide the following empirical study.

The third part has four chapters. In chapter four and five, I respectively review and compare the socio-political context and the spatial planning systems and dominant planning styles in the Netherlands and Taiwan mainly from 1970 to 2012. In chapter six, I first outline the high-tech spatial policy in the Netherlands and Taiwan and examine the provision of high-tech spatial elements in these two city-regions. Then, I investigate the major similarities and differences between the two cases regarding their means to conduct, facilitate, and coordinate the provision of high-tech spatial elements. The findings of the three chapters form a foundation for a comparative study of the spatial planning and governance means of high-tech development in the two city-regions. In chapter seven, I present the practices of high-tech oriented spatial planning and governance in these two city-regions. Through comparisons, I recognise their major similarities and differences. On the basis of the findings in chapter four, five and six, I examine the major institutional factors that cause the differences.

In the last part, chapter eight, I make a synthesis of the main findings and the conclusions of the entire research, and also reflect on the methodology and give recommendations for future research.

PART 2 Theoretical Framework


新家禧・水漾白

2 Principal Components of High-tech Development

In this chapter I develop a theoretical framework by reviewing literature that sheds light on regional high-tech development, including regional development, economic geography, high-tech policy, regional innovation systems and governance. Through the review, two themes are addressed: 1) the principal components of high-tech development, and 2) the spatial dimension of the identified components. The principal components, which constitute the core concept of high-tech development, assist in understanding the distinction between 'high' technology and middle/low technology development as well as the underlying ideas guiding policy-making for high-tech development. On the other hand, recognition of the spatial dimension of the identified components can help make the connection between high-tech development and spatial planning more explicit. The two themes together form a theoretical understanding of the 'spatial' in high-tech development and show the potential for spatial planning instruments to facilitate, induce and/or support high-tech development in a particular place.

§ 2.1 Conceptual Foundations of Regional High-tech Development

High-tech development has played a central role in regional development policy for decades. The emphasis on high-tech development is underpinned by understanding of the complex interrelationship between technological change, innovation, economic growth and *places*. As Dicken (2003, 85, 115; emphasis in the original) states technology is 'an *enabling* or *facilitating* agent…[that] makes possible new structures, new organizational and geographical arrangements of economic activities, new products and new processes…Technological change, then, lies at the very heart of the processes of economic growth and development…Innovation [is] the heart of technological change… Nevertheless, "conditions of knowledge accumulation are highly localized". Knowledge is *produced in specific places* and often used, and enhanced most intensively, in those same places.'

Two groups of theories have provided important insights into regional high-tech development: theories that stress diffusion of growth or innovation and theories that focus on the analytical concepts of a regional innovation system. Both groups of theories view space as a type of network, but are developed in isolation from each other. The first group of theories refers to growth pole/growth centre and hierarchical theories.

Both address the 'spatial filtering' or 'trickling down' effects, but the former 'focuses on the transmission of growth from center to hinterland within a region', while the latter assumes 'innovations are transmitted from larger to smaller metropolitan areas.' (Goldstein and Luger 1990, 66) Growth pole/growth centre theory states that 'the centers should offer the greatest agglomeration economies...[and] the investment would be targeted to those sectors (for example, microelectronics, biotechnology, or machine tools) with the greatest multiplier effects and competitive advantages in their region vis à vis the rest of the world.' (p.67) This statement has underpinned the development of science/technology parks for decades.

Despite the fact that since the 1980s growth pole/growth centre theory has been severely criticised for its lack of empirical evidence, ignorance of the influences of the institutional context and path dependence (Dawkins 2003), the discourse has had significant effects on the practice of regional high-tech development and its spatial mechanisms. For example, in the 1960s and 1970s the French national government played a leading role in the genesis of technopoles in order to reshape the imbalanced regional development (Halbert 2008). In the 1980s, the Japanese central government launched the Technopolis programme as an instrument of regional development and industrial decentralisation (Castells and Hall 1994). Since the 2000s, the Taiwanese government has changed their science park development policy from a single technopole strategy to a technopolis programme (Hsu 2010).

However, this group of theories cannot explain why some regions succeed while others fail to create growth poles/growth centres in their regions. This leads the field of regional development to a shift in focus towards the second group of theories, which address how valuable knowledge is generated by managing relationships between actors within a particular functional region, including industrial districts, cluster theory, innovative milieus and new regionalism. They reveal and explain some hidden operating rules and factors of a regional innovation system. The theory of industrial districts emphasises the presence of external economies, namely the 'industrial atmosphere', in shaping the development patterns of local production systems (Camagni, 1991). The term industrial atmosphere refers to 'factors that reduce transaction costs and stimulate (informal) networking (e.g. trust) as well as factors pointing to (informal) labour skills such as tacit knowledge' (Halbert 2008).

Cluster theory emphasises the importance and advantage of regional clusters in the new economics of territorial competition because 'a cluster allows each member to benefit as if it had greater scale or as if it had joined with others formally—without requiring it to sacrifice its flexibility' (Porter 1998, 80). In other words, spatial proximity could 'spread risks via increased access to other producers' (Storper 1997, 41) and facilitate mutual learning through easily making site visits and frequent face-to-face contact (Porter, 1998).

From a network perspective, GREMI group developed the concept of innovative milieu. The concept recognises that 'spatial proximity matters not really in terms of a reduction in physical "distance" and in the related transport costs, but rather in terms of easy information interchange, similarity of culture and psychological attitudes, frequency of interpersonal contacts and cooperation, and density of factors mobility within the limits of the local area.' (Camagni 1991, 2) Storper (1997), one of the leading proponents of new regionalism, addresses the role of regions as a fundamentally spatial unit of economic and social life linking to the global network. He uses the relational dynamics among 'technology—organisation—territory' to explain the formation of flexible specialisation in the global economy.

While theories about industrial districts, clusters and innovation milieus are centred on how collective actors in a particular place benefit from physical proximity, new regionalism tries to provide a comprehensive framework regarding economic geography and territorial development. Although each theory has its own analytical approach based on its focus, they all indicate that high-tech economic development has a very definite spatial dimension. However, no theory alone can explain the emergence or dynamics of a high-tech region because its development is influenced by a large number of partly interdependent factors (Sternberg 1996a; Komnonis 2002). But taken together, these theories have revealed several hidden rules and factors of high-tech development.

On the basis of the theories, a number of empirical studies have tried to explore a set of policy principles that can contribute to the emergence of high-tech regions in order to offer feasible suggestions to policy makers. For example, Sternberg (1996a) evaluates seven high-tech regions in France, Great Britain, Japan and the United States (See Table 3). He concludes that while there is no single determinant that constitutes a necessary or sufficient precondition, national technology policy (such as R&D expenditure) together with R&D infrastructures (such as science park and research institutes) act as the main impacting factors in the emergence of the seven high-tech regions.

Determinants	Silicon Valley (U.S.A.)	Research Triangle (U.S.A.)	Grenoble (F)	Western Crescent (U.K.)	Cambridgeshire (U.K.)	Munich (GER)	Kyushu (J)
Government policies (with explicit regional goals)	○	○		○	○	○	●●
Federal R & D expenditure (with implicit regional impact, e.g., contract research)	●●	●	●	●●	○	●●	○
Technology policy of the region (with explicit regional goals)	○	●	●●	○	○	●	●
Private demand for technology-intensive new products	○	○		○	○	○	○
Public demand for technology-intensive new products (especially military demand)	●●	○		●	○	●	○
Amenities (environment, culture, living conditions etc.)	●	○		●	●●	○	○
Research and educational infrastructure (and, therefore, availability of qualified labor)	●	●	●	○	●●	○	○
Innovation Centers, Science Parks	○	●●	●●	○	●	○	○
Availability of large enterprises and their attitude towards small and young technology-oriented firms, also intra-regional production networks	○	○		○	●●	●	●
Location of major inventions	○	○		○	○	○	○
Availability of venture capital	○	○		○	○	○	○
Role of key persons	●	●●	●	○	○	●	○
Decentralization processes in large agglomerations	○	●	●	●●	○	○	●●

●●The two most important factors, ● important factor, ○ less important or not relevant.

Table 3

An assessment of the genesis of seven high-tech regions (Source: Sternberg 1996a, 210).

Learning from the experience of Silicon Valley, Castells (1989) identifies three preconditions for the development of the innovative milieu that can be facilitated through technology policy. These are, 'raw material' of technology, a sufficiently large pool of mobile labour, and the accessibility of venture capital. He suggests that the first factor could be acquired from leading universities, public and private R&D institutes, and their networks. Later on, he works with Peter Hall to study technopole developments around the world and concludes that besides the three preconditions, the relationships between the state and the private sector in promoting R&D activities and the synergy of socio-economic networks are also the major factors that underpin the innovative milieu (Castells and Hall 1994).

As shown in Table 4, Komininos (2002) summarises six basic components of the innovation environment—including research and technological development, innovation finance, technology transfer, product development services, technology cooperation networks, and network infrastructures—and proposed 21 key organisations for a high-tech region. He argues that research results and scientific knowledge feed the cycle of innovation, but only with the support of the other five components can the 'raw material' be transformed into products. He further asserts that cooperation networks are the key elements in the construction of the innovation environment.

Field	Key organisation
In the field of R&D	– Universities – University labs – Public research centres – Private R&D centres – Patent offices
In the field of innovation finance	– Venture capital funds – Business angels – Regional incentives for technology based companies
In the field of technology transfer	– Science or technology parks – Business innovation centres – Technology networks – Industrial/university liaison offices – Technology brokers – Best practices clubs/associations
In the field of new product development	– Specialised consulting companies – Graphic design companies/centres – Marketing companies
In the field of business networks	– Industrial districts – Knowledge-intensive tertiary clusters – Suppliers' associations – Distribution networks

Table 4
Twenty-one key organisations for an 'innovating region' (Source: Komninos 2002, 154)

Nijkamp et al. (1994) introduces a pentagon model based on the study of high-tech regions. They claim that the model could help reproduce favourable conditions for the development of science parks, which they recognise as 'potentially powerful policy tools for regional development' (23). The model consists of five dimensions: hardware, software, orgware, finware and ecoware. The hardware includes good transport and communications systems and availability of land for further development. The software represents accessibility to skilled labour force, research institutes, and markets of users and supply. The orgware relates to supporting services and policies that favour entrepreneurship, such as support for technological spillovers and knowledge flows between enterprises and technology-based spinoffs and start-ups. The finware refers to the availability of seed capital and venture capital. The ecoware regards favourable living quality.

In short, all of the studies have a different focus and starting point, but their arguments are complementary rather than in conflict with one another. On the basis of the studies, I understand that *R&D capital*, *relational capital* and *human capital* play a vital role in innovation and recognise them as the principal components of high-tech development. Specifically, the high-tech development of a particular place refers to the development of these three components. They are interrelated and must be in place at the same time. In the following section, I outline theoretical discussions about the nature of the three types of capital and summarise a set of strategies that are expected to contribute to the three capitals, through literature review.

§ 2.2 The Nature of the Principal Components

§ 2.2.1 R&D Capital

R&D capital refers to the effectiveness of R&D activities in generating valuable knowledge for the development of new products or services. Castells and Hall (1994) argue that governments can contribute by encouraging R&D activities that are too large-scale, too high-risk, or both, to be justified in a normal commercial balance sheet. Mani (2002, 5), based on OECD statistics about government and business enterprise R&D expenditure, indicates that 'the relationship between government and business enterprise R&D is complementary, implying thereby that a reduction in the former will always be met with reductions in the latter.' There is a consensus that public interventions in R&D activities are necessary, because leaving R&D activities entirely to the private sector will quickly lead to underinvestment.

In addition to establishing physical infrastructures—such as universities, research centres, and patent offices—financial measurements are most commonly used in innovation policy to promote R&D activities. These include: 1) subsidising exchange of goods and services R&D personnel between the public and private sectors; 2) tax incentives for R&D; 3) direct funding through grants, soft loans, loan guarantees for R&D projects; 4) promotion of national R&D projects; 5) joint cooperative R&D projects between government and the private sector; 6) creation or improvement of specialised financial market mechanisms (e.g., venture capital); and 7) public procurement particularly in defence (Mani, 2002). However, a large amount of financial incentive for R&D activities does not guarantee a high value outcome. There is also a difficulty to quantify the outcome of R&D activities in advance.

These financial measurements are more or less based on a linear innovation model, which consists of a chain of successive, interrelated activities that 'begin with basic scientific research and pass through applied and more developmental research activities, the development of new product and process ideas, the evolution and testing of prototypes, to commercial production and finally to diffusion' (Massey, Quintas, and Wield 1992, 56). The linear innovation model ignores the role of socio-cultural structures and the interactions among local firms and institutes in technological development. This involves a social process of 'learning by doing' and 'learning by using'. In the process, tacit knowledge is produced. In other words, innovation is 'a complex process involving users, producers and various intermediary organisations learning from each other regarding demand and supply capabilities and exchanging both tacit and codified knowledge' (Cooke 2001, 33).

On the basis of this understanding, Chesbrough (2006) describes a desirable shift of innovation paradigm from a closed to an open model, which addresses the utilisation of not only internal but also external knowledge to create value and increase the effectiveness of R&D activities (see Figure 10). The model is labelled as an open innovation paradigm, because in this model there are many ways for ideas to flow into the innovation process as well as to flow out into markets through R&D outsourcing, licensing or spin-offs, so the boundaries between firms and other research organisations are becoming blurred. Not only does proximity of innovative firms and other research organisations remain important, but also the management services of internal and external knowledge flows start to play a key role (Spithoven 2009). The transformation from Philips High Tech Campus to High Tech Campus Eindhoven in the Netherlands is a good example of the shifting paradigm, as their brochure[1] claims that the shifts are not only from closed to open, but also 'from owning everything to focus on core competences, from just knowledge sharing to developing together'.

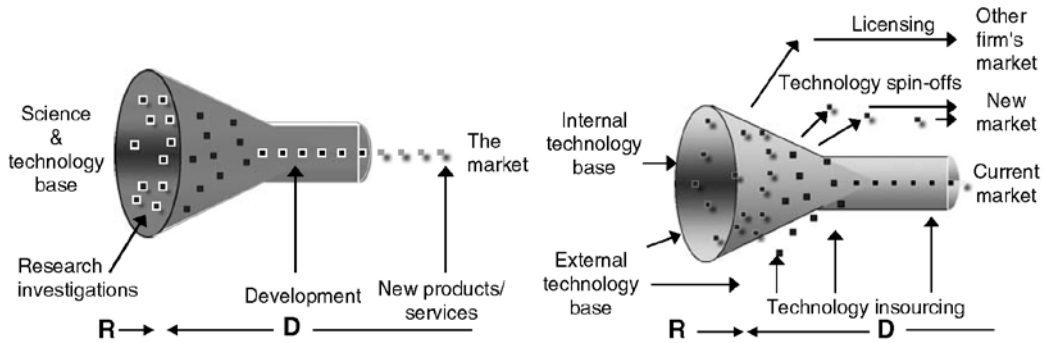

Figure 10
Closed (left figure) and open (right figure) innovation models (Source: Chesbrough 2006, 3).

The policy issue regarding R&D activities is no longer limited to combating private underinvestment in R&D. Instead, the role of the three groups of actors and their interrelationships has to be addressed in policy: knowledge infrastructures (including universities and R&D institutes), high-tech firms (including large firms and small and medium-sized enterprises) and professional associations. First, regarding the role of knowledge infrastructures, a growing number of universities initiate entrepreneurial

1 http://www.hightechcampus.com/viewfile.php/424 (Accessed in January 2012)

programmes as well as technology transfer centres or business parks to help university graduates and personnel, or people from business to start their own company, and to arrange meetings between the emerging entrepreneurs and representatives of larger firms and organisations, such as the University of Twente in the Netherlands (Hosper and van Tongeren 2008).

Nonetheless, Florida (2005, 146) argues that such initiatives may 'tend to distract the university from its core missions of conducting [basic] research and generating talent' and thus retard advances in basic science that underlie these technology intensive firms' long term futures; furthermore, '[t]he region surrounding the university may not even benefit if it does not have the required infrastructure and environment to keep these companies [and talents] in the area', or if the communities surrounding the university do not have the capacity to 'absorb and exploit the science, innovation, and technologies that the university generates' (150). This argument implies that it is impossible to rely on a single policy instrument or organisation to sustain or enhance local R&D capacity and to transform the R&D results into local economic wealth. To achieve this goal requires a mixed approach based on a relational perspective, the content of the approach has to depend on different territorial contexts and to take into account possible long term effects.

Second, some small countries, such as the Netherlands and Sweden, rely more on a limited number of large multinational firms for business R&D. Governments have recognised the risks associated with these large firms undertaking more of their R&D overseas, so it is necessary to generate new entrepreneurial opportunities for the development of local technology-based firms that can provide R&D services and help to sustain the country's R&D capacity (OECD 2005). However, this does not mean that the role of large firms in high-tech development is not important anymore, but rather their relationships with local small and medium-sized enterprises (SMEs) have to be addressed. In other words, the policy issue regarding the enhancement of R&D capital has to include the strategies to foster SMEs and new technology-based firms, which can provide technology/knowledge-based services for large firms, but also to promote collaboration between the large firms and the SMEs.

Finally, although some governments have launched certain initiatives such as federally funded Small Business Development Centres in the USA, a more effective way to help individuals to pursue entrepreneurial ventures may be to foster new technology-based firms by helping unions and professional associations to provide entrepreneurship training for their members, and to assist their members to identify new business opportunities, develop business plans, navigate capital access and intellectual property concerns (Markusen 2008). This strategy relates to the development of local support networks, which is discussed in the following section on relational capital.

§ 2.2.2 Relational Capital

Relational capital refers to the capacity to identify specific resources, alongside the know-how to gain access to and mobilise these resources based on not only a monetary nature but also relations, which are based on 'trust' and 'reciprocity' (Crevoisier 2004). It has been recognised that networks that are maintained by social relations provide transmission routes for specialised knowledge and market information exchange within a cluster (Kenney and Patton 2005). This addresses the issue of coordinating and networking among actors in the innovation process. Crevoisier (2004, p.7; emphasis in original) suggests that territorialised economic development 'is characterized by competition through *innovation*, not through production costs; an organization of the productive system based on *networks*, not on hierarchical or market mechanisms; and competition among *territories*, not among companies.'

Studies from this perspective, such as those regarding innovative milieu, learning region, and institutional thickness, have endeavoured to explore the constitution of relational capital and its relation to regional innovation capacity. Based on their findings, the capacity to mobilise relations has been considered as one of the critical factors in the innovation process. Therefore determining the preconditions and kinds of strategies that can be used to build relations and promote collective learning becomes an essential question for the development of a high-tech economy. Several strategies have been proposed. I summarise the strategies according to three aspects, including the development of relations and trust between actors, enhancement of local innovation networks and construction of external knowledge linkages.

First, Storper (1997) proposes two strategies for the public sector to build relations with high-tech firms—'talk' and 'confidence'. He recognises talk as the first step to build a relation, because it refers to communicative interactions that can help to achieve mutual understanding. Talk is a low-cost method, but gives the possibility to create depth in the interactions. This may lead to the development of a relation, which involves having confidence in what other actors will do and showing trust in them. He further argues that a relation based on special material incentives, which are provided by the public sector to private actors, is likely to work only as long as the incentives last, so it is necessary to apply other approaches at the same time, for example, public procurement, joint projects as well as other small, repeated, experimental interactions. However, he does not explain in detail how mutual understanding and confidence/trust can be achieved in practice.

According to the empirical study of collective learning and networking in the Cambridge area, Keeble et al. (1999) suggest that trust can be developed on the basis of culturally based rules of behaviour, innovation engagement and collaboration, as well as accepted but tacit codes of conduct between individuals and firms. Specifically, these preconditions

of developing trust are based on the construction of shared knowledge that is not only in the form of establishing a common technological and organisational language (Keeble et al. 1999), but also in the form of developing a collective identity, convention, and cultural asset (Benner 2003). Keeble et al. (1999, 322-323) further assert that local universities and large R&D consultancies in this respect are key sources of such culturally based rules of behaviour, because their new knowledge will spill over into and help shape 'the wider culture of the local research based business community, via university spin-off, research recruitment and direct research collaboration.' Such spillovers also relate to the movement of knowledge workers. In other words, knowledge workers are carriers of knowledge, norms and socio-economic relations, so their movements actually play a role in increasing the density of local innovation networks and in shaping the culture of the local innovation community.

Second, regarding local innovation networks, besides the networks among universities, research organisations and high-tech firms, appearances of entrepreneurial support networks, networks between big firms and SMEs and networks between upstream suppliers and downstream consumers in a value chain and are also considered as important elements in the innovation system of a high-tech region. For SMEs and start-ups, business services and technology transfer are even more important than R&D and direct cooperation with research organisations (Komninos 2002). Actors of the entrepreneurial support network include law firms, venture capitalists, executive search firms, investment banks, business consultants, accountants, professional associations and other local business services, which help the commercialisation of innovations and facilitate the development of new products and services.

Regarding the networks between big firms and SMEs and between upstream suppliers and downstream consumers, Tödtling et al. (2011, 1889) argue that innovation activities benefit from the presence of lead firms in a particular region, because they can afford to invest in R&D activities and if the lead firms can cooperate with small high-tech firms through outsourcing or licensing, 'the strengths of both can be used to exploit open innovation opportunities.' Further, 'interaction with regional suppliers and customers makes it possible to include knowledge from these partners early in the development process to speed up the learning curve.' (1889) They conclude that there is no uniform model that applies to all types of regions, but certain characteristics of regional culture do support the appearances and quality of the networks, such as cosmopolitanism, social tolerance, and openness to global interaction.

Further, it is important for policy makers and planners to recognise the correlation between clustering of different high-tech industries and emergence of their local support networks. Some studies suggest that networks have a strong geographical limitation because social relations maintain these networks, but Kenney and Patton (2005) argue that the clustering degree of a particular industry and its support networks differs according to its source of technology transfer and the characteristics of its production

system. Furthermore the concentration degree of actors in support networks is influenced by their service content and attributes of the interactions between high-tech firms and business services. For example, biotechnology industry reveals considerable clustering of firms and support networks, but its distribution is comparatively more dispersed than electronic-based industries, because biotechnology firms depend more on universities or research institutes rather than on suppliers and each other, which are more important for electronic-based firms.

Third, many studies claim that external sources of knowledge are essential for continuous success of a high-tech region, a way to help local organisations from becoming locked into non-competitive technological trajectories (Camagni 1991; Keeble and Wilkinson 1999; Keeble et al. 1999; Bathelt, Malmberg, and Maskell 2004). For example, Bathelt et al. (2004) propose a buzz-and-pipeline model to explain the structure and dynamics of local networks and their global linkages in terms of knowledge collaborations and information exchange, both of which contribute to innovation (see Figure 11). In their model, the quality of a cluster depends on the amount of related yet complementary and heterogeneous knowledge, skills and information that resides in the local networks. They further argue that it is beneficial for firms to have a well developed system of pipelines to connect the cluster to elsewhere, based on two reasons. First, '[n]ew and valuable knowledge will always be created in other parts of the world and firms who can build pipelines to such sites of global excellence gain competitive advantage. Second, it seems reasonable to assume that the information that one cluster firm can acquire through its pipelines will spill over to other firms in the cluster through local buzz.' (Bathelt et al. 2004, 46)

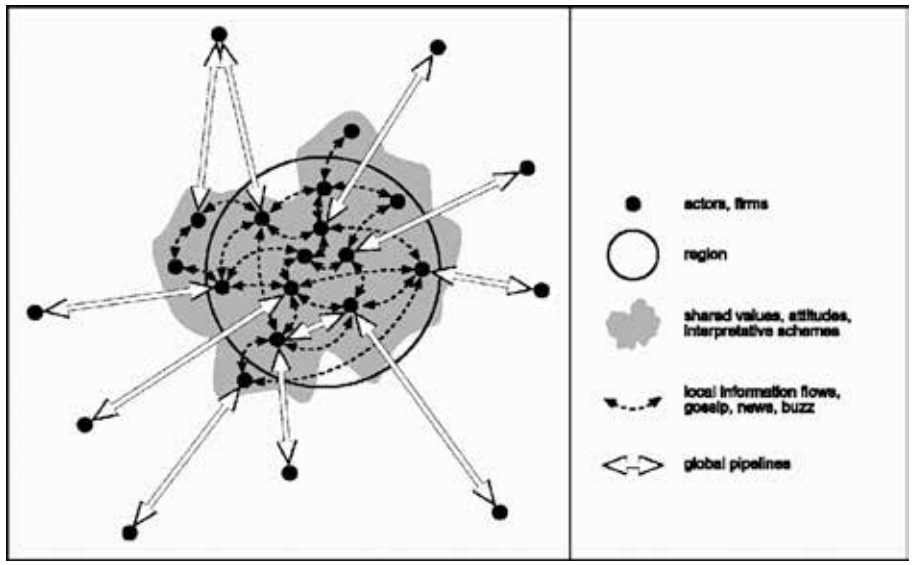

Figure 11
The buzz-and-pipeline model (Source: Bathelt et al. 2004, 46).

However, it requires substantial time, cost and effort for a firm to establish and maintain a global linkage, because it is more difficult to develop trust between organisations when they are located in different territories. The difficulties result from not only long distance, which reduces the chance of face-to-face contact, but also differences in cultural and institutional contexts, which lead to greater uncertainty and less understanding. Hence, policy makers and planners may need to consider how to stimulate and assist in the development of global pipelines through institutional and infrastructure support, such as promoting international research collaboration, holding international conferences, developing local identity and reputation, providing a well-established internet network infrastructure, and so on.

§ 2.2.3 Human Capital

It has been broadly accepted that cities and regions with higher educated residents grow faster than comparable cities and regions with less human capital, although there is no consensus on the causes and effects of the correlation between high human capital and urban/regional growth (Glaeser and Saiz 2003). Two concepts underlie human capital models of regional development: people follow jobs, and jobs follow people, a complex chicken-and-egg relationship (Storper 2010). The former concept emphasises building a business climate that can attract firms to locate in the area and thus create a thick

labour market that can not only provide many high paying, challenging employment options (Florida 2005), but also secure a new post following layoff for talented people (Storper 2010).

The latter concept, on the other hand, focuses on developing a creative environment that can supply and retain top-notch talent, both 'home grown' and imported (Markusen 2008), because the location of labour skills and education is recognised as one of the essential factors that draw high-tech and knowledge-intensive firms (Anderstig and Lundgren 1994; Florida 2005). Although their starting points are different, they both recognise the contribution of the clustering of talented people or human capital to the productivity of a city or a region, especially in the emerging knowledge economy. This shows a complex chicken-and-egg relationship between talented people and high-tech firms.

Regarding the supply of knowledge workers, a group of scholars recognise well-functioning education and training institutions as an essential element. Florida (2005, 151) considers a university to be a talent magnet 'that attracts eminent scientists and engineers, who then attract energetic graduate and undergraduate students, who create spin-off companies, all of which encourages companies to locate nearby.' Anderstig and Lundgren (1994), on the other hand, indicate that the quality of the basic school system has a significant effect on the transition probability to university education. Markusen (2008) addresses the role of occupational organisations—including professional associations, trade unions, industry advisory groups, and other education and training organisations—in securing and enhancing the pool of regional talent, but policy makers and planners need to make sure their initiatives are systematically connected to the demand side of the labour market. This connection can also help to recruit regional graduates before they leave for a better situation elsewhere as well as to ensure the graduates remain current. Her consideration implies another important policy issue, how to attract and retain knowledge workers.

Castells and Hall (1994, 26) argue that 'quality of life is a highly subjective attribute, and many areas in the world are of startling beauty without having much chance to become technological or industrial centers.' Storper (2010, 2034) also claims that '[s] killed people appear in most cases to precede the creation of amenities'. But both in theory and practice, there is a growing focus on amenities, entertainment, and lifestyle considerations in attracting and retaining knowledge intensive firms and people, for example, Gottliep (1994; 1995), Florida (2002; 2005), Yigitcanlar et al. (2007), Baum et al. (2007). They argue that since knowledge workers have high mobility and many job options, to attract and retain them, a high 'quality of place'—consisting of infrastructural facilities, amenities, lifestyle, professional networks, urban diversity, tolerance, and territorial identity—must be in place (Florida 2005). Such an argument has had influential effects on contemporary high-tech policy making and spatial planning practices.

§ 2.2.4 Remark

On the basis of previous discussions, three sectors can be identified as key players in a territorial innovation system: government, industry and academic institutes. The roles that governments, lead firms, and academic institutes play 'are essentially strategic in that they shape the discursive and material settings for localized forms of economic development' (Lagendijk and Boekema 2008, 933). This has profound implications for the governance activities of spatial planning, since governments may need to mobilise powerful high-tech players and their resources to induce and/or support high-tech spatial development and to deal with the spatial issues generated in the high-tech spatial planning and development processes. This identification can also assist in analysing and explaining the behaviour of the key players in the process of high-tech spatial policy/plan/strategy-making.

As shown in Figure 12, the role of industry and academic institutes is twofold. They form the basis of both R&D capital and human capital in a high-tech region. Universities and research institutes are knowledge generators as well as talent magnets in a regional innovation system. Industry consists of large, medium and small high-tech firms and their support networks that provide services to the high-tech firms and help the commercialisation of innovation. Their constant interactions and collaboration may generate new knowledge and facilitate the development of new products and services. Besides, high paying, challenging occupational opportunities provided by the high-tech firms also contribute to the enhancement of human capital.

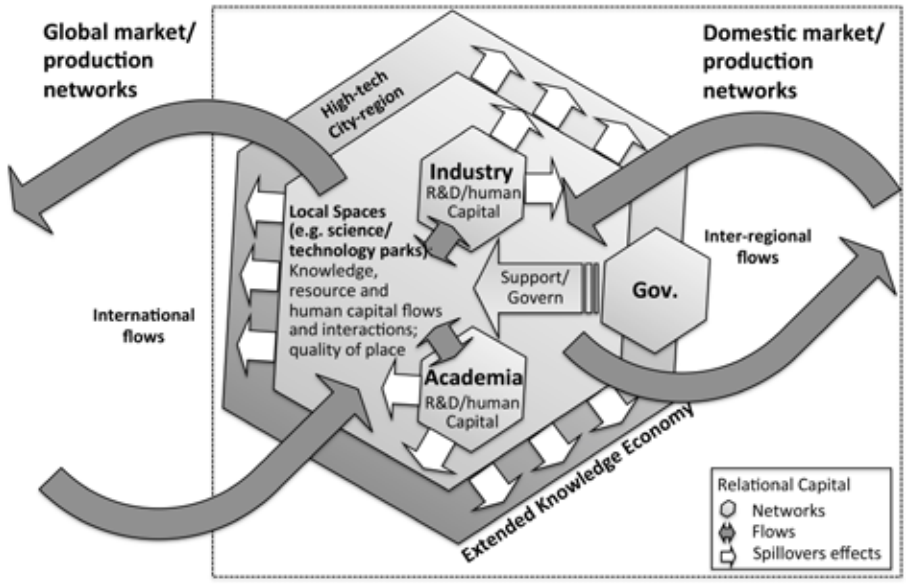

Figure 12
Interrelationships between the key players.

Regarding relational capital, these two groups of actors can be recognised as knowledge generators and knowledge exploiters—the interactions of which can be mutually fertile (OECD 2005; Benneworth and Hospers 2007). The dynamics of local networks between the two sectors and their external knowledge linkages can help to generate valuable knowledge and prevent a lock-in situation in the high-tech city-region.

Government, on the other hand, is considered as the key supporter and governor who can provide and/or strengthen the principal components of high-tech development in a particular innovation system. In the previous sections, I discussed a set of strategies that are expected to contribute to the three principal components of high-tech development. I summarise the strategies in Table 5. Most of the strategies are comprehensive and have to be implemented through collaboration between the three sectors, because the strategies need certain resources that may be held by the high-tech firms and/or knowledge institutes rather than the government, such as generation of valuable knowledge, information about new trends in technology and the market, access to international markets, production and knowledge networks and to the talented labour pool.

Principal components	Strategies
R&D Capital	– Financial resources (e.g. incentives, funding, venture capital and public procurement) – Entrepreneurial climate (Knowledge transfer/spillovers, spin-offs from universities, R&D institutes and lead firms) – Other
Relational Capital	– Collaboration networks among knowledge infrastructures and high-tech firms – Local support networks (including the networks between big firms and SMEs as well as upstream suppliers and downstream customers) – External knowledge linkages – Professional networks – Other
Human Capital	– A sufficiently large pool of mobile labour and high paying, challenging occupational opportunities – Well-functioning education and training systems – Quality of place (e.g. quality of life, urban diversity, tolerance, and territorial identity) – Other

Table 5
Strategies to enhance the principal components

For example, external sources of knowledge are essential for a high-tech region to avoid becoming locked in to a non-competitive technological trajectory. To stimulate and assist in the development of global pipelines, governments rely on not only a well-established international transport system and ICT infrastructures in the region, but also a set of strategies to promote international research collaboration and knowledge sharing as well as the development of regional identity and reputation, such as holding international conferences and other events, providing international collaboration research funding, and so on. However, a large amount of public investment and research funding does not guarantee a high value outcome. The government is expected to provide a 'sound' environment, both physical and non-physical, that can stimulate and support the collaboration, but universities, R&D institutes and/or high-tech firms are the crucial actors—the ones conducting the collaboration. Their capacities and behaviours decisively affect the quality of the collaboration in terms of building social relationships and generating, exchanging, sharing and gaining knowledge. Policy makers and planners should be aware of the role that high-tech firms and academic institutes can play and should play. The two groups of actors may potentially bring necessary resources to assist in the high-tech spatial development, but also be powerful actors determining the effectiveness of a high-tech spatial policy/plan/strategy.

§ 2.3 Spatial Dimension of the Principal Components

In the last section I discussed the nature of the three principal components—R&D capital, relational capital and human capital—for high-tech development and summarised a set of strategies and elements that can provide and/or strengthen the principal components. Since high-tech development has a definite spatial dimension, some of the strategies do have implications for spatial planning and development. In this section, I try to make the implications more explicit by identifying the spatial mechanisms that are considered to be useful for the development of the three principal components.

§ 2.3.1 R&D Capital: Role of Universities and Innovation Centres

One of the most important components of an innovation system is R&D capital, which refers to the 'raw material' of innovation generation. Universities, R&D institutes, R&D in large high-tech firms, innovative SMEs and their networks are considered the essential units of R&D activities. However, for governments there is always the risk that large-firms with high mobility can undertake more of their R&D overseas (OECD 2005). Namely, 'rationalising and restructuring large firms may function as resource-removers' in a regional innovation system (Benneworth and Hospers 2007, 113). Therefore, the emphasis of R&D capital accumulation more recently is being placed on local universities, R&D institutes, and innovative SMEs. Addressing the presence of universities and R&D institutes and promoting the development of innovative SMEs are thus considered as stepping-stones to creating an innovative milieu.

A Presence of universities and R&D institutes

Among discourses on innovation there has been consensus for decades that the presence of universities and R&D institutes are crucial for knowledge generation in innovation systems, essential for economic growth in the knowledge economy. The locations of leading universities and R&D institutes often play a strategic role for governments to conduct high-tech oriented development. Sometimes national governments may relocate leading universities or R&D institutes to less favoured regions or develop new universities or R&D institutes in those regions in order to raise the local technology level, trigger new high-tech industrial clustering, and thus achieve balanced regional development. For example, in the 1960s and 1970s the French government relocated some higher education institutes and research centres outside of the Paris metropolitan region to Southern France to balance regional development (Halbert 2008). In its 2004 Pre-Budget Report the UK Finance Ministry announced a promotion of Science Cities for

the North, starting with Manchester, Newcastle and York. Strategies for the promotion included physical developments of large research organisations, such as new universities (Benneworth and Hospers 2007).

However, the presence of universities or R&D institutes is not a panacea for all regional economic issues, because each region faces different innovation barriers requiring different combinations of strategies. For example, as shown in Table 6, Benneworth and Hospers (2007) summarise an OECD report, *The Response of Higher Education Institutions to Regional Needs* (1999), stating that when universities try to engage in regional innovation governance several research barriers may be present that vary depending on the institutional, regional, and national context. Moreover, the creation of an innovative milieu, which can effectively turn knowledge into products, relies on well-functioning coordinated networks among actors—including knowledge producers, knowledge users and appliers, knowledge regulators, knowledge funders (Cooke 2005)—rather than on local universities or R&D institutes alone.

Background Conditions	Research Barriers
On the scale of institution: University weakly focused on regional engagement at institutional level	– A lack of strong linkages between the senior management team and research centres to develop proposals for strategic research activities that underwrite and drive through greater regional engagement. – No inclusion of regional engagement as a criterion for promotion, undermining academic interest.
Regarding regional structure: Weak regional demand for universities' outputs	– Regions lack a strong base of local research users, such as a strong base of research-intensive multi-national businesses. – A lack of regional provision of studentships at the graduate level to allow high-level technology transfer between universities and regional businesses through 'knowledge on legs'.
Regarding regional institutions: Poor regional governance and partnership systems	– A lack of regional stakeholders to work constructively with universities in developing new courses. – A lack of regional science policy able to develop new research capacity and invest in latent research strengths with potential regional advantages. – A lack of awareness within the universities of the importance of regional networks because of an institutional emphasis of developing international research networks.
National/external barriers and threats to engagement	– Nationally focused research agendas overlook the distinctive needs of regions. – The selective nature of research funding concentrates resources in regions fulfilling national criteria. – A lack of sensitivity of research funders and sponsors to research, which meets regional needs. – A peer review system, which denigrates and undermines the quality of proposals, which support greater regional development activity.

Table 6
Research barriers to universities' regional engagement (based on Benneworth and Hospers 2007, 119-120)

B Development of innovation centres

As discussed in the previous section, fostering small and medium-sized enterprises (SMEs) and new technology-based firms is one of the major strategies considered to be useful for the enhancement of R&D capital in a particular place. A broadly adopted mechanism is to encourage universities or R&D institutes to establish an innovation centre on their property, on account of two reasons. First, compared to other types of high-tech industrial facilities, the size of innovation centres is considerably smaller, because they focus on start-ups, which usually employ less than five people. Therefore, 'most of the centres are based on a simple idea: an existing building is altered to make room for between 10 and 30 small businesses' (Allesch 1986, 59). For a university or R&D institute, there is a high chance that they have the capacity to accommodate such initiatives, sharing their technological facilities—such as clean rooms and laboratories—with the start-ups. Second, it is also a way to promote spin-offs and technology transfer from the university or R&D institute, and help to construct regional networks between the research organisation and industry.

Some policy makers recognise SMEs as an innovative motor for the local economy (Allesch 1986), so sometimes the establishment of innovative centres has spatial preference for less favoured regions in order to achieve a more balanced regional technology development. For example, from 1991 to 1995 around 43 technology centres in eastern Germany benefitted from federal funding in order to create new jobs. The German case shows that the technology centres 'do not play a particularly significant role' in economic development in terms of their contributions to local job creation, however the indirect effects are unknown (Sternberg 2004, 462).

On the other hand, the Business Technology Centre established by the University of Twente in the Netherlands is recognised as a successful case to foster university spin-offs and promote a mutually reinforcing network of regional knowledge-intensive activities, which not only broadens the scope of the existing regional networks but also increases the innovation resources available to others (Hospers and van Tonferen 2008). The two cases indicate that the major function of an innovation centre may not be to create new jobs, but rather to play a role in promoting technology transfer, spillovers and spin-offs from local research organisations, and to enhance regional innovation networks. This may not fit the job creation demand of the less favoured regions, but can be one of the supplementary policy tools to support regional R&D activities and networking.

C Remarks

The presence of universities and/or R&D institutes and the development of innovation centres are considered as useful spatial strategies that can enhance regional R&D capital. However, the performance of these knowledge infrastructures is not always

as good as expected, because each region faces different innovation issues requiring different combinations of strategies. Nonetheless, it is also an undeniable fact that some universities, R&D institutes and innovation centres do play a significant role in enhancing regional R&D capital and innovation networks by promoting technology transfer, spillovers and spin-offs.

§ 2.3.2 Relational Capital: Development of High-tech Spaces

Spatial proximity of knowledge generators and users has been recognised as the most important precondition for the enhancement of relational capital, which relates to the capacity to build and mobilise relations and promote collective learning in the innovation process. One of the main spatial mechanisms is to provide a particular space with sufficient institutional and physical development to encourage the formation of local university-industry and inter-firm networks, to promote technology transfer and knowledge spillovers, and to connect local innovation systems with global innovation networks—the development of high-tech space. The term high-tech space in this study is defined as a place where technologically advanced industries and/or R&D firms and institutes gather, which have been specifically selected by national technology policies to trigger economic growth at the national and/or local level. This includes technology parks, science parks, science cities, technopolises, high-tech corridors and high-tech regions.

Many countries have recognised high-tech spaces not only as an important element of national and regional innovation systems (Link 2009), but also as a nodal point of science and technology in a region or a country as well as a locally embedded hub in a global economic network (Anttiroiko 2004; Spithoven 2009). They also consider that such developments can help develop local identity and image that can be used to attract external investors and partners, and thus promote the construction of 'global pipelines'. The global phenomenon is shown in the Science Park and Innovation Centre Association's (SPICA) Directory. According to the directory, by the end of 2010 there were more than 395 science and technology parks (STPs) located in 102 countries. These figures are provisional and do not claim to be exhaustive, but they give an impression of the extension of the phenomenon.

Nevertheless, the planning concept of high-tech spaces varies according to space and time. Based on previous academic studies, five types of high-tech spatial development are recognised in this research. On a district scale, research parks, science parks, and technology parks are identified. On a city-regional and a national scale, high-tech city-region and technopole planning are categorised respectively.

A On a district scale: research parks, science parks, and technology parks

As shown in Table 7, in 1994 the *Official Journal of the European Commission* defined research parks, science parks, and technology parks (Guy 1996; Komninos 2002). The research and science parks are deliberately planned either by governments, universities, high-tech firms, or private sector parties. What distinguishes them from technology parks is the emphasis on basic and/or applied science research. The research and science parks address research more than product development. For them, the key is the link between academic and applied research and thus the production plants are normally precluded.

Type	Key features
Research Parks	Normally located very near to one or more universities or similar academic and research institutions. The emphasis is placed on research rather than development, and the key is the link between academic and applied research.
Science Parks	A real estate initiative in one or more sites that are geographically near to one or more higher education or R&D institutions, and maintains operative links with them. The main objectives of science parks are research, development and design, conceiving new products and developing them to the marketing stage.
Technology Parks	A technology park is a group of high-tech companies in close proximity. Their activities include R&D, production, sales and services, but compared to science parks they emphasise production more. The presence of academic institutions is not essential.

Table 7
Definition of research, science and technology parks in the European Union (based on Guy 1996; Komninos 2002)

The latter emphasise R&D activities, conceiving new products and, and developing them to the market stage. Firms activities in the science parks often end at the stage of prototype design, while their production activities are located elsewhere (Guy 1996). From the main objectives and activities of the research and science parks, we can recognise that their original planning logic is based on the linear innovation model, whereby the scientific and applied research activities can be spatially separated from production and diffusion activities. The philosophy of the planning model is the 'science-push', 'which sees scientific results as raw material for innovative activities among the business firms' (Annerstedt 2006, 287).

However, a group of scholars, such as Massey et al. (1992), Asheim (2000), Cooke (2001; 2005), argue that the linear model not only is weak in connecting the development of research and/or science parks to local economy, but also ignores many feedbacks and loops that occur between different stages in the chain of successive, interrelated innovation activities. On the other hand, they propose an interactive innovation model,

which is underlined by the logic that innovation is a social process of 'learning by doing' and 'learning by using' that is based on tacit knowledge. The emphasis is on the role of socio-cultural structures and the interactions among local firms and institutes in technological development (Asheim 2000).

The logic of the interactive model implies that the essence of high-tech economic development is to promote technology transfer and knowledge spillovers, which are 'relying on close university-industry cooperation, where large and smaller firms establish network relationships with other firms, universities, research institutes, and government agencies' (Asheim 2000, 472). In other words, knowledge generation is not limited to the R&D activities within universities and R&D institutes, but also develops in the interaction process between the knowledge infrastructures and high-tech firms, between upstream suppliers and downstream customers in a value chain, and between the firms and their support networks.

A technology park is a specific zone that is designated to accommodate firms that are engaged in the commercial application of particular high technologies. The firms normally work in similar or complementary areas. The planning logic of the technology park is based on the concept of industrial district, so it addresses more the interrelationships among high-tech firms. The purpose of such initiatives is to trigger particular high-tech industrial clustering, enforce the 'industrial atmosphere', and thus contribute to local economic growth and job creation. The emphasis is more on production than the link with academic activities, although academic involvement is also essential (Guy 1996; Komninos 2002). Governments often initiate the development of technology parks as part of their industrial cluster policy.

According to the implementation experiences of cluster policy in Asian countries, including Japan, China, India, Malaysia and Thailand, Kuchki and Tsuji (2005; 2008) proposed a flowchart to illustrate the development process (see Figure 13). This approach is applied to the development of technology parks as well. In the beginning, governments devote to capacity building—such as developing infrastructure, and providing incentives, business services, human resources and superior living conditions—to attract selected high-tech industries to a specific zone. Capacity building may successfully trigger the industrial agglomeration process. In the later phase anchor firms and their related firms start to play a role in reinforcing local innovative activities. This flowchart approach is based on the interactive innovation model and argues that new industries and new businesses do not emerge alone but rather are part of regional economic and innovative activities. This argument implies that it is important to promote university-industry collaboration, but for local economic development the key strategy is to harness the power of industrial clustering, which forms the base of the creation of the regional innovation milieu.

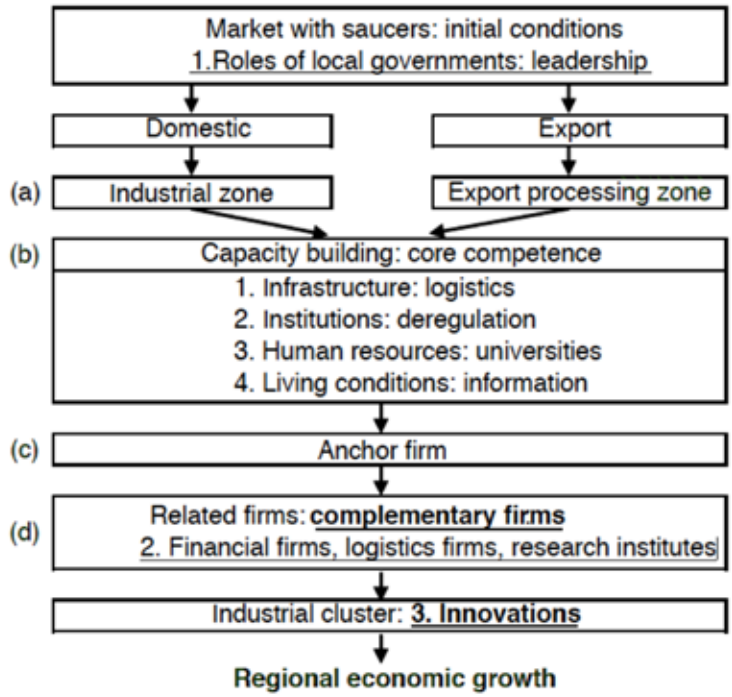

Figure 13
A flowchart approach to industrial cluster policy (Source: Kuchki and Tsuji 2008, 5)

B On a city-regional scale: science cities and high-tech city regions

On a city-regional scale, developments of a science city and/or a high-tech city-region are the most common approaches to high-tech development. The starting points of the two approaches are different. While the former refers to a new town project acting as a high-tech growth pole for a region, the latter is an urban extension plan of one or more science/technology parks with an aim to create or enhance favourable conditions for the development of an innovation milieu on a city-region scale. But both of their underlying concepts imply that the linkages between R&D activities and industrial activities are so important that on a city-regional level it is crucial to provide adjacent or well-connected spaces for these two activities from the outset. Following is an explanation of the origin and planning concepts of these two approaches.

On the basis of high-tech spatial development experiences from the 1960s to 1980s in the USA, Europe as well as Asia, Castells and Hall (1994) identify a science city development approach. According to their case studies, including Akademgorodok in Russia, Taedok Science Town in Korea, and Tsukuba Science City in Japan from the

1960s to 1980s, they define science cities as 'new settlements, generally planned and built by governments, and aimed at generating scientific excellence and synergistic research activities, by concentrating a critical mass of research organisations and scientists within a high-quality urban space' (p.39). Specifically, a science city is a new town plan that consists of strictly scientific research complexes and high-quality urban assets with no direct territorial linkage to industrial activities, a planning concept that is based on the 'science push' model.

However, Castells and Hall find that in such an isolated environment, remote from normal human society, research communication and networks could hardly be developed, so many existing science cities alter their development strategies to have closer linkages between scientific research and industrial activities. The adjustment in planning and development shows an underlying concept that knowledge exploitation and generation can interact and cross-fertilise, so it is essential for a regional innovation system to promote the linkage between knowledge producers and exploiters by providing space for industrial activities adjacent to the proximity of R&D activities. Thus, the original conception of science cities is too narrow to encompass current development.

On the other hand, since the 1990s some successful science or technology parks have gradually evolved towards a city-region scale, such as Kista in Sweden and Hsinchu in Taiwan. Anttiroiko (2004, 396) points out that this evolution involves 'the wider geographic area, new infrastructures and logistical solutions, housing projects, wider commercial services, and closer relations with the surrounding urban community', comprehensive spatial planning and development on a city-region level. In those city-regions there is a considerable concentration of academic, R&D and industrial activities with dense interactions among these activities and sufficient supplies of infrastructure, housing, business and commercial services, entertainment, recreation and amenities. This concentration is deliberately planned and developed by governments and can be seen as an urban extension of one or more science or technology parks.

C On a national scale: technopole planning

Technopole planning is a set of larger scale high-tech spatial developments based on the concept of balanced regional development, a tool of regional policy rather than technological innovation on the basis of growth pole/growth centre theory (Masser 1991). In other words, it is a national policy aiming to balance geographical development and to improve local competitiveness by promoting local high-tech industrial development. The implementation is usually based on a new town model, conducted by local governments and supported by national governments. It involves cooperation between different government levels, but the way of cooperating differs from country to country and shifts from over time depending on the administrative, legal and spatial planning systems of the country at that time.

For example, since the 1960s the concept of technopole has appeared in France under the intervention of the state in the context of the specific French spatial planning strategies developed by DATAR—the Prime Minister's National Agency for Spatial Planning and Regional Action (Halbert 2008). In the 1960s and 1970s, the French government relocated some higher education institutes, research centres and national industrial firms outside metropolitan Paris to Southern France, areas such as Toulouse, Grenoble and Nice. Following the decentralisation of the French government's powers between 1982 and 1984, local governments greatly increased their influence on technopole planning (Benko 2000; Halbert 2008; Simmie 1994). Furthermore, the planning strategy altered from exogenous to endogenous development and aimed to accelerate existing growth poles rather than to create new ones.

In 1980, according to the Technopolis Law, the Japan Ministry of International Trade and Industry (MITI) founded the technopolis (technology-intensive city) programme aiming to promote local technological and industrial development by raising the local technology level, establishing new high-tech industries, encouraging local research and development, and creating attractive communities where people could live and work. The underlying logic was to reduce the geographical imbalanced between Japan's three major metropolitans—Tokyo, Nagoya and Osaka—and other peripheral areas (Castells and Hall 1994; Simmie 1994; Suzuki 2004). At that time twenty-six regions were designated as technopolises, and the role of the Japanese government was to facilitate local developments rather than directly invest, except for Nishi-harima Technopolis (Masser 1991; Castels and Hall 1994; Suzuki 2004).

However, the Technopolis Act was terminated in 1998. The programme ended in failure due to the gap between theory and reality (Suzuki 2004). The technopolis programme in Japan 'was a development policy that depended upon the investment of big companies outside the concerned region', but there were technical gaps leading to a weak relationship between the invited industries and the local existing industries (600). Since 1998 the MITI has changed its technology planning and policy model to promote venture business and to enhance the links between universities and industries, a shift from exogenous to endogenous development as well.

Influenced by Japanese, the Korean government also established its own technopolis programme in 1989 and designated nine sites as technopolises, but only Kwangju was built. The remaining eight technopolises were re-designated as local high-tech industrial parks—technoparks. The scale of the technoparks is smaller than the technopolises, because the national government intended to authorise local governments to conduct the development with limited national support (Oh 1995). Compared to the French case, the Japanese and Korean technopolis programmes are more production oriented, but all of their technology planning and policy models have the tendency to shift from exogenous to endogenous development and their national governments also changed to play a more strategic and supportive role rather than to lead the implementation of

high-tech space developments. Further, they all recognise the presence of both R&D and industrial activities as important, but the French and Japanese cases emphasise more the role of big firms, while the Korean case addresses more the role of locally-based SMEs and new technology-based small firms in the development process.

D Remarks

The previous studies show that most cases identify the role of science and/or technology parks as important for high-tech spatial development whether on an urban, regional or national scale. This is because the cases recognise that the parks can provide adequate spaces for R&D and high-tech industrial activities while helping them to develop linkages with each other, facilitate industrial clustering, and promote valuable knowledge generation and application. In other words, science and/or technology parks are expected to be the basic spatial elements for high-tech development in a particular place. Learning from the studies on larger scale high-tech spatial developments, including science cities, high-tech city-regions and the technopole programme, we can understand that besides the development of science and/or technology parks, sufficient supplies of transport and communication infrastructures and spaces for business and commercial services are recognised as crucial spatial elements for such developments.

§ 2.3.3 Human Capital: Planning and Design Strategies

Human capital is another principal component that is commonly addressed in high-tech development. Many studies have shown that there is a strong and steady connection between education levels and urban/regional population, employment, and income growth (Glaeser 2001; Glaeser and Shapiro 2001; Glaeser and Saiz 2003). The major issue is how to produce, attract and retain knowledge workers in a particular city/region. In academic discussions, the two most commonly mentioned and complementary factors in relation to the issue of reinforcing human capital are 'quality of education system' and 'quality of place'. These discourses have had fundamental influences on the content of spatial strategies.

Some scholars recognise the importance of well-functioning education and training systems, from higher education down to basic school. For example, Florida (2005) claims that universities can act as a talent magnet to attract eminent scientists and engineers, while Anderstig and Lundgren (1994) argue that the quality of basic school system significantly affects the transition probability to university education. Glaeser and Shapiro (2003) also suggest that knowledge workers may be produced and attracted by the provision of quality public schools. In the practice of high-tech spatial planning, the

argument has been transformed into the establishment of international (basic) school in order to create a friendlier environment for international knowledge workers and their families.

Other scholars claim that the provision of a high 'quality of place'—consisting of infrastructural facilities, amenities, lifestyle, professional networks, urban diversity, tolerance, and territorial identity—is another effective strategy to attract and retain knowledge workers. For example, Markusen (2008, 59) argues that 'to build a regional identity around key occupations that allows it to be known as a "place to be" for that occupation' can attract particular group of knowledge workers on regional and urban levels, such as IT professionals in the Bay Area, media artists in the Los Angeles, software engineers in Seattle, and so on.

Florida (2005) also conducts a study of talent via focus groups and interviews, and statistical research in the USA to explore the factors that enable places to mobilise and attract technology and talent. He concludes that the diversity and tolerance of a place, in other words openness and low barriers to entry, are the most important factors that attract and retain talent rather than the supply of high-paying, challenging employment, which is recognised as a necessary but insufficient condition. However, some scholars have challenged the validity of the data Florida presents to support his argument, such as Glaeser (2005) and Rausch and Negrey (2006).

Despite the issue of validity, the discourse of creative capital has inspired planners and designers to generate spatial strategies for high-tech spatial development. For example, one-north in Singapore seeks to create an intellectually stimulating and creative physical environment that can attract, retain and form a critical mass of talents

by providing residential options such as home offices to create a 'work-live-play' environment; by fostering a 'vibrant' cultural scene with art galleries, restaurants, pubs, and cafes…]TC [,the master developer of one-north,] attempted to enhance existing bohemian spatial qualities so as to attract more creative talents who would in turn further contribute to the 'innovative milieu' at one-north (Wong and Bunnell 2006, 76, 78).

However, the concept of quality of place is very abstract and can be interpreted in different ways. Spatial demands and preferences of different groups of knowledge workers may vary according to their life stages, nationalities, professions, and so forth, so for planners and designers to fit all the potential demands of knowledge workers often becomes a commonly used strategy. This results in a compact, diverse, mixed-use urban form with a variety of sufficient facilities and amenities.

§ 2.3.4 Remarks

In the previous sections, I discussed a set of spatial strategies that are expected to make a contribution to the three principal components of high-tech development. The spatial strategies and their spatial implications are summarised in Table 8. Two types of spatial implications can be identified, including 1) *land supply* for accommodating R&D, knowledge-based production, training and/or education activities, and 2) *particular spatial conditions* for inducing knowledge generation and application, for supporting production activities, or for attracting and retaining human resources. The former is more visible than the latter.

Principal Components	Spatial Strategies	Spatial Implications
R&D Capital	– Knowledge infrastructures: universities, R&D institutes, and technology centres/incubators – Lead high-tech firms	– *Land supply* for accommodating R&D activities
Relational Capital	– Research/Science/Technology/ Industrial Parks	– *Land supply* for accommodating R&D and other knowledge-based production activities – *Spatial conditions* for inducing knowledge generation and application
	– International and internal accessibility (e.g. Airport, highway, ICT infrastructure, etc.)	– *Spatial conditions* for supporting knowledge-based production activities
Human Capital	– Education and training institutes (including international schools)	– *Land supply* for accommodating education and training activities
	– A variety of sufficient facilities, amenities, commercial and business service centres and housing choices; landmarks	– *Spatial conditions* for attracting and retaining human resources

Table 8
Spatial strategies for enhancing the principal components

However, it is important to highlight that in many studies the spatial elements are considered as preconditions for a high-tech space, but their presence does not guarantee the success of the development, because synergy between physical (e.g. the establishment of knowledge infrastructures and science/technology parks, etc.) and non-physical developments (e.g. R&D capacity, quality of human resources, etc.) is key. This implies the importance of linking the governance activities of the territorial innovation system with the planning activities of high-tech spatial development.

3 Institutional Variables of Spatial Planning Systems

§ 3.1 Introduction

In the previous chapter I identified the three principal components of high-tech development and their correlated spatial elements based on the theories of high-tech development. But few of the theories draw attention to the role of spatial planning and governance in the high-tech development process. The concept of spatial planning encompasses more than land use planning and development control. Although the term 'spatial planning' is considered a 'Euro-English' concept that has been formidably advocated by the European Community since the 1990s (Thompson 2000; Harris and Hooper 2004), there are two reasons why the term particularly fits the domain of this research. First, spatial planning can be used as a generic term to name different sorts of 'governance system[s] for managing spatial development and/or physical land use in a particular place' (Dühr et al. 2010, 26). Its generic nature is useful for cross-country comparison, because the term is not specific to a particular country. Second, the term spatial planning is often used to describe a specific spatial approach that focuses on policy coordination and spatial cohesion, so it can be used to address the 'spatial' concern of this research on the policy of high-tech development and its implications for managing the organisation of space.

In this research, I understand the key function of spatial planning to be managing spatial development and organisation in a particular place in order to provide sound space and place qualities for a range of economic and socio-cultural purposes. Spatial planning includes a set of governance practices not only 'for developing and implementing [spatial] strategies, plans, policies and projects, and for regulating the location, timing and form of development.' (Healey et al. 1997, 4), but also for mediating the tensions and contradictions among sectoral policies (United Nations Economic Commission for Europe 2008). Specifically, in the development process of a high-tech economy, spatial planning needs to play a role either in providing sound space and place qualities for the purpose of high-tech development, and/or in mediating the tensions and contradictions between high-tech development and other sectoral policies at different scales. The question is what are the major factors that lead different countries to adopt different spatial planning and governance approaches to high-tech spatial development?

Learning from previous comparative research of spatial planning systems and practices (e.g. Davies et al. 1989; Newman and Thornley 1996; Commission of the European Communities 1997; Ng 1999; Sanyal 2005; Farinós Dasí 2007; Nadin and Stead 2008a; Knieling and Othengrafen 2009a; Booth,2011; Ernste 2012; Getimis 2012), I identify six groups of variable that may affect the operational situations of spatial planning and governance practices, including 1) model of society, 2) legal system and constitutional law, 3) property relations, 4) administration system, 5) planning doctrine, and 6) spatial planning system (see Figure 14).

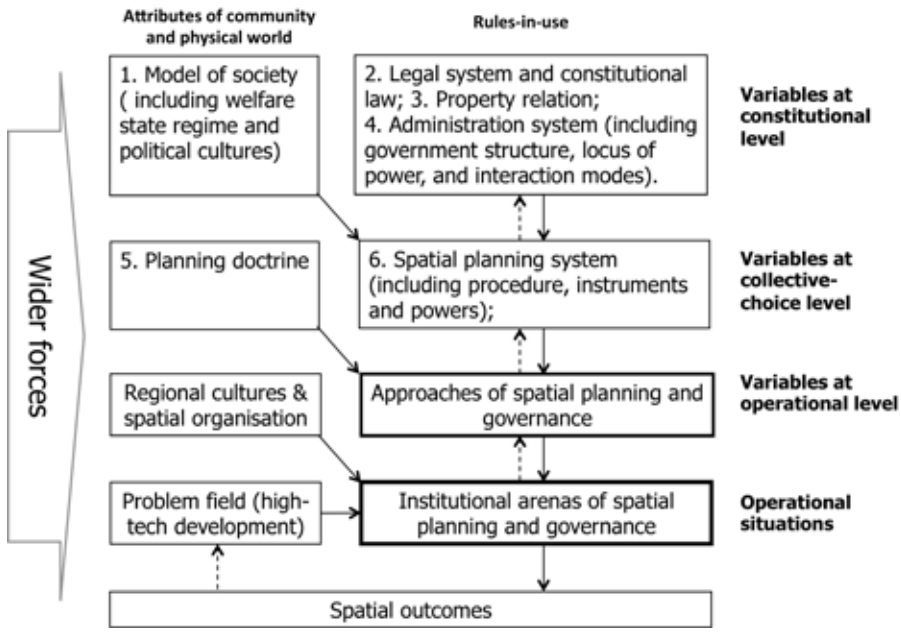

Figure 14
Institutional variables of spatial planning and governance.

According to the concept of multiple layers proposed by Ostrom (2005), rules at a deeper level are more difficult and costly to change, but what can be done and/or changed at a lower level is defined by the rules at that level and deeper levels. This implies that it is important to distinguish different levels of institutional variables, whether the purpose of research is to understand the origin of the rules at one level, or to identify the causes of policy problems with an intention to solve the problems by changing institutions. Since in this research I aim to explore the major institutional factors that shape the practices of spatial planning and governance in the development process of high-tech city-regions, it is necessary to clarify the relationships between different groups of variables.

Hence, I divide six groups of variables into two analytical levels, including the constitutional level and the collective-choice level, and assume that they will cumulatively shape the rules-in-use at the operational level: the mechanisms of spatial planning and governance of high-tech development. Besides, regional cultures (cultural attributes of community) and spatial organisation (physical world) are recognised as the other two major elements that will affect the operational arenas and action situations of high-tech city-regional development according to Ostrom's framework. In the following sections I explain the implications of the six groups of variable for spatial planning practices by reviewing theoretical concepts and typologies corresponding to the variables on the basis of previous comparative research. In the end of this chapter, I propose a typology of spatial planning and governance approach as a generic analytical tool to position and characterise spatial planning practices in particular places and measure their trends and direction of change.

§ 3.2 Institutional Variables at the Constitutional Level

In this section, I explain the concepts of the four institutional variables, including model of society, legal system and constitutional law, property relation, and administration system, at the constitutional level and their implications for spatial planning systems and practices according to previous comparative research.

§ 3.2.1 Model of Society

The *EU Compendium of Spatial Planning Systems and Policies* (Commission of the European Communities 1997) has considered the relative roles of the public and private sectors in spatial planning and implementation as one of the essential factors of a national spatial planning system. On the basis of the studies of European social models and planning systems, Nadin and Stead (2008a, 35, 44) define the notion of model of society as 'the diverse values and practices that shape relationships between the state, the market and citizens in particular places', and illustrate 'how the planning model is embedded in the wider model of society.' For example, due to the rise of neoliberalism in the 1980s and 1990s, English spatial planning has changed from serving public interests to selling a service. This shows that the liberal ideology has become the dominant model of English society, in which the planning system has evolved and is practiced.

The typology of welfare state regimes proposed by Esping-Andersen (1990) forms a theoretical base for the social models. He considers the quality of social rights, the effects of social stratification and state-market-family relationships in social provision as three major criteria to classify three ideal types of welfare state regimes: liberal, social democratic and conservative regimes. The number of regime types and criteria have increased over time not only because of more sophisticated analyses of welfare systems but also because of the need to put more countries into the classification and to present simultaneously their prominent attributes in policy-making. For example, Holliday (2000, 707-708) argues that the criteria set by Esping-Andersen only consider the states that 'are deeply affected by their social policy that they are best defined as welfare states' and exclude the states 'that do engage in social policy, while also subordinating it to other policy objectives.' She further suggests a productivist welfare state regime, and puts this into Esping-Andersen's typology to demonstrate the social models of East Asian countries (see Table 9).

Welfare state regime	Social policy	Social rights	Stratification effects	State-market-family relationship
Liberal	Neither privileged nor subordinate	Minimal	Equality of poverty for minority; market differentiated welfare for majority	**Market provision encouraged**
Conservative	Neither privileged nor subordinate	Quite extensive	**Existing status differentials preserved**	Family protected
Social democratic	Privileged	**Extensive**	Universal benefits graduated according to accustomed earnings	Market crowded out; family socialised
Productivist	**Subordinate to economic policy**	Minimal; extensions linked to productive activity	Reinforcement of productive elements	Premised on overriding growth objectives

Table 9
Four worlds of welfare state regimes (Source: Holliday 2000, 709; emphasis in original)

The typologies of welfare state regimes provide a way to explore the social model of a country that underlies its spatial planning system and planning practices, although most countries present hybrid forms of the regimes and 'the classification of countries into regime types is time-dependent' as well as their planning systems (Nadin and Stead 2008a, 38). For example, the Dutch planning system was recognised as a typical social democratic model in the 1980s and 1990s, but has since undergone a change towards a more liberal approach. Additionally, if we consider the model of society as a collection of values and practices, the discourse of welfare state regimes, which mainly focuses on social policy and its relation to other policies in general, can only reflect the model

of society to a certain degree. Besides the social perspective, the political economic dimension has to be considered in the model of society as well. Friedman (2005) argues that political culture is another variable for differentiating societies in ways that affect planning systems. Political culture is a broad term that includes the degree of civil participation in public decision-making, the degree of openness in the political process, the party system of the state, and so on. These elements must be taken into consideration.

§ 3.2.2 Legal System and Constitutional Law

The legal system has been recognised as one of the crucial factors that determines the characteristics of spatial planning systems and practices (Davies et al. 1989; Healey and Williams 1993; Newman and Thornley 1996). National 'legal style' and constitutional rights are considered as the foundation of the legal system, which also have effects on planning systems. *Planning Control in Western Europe* (Davies et al. 1989) is the first example that categorised planning systems according to the effects of law on the legal certainty and mechanisms of spatial planning systems. It identifies two types of planning systems: the 'English system' based on English common law and the 'continental system' based on the Napoleonic and Scandinavian law. The English common law is case-law, which originates from the court and gradually develops from decision to decision. On the other hand, the Napoleonic and Scandinavian law is enacted law, which comes from study and relies on abstract rules and principles in advance.

In practice, following legal thinking, there are no legally binding zoning plans in the English system, in which a higher degree of discretion is given to politicians and professionals. The decisions they make do not necessarily have to be to in accordance with policies and plans if they have good reasons at the time for doing otherwise (Nadin and Stead 2008b). In the other systems, administrative decisions are made according to legally binding plans and regulations, a lower degree of administrative discretion that thus guarantees higher legal certainty (Davies et al. 1989). However, this approach may create two misleading implications. First, although this way of categorising is simple and effective, it reduces the other four northern European countries (Denmark, France, the Netherlands and West Germany) into one category and ignores some important distinctions between them (Nadin and Stead 2008b; 2012).

Second, this categorisation does not simply imply that the English legal style remains more flexible, while the other legal style provides more certainty. All systems require discretion regarding when to apply or how to interpret plans and rules. For example, in Italy although plans are legally binding, informal political networks play a key role in the operation of planning regulations, and the distance between a plan and its

implementation may be considerable (Healey and Williams 1993). This example shows that in practice, greater flexibility exists in the planning system that is based on Napoleonic law. Although the fundamental differences between the two legal styles cannot be removed because new mechanisms can only be generated and operate within the existing legal system, it is important to avoid oversimplifying the influences of different legal styles by being aware that all systems incorporate discretionary and indicative elements, and planning practices often seek innovative mechanisms to combine the advantages of flexibility and certainty.

In addition to the effects of different legal systems, the constitution of a country, which defines individual and government duties and rights and the relationships among different levels of governments, also has an enormous influence on the institutional arrangement, priorities, competences, and operation of spatial planning (Newman and Thornley 1996; Commission of the European Communities 1997). For example, in Germany the protection of property rights are explicitly written into the Constitution and a particular right is reserved to challenge the decisions of government through administrative courts. This is interrelated with the 'principle of legality', which 'holds that the government is only authorised to intervene in and determine limitations on the freedom and property of its citizens on the basis of statutory power…therefore relates to the *power* of public bodies' in spatial planning practices and control of development (Hobma 2011, 4; emphasis in original).

§ 3.2.3 Property Relations

Regarding property relations, the conceptualisations of 'rights in land' and who owns the rights in a given location are the two factors that substantially influence the systems and practices of spatial planning, and affect the laws that underpin the planning system and practice in a particular country (Booth 2005; 2007; Needham 2005; 2006). First, '[a] property right is the *right to use some thing in a particular way*' (Needham 2006, 30; emphasis in original). A right 'is a social creation…[that] give[s], or should give, clarity, certainty and stability in the relationships between people with respect to a thing' (31-32). The 'thing' can refer to landed property 'that is a piece of land and "things" connected to that land' (31; emphasis in original). Specifically, the attitude toward 'rights in land' and 'market in rights in land' will influence the spatial planning systems and practices in a particular country.

For example, the major reason why the British government in 1947 could nationalise future development rights without affecting the rights to current enjoyment of land is due to two deeply ingrained concepts about rights in land, 'the capacity to envisage overlapping interests in a single piece of land', and a separation 'between current and

future rights to beneficial enjoyment' (Booth 2005, 264). In contrast, countries that are deeply influenced by Roman law—legitimacy of the government to restrict the exercise of rights in land under public law, ranging from expropriation to land use regulation and building control—is based on the concept of *imperium* (Booth 2005, 2007; Needham 2006). According to the concept, 'the enjoyment and occupation of property must be within the limits proposed by laws approved by government.' (Booth 2005, 275) This gives the government the right to intervene and govern spatial organisation.

Second, 'who has responsibilities, duties, rights, liabilities, etc. with respect to which parcels of land' also affects the practices and the outcomes of spatial planning in a given area (Needham 2006, 10). This relates to the degree of difficulty to implement a spatial plan involving a change of land use and/or an acquisition of land for new development, because the transition costs of bargaining have a direct relationship with the number of stakeholders and the 'initial assignment' of those rights with respect to the parcels of land in the given planning area. For example, if in an area land ownership remains concentrated and land holdings are large and contiguous, it will be relatively easier for someone to assemble plots for a large-scale development.

§ 3.2.4 Administration System

Administrative systems also have fundamental implications for spatial planning systems. In the comparative planning studies, the emphasis is often on not only governmental structures, but also the power relations among levels of government and their planning competences, although the focus of the studies may differ according to their research aims and underlying assumptions. For example, the the ESPON (2007) Governance of Territorial and Urban Policies paid particular attention to the distribution of power in relation to spatial planning among levels of government by analysing state structures, decentralisation processes and devolution of powers based on a combination of taxonomies (see Table 10). Eight types of devolution of planning powers, three types of additional planning features and five types of regionalisation were used to tabulate 120 categories to characterise styles of planning in each country. Through the tabulation the dynamics of administrative structures and power relations within governments were described, but the interrelations among the typologies and their effects on spatial planning systems were not explained.

Taxonomy	Type	
Devolution types of planning powers	Powers to regions	1. Unitary state—power in central state; 2. Unitary state—power in regions; 3. Unitary state—centralisation, dominant state; 4. Federal state—strong central state and regions; 5. Federal state—weak central state and regions; 6. Federal state—weak central state, strong regions.
	Powers to local authorities	1. Powerful local – municipal level (with equally strong central state); 2. Powerful local – municipal level (with relatively weak central state).
Additional planning features	1. Regional spatial planning through inter-municipal cooperation; 2. National – regional interactive, negotiative and / or contractual approaches to spatial planning; 3. Other	
Regionalisation types	1.Administrative Regionalisation; 2.Regional Decentralisation; 3.Regionalisation through the existing Local Authorities; 4.Regional autonomy (Political Regionalisation); 5.Regionalisation through the Federate Authorities.	

Table 10
Taxonomies used in the ESPON Project 2.3.2, Annex B (based on Farinós Dasí 2007)

On the other hand, Newman and Thornley (1996) and the *EU Compendium of Spatial Planning Systems and Policies* (Commission of the European Communities 1997) emphasise the locus of power and its effect on the systems rather than its dynamic nature. The former emphasises 'the role of central government and the extent of its involvement in planning at the urban level', because they assume that 'the locus of power will have a significant effect on the autonomy and strength of urban planning.' (Newman and Thornley 1996, 5, 28) The latter gives a more general view about the locus of power regarding the extent to which the operation of the planning system is centralised, regionalised or localised. They further suggest that 'there is no simple correlation between the structure of government and the real locus of power and responsibility of spatial planning in practice.' (Commission of the European Communities 1997, 41) Learning from the studies, it is crucial to keep in mind the dynamics of administrative systems and of governance attributes because previous institutional development will influence the current and future trajectories of planning systems and practices. However, the focus should be on their implications for the organisation of spatial planning and on the way they affect the relationship between a national planning system and planning practices at each level of government.

§ 3.3 Institutional Variables at the Collective-choice Level

In the previous section, I described why the model of society, legal system and constitutional law, property relation, and administration system are four essential variables at the constitutional level that shape spatial planning systems. At the

collective-choice level, besides the spatial planning system, which is often the focus of comparative research, planning doctrine will also shape the mechanisms of spatial planning and governance in a particular place. Planning doctrine can be used to describe the attributes of a planning community in decision-making and implementation. I further explain the two groups of variable in the following sections.

§ 3.3.1 Planning Doctrine

According to the definition of Faludi and van der Valk (1994), planning doctrine is a set of interrelated and durable notions about the principles of spatial organisation and planning principles. The principles of spatial organisation refer to a body of thoughts concerning spatial arrangements within a given area and the development of that area, such as the planning concepts of Green Heart in the Netherlands and of Green Belt in the UK. The concept of planning doctrine indicates an arena for discussion and action, which involves the process of consensus seeking in a particular planning context. But planning is a long term process. Progressing from the initiative stage to the implementation stage often takes years or even decades. The planning context is so dynamic that planning concepts may be replaced in the planning process due to the changes of political preference, socio-economic conditions and contemporary scientific knowledge over time (Roodbol-Mekkes, van der Valk, and Korthals Altes 2012).

Planning principles, on the other hand, relate to the way of handling the principles of spatial organisation, including the preparation, form, uses and implementation of plans. Adopting the concept of policy style, which was introduced by Richardson et al. (1982, 2), I identify four styles of planning principles based on two criteria, which respectively refer to 1) the interaction between the government's approach to spatial problem solving (proactive vs. reactive) and 2) the relationships between government and other actors in the spatial planning and implementation process (imposition vs. consensus). As shown in Figure 15, governments that are located in the first category tend to have a reactive attitude to problem-solving or goal-achieving and less concern for consensus seeking in the planning process. This shows a regulative oriented planning style, which relies more on precise regulatory rules than interpretive and discretionary regulation.

Governments located in the second category act as a provider. They are also less concerned with consensus seeking in the planning process and prefer an active approach to problem-solving or goal-achieving. Such an active attitude is triggered by a set of normative values, such as the duty to provide a reasonable quality of space. The third category refers to a negotiative style of planning, which stresses consensus, with a reactive attitude to problem-solving. The fourth category implies a collaborative character of planning style, which also emphasises consensus in the planning process

and is inclined to apply an active approach to problem-solving or goal-achieving. This typology is so simple and generic that it is manageable for cross-national comparisons. However, it is important to keep in mind that even within one government more than one planning style may exist according to the planning context. Hence, even if a dominant planning style can be identified, exceptions will always occur.

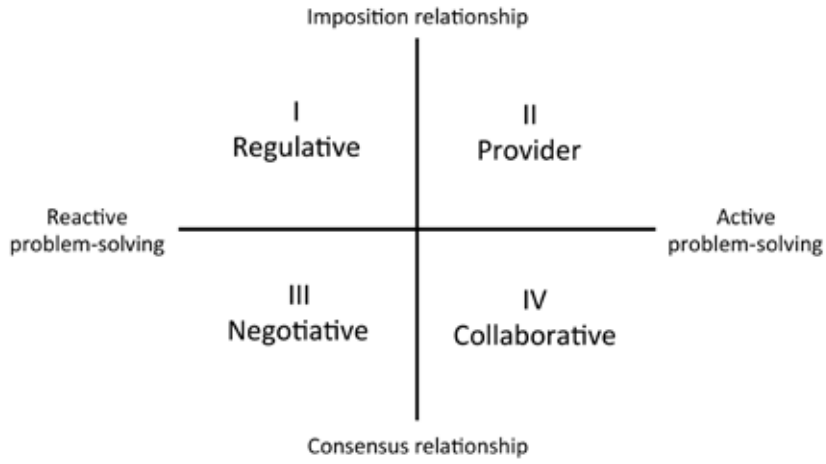

Figure 15
A typology of planning principles

§ 3.3.2 Spatial Planning System

According to Healey and Williams (1993, 702), planning systems consist of three functions:

- a plan-making function, expressing strategies and principles for spatial organisation and land use/built form arrangement;
- a developmental function, which may range from land assembly and servicing, to infrastructure provision and construction and development activity; and
- a regulatory function relating to the control of building location and form, and activity change within existing buildings.

In other words, spatial planning systems contain two major elements. The first is the various *institutional arrangements* for formulating and expressing the objectives, strategies and principles of spatial organisation (plan-making). The second is the *planning mechanisms* that are used to realise the plans. The planning mechanisms include a collection of planning instruments and their accompanying proactive (developmental) and/or reactive (regulatory) planning powers. I further explain the two elements in the following sections.

Institutional arrangements for plan-making

Regarding the institutional arrangements for plan-making, I apply the combinative framework (as shown in Figure 3) to link the institutional arenas of plan-making to the institutional variables at the constitutional level through identifying the relations between the variables and the seven types of rule. As shown in Table 11, the actor constellations refer to the number and attributes of primary actors who can be involved in the legal procedure for spatial planning. The primary actors may not include all the stakeholders who can influence the decisions or who will be affected by the decisions. The constellation of primary actors in a particular arena has to be identified through both formal and informal interactions in the decision-making process. The model of society and administration system may provide directions to understand the variation between different planning systems.

Action orientations of primary actors are shaped by the position rules and pay-off rules. Position rules refer to the responsibilities of different levels of government and how they perceive the relative roles of public and private sectors in spatial planning and development. The model of society, constitutional law and administration system may be the major factors of this type of rule. Pay-off rules will influence the interest of stakeholders, so property relation and land policy mechanisms can be identified as the most important factors.

The decision rules, information rules, scope rules and competence rules together shape the capacities of primary actors. The decision rules determine the level of control for primary actors when they exercise the decision function at a particular moment. The information rules define the conditions for the actors to communicate with each other. The scope rules refer to the scope of a spatial planning system. According to the Commission of the European Communities (1997, 34), the scope of a planning system 'refers to the range of policy topics over which the planning system has some competence or influence, and the extent of integration between the spatial planning system and planning and investment in particular sectors.' The model of society, constitutional law and administration system may have influences on the delimitation of the scope.

Action situations	Type of rule	In the field of spatial plan
Actor constellations	Access rules	This type of rule refers to the number and attributes of primary actors who can be involved in the legal procedure for spatial planning. This may relate to the model of society and administration system.
Action orientations	Position rules	Referring to the responsibilities of different levels of government and the relative roles of public and private sectors in spatial planning and development. This may relate to the model of society, constitutional law and administration system.
	Payoff rules	Property relation and land policy mechanisms are identified as the most important factors that will influence the interest of stakeholders.
Actor capacities	Decision rules	This type of rule refers to the legal and administrative procedures of plan-making. This may relate to legal framework, constitutional law and administration system.
	Information rules	Conditions for actors to communicate to each other and gain relevant information and knowledge. This also relates to the model of society, especially the level of public participation.
	Scope rules	Referring to the scope of spatial planning. This may relate to the model of society, constitutional law and administration structure.
	Competence rules	This type of rule refers to the planning instruments and planning powers. The legal system, constitutional law and administration system may have influential effects.

Table 11
Rules used to structure the arenas of plan-making

The competence rules refer to the planning instruments and planning powers. The forms of planning powers in a planning system reflect the scope of resources that are empowered to each level of governments and conditions for them to use resources, such as land use plans and regulations. The land policy mechanisms—such as land acquisition, expropriation, pre-emption right, etc.—not only relate to the competence of governments to implement the plan, but also affect the benefits and costs (pay-off rules) that governments, developers, owners and other relevant stakeholders in relation to the supply and demand of land property may gain or lose due to planning decisions. This shows that the types of rules are interrelated.

Planning mechanisms

The framework proposed above also takes the planning mechanisms into account, because they reflect the pay-off rules and the competence rules that influence the situations of plan-making. The planning mechanisms consist of the planning instruments and their accompanying planning powers. The planning instruments include statutory and non-statutory plans, regulations and guidelines, and the full range of political documents that are used to express spatial planning policy. The Commission of the European Communities (1997, 51-53) has recognised four types of planning instruments according to the form and purpose of the instrument, including national policy and perspectives, strategic instruments, framework instruments, and regulatory instruments (see Table 12).

Type of instrument	Purpose	Areas covered	Sub-categories
National policy & Perspectives	To identify the national government's spatial planning policy and strategy. They include documents that give general guidance or performance criteria for development, and those that are spatially specific and are described as national plans.	The whole Member State, significant parts or special areas.	– National perspectives – Spatial policy guidance – Sectoral plans/ guidance
Strategic	To identify broad spatial development patterns or areas below Member State and above the municipality. They do not generally identify specific locations and are intended to be implemented by other 'lower tier' instruments, which specify locations.	They are often tied to the administrative tier of government that prepares them (region or province), but they can be prepared for a functional planning region.	– General strategic instrument – Second level strategic instrument – Sectoral instrument – City region plans
Framework (Masterplan)	To identify a general spatial framework and criteria for the regulation of land use over an area. They are locally specific. They may be binding or non-binding in respect to regulation but are generally implemented through lower tier plans.	Generally the whole of one municipality, but where local authorities are small they may cover several municipalities—a functional planning area.	
Regulatory (Control may also be exercised by general codes, which can apply over very large areas, even whole countries)	To regulate the development and protection of individual parcels of land. These may be general regulation zoning plans, implementation instruments, or special instruments to secure particular types of development.	Ranging from one site, a neighbourhood of one municipality, the whole municipality or more than one.	– Regulatory zoning instrument – Local building control instrument – Implementation instrument

Table 12
Categorisation of planning instruments of EU Member States (Source: Commission of the European Communities 1997, 52)

However, this categorisation of planning instruments is based on the statutory planning instruments used in EU Member States at the time it was conceived. The categorisation already masks many subtle differences between instruments, but it is still unmanageable and may not be sufficient for the purpose of comparisons when the studied nations are outside the EU. It is necessary to propose a simple and universal way to categorise planning instruments. Learning from a decision-centred view of planning, which views planning as a process of decision-making (Needham 1988; Faludi and van der Valk 1994), I categorise planning instruments into two categories according to the moment of decision-making: strategic instruments and operational instruments (see Table 13).

Type of instrument	Major characteristics
Strategic instruments	The purpose of strategic instrument is to provide a framework to build planning consensus in a given area and/or to provide a frame of reference for the formulation of the operational instruments. They may or may not identify specific locations and include statutory as well as non-statutory instruments. The object of the strategic instruments is decisions.
Operational instruments	Operational instruments are implemented at the lower tier including the preparation of regulations and/or regulatory zoning plans and the taking of measures based on them, by which the government can directly intervene in the organisation of space. The object of the operational instruments is material.

Table 13
Categorisation of planning instruments in this research

The definition of strategic instruments covers the first three categories proposed by Commission of the European Communities (CEC) and includes cross-border planning instruments, such as the *European Spatial Development Perspective* (Commission of the European Communities 1999). The strategic instruments are intended to be applied by lower tier strategic instruments and/or implemented through the operational instruments. The purpose of the strategic instruments is to provide a framework to build planning consensus in a given area and/or to provide a frame of reference for the formulation of the operational instruments. Since one of the purposes of this research is to identify the major factors that shape the practices of spatial planning and governance when conducting high-tech spatial development, I focus more on the implications of the strategic instruments for the practices of spatial planning and governance rather than the form and content of the strategic instruments themselves. Hence, the strategic instruments that I refer to have a very broad definition. They may or may not identify specific locations and include statutory as well as non-statutory instruments.

The definition of operational instruments is beyond the last category proposed by the CEC. They are instruments implemented at the lower tier including the preparation of regulations and/or regulatory zoning plans and the taking of measures based on them, by which the government can directly intervene in the organisation of space. Therefore, they always go alongside certain proactive and/or reactive planning powers. The mechanisms of proactive planning powers range from different public powers for acquiring land ownership (such as the right of expropriation, zone expropriation and urban land consolidation) to diverse market mechanisms based on private law (such as purchase, ground lease, agreement and various forms of public-private partnership) in order to effectively realise the plans. On the other hand, the reactive planning powers mainly refer to the control of land use and building activities as well as the protection of particular environmental and cultural heritage by issuing different kinds of permit.

Specifically, the object of the strategic instruments is decisions, while the object of the operational instruments is material. This categorisation can be used to describe two forms of planning mechanisms—framework-based planning and project-based planning (see Table 14). The former mechanism addresses the role of strategic instruments in guiding operational decisions. It more focuses on the interrelationships between spatial elements and aims to provide a frame of reference for operational planning decision-making or to be used as a tool to build planning consensus in a given area. Project-based planning, in contrast, refers to a form of spatial planning and governance by which the operational decisions are made without strategic instruments as a frame of reference. In other words, the decisions are made case-by-case. In some cases, the project may be so grand that planning can only take place within the context that is set by the project. However, these two forms of spatial planning mechanisms may be simultaneously employed by the same level of government according to the planning context, such as time of preparation. The point is to identify the dominant planning mechanism and its implications for the practices of spatial planning and governance.

Type of mechanism	Major characteristics
Framework-based planning	Framework-based planning addresses the role of strategic instruments in guiding operational decisions and more focuses on the interrelationships between spatial elements.
Project-based planning	When applying project-based planning mechanism, the operational decisions of spatial planning are made without strategic instruments as a frame of reference.

Table 14
A typology of planning mechanisms

§ 3.4 A Typology of Spatial Planning and Governance

In a search of a simple, manageable and generic typology of spatial planning and governance approaches as an analytical tool, I choose the two variables at the level of collective-choice as the criteria—the style of planning principles (planning doctrine) and the mechanisms of spatial planning (planning system)—because I consider these two to have more direct and obvious effects on spatial planning and governance approaches (see Figure 14). The first criterion refers to the dominant attributes of a planning community in terms of its governance mode. As shown in Figure 15, I have identified four ideal types, including the regulative type, the provider type, the negotiative type, and the collaborative type. The second criterion consists of two types of planning mechanisms,

including framework-based planning and project-based planning (see Table 14). As shown in Table 15, the two criteria together form seven types of spatial planning and governance approaches.

	Mechanism of Spatial Planning	
Style of planning principles	*Framework-based Planning*	*Project-based Planning*
Regulative (Reactive-imposition)	1. A legally binding spatial framework and criteria for the regulation of land use over an area	
Provider (Active-imposition)	2. Self-binding strategic plans/frameworks guide public investments and infrastructure developments	3. Project plans (initiatives of government) without frameworks as reference
Negotiative (Reactive-consensus)	4. Strategic plans/frameworks guide project developments (based on individual bargaining)	5. Project plans (initiatives of private sector) without frameworks as reference (based on individual bargaining)
Collaborative (Active-consensus)	6. There are recursive interactions between strategic plans/frameworks and project plans. The function of the strategic plans/frameworks is to build consensus between stakeholders and to guide, facilitate and coordinate project developments	7.Project plans (initiatives in a form of public-private cooperation) without frameworks as reference

Table 15
A typology of spatial planning and governance approaches

Some types of spatial planning and governance approaches may coexist in a given area according to the planning context, such as the purpose of the spatial planning and governance activities, the time of preparation, and which level of government is the major promoter. Nonetheless, the typology is useful not only for the characterisation of each single spatial planning case and for the identification of the dominant spatial planning and governance approach in a given territory, including a nation, a region, a city-region/metropolis, or a municipality, but also for measurement of their trends and directions of changes.

However, although the typology of spatial planning and governance approaches can be used to identify the dominant planning style in a particular place, it cannot explain how planning decisions are made and how the decision-making relates to the institutional variables. The typology has to be used alongside the combinative framework (see Table 11), which provides a clear direction to explore the institutional arrangements for plan-making and their relations to institutional variables. The utilisation of the combinative frameworks can deepen our understanding of a particular planning system and its practices. For comparative analysis, the combinative framework can also help us explore the significant factors that shape planning decision-making in a particular place.

The value of comparative research is great, especially for revealing the implicit assumptions and other institutional factors that shape the systems and practices of spatial planning in particular places but are often taken for granted or overlooked. In the next two chapters, I respectively investigate and compare the socio-political contexts and the evolution of planning doctrines and planning systems in the Netherlands and Taiwan on the basis of the analytical tools I have established in this chapter. This forms a foundation to explore the major factors that shape the means and practices of high-tech spatial development in these two case study city-regions.

PART 3 Emperical Study

4 Socio-political Context in the Netherlands and Taiwan

In the past four decades, it is possible to recognise two correlated wider forces that are bringing about major changes in policy-making as well as spatial planning: global competitiveness and neoliberalisation (Manuel Castells 1989; Green-Pedersen, Kersbergen, and Hemerijck 2001; Hall and Pain 2006; Hsu 2009; Waterhout, Othengrafen, and Sykes 2012). Some scholars have warned that a growing concern with economic competitiveness in the political agenda leads to the danger to exclude other possible perspectives, such as social, cultural, and environmental, and to neglect non-monetised issues and interests, such as social housing, environmental protection and so on (such as Friedman 2005; Waterhout et al. 2012). However, this does not mean that every country will follow the same trajectory. In fact, within different national contexts the manifestations and interpretations of global competitiveness and neoliberalisation differ (Green-Pedersen, Kersbergen, and Hemerijck 2001; Friedman 2005; Dicken 2003; Waterhout, Othengrafen, and Sykes 2012).

In this chapter I review how the constitutional variables—including the model of society, legal system and constitutional law, property relations and administration system—have evolved in the Netherlands and Taiwan from 1970 to 2012 under global forces, and investigate the significant similarities and differences between the two countries based on the analytical framework I established in chapter three (see Figure 14). The framework follows the concept of multi-level analysis proposed by Ostrom (2005; 2008) and assumes that the variables at the constitutional level and collective-choice level will cumulatively shape the rules-in-use at the operational level—the means and practices of spatial planning and governance. The investigation forms a foundation to explore the relationships between the institutional variables and the practices of spatial planning and governance in the development process of the high-tech economy in the Eindhoven city-region and the Hsinchu city-region.

§ 4.1 The Netherlands

Due to the wider forces of globalisation, Europeanisation, and neoliberalisation, the relationships between the Dutch government, the market and civil society have changed. The Dutch government has gradually accepted the market in policy measures since the end of the 1980s. Economic competitiveness now is not just 'the way it is'

but also a goal that takes priority over other policy concerns (Lagendijk and Boekema 2009; Waterhout, Othengrafen, and Sykes 2012). Although the Dutch legal system and the way Dutch society conceptualises property rights remain intact, the Dutch societal model and administration system have had certain changes in response to the wider forces. I investigate the changes in the following sections.

§ 4.1.1 Model of Society

The model of society can be understood as the type of welfare state regime that presents 'the diverse values and practices that shape relationships between the state, the market and citizens in particular places' (Nadin and Stead 2008a, 35). In the tradition of the three ideal types of welfare state regimes proposed by Esping-Andersen (1990), the Dutch welfare state is often classified as either a conservative type, social democratic type, or a hybrid type in-between these two (van Oorschot 2006; Vis et al. 2008). Some scholars argue that 'it is neither of them, and its development has not been a movement from one to another type but a change of its hybrid character.' (Vis et al. 2008, 43) In the post war period, the Dutch welfare system expanded rapidly with a strong paternalist character. The right to social protection was regarded as universal and unconditional (van Oorschot 2006). The Dutch welfare system was also recognised as a *verzorgingsstaat* (caring state), which embodied a concept that '"[t]he strong" had to care for "the weak" and for the sake of social harmony benefits had to be generous' (Vis et al. 2008, 43; emphasis in original).

However, since the financial crisis of the late 1970s and the early 1980s, the Dutch welfare system has experienced financial problems, gradually leading to the development of a new concept of social protection. The new concept further emphasises personal responsibility and has led to various liberalised policy measures, such as privatisation, decentralisation, and so on. The growing pressure of global competition and effects of Europeanisation have further enhanced the reorientation process, but some paternalist features and social democratic elements still remain in the system (van Oorschot 2006; Vis et al. 2008). In other words, the new Dutch welfare system embraces 'both an acceptance of the market as a superior mechanism for arriving at certain outcomes, and a crucial role for strong state intervention.' (Green-Pedersen, Kersbergen, and Hemerijck 2001, 320)

The reorientation of the Dutch social model has also altered the relative role of the public and private sectors in spatial planning and implementation. For example, *Stellingnamebrief Nationaal Ruimtelijk Beleid* (the Position Statement of National Spatial Policy) in 2002 proposed close and early cooperation of governments, civil society organisations and market participants, for the spatial development of an area,

and jointly formulated quality goals followed by incremental agreements between the parties (VROM 2002). This proposal shows that the focus of Dutch national spatial planning policy has shifted from government to governance. Since the middle of the 1990s, market participants have played a larger role in spatial development and market finance has replaced public funding in many cases (Needham 2007; Roodbol-Mekkes et al. 2012). This implies that the government tends to share the responsibility of spatial development with other sectors.

§ 4.1.2 Legal System, Constitutional Rights and Property Relations

According to the classification of Zweigert and Kötz (1998), the Dutch legal system is located in the Napoleonic legal style. The ideology that underpins the legal style is to make plans, to regulate things in advance, and to draw up abstract rules and systematise them. The Dutch Constitution defines a right for all citizens to have a decent home and requires local authorities to ensure good living conditions, a responsibility combined with a legitimacy that is given to each level of government to maintain the quality and quantity of housing through spatial planning (Commission of the European Communities 1997). The right to a decent home is one of the most substantial concerns of Dutch planning practices.

The realisation of spatial policy and plans relies on certain planning powers, such as land use regulations and building permits, to manage the location and forms of spatial development, which may limit landowners in how they use their property. When considering the protection of property rights in relation to Dutch planning powers, the *Burgerlijk Wetboek* (Dutch Civil Code)[2] declares that:

Ownership is the most comprehensive property right that a person, the 'owner', can have to (in) a thing. The owner is free to use the thing to the exclusion of everyone else, provided that he respects the rights and entitlements of others to the thing and observes the restrictions based on rules of written and unwritten law. The owner of the thing becomes the owner of its separated fruits and benefits, except when another person is entitled to them.

2 http://www.dutchcivillaw.com/civilcodebook055.htm [accessed in December 2012]

In 2005, the *Afdeling bestuursrechtspraak Raad van State* (Department of Administrative Justice of the Council of State) stated that:

the new land-use plan regulations do not take away the property of the appellants; they stay entitled to the enjoyment of their possessions within the planning framework. Insofar as the limitations on the use of the property as set forth in the land use plan can be interpreted as infringement of the right to unimpeded enjoyment of possessions, art. 1 of the First Protocol of the Convention for the Protection of Human Rights and Fundamental Freedoms leaves intact the application of laws that can be considered to be necessary to regulate the use of property in keeping with the public interest. (Hobma and Schutte-Postma 2011, p.21-22)

In other words, although the Dutch law protects the ownership of rights in land, including the enjoyment and occupation of land, the Dutch state has the power to restrict the ability to exercise rights in land in keeping with public interests. However, two conditions have to be addressed under Dutch law. First, the restrictions to exercise rights in land have to follow *the principle of legality*, which holds two core values: universal equality before law and legal certainty. That is to say, 'the government is only authorised to intervene in and determine limitations on the freedom and property of its citizens on the basis of statutory power.' (Hobma and Schutte-Postma 2011, 11) Second, according to Dutch spatial planning law the owner of a right in land can claim planning compensation for loss, when the loss results from governmental restrictions on the owner's right in land, such as a change to a land use plan (Needham 2006; Hobma and Schutte-Postma 2011). This follows the principles of Napoleonic law that consider ownership of land to include the rights to own not only current but also future benefits from the land (Booth 2007; Needham 2007).

The legal principle also means that the owner of the land owns any increase in land value, even if the increase is caused by public works or planning decisions (Needham 2007, 29, 153–155). Nonetheless, after the enforcement of the new *Wet ruimtelijke ordening* (Dutch spatial planning act) in 2008, if a *bestemmingsplan* (municipal land use plan) contains an *exploitatieplan* (land servicing plan), it is possible to impose financial conditions on the granting of a building permit as a contribution to the costs of infrastructure and other public works within the plan area as well as to the costs of planning compensation paid for the loss caused by the development of the plan (162-163). But the underlying ideology is not so much about skimming off the 'unearned increments', but rather to use a part of the value increment to increase the quality of what is being developed (29). This does not conflict with the legal principles.

§ 4.1.3 Administration System and Interaction Modes

There are three levels of government in the Dutch administration system, including the national government, provinces and *gemeenten* (municipalities). Despite the shifting role of the public and private sectors, the Dutch public administration system maintains the feature of a *decentralised unitary state* (Faludi and van der Valk 1994; Hajer and Zonneveld 2000; Lagendijk and Boekema 2009; Needham 2007). Rather than through a top-down system of command and control, public policy is enacted through 'a subtle mix of inducement and dialogue primarily based on discursive practices, alongside a sophisticated system of financial support and control.' (Lagendijk and Boekema 2009, 129) On the one hand, the income of both provinces and municipalities heavily depend on the national government. They respectively make only 24 per cent and 19 per cent of their total income themselves and the rest comes as a grant from the national government (Needham 2007; Rfv 2010). This strengthens the power of the national government.

On the other hand, the system requires different levels of government to seek *consensus* on policy-making (Faludi and van der Valk 1994; Hajer and Zonneveld 2000; Lagendijk and Boekema 2009). Two forms of coordination mechanisms are established in the planning practices—the vertical and horizontal coordination and the diagonal coordination (see Figure 16 and 17). The supervisory powers of the state are used to facilitate bottom-up coordination, to generate consensus, and to exchange experience. The underlying logic of the Dutch institutional arrangement rests on a theory—'unity cannot be imposed on the state from above' but rather comes from 'a plurality of forces thrashing out their differences within an agreed-upon framework.' (Faludi and van der Valk 1994, 33) This contributes to the stability of policy.

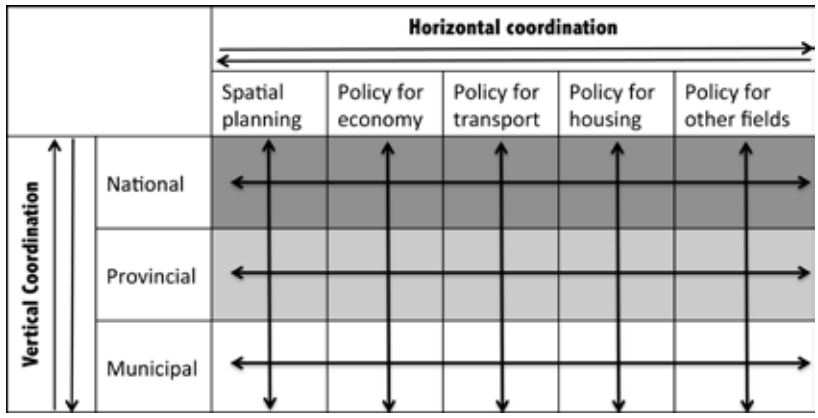

Figure 16
Intergovernmental coordination in Dutch planning practices (based on Faludi and van der Valk 1994, 224; Needham 2007, 148).

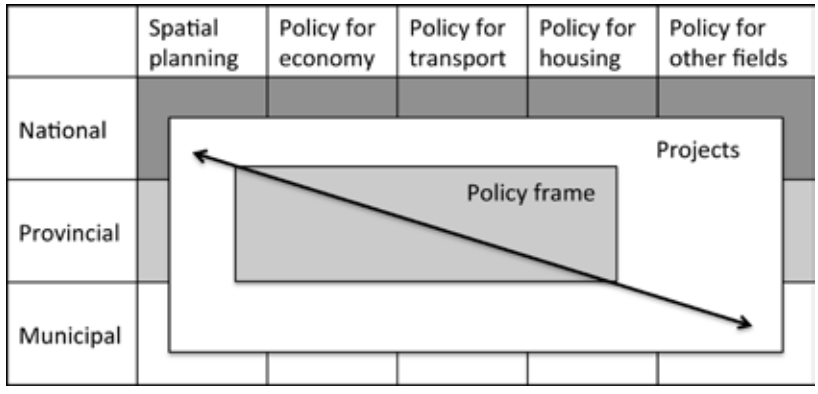

Figure 17
Diagonal coordination in Dutch planning practices (based on Faludi and van der Valk 1994, 224).

The diagonal coordination approach refers to *ad hoc* working practices for large national projects (see Faludi and van der Valk 1994, 223-224 ; Needham 2007, 233-236). Such projects often involve many policy sectors at all levels of government, so the best coordination approach is considered to be the establishment of *ad hoc* teams instead of the vertical and horizontal coordination routine, which mainly relies on mutual notification. The coordination process starts with the amplification of relevant policies into specific strategies and concrete projects. Based on the amplification, the responsibilities of each actor can be recognised and formulated into a commitment package to assure the realisation of various projects (Faludi and van der Valk 1994). The national project Brainport Avenue in the Eindhoven city-region is one of the best examples of diagonal coordination, as is further discuss in chapter seven.

In the past two decades, a rescaling process has been occurring in the Dutch administration system. On the one hand, responsibilities of spatial planning have been decentralised to the twelve provinces without accompanying resources to execute their new duties (Waterhout, Othengrafen, and Sykes 2012). On the other hand, a centralisation trend of the Dutch spatial planning system has emerged parallel to the decentralisation process. In the decentralised unitary setting each level of government can formulate a strategic plan, but the relations between the plans at different levels is so unclear and complex that the plans and policies made by the higher authorities cannot perform well (Hajer and Zonneveld 2000; Needham 2005). This issue of inconsistency has led to a series of revisions to strengthen the planning power of the central and provincial governments at the cost of the municipalities. I further discuss the parallel decentralisation and centralisation trends of spatial planning system in chapter five.

§ 4.2 Taiwan

In the past three decades Taiwan has gone through a smooth and peaceful democratic transition from a party-state authoritarianism to a liberal democracy (Rigger 1999; Hsiao 2006; Ho 2010). Taiwan has twice carried out agriculture land reform, in 1949 and 2000 (Lai 2012). The transitions of political system and land policy have had profound influences on the Taiwanese spatial planning system and its practices and spatial outcomes. It is necessary to outline the evolution of the four constitutional variables as a basis to inspect the Taiwanese planning system and its practices.

§ 4.2.1 Model of Society

From the 1950s to 1980s Taiwan was recognised as a developmental state, where economic policy had a privileged position compared to other policy issues (Holliday 2000), because becoming competitive in the global economy was its way of surviving and becoming independent in the world, both as a state and as a society. In contrast with the democratic state, its legitimacy principle was exercised on behalf of the societal project, which 'aims at a fundamental transformation of economic order', rather than on behalf of the society (Castells 1992, 57). In other words, economic development for the Taiwanese state was not a goal but a means.

The relationships between the state, the market and civil society were highly authoritarian and hierarchical. Political participation was encouraged only when the carried out in

ways that favoured the ruling regime (Rigger 1999; Hsiao 2006). Moreover, under the centralised control of the Kuomintang (KMT) led party-state, the local government had minimal administrative powers and their elected heads were a symbol of democracy rather than the substance of self-government. However, the steady high rates of economic growth in Taiwan did provide resources, both material and psychological, for its citizens to question the authoritarian practice of the single party-state and pushed the state to end the Martial Law in 1987, the demise of authoritarianism.

After that, political obstacles restricting the development of civil society were dramatically removed. The rise of social movements and emerging civil society had forced a series of political reforms. For example, the temporary provisions effective during the period of communist rebellion, which scrapped certain emergency powers that superseded the Constitution, ended in 1991 and the first direct presidential election was held in 1996. At the same time, the Democratic Progressive Party (DPP) quickly grew to be the biggest opposition party balancing the power of the KMT regime, eventually winning the presidential election in 2004 and 2008. Several relatively small but significant political parties, such as People First Party and Taiwan Solidarity Union, were successively established and developed in the early 2000s. The political system has thus become a multi-party system.

On the one hand, a close relationship between government elected officials and business interests strengthens 'gold-power' politics (Ng 1999). Local factions and big business groups, which used to be passively subordinate to the state, now play an active role, intervening in policy-making and spatial development in order to reap huge profits (Chen 1995). On the other hand, issue-rich electoral debates have forced the Taiwanese government to address key policy areas in relation to general public concerns, such as creating a more equitable welfare system, working on environmental protection and tackling political corruption (Fell 2010).

Regarding state-civil relations, Rigger (1999) argues that in the democratisation process of Taiwan, elections were the most important channel that gave the opposition regular opportunities to demonstrate its popularity, to publicise its ideas and to influence policy-making. Hsiao (2006) addresses the role of Taiwanese indigenous NGOs in promoting socio-political reforms and influencing policy-making to safeguard a healthy and mature democratic political system. Based on a survey of 250 NGOs in the Taipei metropolitan area, he states that 'NGO-government relations have gradually changed in favo[u]r of NGOs, though they do still face the legacy of past authoritarianism' (219).

In terms of spatial planning, it is common that citizens challenge the contents of planning based on the support of NGOs and other relevant civil society organisations. Some of the citizen groups, if they have a sufficiently large following, will try to motivate local politicians to support their demands during an election period. In spite of changing relations between the state and civil society, economic development still retains its

priority on the political agenda even during the 2000 to 2008 period of DPP government, which used to have close collaboration with social movement organisations (Ho 2010). Spatial planning and development becomes one of the crucial political arenas, where different stakeholders from the government, business sector and civil society fight for their own interests.

§ 4.2.2 Legal System and Property Relations

The Taiwanese legal system applies a diversified and hybrid legal style, consisting of traditional Chinese legal culture that derives from Confucian thought and westernised modern legal culture based on German- and Japanese-style legal codes. The former emphasises social harmony and collectivism, while the latter stresses individualism and personal rights (Lin 2011). The Taiwanese legal system gives priority to statutes rather than case law. The hierarchy of the law system ranks from the Constitution, codes, statutes, to ordinances. There is a slight distinction between property rights and rights in land in the Constitution. Articles 5 and 23 state that:

The right to live, the right to work, and the right to own property shall be guaranteed to the people…All the freedoms and rights enumerated in the preceding articles shall not be abridged by law except such as may be necessary to prevent infringement upon the freedoms of others, to avert an imminent danger, to maintain social order, or to promote public welfare.

But article 143 in chapter 13, the fundamental national policies of the Constitution, further declares the protection and restrictions of landownership as follows:

All land within the territorial limits of the Republic of China [Taiwan] shall belong to the entire body of citizens. Private ownership of land, acquired by the people in accordance with law, shall be protected and restricted by law. Privately owned land shall pay taxes according to its value and may be purchased by the Government according to its value… The State shall levy a land value increment tax on any land whose value has increased not through the application of labour or capital, and the proceeds therefrom shall be used for the people at large.

The declaration shows three concepts of Taiwanese land policy. First, the whole national territory is seen as one entity and belongs to the entire body of citizens. This distinguishes rights in land from general property rights. This relates to the second concept. That is, the protection of rights in land should be controlled on the basis of statutory powers, because land is considered as a scarce and irreplaceable resource that cannot be monopolised by a small number of people or certain consortium (Hu 2006).

Third, land value increment, which is not derived from the application of labour or capital, should belong to the public. These three concepts are underpinned by one core value—equalisation of land rights. This shows the ultimate goal of Taiwanese land policy and has fundamental effects on the Taiwanese land system.

In the name of equalisation of land rights, Taiwan carried out the first land reform soon after World War Two. The redistributive land reform successfully channelled land capital into industrial capital and encouraged the movement of rural labour into the industrial sector. The policy of land redistribution has not only laid a foundation for economic development but also resulted in a high degree of land fragmentation in Taiwan (Deininger 2003; Lai 2012). Compared to other countries, the high degree of land fragmentation and real estate values can be identified as distinct features of the Taiwanese land system (see Table 16). The features increase the difficulty to conduct integrated land development projects for the need of national economic policy, new community development, and enhancement of social benefits. As a result, various land acquisition and assembly instruments have been invented, including zone expropriation, agriculture/urban land consolidation, and so on, for implementing the projects based on the principle of equalisation of land rights and the assumption that the unearned increment of land value belongs to the public.

Since the 1980s the Taiwanese government has gradually adopted neoliberalisation measures in public policies, such as privatisation, financial liberalisation and public-private partnership (Hsu 2009), and encourages private investment and participation in spatial development. Learning from other countries two concepts have been introduced to Taiwan: beneficiary pays principles and development impact fees. Additionally, due to a series of social movements the government pays more attention to the protection of land ownership. In response to the changing socio-political context, not only are new land assembly instruments being invented, such as case-by-case rezoning exaction, but also existing instruments have been revised to safeguard rights and interest in private land, and to encourage the participation of the private sector in land assembly practices for spatial development.

Country	Total farmland (Km2)	Average farm real estate values per hectare (1000 euro)	Average farm size (hectare)
Taiwan (1999)	8,500	483.9	1.08
Korea (1999)	19,000	50.1	1.37
Japan (1999-2001)	47,900	78.7	1.56
Netherlands (2000-2001)	19,600	46.9	20.4
Germany (1998-1999)	171,500	9.4	36.34
France (1997-1999)	283,300	3.6	41.68
US (2000)	3,816,000	3.0	175.63

Table 16
Farm real estate values and average size (based on Huang 2002, 171-180)

§ 4.2.3 Administration System and Interaction Modes

At the end of the 1990s the Taiwanese central government decided to downsize provincial authority and to promote a central-local two-tier government in order to increase administrative efficiency. This decision led to several initiatives that devolve administrative powers and responsibilities from the provincial government to local authorities, but also centralise some powers and responsibilities. In the past ten years these government initiatives have changed the relation between central and local governments and their functional divisions in spatial planning and governance. In terms of the spatial planning system, the review of detailed plans for urban planning purposes becomes the authority of local government. The local government only needs to report the result to central government.

However, urban planning masterplans still need to report to the central competent authority for approval. Although there is more and more space for negotiation between the central government, local governments and local communities in the reviewing process, the central government still plays the most decisive role. Further, the allocation of government revenues and expenditures is highly asymmetrical. Around 73 per cent of the net government revenue belongs to central government, but only 63 per cent of total government expenditure at all levels is spent by the central government (Yen 2011). Except for the two major municipalities, Taipei City and Kaohsiung City, which are directly under the central government, only 50 per cent of local government expenditure, including centrally allotted revenue (17 per cent), is derived from their own-source revenues. Most Taiwanese local governments highly rely on project grants and subsidies from the central government. This has undermined the autonomy of the local governments.

Although in the past three decades Taiwan has transitioned from a party-state authoritarianism to a liberal democracy, its governance system still tends to be hierarchical and centralised. Nevertheless, there is more and more space for the business sector as well as civil society to participate in the decision-making process. Not only the central government, but also the local governments have recognised the changing relationships between the government, the market and civil society and have been learning how to deal with the new relationships. Further, the emerging competitive city-region discourse has pushed some local governments to acknowledge the importance of intergovernmental networking. Eight city and county governments in Northern Taiwan thus established the Northern Taiwan Development Commission in 2005 to facilitate inter-regional cooperation, a bottom-up initiative that is looking for support of the central government. However, the intergovernmental and interagency relations in Taiwan are always criticised for a lack of institutional support as well as of internal officials' willingness to coordinate and collaborate (Pei, Shih, and Chen 2011). It is not yet clear whether or not the eight local governments can resolve the internal institutional barriers through a more innovative approach.

§ 4.3 Comparisons

I summarise the major characteristics of the Dutch and Taiwanese socio-political contexts in Table 17. Both countries can be identified as strong states, but when formulating and conducting certain public policies they have gradually accepted market-based measures—such as public-private partnership, privatisation of state-owned enterprises, and so on—due to the influence of neoliberalisation since the 1980s. However, their starting points are different. The Netherlands is categorised as a caring state with a decentralised unitary nature. Policy-making is based on broad consensus among different levels of government and stakeholders. Taiwan is known as a developmental state with a hierarchical nature. Although Taiwan has shifted from a party-state authoritarianism to a two-party democratic system with a growing role of civil society in policy-making, the legacy of authoritarianism and economic development-oriented policy-making remains.

Major characteristics		
Constitutional Variables	*Netherlands*	*Taiwan*
Model of society	– A caring state (but has gradually accepted the market in the policy measures but some social democratic elements and strong state interventions retain) – Multi-party democratic system	– A developmental state (has adopted the public-private partnership approach to conduct infrastructure and economic developments) – From a party-state authoritarianism to a liberal democracy
Legal system & constitutional rights	– Napoleonic legal style – The right to housing	– A diversified and hybrid legal style consisting of Confucian thought and German- and Japanese-style legal codes
Property relations	– The right to property may only be encroached upon in the interest of public need – Land value increment belongs to property owners, because the landowner owns the (current and future) rights and interests in land	– The ultimate goal is the equalisation of land rights – The protection of rights in land should be under control on the basis of statutory powers – Land value increment belongs to the public
Administration system	– A decentralised unitary state – Decision-making is based on broad consensus	– An unitary state – Hierarchical direction

Table 17
Comparisons of the Dutch and Taiwanese socio-political context

Regarding the conceptualisation of rights, there is a fundamental difference in rights in land between these two countries. In the Netherlands, rights in land are part of property rights, which can only be encroached upon in the interest of public need. There is no distinction between current and future rights to beneficial enjoyment. According to the legal principles, it is considered somewhat indecent if the landowner profits fully from the land value increment when the increment is caused by public works or planning decisions. In contrast, the core value of Taiwanese land policy is the equalisation of land rights, which is written in the Constitution. In light of the core value, rights in land are distinguished from other property rights and should be under control by law, because the whole national territory is seen as one entity belonging to the entire body of citizens and land is considered as a scarce and irreplaceable resource that cannot be monopolised by a small number of people or certain consortium. The institutional setting and design of land policy mechanisms in Taiwan is mainly based on the value of equalisation of land rights.

Further, the conceptualisation of rights in land has led to a series of land reforms. As a result, the landownership of farmland in Taiwan is much more fragmented and its real estate value is also higher than the farmland in the Netherlands. As shown in Table 16, the average farm size in the Netherlands is thirty-six times more than in Taiwan, and the average farm real estate value per hectare in the Netherlands is around one-tenth of

the average farm real estate value per hectare in Taiwan. It is no wonder that other than expropriation the Taiwanese government tends to develop and employ various land policy mechanisms to undertake integrated land development projects and acquire land for public uses, such as zone expropriation, urban land consolidation, etc. In the next chapter, I outline and compare the spatial planning systems and practices in these two countries and further investigate the influences of the constitutional variables on their spatial policies and planning systems.

5 Spatial Planning Policies and Planning Systems in the Netherlands and Taiwan

Under the forces of global competitiveness and neoliberalisation, the relationships between government, the market and civil society in the Netherlands and Taiwan have changed to accept the market in policy measures. They both are acknowledged as strong states but with different natures. The former is recognised as a caring state based on consensus building/seeking, while the latter is identified as a developmental state with a hierarchical nature. Dutch and Taiwanese spatial policy has evolved in accordance with the neoliberalisation trend. The changes can be explained with reference to spatial planning policy and the broader notion of 'planning doctrine'.

According to the definition of Faludi and van der Valk (1994), planning doctrine is a set of interrelated and durable notions addressing principles of spatial organisation and planning principles. The former refers to a body of thoughts concerning spatial arrangements within a given area and the development of that area, such as the planning concepts of Green Heart in the Netherlands and Green Belt in the UK. The latter relates to the ways that the principles of spatial organisation are handled. This includes the preparation, form, and implementation of plans. Planning doctrine indicates an arena for discussion and action, which involves the process of consensus seeking in a particular planning context. But the planning context is so dynamic that various planning concepts may be replaced during the planning process due to changes of political preference, socio-economic conditions and contemporary scientific knowledge over time (Roodbol-Mekkes, van der Valk, and Korthals Altes 2012). On the basis of the understanding of the socio-political context of these two countries in the previous chapter, I respectively investigate the evolution of spatial organisation principles and planning principles in the following sections.

§ 5.1 The Netherlands

Since the end of the 1980s a trend of 'economisation of spatial policy' has occurred in the Dutch spatial planning system (Hajer and Zonneveld 2000; Lagendijk and Boekema 2009). The primary concern of Dutch national spatial planning policy has shifted from housing to improving competitiveness (Hajer and Zonneveld 2000; Faludi 2005). In response to the forces of globalisation, Europeanisation and neoliberalisation, a more fundamental revision of the planning act was enforced in 2008 with attempts to simplify the decision-making procedure, ensure planning effectiveness and to encourage rather than to restrict spatial development. Many new planning instruments have been introduced. This has changed the power relations between the national government and local authorities. In this section, I outline the evolution of Dutch spatial planning policy and planning instruments and review relevant literature that evaluates planning practices in the Netherlands to explore the essence of the Dutch planning system in the form of rules-in-use rather than rules-in-form.

§ 5.1.1 The Evolution of Spatial Planning Policy

The right to housing written in the Dutch Constitution gives each level of government a responsibility combined with a legitimacy to keep the quality and quantity of housing through spatial planning (Commission of the European Communities 1997). While housing has always been a vital element of Dutch spatial planning, since the 1980s the primary concern of national spatial planning policy has shifted from housing to economy, a trend of 'economisation of spatial policy' (Hajer and Zonneveld 2000). This trend was triggered by four contextual factors: the changing relationship between spatial planning and other sectoral policies, the severe economic recession, rising global competition and the declining planning identity. Figure 18 illustrates the changing planning context, the core threads of discursive concepts and the scope of every national spatial planning document from 1970 to 2012 in the Netherlands.

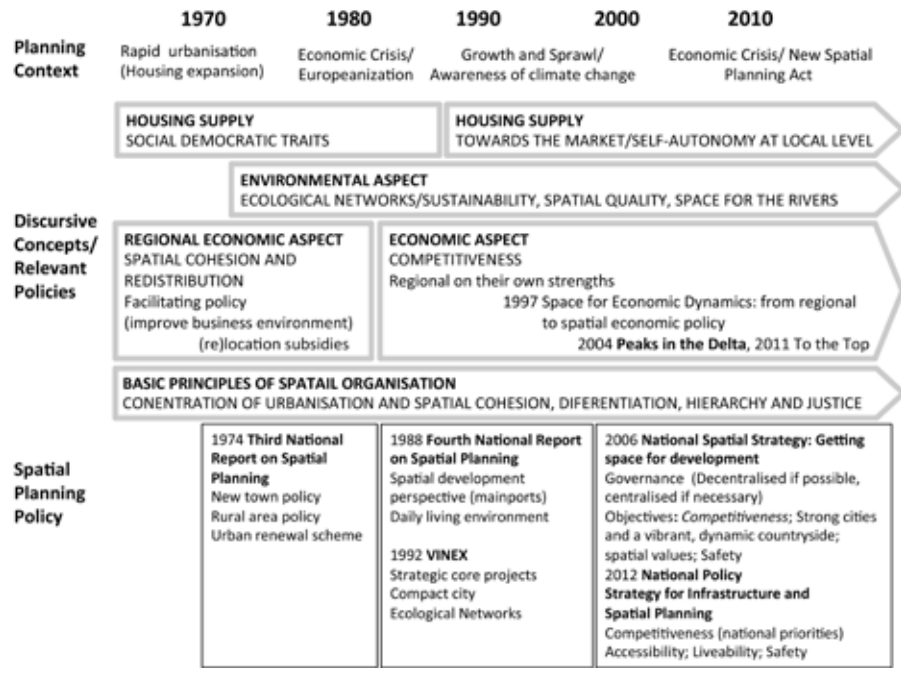

Figure 18
Core trends in discursive concepts and spatial policy

First, the spatial planning agency in the Netherlands does not have a substantial budget, so spatial planning lies in extensive intra-governmental coordination, negotiation and consultation (Hajer and Zonneveld 2000; Needham 2007; Roodbol-Mekkes, van der Valk, and Korthals Altes 2012). It is common for the spatial planning agency to collaborate with other departments to achieve its planning goals. Furthermore, Dutch spatial planning was not independent of housing policy until the separation of the *Woningwet* (Housing Act) and *Wet Ruimte Ordening* (Spatial Planning Act) in 1962 (Faludi and van der Valk 1994). Since the 1980s, economic and infrastructural sectors have become the new partners of spatial planning. This change has been underpinned by the remaining three factors—the severe economic recession, rising global competition and the declining planning identity in the 1980s.

In the early 1980s rapid growth and urbanisation came to an end. Dutch unemployment rose enormously. More than one-quarter of national income was thus needed to pay for social insurance, a huge burden on the national economy (Faludi and van der Valk 1994). On the other hand, the Dutch government became aware that internal European boarders would disappear by the end of 1992. This would create great opportunities for Dutch business and industry (Carter 1996). Hence, the potential to grasp the opportunities and strengthen national competitiveness were dominate topics on the political agenda.

At the same time, Dutch national spatial planning faced severe criticism about the loss of its identity and political appeal because it became too technocratic and lacked vision. The need to clarify the core business of planning with an innovative approach became urgent (Faludi and van der Valk 1994). As the economy became the dominant topic on the political agenda, asserting a role for spatial planning within this the topic became an imperative. As a result, in 1988 the *Vierde Nota* (Fourth National Policy Document on Spatial Planning) proposed a Mainport strategy from a more selective and strategic perspective. The strategy emphasised the essential role of Schiphol airport and Rotterdam seaport for the Dutch economy. According to Faludi and van der Valk (1994, 195), this shift implies that the Dutch national spatial planning had became 'a tool of economic recovery' rather than 'an instrument of overall guidance'.

Ruimetelijke Ontwinkkelingspolitiek (Spatial Development Policy), a report from the National Scientific Council for Government Policy (WRR) in 1998, further promoted the trend of 'economisation of spatial policy'. This report proposed an area-based proactive development concept that has been broadly adopted on the planning agenda. It was deemed better to 'let spatial policies follow autonomous spatial developments' and pay more attention to implementation and finance rather than controlling spatial developments (Gerrits et al. 2012, 338). *Nota Ruimte: Ruimte voor Ontwinkkeling* (National Spatial Strategy: Getting Space for Development) in 2004 and the *National Policy Strategy for Infrastructure and Spatial Planning* (SVIR) in 2012 continued to follow this trend and tried to integrate with other sectoral policies, such as infrastructure, nature and agriculture. The first goal listed in both policies is to enhance competitiveness strategically by identifying what is nationally important, addressing the role of urban regions and strengthening national spatial and economic infrastructure (Ministerie van Economische Zaken 2004; Ministerie van Infrastructuur en Milieu 2012). According to the letter from Minister Schultz van Haegen to the *Tweede Kamer der Staten-Generaal* (House of Representatives), the *Multi-Year Plan for Infrastructure, Spatial Planning and Transport* (MIRT) has been used as a framework for balancing national interests and projects with local interests and projects (van Haegen 2012, 1). In other words, planning concepts of Dutch spatial planning policy since the 2000s are mainly derived from the emphasis of area-based economic development through an infrastructure network approach.

However, the shifts of planning concepts and scope do not necessary imply that Dutch planning doctrine has encountered a revolutionary change. Five basic principles of spatial organisation have been identified in the Dutch national spatial policy since the first national spatial policy in the 1960s: concentration of urbanisation, spatial cohesion, spatial differentiation, spatial hierarchy and spatial justice (Netherlands Scientific Council for Government Policy 1999; Hajer and Zonneveld 2000; Needham 2007). Concentration of urbanisation is an ambition to avoid urban sprawl. Spatial cohesion indicates a good geographic relationship between various activities in a given area on different scales. Spatial differentiation relates to the manifestation of city and country

concerning the prevention of uniformity and monotony. Spatial hierarchy refers to an intention to create and keep a range of urban centres. Spatial justice means that people should have access to adequate facilities and services wherever they live. The national spatial planning policy has followed the principles for decades, although in different ways and to different degrees. The principles do provide an element of stability in Dutch planning doctrine and form the core of the professional approach and negotiation framework for the Dutch national spatial planning policy.

§ 5.1.2 Dutch Spatial Planning System

On 1 July 2008 the new Dutch Spatial Planning Act (Wro) came into effect, replacing the old act (WRO) that was promulgated in 1965 and since revised only marginally. Deregulation, coexisting trends of centralisation and decentralisation of certain planning powers, and a focus on development are the important features of the new act. These lead to three major changes in terms of planning instruments. The first is the introduction of *projectbesluit* (project plan), a new form of implementation plan that can be made by the national government, provinces and municipalities. A project plan allows deviation from existing *bestemmingsplan* (municipal land use plan), but within a year after the plan gets approved, a *bestemmingsplan* consisting of the project plan has to be prepared and put on public display, otherwise the project plan will lose its legal force. This new instrument is designed to maintain flexibility in *bestemmingsplan* (Needham 2007).

Second, the *Planologische Kernbeslissing* (key planning decision) of the national government, the *streekplan* (regional plan) of provinces and *structuurplan* (structure plan) of municipalities are replaced by the *structuurvisie* (structure vision) at each level of government (see Figure 19). The *structuurvisie* expresses a vision of how a planning agency seeks to shape its territory and serves as an important basis for the *bestemmingsplan* and the *projectbesluit* to assure the consistency between planning decisions and the cohesion of physical developments in a particular area (Needham 2007; PBL 2010). The *structuurvisie* is a 'self-binding' indicative plan. The major measure to realise the visions of national and provincial governments is through *AMvB Ruimte* (General Regulation on the Management of Spatial Planning) of the national government and *Verordening Ruimte* (spatial regulations) of provinces.

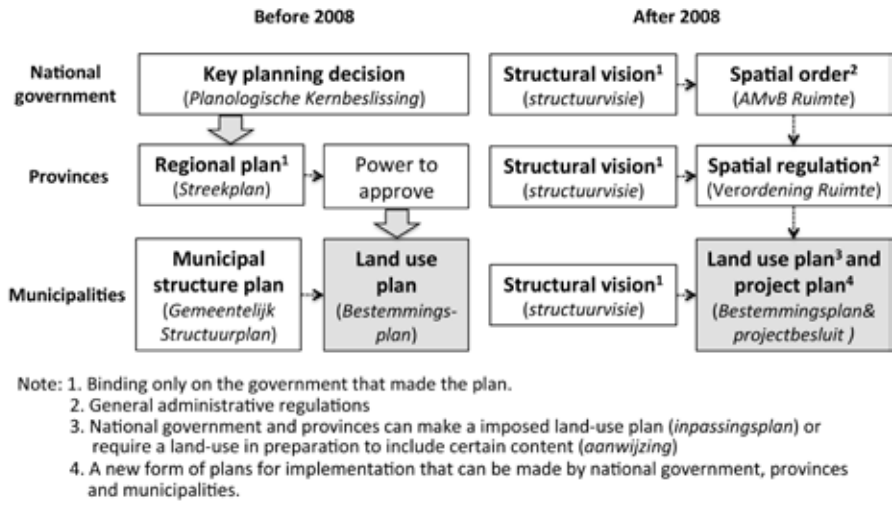

Figure 19
Changes of Dutch spatial planning system after 2008.

Under the new act, the establishment of structure visions is obligated for the entire territory of each municipality. However, according to an evaluation report of the new act in 2010, only a limited number of municipal structure visions have been established, because there is no penalty for a municipality when it does not establish a structure vision for its entire territory (PBL 2010). While some municipalities are planning to comply, others have already made a structure plan according to the old act and do not plan to make a new structure vision in the near future, although their spatial planning frameworks have become obsolete. Others still use a non-statutory form of plan, such as a development vision. Those municipalities that do not follow the new act to establish structure visions often have other priorities on their planning agenda, such as updating their land use plans.

The third change refers to the coexisting trends of decentralisation and centralisation of planning powers. Previously, municipalities were obliged to make *bestemmingsplan* for the land outside the built area within the municipal territory and the plans had to be approved by the province. A *bestemmingsplan* determines what can be built where and which regulations apply to it. It also relates to three public powers: environmental permit, the pre-emption right and the expropriation, which are explained later. Since the enforcement of the Wro, municipalities have to make bestemmingsplan for the entire territory and the plans do not need approval from the province anymore. This shows a decentralisation of planning powers to the municipality.

However, there is also a centralisation trend. National and provincial governments now can give an *aanwijzing* (directive) to municipalities to produce a land use plan with a given content, or make an *inpassingsplan* (imposed land-use plan), which has all the legal force of the *bestemmingsplan*. When an inpassingsplan is made in a particular area, the land use power of the municipality in the area is taken away. Generally, the inpassingsplan is made when the planning area crosses municipal boundaries, such as the construction of roads or power lines. The revision of the planning law does provide new possibilities for the national and provincial governments in negotiations with municipalities, and thus alters 'the balance of power between the actors' (Needham 2005, 340).

Nonetheless, based on the interviews of central, provincial and local government officials the evaluation report of the new act shows that the move to give *aanwijzing* to municipalities is undesirable and often not necessary, because the draft land use plan of the municipalities is modified according to the *zienswijze* (submitted views) of the national or provincial governments. This can be demonstrated by the statistics highlighting that from 2008 to 2010 the *aanwijzing* has been given by the national government only once and by provincial governments eleven times. Compared to 274 withdrawals of *bestemmingsplan* approval in 2007, which were all made by provincial governments under the old act, it can be said that at present the national and provincial governments restrain the use of the directive power. The report also shows that almost all plans that are established by higher authorities are obviously beyond local significance, and in good consultation with the municipalities (PBL 2010).

Further, in 2011 the Minister of Infrastructure and Environment announced that the *AMvB Ruimte* (General Regulation on the Management of Spatial Planning) would be redrafted in a more decentralised form (Ministerie van Infrastructuur en Milieu 2011). This indicates that although the planning power has been centralised under the new act, the central and provincial governments tend towards setting general regulations and developing common agreements rather than directly influencing land use in a particular area through giving an *aanwijzing* or making an *inpassingsplan*. This tendency reflects the Dutch culture of consensus-seeking as well as their principle of governance—decentralised if possible, centralised if necessary—within the daily practices of planning principles since the 1990s.

According to the National Policy Strategy for Infrastructure and Spatial Planning (Ministerie van Infrastructuur en Milieu 2012, 29–67), the position of the national government in the field of spatial planning and development is limited to thirteen national interests as follows:

1 an excellent spatial-economic structure of the Netherlands consisting of an attractive business climate and good international accessibility in the city-regions where the top sectors of high-tech industry are clustering;

- the main networks (renewable) energy and the energy transition;
- space for the transport of (hazardous) substances through pipelines;
- efficient use of the subsoil;
- a robust network of main roads, rail and waterways around and between the main urban areas and hinterland;
- the capacity of the existing transportation system (road, rail and waterways);
- the maintenance of main networks of road, rail and waterways;
- the improvement and protection of environment (air, soil and water);
- space for flood protection, sustainable fresh water supply and protection (significant) climate change;
- preservation of unique cultural and natural qualities (such as the World Heritage);
- space for a national network of nature for biodiversity;
- space for military sites and activities;
- careful consideration and transparent decision-making at all spatial plans.

Outside national interests, responsibilities in the field of spatial planning and development fall on provinces and municipalities, such as the supply of housing and business sites. It is expected that provinces and municipalities are more aware of the regional situation and the demands from residents, businesses and organisations, so the decisions made by provinces and municipalities can better fit the needs and challenges of their area.

§ 5.1.3 Means to Influence Land Use Directly

Hobma and Schutte-Postma (2011) classify planning powers into two categories—reactive powers and proactive powers. With reactive powers the government reacts to the development initiatives of the private sector through issuing permits for development activities, such as a building permit, on the basis of the land use plan and other general regulations, such as building codes. In the Netherlands, since 2010 a single permit has replaced various permits in the areas of housing, spatial planning and the environment in order to simplify the permission system and encourage development. It is called the *omgevingsvergunning* (environmental permit).

Proactive powers enable the government to take development initiatives, such as land development, urban expansion, infrastructure construction, etc. Under Dutch public law, the government can exercise the *voorkeursrecht* (pre-emption right) based on the *Wet voorkeursrecht gemeenten* (Municipal Pre-emption Rights Act) and *onteigening* (expropriation) on the basis of the *Onteigeningswet* (Expropriation Act). After exercising the pre-emption right, governments can be the first party to enter into negotiations with the owners of the appointed land, if the owners are willing to sell or lease their property.

Article 77 of the *Onteigeningswet* allows expropriation 'in the interests of spatial planning and housing.' In other words, the land can be expropriated for either executing the land use plan for purposes of new infrastructure and/or future urban development, or for maintaining the status quo to be in accordance with the land use plan. The argument is that 'if a land use plan has been adopted, this is sufficient proof of the public interest.' (Needham 2007, 169) But if the owners of the land want to realise the plan on their own, expropriation is not necessary. According to the law, compensation paid for the expropriation shall consist of not only the loss of the property according to the market price with the proposed new development, but also the loss suffered as a result of disturbance, removal, etc.

In addition to the interventions on the basis of public law, the Dutch government commonly uses private law to achieve planning ambitions, including purchase, sales, ground leases, and public-private partnerships (Needham 2007; Hobma and Schutte-Postma 2011). For example, if a municipality owns a piece of land, they can sell or lease the land with some conditions based on private law and the buyer or the leaseholder is obliged to satisfy the conditions. But in the latter situation, the government can impose numerous obligations on the leaseholder in relation to use, maintenance, and upkeep.

§ 5.1.4 Summary of the Dutch Planning System and Practices

I summarise the Dutch spatial planning system and practices in Table 18 according to the framework proposed in chapter three. Under the forces of global competitiveness and neoliberalisation, in the past two decades the primary concern of Dutch spatial planning policy has shifted from housing supply to economic development with an infrastructure network approach. Parallel to the shifting concern of Dutch spatial planning policy, there has been evolution of the Dutch legal planning system. Important features of the new planning act are expected to be deregulation, decentralisation, and a focus on development. According to the explanatory memorandum of the new act, the Dutch planning system needs to fulfil a dual concept, which embraces a steering function and a safeguard function at the same time (Buitelaar and Sorel 2010). On the one hand, the steering function implies that the new act has to create more room for development under the pressure of global competition, so it simplifies the legal procedure and introduces the *projectbesluit*. The safeguard function, on the other hand, leads the new act to an inclination for a plan-led system and a stronger role of the land use plan in order to guide spatial development and enhance legal certainty (Buitelaar, Galle, and Sorel 2011). Hence, the new act requires municipalities to make the *bestemmingsplan* for all of their territories and reduces the possibility of granting exemptions (Needham 2005; 2007).

Effects on (Type of rules)	Action situations for planning agencies in the Dutch planning system
Actor constellations	**Regarding the *bestemmingsplan* and the *inpassingsplan*** – In the stage of preparation: Involvement of citizens and societal organisations. – In the stage of draft plan: *Any person* may express their views on the draft plan. – In the stage of final plan: *Elected representatives* discuss and vote upon the final version. **Regarding the structure vision** – It is a self-binding plan, so the procedure is not stipulated in the act.
Action orientations	**Position of each level of government** – National government: determines spatial policies in the national context and is expected to focus only on the 13 national interests. – Provincial governments: are responsible for translating national spatial policies into the regional context. – Municipalities: implementing national policy and strategy on spatial planning is largely decentralised to municipalities. The municipalities play a decisive role in detailing and implementing spatial planning throughout the country.
	Pay-off rules – Compensation for expropriation is based on market price. – Planning compensation: for the loss suffered resulting from planning decisions. – The *exploitatieplan* (land-servicing plan): Implementation of the *bestemmingsplan* has to be financially feasible. The costs of certain municipal services for land development must be recovered from those parties who profit from the municipal services.
Actor capacities *(Planning instruments)*	**Municipalities**—*bestemmingsplan* and *projectbesluit* (project plan) **National and provincial governments** – *Inpassingsplan* and *projectbesluit* – *Aanwijzing* (directive) – Regulations on spatial planning (e.g. *AMvB Ruimte* of national government and *Verordening Ruimte* of provinces) **Means to influence land use/development** – Public law: rights to pre-emption and expropriation. – Private law: purchase, ground lease, sale and public-private partnership.

Table 18
Summary of the Dutch planning system after 2008 (based on: Needham 2007; Hobma and Schutte-Postma 2011; Spatial Planning Act 2006 http://wetten.overheid.nl/BWBR0020449/ ; Government of Netherlands website http://www.government.nl/issues/spatial-planning [Accessed in July, 2012])

However, there are high ambitions for the physical environment and land use in Dutch planning practices. Dutch municipalities commonly use the legally binding land use plan as a form of contract to regulate informal agreements between stakeholders rather than as a means to guide spatial development (Needham 2007; Buitelaar and Sorel 2010). Based on empirical research, Buitelaar and Sorel (2010, 988) conclude that 'the Dutch planning system was neither plan-led nor based on legal certainty.' Even after the promulgation of the new act, the *bestemmingsplan* is primarily used for recording new development initiatives or maintaining existing land uses rather than for planning and guiding future development (PBL 2010; Buitelaar, Galle, and Sorel 2011). In other words, it is a plan-led system within development-led practices.

Many consider that there is a centralisation tendency of planning powers rather than decentralisation under the new planning law, because several new planning instruments

have been introduced to national and provincial governments, including *projectbesluit*, *inpassingsplan* and *aanwijzing*. This has increased the planning powers of national and provincial governments at the cost of the municipalities. But in practice the national and provincial governments follow the principle—decentralised if possible, centralised if necessary. In other words, they do not intervene with municipal planning decisions unless it will influence national or provincial interests. They are encouraged to lay down spatial regulations and to build consensus on spatial policy rather than to influence land use directly. Specifically, municipalities are expected to be the level of government obliged to detail and implement spatial planning throughout the country.

§ 5.2 Taiwan

Spatial planning in Taiwan is centralised, state-led, technocratic, blueprinted and development-oriented (Chang 1988; Hsia and Chang 1995; Lai 2000; Lee, Lan, and Juang 2005). These features can be traced back to 1936 when the urban planning law was first promulgated during the Japanese occupation period (Hsia and Chang, 1995). Although national economic development has always been the priority on the political agenda, changing socio-political context and discursive concepts have incrementally altered the scope and direction of national spatial planning policy. Since the 1990s, national economic development and relevant infrastructure construction are no longer the sole concern. Other issues, such as living quality, national land conservation and disaster prevention, have been addressed in national spatial planning policy due to the changing socio-political context, the emerging civil society and the outbreak of several severe disasters, such as the 921 Earthquake[3] in 1999 and Typhoon Morakot[4] in 2009, which resulted in thousands of deaths. How to manage national land in a more sustainable way has become one of the major challenges for the Taiwanese planning community in the twenty-first century. In the following section, I review the evolution of Taiwanese spatial planning policies and planning instruments.

3 The 921 earthquake occurred in 1999. It was the second-deadliest quake in recorded history in Taiwan. It caused the death of 2,415 people, the injury of 11,305 people, and the damage of US$10 billion.

4 Typhoon Morakot hit Taiwan in 2009. It was the deadliest typhoon in recorded history in Taiwan. It resulted in 461 people dead, 192 others missing and roughly $3.3 billion USD in damages.

§ 5.2.1 The Evolution of Spatial Planning Policy

The dynamic interrelationships between the planning context and spatial planning policies in Taiwan are shown in Table 19. The evolution of Taiwanese spatial planning policy can be divided into five periods. In the first period from 1949 to 1964 the planning emphasis was put on short-term, partial improvements to individual urban areas (Chang 1988). Due to the financial and technical support of spatial planning from the United Nations Development Programme (UNDP) from 1966 to 1971, systematic planning methods and regional planning concepts were introduced to Taiwan (Chang 1988; Hsia and Chang 1995). At the same time, Taiwan encountered rapid urbanisation and industrialisation. Some sub-regional plans were made for the extension of port and metropolitan areas, but there was no nation-wide spatial planning until the announcement of the *Plan for the Overall Development of the Taiwan Area* in 1979 (Lee, Lan, and Juang 2005).

Planning policy	Planning context	Principles of Spatial Organisation
1949-1964 *Urban plans*	– Significant migration from mainland China – Imposition of Martial Law in 1949 – The first land reform in the 1950s	– Individual urban area as the planning object – Focus on short-term, partial improvements of problem areas
1964-1979 *Urban and Regional Plans*	– Rapid urbanisation and industrialisation – Financial and technical support from the UNDP (1966-1971) – Diplomatic isolation in the 1970s	– Sub-regional planning for the extension of port and metropolitan areas
1979-1996 *Plan for the Overall Development of the Taiwan Area* (CEPD 1979)	– Increasing uneven regional development – Emerging social and environmental movements – End of Martial Law – Democratisation – Economic liberalisation	– Emphasis the directives of major public investment projects and sectoral developments – Establishment of an urban hierarchy system and introduced the concept of local living perimeters
1996-2001 *National Comprehensive Land Development Plan* (CEPD 1996)	– Asian financial crisis in 1997 – Toward a two-tier governments system in 1999 – 921 Earthquake in 1999 – First political party rotation in 2000 (DPP government)	– Identification of national spatial structure, including two development axes, three metropolitan belts and twenty living perimeters
2001-2012 *Strategic Plan for National Spatial Development* (CEPD 2010)	– Economic crisis – Second political party rotation in 2008 – Typhoon Nalee in 2002 and Typhoon Morakot in 2009	– Identification of central mountain range conservation axis, coastal development conservation belt, and seven regional living perimeters and city-county cooperation regions

Table 19
An outline of spatial planning policy evolution in Taiwan (based on Chang 1988; Hsia and Chang 1995; CEPD 1996; CEPD 2010; CEPD 2011a; Ministry of Interior, R.O.C. 2004; Lee et al. 2005; Bristow 2010; Hsu 2010)

There has been one essential administrative issue in relation to spatial policy formulation. That is, the confusion of functional divisions within the level of central government. The Ministry of Interior is the authority in charge of territorial planning on the national level, but in actuality the Council for Economic Planning and Development (CEPD)[5] plays a decisive role in formulating national spatial development policy, including the *Plan for the Overall Development of the Taiwan Area* in 1979, the *National Comprehensive Land Development Plan* in 1996, and the *Strategic Plan for National Spatial Development* in 2010. These policies determine public investments and national spatial structure. As a result, the land resource in Taiwan has been treated as a developmental instrument to encourage economic growth rather than a precious asset to be carefully managed (Lai 2000), because the mission of the CEPD is to formulate and coordinate national economic development policy.

Nonetheless, two events have the potential to promote the reorientation of Taiwanese national spatial policy from spatial planning dominated by economic development to a more balanced and comprehensive land management. First, in 2013 the CEPD will be merged with the Research, Development and Evaluation Commission (RDEC), the Public Construction Commission (PCC) and other evaluation agencies to become a national development council. In contrast to the CEPD's over-concentration on economic planning, the new council will be authorised for national development planning, coordination, consideration and resource allocation from a more comprehensive and balanced perspective.

Second, learning from the lessons of the 921 earthquake and the Typhoon Morakot, the issue of disaster prevention has been more significantly addressed in the new version of the national plan and the central mountain range conservation axis was identified in the national spatial structure (CEPD 2010). The central mountain range conservation axis aims to link a national park and conservation area and to form a 340 kilometres long, 80 kilometres wide ecological corridor. This identification would be the first step towards making the concept of sustainable development more than a political slogan in the planning agenda, however its legitimacy relies on the promulgation of a new planning law—the National Land Planning Law. A draft has been revised several times since 2001 and is still in the review process in the Legislative Yuan, the Taiwanese parliament. The result is still uncertain.

5 The CEPD evolved from the Council for U.S. Aid (CUSA), which was established as part of the Sino-American Economic Aid Agreement signed between the Republic of China and the United States in 1948, and reformed three times in the 1960s and 1970s. Since 1948, the CEDP has served as an advisory body for the Executive Yuan to promote comprehensive national economic development and to coordinate sectoral policies and projects.

§ 5.2.2 Taiwanese Spatial Planning System

Table 20 outlines the evolution of the spatial planning system according to the five periods of spatial planning policy. The Urban Planning Act (UPA) was first announced in 1939 by the Kuomintang government in China mainland. However, the content of the UPA was very simple and could not meet the actual demand of Taiwanese society, so even after the Kuomintang government took over the dominion over Taiwan in 1945, urban planning in Taiwan basically followed the Urban Planning Decree issued by Japanese government during its occupation (Lee, Lan, and Juang 2005).

In the beginning of the 1960s the Kuomintang government recognised urban development as a part of infrastructure development to support economic development and began to revise the UPA. At the same time, Taiwan encountered rapid urbanisation and industrialisation. The rapid growth had led to severe urban sprawl and rural industrialisation and caused intensive land conflicts between industrial use and agricultural use. The Urban Planning Act had provided the legal base to manage urban land, but there was no clear statute to manage non-urban land until the enforcement of the Regional Plan Act in 1974 (Hsu and Lai 2007). Since the enforcement, the two land management systems—urban planning system and non-urban land use control system—were formed.

These two systems are respectively based on the Urban Planning Act and Regional Plan Act, which have different types of land use and control systems. The planning emphasis of the urban planning area is put on development, so various planning instruments and development mechanisms are provided in the urban planning area on the basis of the Urban Planning Act under the supervision of the Construction and Planning Agency, Ministry of the Interior (CPAMI). On the other hand, the planning emphasis of the non-urban area is put on the protection of agriculture land, so the Regional Plan Act addresses land use regulation function under the supervision of the Department of Land Administration, Ministry of the Interior (Hua 2010).

In the dual land management system, three interrelated planning issues appear regarding the efficiency and effectiveness of the planning system. First, the system is inflexible and lacks efficiency. If the government initiates a new urban development plan, it first has to get permission from the regional planning commission on all levels of government to change the planned area from non-urban land to urban planning land. Based on the comments of the regional commissions, the government drafts a masterplan together with one or several detail plans to go through the legal process of the urban planning system to gain approval from the urban planning commission on all levels of government. After this complicated process, the plan can then be implemented. It is common to spend more than ten years going through these two systems in order to initiate a new urban development plan.

Planning policy	Planning context	Planning Principles
1949-1964 *Urban plans*	– Significant migration from mainland China – Imposition of Martial Law in 1949 – The first land reform in the 1950s	– Adoption of the highly centralised and state-led urban planning system introduced in Japanese occupation period – Urban plan as a legally binding land use plan
1964-1979 *Urban and Regional Plans*	– Rapid urbanisation and industrialisation – Financial and technical support from the UNDP (1966-1971) – Diplomatic isolation in the 1970s	– Urban development as a part of infrastructure development to support economic development – The first revision of Urban Planning Act based on the advises of the UNDP experts – Regional Plan Act was established in 1974 to regulate non-urban land. Two land management systems are thus formed.
1979-1996 *Plan for the Overall Development of the Taiwan Area* (CEPD 1979)	– Increasing uneven regional development – Emerging social and environmental movements – End of Martial Law – Democratisation – Economic liberalisation	– Ministry of Interior promoted the establishment of County/City Comprehensive Development Plan in 1989, aiming to complete the structure of Taiwanese spatial planning system – Respectively adopted the concepts of development permit and urban design in non-urban area and urban planning area
1996-2001 *National Comprehensive Land Development Plan* (CEPD 1996)	– Asian financial crisis in 1997 – Toward a two-tier governments system in 1999 – 921 Earthquake in 1999 – First political party rotation in 2000 (DPP government)	– Towards a two-tier reviewing system – Aiming to integrate the urban and non-urban land systems into a coherent land planning system – Adopted the concept of exaction mechanism (回饋機制) in urban planning area
2001-2012 *Strategic Plan for National Spatial Development* (CEPD 2010)	– Economic crisis – Second political party rotation in 2008 – Typhoon Nalee in 2002 and Typhoon Morakot in 2009	– Setting up a platform for regional cooperation governance – Promoting National Land Planning Law (in progress) to establish a more flexible, coherent, decentralised and market-oriented planning system

Table 20

An outline of spatial planning system evolution in Taiwan (based on Chang 1988; Hsia and Chang 1995; CEPD 1996; CEPD 2010; CEPD 2011a; Ministry of Interior, R.O.C, 2004; Lee et al. 2005; Bristow 2010; Hsu 2010)

Second, the dual land management system has led Taiwanese spatial planning to a fragmented project-oriented planning approach, by which planning decisions are made case-by-case, lack comprehensive long-term vision and ignore the interrelationships among different developmental initiatives. This has become one of the most fundamental issues in Taiwanese spatial planning system and is the reason why the Ministry of Interior was eager to promote the establishment of County/City Comprehensive Development Plan at the end of the 1980s. The Ministry of Interior had asked city and county governments to propose their own comprehensive plan to guide local long-term development and to deliver spatial strategies for their territory as a whole in order to complete the structure of the Taiwanese spatial planning system (see Figure 20).

Figure 20
The plan system hierarchy in Taiwan, 2012 (modified on the basis of Chen and Shih 2010, 106)

However, the function of the comprehensive plan was weak because it did not have a legal status (Chen and Shih 2010). Besides, the local governments did not have enough resources, including planning professionals and funding, to undertake the task, so they would ask the Housing and Urban Development Bureau (HUDB) of the Taiwan provincial government for help. However, the plans made by HUDB hardly matched the politics of the elected head of the local government, so the plans were often shelved by the local governments. Eventually, the formulation of local comprehensive development plans had become merely a formality to serve the requirement of Ministry of Interior, and failed to fulfil the original intention of the Ministry of Interior.

The failure relates to the third issue—poor spatial quality in non-urban areas. The regulatory characteristic of the non-urban land management system does not promise the quality of non-urban space, because the local governments have no effective spatial planning instruments to govern local spatial development and to deliver spatial strategies for their territory, including both urban and non-urban areas, as a whole. Under this context, agriculture policy takes on a crucial role in managing the non-urban land in Taiwan. In response to the impact of accession on the World Trade Organisation (WTO) on the agricultural industry, since 1995 the Execute Yuan has launched a farmland release program to release surplus agrarian land. The new agricultural policy eases restrictions on the sale and purchase of farmland and allows a farm cabin to be built on each piece of farmland. This has encouraged the sprawl of rural development surrounding metropolitan areas (Hua 2010).

Following several severe disasters in the 1990s and 2000s, the Taiwanese central government has recognised the urgency to restructure the planning system and legitimise the position of national spatial planning in order to have better territorial

management and to increase the symmetry between national land development and environmental protection. The Ministry of Interior has undertaken the task to reform the spatial planning system by promoting the new National Land Planning Law. There are some probable contributions of the new law. First, in the new National Land Planning Law, the two land management systems will be integrated into a coherent land planning system underpinned by a development permission system combined with a growth management approach. After the promulgation of the new law, the Regional Plan Act will be abolished, but the Urban Planning Act will remain.

Second, land plans both at the national and local levels will have a legal status and the plan system hierarchy will be completed. Land plans at the local level will serve as a framework for making operational decisions, such as the issuance of development permits. Third, the new law allows local governments to delineate urban and rural development areas and agricultural development areas within their jurisdictions, while the central government is responsible for the designation and delineation of the conservation areas and marine resource areas. This will strengthen the conservation measures as well as decentralise the planning powers to local governments.

Finally, public participation and sectoral coordination in the planning process will be enhanced through establishing wider, more informed, inclusive and transparent mechanisms. For example, according to article 16 of the draft National Land Planning Law from the stage of preparing a land plan, the government has to provide public hearings and invite the public, academics, experts and interest groups to provide their opinions. Although the Legislative Yuen has not yet approved the new law and the result is uncertain, it has demonstrated that planning principles in Taiwan have the tendency to be more flexible, coherent, decentralised and market-oriented.

§ 5.2.3 Means to Influence Land Use Directly

In Taiwan, the major means to influence land use in urban planning areas are the principal masterplan and its supplementary detail plans. It is the power and obligation of municipalities to prepare and review a masterplan, to make and review a detail plan, and to issue building/user permits according to the detail plan. Central government is responsible for making spatial planning and land management policies in the national context, implementing major public investment and sectoral development projects (including industrial land supply and science park development), providing project grants to stimulate local development and supervising local land development and conservation.

According to the Urban Planning Act the masterplan has to set out development goals and planning principles on the basis of understanding complex relationships between land uses both inside and outside the planned area. Under the masterplan, one or several detail plans are made for implementing the masterplan. A detail plan specifies what can be built where and which land use regulations and urban design guidelines apply. A detail plan also relates to four public powers, including building/user permit, expropriation, zone expropriation and urban land consolidation. However, the masterplan is often criticised for its lack of vision and for not being proactive. Furthermore, the detail plan, as its implementation instrument, is considered as an extended zoning ordinance rather than a 'plan' (Hua 2010; Chen and Shih 2010).

Figure 21 illustrates the legal procedure of masterplan-making. The urban planning commission (UPC) at each level of government, particularly the national level, plays a decisive role in decision-making. The UPC members at the national level are appointed by the minister of the Ministry of Interior, and at the local level are appointed by the elected head of local government. The members can be heads of competent authorities, heads or representatives of relevant authorities, spatial planning experts with academia experience and public-spirited people. At the local level, more than half of the members must be either the experts or public-spirited people as mentioned above. Specifically, the legitimacy to appoint the UPC members provides the head of local government with the power to intervene in the content of urban planning, but requires supervision of the central government.

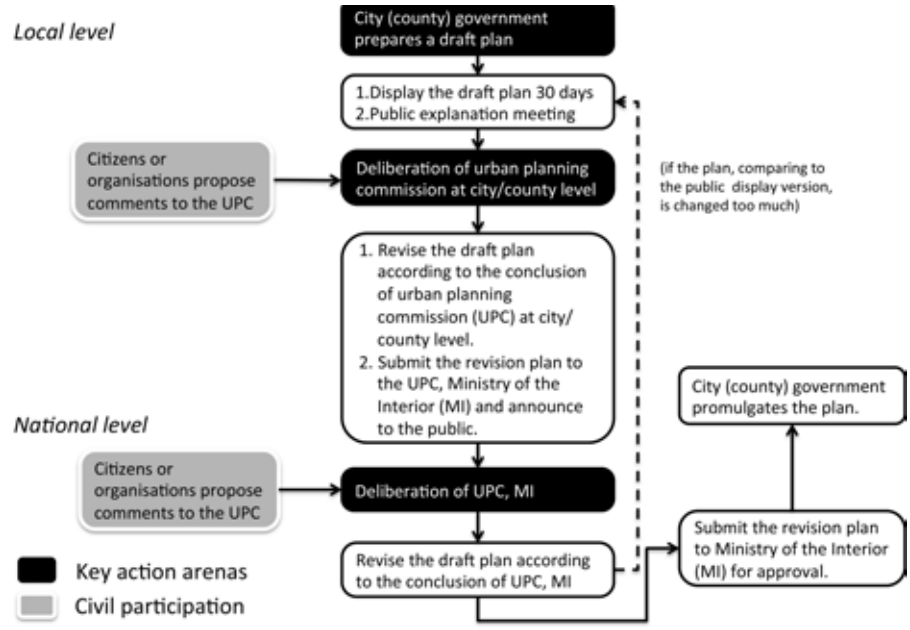

Figure 21
Legal procedure of masterplan-making in Taiwan (based on Urban Planning Act 2010).

As shown in Table 21, various proactive instruments can be employed by the Taiwanese government to acquire land for public use or to conduct integrated development projects on the basis of public law. The Urban Planning Act gives the planning authorities not only reactive powers to control land use and building activities by issuing building permits and user permits, but also various proactive instruments to implement actively integrated land development projects. For example, article 48 of the Urban Planning Act signifies that the government can apply the mechanisms of expropriation, zone expropriation or urban land consolidation to acquire land for the development of public facilities. Article 58 indicates that the government can conduct the development of a new urban planning area through zone expropriation or urban land consolidation.

The measures of zone expropriation and urban land consolidation create partnerships between the government and landowners. When the government conducts zone expropriation in a particular area, the landowners can choose to take their land back as compensation after the land is converted into building plots for new uses. Both the government and the private sector can employ urban land consolidation to implement a new urban land development or an urban redevelopment project. Through urban land consolidation, the government can acquire building lots from the landowners as payment for the construction cost of local public facilities within the consolidation area. In other words, the government can share the benefits and risks of urban land development with landowners via these two mechanisms.

Instrument	Explanation
Expropriation	The Land Act allows the possibility of expropriation for the purposes of public undertakings or for the implementation of national economic policies.
Zone expropriation	Zone expropriation is an alternative way of expropriation. The Land Act and the Equalisation of Land Rights Act allow the possibility of zone expropriation for the purposes of public undertakings or for the implementation of national economic policies and urban development projects. After re-planning and re-development, except for the land needed for public facilities that will be directly controlled and used by the government, the government can sell the remaining part of land to balance the cost of land development. The compensation may be paid in kind, if so applied for by the landowner, with the construction land after zone expropriation of which the land value is equivalent to compensation in cash. In principle, the total area of lands in lieu of compensation should be 50 per cent of the total zone expropriation area, unless approved by the superior authorities due to special conditions. But it should not be less than 40 per cent. This institutional design was originally based on *the principles of equalisation of land rights* and *unearned increment of land value belongs to the public*.
Urban land consolidation	The Land Act allows the government or landowners to conduct urban land consolidation to execute the urban planning detail plan. The consolidated plots of land should be redistributed to their original owners in proportion to the area or value of the original plots (no less than 45 per cent of the total consolidation area). After the consolidation of land, those who have gained thereby should compensate the landowners who have sustained loss. The government should pay the compensation for the value of lands used for public purposes. The institutional design is based on *the principle of equalisation of land rights* and *beneficiary pays*.
Case-by-case rezoning exaction	If land right owners in an urban planning area apply for rezoning to increase market value of the land, local government can require exactions from the owners in the form of land, building lots, floor areas, or equivalent money. The institutional design is based on the principles of *unearned increment of land value belongs to the public and of internalisation of externalities*.
Other approaches	Such as development right transfer, mortgage rights, real estate security (such as REITs, REATs) and normal trust, etc.

Table 21

Proactive planning instruments in Taiwan (based on Land Act 2011; Equalisation of Land Rights Act 2011; Urban Planning Act 2010; Chen and Shih 2010)

According to the statistical data from the Department of Land Administration, up to December 2011 the amount of land subject to zone expropriation was 7,650.58 hectares. Around 46 per cent of the land has been acquired for public uses[6]. The total amount of the land subject to urban land consolidation was 14,940 hectares. Around 35 per cent of the land has been acquired for public uses[7]. Since 1991 the Execute Yuen has issued an ordinance that requires planning agencies to apply zone expropriation rather than urban land consolidation for the implementation of integrated land development,

6 http://www.land.moi.gov.tw/chhtml/content.asp?cid=86 [Accessed in December 2012]

7 http://www.land.moi.gov.tw/chhtml/content.asp?cid=993 [Accessed in December 2012]

because they consider that by zone expropriation they can acquire more land for public use, provide better spatial quality and save more on development costs. However, the decision conflicts with the interest of landowners, because it means they will take less land back for development. In some cases, this has led to strong protest against the government.

§ 5.2.4 Summary of the Taiwanese Urban Planning System

I summarise the Taiwanese urban planning system in Table 22 according to the framework proposed in chapter three. In light of the system of spatial planning and the legal procedure of masterplan-making (see Figure 20 and 21), it can be recognised that the planning system in Taiwan is centralised, technocratic and project-based. However, the promotion of the National Land Planning Law since the late 1990s and the reorganisation of CEPD in 2013 imply that spatial planning policy in Taiwan may have the potential to change from an economic development dominant spatial planning to a more balanced and comprehensive land management.

The draft version of the National Land Planning Law shows that there may be three fundamental changes to the Taiwanese spatial planning system. First, the central government will play a less proactive role and the planning powers will be decentralised to local governments. Second, the plan system hierarchy will be completed. It will become the obligation and power of the local government to formulate a land plan for its entire territory as an overall spatial framework for making operational decisions, such as the issuance of development permits. Third, the dual land management system will be integrated into a coherent planning system underpinned by a development permission system, which will provide more space for the private sector to conduct land development. Although the planning system may become more decentralised, coherent, plan-led and market-oriented, the blueprinted nature will remain.

Effects on (Type of rules)	Action situations for planning agencies in the Taiwanese planning system
Actor constellations	**Regarding master/detail plan in urban planning area** – In the stage of draft plan and deliberation of the urban planning committee: *Any person and organisation* may express their comments on the draft plan. – In the stage of final plan: *Urban planning commission* examined and approved the final version.
Action orientations	**Position of each level of government** – Central government: determines spatial policies in the national context, implements major public investment and sectoral development projects, and supervises local land development and conservation. – Local governments: are responsible for implementing urban plans, undertaking land-use and building-use control and providing local collective consumption goods.
	Pay-off rule – Compensation for (zone) expropriation: shall be paid to the landowners at the current land value publicly announced by the government. For the lands subject to zone expropriation, the original landowners can choose to take back part of the construction land as compensation. – Urban land consolidation: the land needed for local public uses, the expenses for engineering work and land consolidation, and the interest from loans shall be jointly contributed by the owners in proportion to the benefits that they accrue. – There is no adequate mechanism for the stakeholders to appeal the approval of master/detail plan.
Actor capacities *(Planning instruments)*	**Local governments**—preparing masterplans and making detail plans **Central government** – *Administrative orders* are commonly used to guide the planning activities. – The urban planning commission at the national level plays a decisive role in examining and approving the final version of a masterplan **Means to influence land use/development** – Based on public law government is authorised to exercise expropriation, zone expropriation and urban land consolidation, and to set up the rules of case-by-case rezoning exaction

Table 22
Summary of the Taiwanese urban planning system in 2012

§ 5.3 Comparisons

In this section, I summarise the comparisons between the Dutch and Taiwanese planning systems in Table 23 as a base to explore the similarities and differences of the planning styles in the Netherlands and Taiwan from the three interrelated aspects regarding the action situation of plan-making—actor constellation, action orientations and actor capacities. Regarding the actor constellation, there are two major differences between the two systems regarding the role of planning experts and the moment of public participation. First, in the Netherlands experts are but one group of many that play a role in the planning process, whereas in Taiwan experts are the keystone of the process. In the Netherlands a

land use plan is democratically legitimatised, because the plan is reviewed and approved by elected representatives. In contrast, in Taiwan the urban planning commissions at the national and local levels examine and approve the final version of the plan and the members of the commission mostly are spatial planning experts and administrative officers, so the nature of spatial planning in Taiwan is highly technocratic.

Second, the moment of public participation in the Netherlands begins from the stage of preparing a draft plan. One of the major tasks for spatial planning authorities is to seek and build consensus with stakeholders in the stage of preparation, so the draft plan can be seen as an agreement between most stakeholders. However, in Taiwan it is common that the government will prepare a draft plan without the involvement of citizens and social organisations from the outset. At the draft plan stage, in theory all people can give comments and express their opinions in the review meetings of the urban planning commission. However in practice, this only makes the review meetings a battlefield for stakeholders to fight for their rights and for the government to defend the content of the draft plan, because consensus seeking and trust building between the government and stakeholders does not exist in the first place. This type of battle only makes the time of review even longer.

As for action orientations, there are two major differences in the two systems regarding the position of each level of government in spatial planning and development, and the underlying logic of the institutional design of land policy mechanisms. First, in both countries the central government determines spatial planning policies in the national context while the municipalities play a major role in detailing and implementing spatial planning throughout the country. But in Taiwan the supply of industrial land, including for science park development, is the responsibility of the central government, while in the Netherlands it is the responsibility of the municipalities and private sector. This is consistent with their societal models and administration systems. The Netherlands is recognised as a decentralised unitary state, where decision-making is based on broad consensus and the implementation of policy has to rely on the collaboration between different levels of government, while Taiwan is identified as a developmental state with a more hierarchical and centralised government system.

Second, there is a fundamental distinction between the conceptualisation of rights and interest in land in these two countries. In the Netherlands, the land value increment belongs to the property owners (Needham, 2007), but in Taiwan it should belong to the public. This distinction also influences how the different countries set up the rule to utilise proactive planning powers. For example, the starting point of the expropriation compensation in the Netherlands is the average value of the land within the plan area and proposed new development. In Taiwan the calculation of the compensation for the expropriated land is based on the current land value publicly announced by the government according to the existing land use plan rather than the proposed new land use plan.

Effects on (Type of rules)	Comparisons of the Action situations for planning agencies in the Dutch and Taiwanese planning systems
Actor constellations	**Similarity** – Public Participation: It is a requirement of the spatial planning law. **Major Difference** – Primary Actors: In the Netherlands they are municipalities and elected representatives, while in Taiwan are local governments and urban planning commissions. – Public Participation: In the Netherlands the moment of public participation is earlier than in Taiwan.
Action orientations	*Position of each level of government* **Similarity** Central government determines spatial planning policies in the national context while the municipalities play a major role in detailing and implementing spatial planning throughout the country. **Major difference** In Taiwan *the supply of industrial land* is the responsibility of the central government while in the Netherlands it is the responsibility of the municipalities and private sector.
	Pay-off rules **Similarity** Financial Feasibility is required when implementing a spatial plan. The principle of beneficiary pays is adopted in the land policy mechanisms. **Major difference** 1. *Land value increment*: in Taiwan it should belong to the public, but in the Netherlands it belongs to the property owners. 2. *Approaches to take development initiatives*: planning authorities in Taiwan have more proactive planning powers. 3. *The relation between property rights owners and the government*: in Taiwan the underlying concept of zone expropriation and urban land consolidation is to share the risks and benefits of a new urban development with the property rights owners in the planned area, while in the Netherlands only developers and/or social housing corporation have the chance to participate a new urban development project. 4. *Compensation*: a. There is no planning compensation in Taiwan. b. The calculation of the land expropriation compensation in Taiwan is based on the *current land value* publicly announced by the government. But the starting point of the expropriation compensation in the Netherlands is the average value of the land within the plan area and *with the proposed new development*. The distinctness is derived from the different cognition about the belongingness of the land value increment after the land development.
Actor capacities *(Planning instruments)*	**Similarity** – In both countries, *financial or technical support* is a common way to stimulate local planning activities. – *Land use plan* is the key instrument to implement spatial plan. – Planning information is published on the Internet and can be easily accessed. **Major difference** – The *interaction mode* in the spatial planning system: Taiwan is relatively more centralised and hierarchical, while the Netherlands is recognised as a decentralised unitary state. – *The way to keep consistence of planning policy on all level*: in the Netherlands the central and provincial governments are encouraged to guide the municipal planning policies by *policy guidelines*, but in Taiwan the central government often uses *administrative orders* to guide the planning activities and *directly intervenes* planning content during the review on national level.

Table 23
Comparisons between Dutch and Taiwanese planning systems

The underlying concept of zone expropriation and urban land consolidation in Taiwan is to capture the land value increment for the public as well as to share the risk and benefits of a new urban development with property rights owners in the planned area regardless of the their willingness, which deeply depends on the booms and busts in the housing market. Therefore, due to overwhelming proactive powers and their underlying logic, the scale of urban development projects in Taiwan tends to be much bigger, while in the Netherlands spatial planning has to be more selective and strategic, because Dutch government has to bear most of the development costs and risks, although the land development sometimes is beneficial and profitable.

In terms of actor capacity, which refers to planning instruments, both countries tend to adopt proactive approaches to planning practices, but compared with the Taiwanese government the Dutch municipalities have relatively limited proactive powers to implement a land use plan. Dutch municipalities often pursue an active land policy as the major land supplier for housing and industrial sites, although there is no legal obligation on the part of municipalities. Except for expropriation and pre-emption powers, which are rarely used, public law does not grant the municipalities other proactive planning powers to enable them to pursue an active land policy and the planning system is designed to be a plan-led rather than a development-led system. But in practice the municipalities actively involve land development activities by purchasing land beforehand and playing the role of developer in order to maintain the quality of space, steer land development and recoup the costs of the development (Needham 1997; 2007; Buitelaar and Sorel 2010).

Due to the forces of neoliberalisation and fiscal dilemma, in the past two decades municipalities have been finding new approaches to cooperate with the private sector. Instead of buying land to control the quality of development on the land, three types of arrangement are commonly used by the municipalities, including the building claim model, the joint venture model and the concession model (for a detailed explanation please see Needham 2007, 194-197). These all involve negotiation with developers to reach agreements on land servicing, the sharing of costs, the content of the plan, and so on. Therefore, the land use plan becomes a record of land development agreement—which is a result of negotiation and coordination between the governments, developers and/or social housing corporations—rather than a means to regulate spatial development (Needham 2007; Buitelaar and Sorel 2010). This shows that although the public law does not give the Dutch government many means to implement spatial planning, in order to achieve its high ambitions for the physical environment and land use, Dutch planning practice has developed several innovative measures that tend to be strategic and selective with an emphasis on the quality.

Planning authorities in Taiwan, in contrast, have more proactive planning powers to take development initiatives. Not only can the government expropriate private land, but also conduct zone expropriation and urban land consolidation to acquire land for public

undertakings, to implement national economic policies or to execute urban planning detail plans. Further, the Taiwanese planning community has adopted a quantitative approach, 'a population-oriented land use organisation procedure', as a base to conduct its blueprint planning since the 1960s (Chou 2010, 76). Population studies and predictions become the key content of urban development planning. This makes urban planning in Taiwan less strategic. In other words, the planning system in Taiwan is inclined to quantitative control and lacks the capacity to deal with qualitative issues.

In short, compared to the Taiwanese planning system and practices, Dutch planning is more selective, strategic, and qualitative-oriented and the planning process is more inclusive, interactive and bottom-up. According to the typology of planning styles I proposed in chapter three (see Figure 15), the spatial planning system and practices in the Netherlands is more inclined to the collaborative style, while Taiwan retains the features of the provider style of spatial planning despite the tendency to accept market measures since the 1980s. The forces of globalisation and neoliberalisation and the changing socio-political context have created big challenges for Taiwanese technocratic planners. When they struggle with the more dynamic and competitive global market as well as with a more democratic and diverse society, the Dutch planning approach may provide a direction for Taiwanese planners to inspect their way of planning.

However, despite its lack of flexibility and openness, compared to Dutch spatial planning and practice, the Taiwanese planning system and practice does provide better legal certainty for landowners and developers. How to keep the balance between legal certainty and flexibility is an old debate in the field of spatial planning. It is no wonder that the planning system in Taiwan recently tends towards adopting a development permit system to improve its flexibility, while the new Dutch planning system strives to enhance its legal certainty.

In chapter four and five I have respectively investigated the variables of the Dutch and Taiwanese planning systems and practices at the constitutional and collective-choice levels and compared their significant similarities and differences according to the comparative frameworks I proposed in chapter three (see Figure 14 and Table 11). The frameworks assist in exploring the differences of the spatial planning systems and practices between the two countries as well as in revealing the blind spots of spatial planning practices, which have been taken for granted in their own system and country. This forms the basis for the in-depth case study of the Eindhoven city-region in the Netherlands and the Hsinchu city-region in Taiwan.

6 High-tech Spatial Policies and Development in Eindhoven City-region and Hsinchu City-region

The major focus of this research is to explore the role of spatial planning in high-tech development and to investigate the major factors that cause governments to apply different spatial planning and governance approaches when realising high-tech spatial developments in a particular region. This relates to the fields of spatial planning as well as high-tech development policy. In the previous two chapters I explored the major factors that shape spatial planning systems and practices in the Netherlands and Taiwan. In this chapter, I first review and compare the high-tech development policies that have an explicitly spatial dimension in these two countries to situate the high-tech spatial development of the two city-regions within their own national context. I then examine and compare the spatial mechanisms of high-tech development in these two city-regions. The comparison is based on the analytical framework that I developed in chapter two. The framework consists of the three principal components of high-tech development—including R&D capital, relational capital and human capital—and spatial strategies that are often used to facilitate, support and enhance the development of the three principal components according to the findings of relevant studies (see Table 8 in chapter two).

§ 6.1 High-tech Spatial Development Policy in the Netherlands

In the past, economic objectives were framed within broader Dutch public policies serving political and social goals (Lagendijk and Boekema 2009). Now, economic performance is not only a goal in its own right but also takes priority over other public concerns. This change results from the pressure of global competition and the influence of neoliberalism and EU policy. One of the key instruments to address economic performance is the development of campuses, including university campuses and science parks (Ministerie van Economische Zaken 2010a). While there is no evidence to confirm that these campuses are succeeding in attracting and retaining high quality employment, the Dutch Ministry of Economic Affairs endoreses the claim that 'the campuses are indeed crystallization points of innovative activity and they form an attractive environment for knowledge workers.' (Ministerie van Economische Zaken 2010b; in Dutch, translated by the author) This statement points out how the Dutch government positions science parks as a key instrument to promote high-tech development. In order to give a more

complete picture of Dutch high-tech spatial development policy, in this section I first present the background, and then summarise the development of campuses in the Netherlands until 2012.

§ 6.1.1 Background of Dutch High-tech Spatial Development Policy

The emphasis on campus development corresponds to the demand of Dutch regional and economic policy in the past two decades for a more area-based and entrepreneurial approach. Previously, the underlying logic of Dutch regional policy was about achieving equality between regions, but since the 1980s an idea has emerged on the political agenda that regions must stand on their own. Provinces as well as municipalities thus have more responsibilities for economic development (Maussart 2009).

In 2004, *Interdepartementaal Beleidsonderzoek* (IBO, Interdepartmental Policy Research) reviewed Dutch regional policy and stressed that regional policy should focus more on the specific potential of a given region, rather than use the same development standards to evaluate all regions. The review suggested that the Dutch government terminate redistributive regional policy and relevant funding programmes, such as the programme of *Kompus voor de Noord* and the *Investeringspremie Regeling*, and instead create an area-based budget to deal with the identified bottlenecks of nationally important regions. In response to the policy research, the Ministry of Economic Affairs (MEZ) initiated a new economic policy, *Pieken in de Delta* (Peaks in the Delta), which recognised the priorities of national economic development from an area-based economic perspective (see Figure 22). This shows that the focus of Dutch regional policy has changed from lagging regions to strong regions, from exogenous and redistributive measures to indigenous and customised mechanisms.

The Dutch government has embraced a more selective and strategic perspective for economic development. The initiative of *Pieken in de Delta* reveals a tendency of 'spatialisation of economic policy' in discursive as well as institutional practices (Hajer and Zonneveld 2000; Lagendijk and Boekema 2009). Through a spatial approach, the government creates focal points to reach a consensus on the priorities of economic development between different levels of governments. In order to achieve the ambitions of *Pieken in de Delta*, from 2008 to 2011 the Dutch government released 129 million euros to enhance the strong clusters of companies and research institutions by investing in a limited number of ambitious projects. The projects included physical infrastructures or the knowledge infrastructures of the 'peaks', particularly of the main ports (the airport and the seaport) and campuses (knowledge-intensive parks) in the four leading areas—Energy Node Gronigen, Randstad, East Netherlands, and Brainport Southeast Netherlands (Ministerie van Economische Zaken 2010c).

Figure 22
An illustration of the peaks in the delta (Source: Ministerie van Economische Zaken 2008, 2).

In 2011 the major focus of economic policy was adjusted. The newly formed Ministry of Economic Affairs, Agriculture and Innovation (EL&I)[8] introduced a new economic policy framework, *Naar de Top* (To the Top). According to this initiative, the Dutch government shifted its focus more towards enhancing the business climate by adopting a sectoral-based cluster approach. They perceived that too little attention was being paid to industry-specific problems, and other public policies, such as environmental policy, spatial planning policy, education policy and health care policy, could also affect the development of industrial sectors. Therefore, the Dutch government decided to select nine top high-tech industrial sectors as targets and to focus on the improvement of the sectoral conditions across the full spectrum of public policy in order to go beyond the boundaries of departments and levels of government. On the basis of this ideology, the Ministry developed a coherent policy framework. The framework consists of the full spectrum of public policies, from foreign policy to education policy, from regulation to research policy, and from development aid to infrastructure and ICT (Ministerie van Economische Zaken Landbouw en Innovatie 2011a).

Nonetheless, the area-based approach remains. The new policy framework recognises that the main-, brain- and green-ports and the city-regions, including Amsterdam, Rotterdam and Eindhoven, where the ports are located, are important for the economic strength of the Netherlands. The policy document also points out that campus development is one of the key instruments for regional governments to make a contribution to the promotion and enhancement of knowledge and innovation in the top sectors (Ministerie van Economische Zaken, Landbouw en Innovatie 2011b). In short, the new economic initiative retains a focus on places, but with a more explicit intention to influence other public policies.

§ 6.1.2 An Overview of Dutch Campus Development in 2012

Respectively in 2009 and 2012, the Ministry of Economic Affairs, Agriculture and Innovation commissioned Buck Consultants International to investigate the development of campuses in the Netherlands based on three main motivations. The first was to develop a complete list and assessment of campus developments and initiatives around the whole country. The second purpose was to identify the campuses considered

8 In 2010 the Ministry of Economic Affairs was merged with the Ministry of Agriculture, Nature and Food Quality to form the new Ministry of Economic Affairs, Agriculture and Innovation.

to be, or having potential to be, nationally important based on two criteria. First, the campus must fit into the area-based innovation policy of the MEZ under the framework of the *Pieken in de Delt*a. Second, the campus must possess, or have the potential to possess, sufficient clusters of knowledge and R&D activities. The third purpose was to evaluate the economic value of stimulating campus development (Buck Consultants International 2009). Although there is no evidence to prove that campus developments have succeeded in attracting and retaining high quality employment, the Dutch government has positioned the role of campuses as a key instrument to encourage clustering of innovative activities and to attract knowledge workers and firms (Ministerie van Economische Zaken 2010c, 2).

Two kinds of campuses were identified in the investigation's report, including science and research parks, and open innovation campuses. Science and research parks are park-like industrial sites, where R&D activities are carried out by universities, hospitals, research institutes and/or companies. Open innovation campuses are science parks that have an anchor tenant, such as Philips in the High Tech Campus in Eindhoven. R&D activities are carried out by the anchor tenant together with other companies. In an open innovative campus research collaboration and interaction among the companies are highly encouraged (Buck Consultants International 2012).

According to the report, a campus that is identified as being of national importance in the Netherlands must encompass four major elements: a focus on R&D activities, a physical location of high quality firms and research facilities, the presence of manifest knowledge carriers, and an open innovation environment (Buck Consultants International 2009; 2012). As the director of Buck Consultants International stated in an interview that 'a beautiful meadow is not enough' for a campus development (Het Financieele Dagblad 2012), for the Dutch government the major tasks of a nationally important campus are to provide high quality research facilities and knowledge carriers—such as research institutes, universities, and anchor firms—to create an open innovative environment in order to promote clustering of R&D activities and to attract knowledge firms and workers.

According to the report by Buck Consultants International of November 2012, from 2009 to 2012 the number of campus developments and initiatives increased from 55 to 74, of which eleven of the campus initiatives will not be realised due to the effects of the Eurozone crisis. Among the 74 campuses, 25 campuses can already be recognised as nationally important and eight campuses currently in the planning stage show the potential to be nationally important (see Figure 23). Regarding the role of government in the campus developments, the report demonstrates that in the past the financial support mainly came from investment programmes of the central government, such as *Sterke Regio's* (Strong Regions), *Pieken in de Delt*a, EFRO (European Regional Development Fund), and so on. The investment programmes particularly focused on the physical elements and preconditions of campuses, including the accommodation of firms (e.g. incubators and accelerators), capital intensive research facilities, accessibility

and restructuring (Buck Consultants International 2012). However, since 2010 the central government has stopped providing grants for campus development. Provinces and municipalities now play a major role in providing financial support to campuses, despite the fact that most local authorities are also under financial pressure and have limited resources to fill the financing gap that the central government has left behind (Het Financieele Dagblad 2012).

Figure 23
Dutch national important campuses in 2012 (Source: Buck Consultants International 2012, 19)

§ 6.1.3 Summary

The Dutch national government has recognised the campus development as an important strategic instrument for the implementation of national economic policies, such as *Pieken in de Delta* in 2004 and *Naar de Top* in 2011, to enhance competitiveness in the global knowledge economy. The role of the Dutch government is expected to be that of facilitator and assistant in the development process of a campus by providing subsidies and conducting infrastructure development, while universities, large high-tech firms

and/or real estate developers are considered to be parties that develop and manage the campuses. Until recently, most grants were provided by the national government, but since 2010 the major responsibility of supporting campus development has shifted from the central government to the provinces and municipalities.

§ 6.2 High-tech Spatial Developments in Eindhoven Region

§ 6.2.1 Socio-economic Context: Towards Brainport Eindhoven

Since 2004 the Dutch Ministry of Economic Affairs has recognised the Eindhoven city-region as the national Brainport, a centre of innovation and knowledge in the Netherlands (Ministerie van Economische Zaken 2004). The Brainport Eindhoven city-region together with the Seaport of Rotterdam and Amsterdam's Schiphol Airport are the top three engines of the Dutch economy (Ministerie van Economische Zaken 2010b). However, the emergence of Brainport Eindhoven has not been a spontaneous process but rather the result of close collaboration between local governments, high-tech industries and knowledge institutes.

Since the 1920s the Eindhoven city-region had been an important manufacturing centre based on the development of Philips Electronics, one of the largest European companies, and Van Doorne's Automobiel Fabriek (DAF), a car and truck manufacturer. A two-pillar-model economic structure formed in the city-region and persisted until the beginning of the 1990s. From 1990 to 1992 the reorganisation of Philips resulted in 8,000 layoffs, and the bankruptcy of DAF in 1993 caused 2,500 job losses (van der Veer 1998; van der Meer et al. 2008). Nonetheless, due to the crisis the local governments in the Eindhoven city-region realised that they could no longer depend on a limited number of large companies. After extensive discussions with key stakeholders, they decided to diversify the regional economy and emphasise the importance of technology in order to lead the regional economy to a more sustainable and stable status. After two decades of efforts, the city-region has shifted from a manufacturing centre to an important innovation hot spot, at the national scale as well as the European scale. This shift was triggered by three successive economic initiatives: the Stimulus programme, Horizon Programme and Brainport Navigator 2013. Initiators, preparers, implementers, goals, themes and approaches of the three economic initiatives are summarised in Table 24.

Programme	Stimulus	Horizon	Brainport Navigator
Acceptance	1995	2002	2005
Initiator	EU and SRE	SRE	SRE
Preparers	SRE worked with research institutes and business sector	Regional opportunity and implementation Commission	Sistermans Commission
Management	NV REDE	NV REDE	Brainport Operation BV
Ambition Level	Regional	National	European
Goals	React to and recover from the crisis	-From industrial main port to top technology region -Strengthening economic structure	-Beyond Lisbon strategy (spending 6 % of gross regional product on R&D) -Top three in Europe competitiveness
Themes	Business and clusters	People-Technology-Environment	People-Technology-Business-Basics
Approaches	Subsidy Framework to support the development of SMEs	Strategic Action Programme	Strategic Action Programme
Implementation Area	Eindhoven city-region (Southeast Brabant; stimulus area)	-Eindhoven city-region -Drawing attention to Southeast Netherlands	-Eindhoven city-region and its relations to Leuven and Aachen -Drawing attention to Southeast Netherlands

Table 24
Strategic economic programmes in Eindhoven city-region (Source: Brainport Eindhoven 2011, 20-21)

According to the object and formulation of the three initiatives, the development of Brainport Eindhoven can be divided into two periods: the economic recovery period and the formation of triple helix collaboration. In the period of economic recovery, the industrial sector was the object of governmental economic initiatives. The major approach was to provide subsidies to stimulate the development of SMEs with an emphasis on economic diversification. Awareness of the economic crisis provoked the twenty-one municipalities located in the Eindhoven city-region into an agreement to establish a regional fund by contributing NLG 11.5 (around 5.2 euros) per inhabitant per year to create jobs in the area. This formed a base to ask for financial help from the EU to initiate the Stimulus programme. The programme not only created 1,950 new companies and 4,000 new jobs but also revitalised 723 hectares of industrial sites and developed 412 hectares of new industrial sites (van der Meer et al. 2008). Its success allowed the city-region to shift from the two-pillar-model to a more diverse and sustainable economy.

Following the success of the Stimulus programme and a series of knowledge infrastructure developments, including the TNO Centre for Industrial Research (1996), the Dutch Polymer Institute (1997), the Philips High Tech Campus (1998), and the Embedded System Institute (2002) the economic focus of the city-region has

since moved to knowledge workers, top technology and open innovation ecosystems. This marks the start of the second period of economic development. In the process, relationships between the government, knowledge institutes and business community were gradually formed and institutionalised.

In the city-region it has been broadly accepted that tight relationships between government, academia, and industry encourage the creation of an innovative milieu, so since the beginning of the 2000s the government has decided to adopt a triple helix model focusing on the development of hybrid organisations and tri-lateral networks that overlap and connect these three institutional spheres. The government first invited knowledge institutes and the business community to formulate and commit to a joint action-focused agenda and priorities—the Horizon Programme (Programme Agency Horizon 2004; Sistermans Commission 2006; van der Meer et al. 2008). On the basis of its success, in 2005 the government established the *Stichting Brainport* (Brainport Foundation) consisting of representatives of the three sectors, forming a platform as well as a collaborative body to determine the development strategies of Brainport Eindhoven (Brainport Development 2012). From within this context, the Brainport Navigator 2013 was formulated.

§ 6.2.2 High-tech Spatial Developments in Eindhoven City-region

I outline the spatial elements of high-tech development in the Eindhoven city-region in Table 25. Except for universities, lead firms and external accessibility, most of the spatial elements were provided after the initiative of the Stimulus programme. The relocation of TNO[9] Centre for Industrial Research in 1996 and the establishment of High Tech Campus in 1998 were the turning points that led the Eindhoven city-region towards high-tech development. By using the funding of the Stimulus programme, the Eindhoven municipality, TU/e and NV REDE[10] promoted the relocation of TNO research centre (van der Meer et al. 2008). After the relocation, TNO has played a key role in promoting and participating in the establishment of four other R&D institutes in the

9 TNO is the biggest organisation for applied scientific research in the Netherlands. TNO is partly funded by the Dutch government and earns most of its funding from the market.

10 NV REDE was established in 1982, the forerunner of Brainport Development NV. NV REDE was the economic development organisation for the Eindhoven region. It aimed to promote business and employment in the region, and its target groups were small and medium-sized enterprises in industry and services.

city-region, including Embedded Systems Institute, Holst Centre, TNO Automotive and TÜV Rheinland TNO Automotive International, which have greatly enhanced regional innovation capacity and high-tech identity.

Spatial Elements	Eindhoven City-region
R&D Capital	
Universities	TU/e (1956), Design Academy Eindhoven (1947), Fontys University of Applied Sciences (1996)
R&D Institutes	– Located in TU/e: TNO Centre for Industrial Research (1996), Dutch Polymer Institute (1997), Embedded Systems Institute (2002), Energy Research Centre of the Netherlands (2010), Foundation for Fundamental Research on Matter (2010) – Located in HTC: Holst Centre (2005) – Located in HTAC: TNO Automotive (2007), TÜV Rheinland TNO Automotive International (2008)
Lead High-tech Firm	Philips (1891), DAF (1928), ASML (1984), etc.
Innovation Centre/Incubator	Twinning Centre (1998), BÈTA Technology & Business Accelerator (2007), Catalyst Technology & Business Incubator (2011)—all managed by Brainport Development NV
Relational Capital	
Science/ Technology Parks	– Campuses: High Tech Campus (1998), High-Tech Automotive Campus (2009), TU/e Science Park (2010) – Other: Food Technology Park Brainport (2012) – Planning stage: Brainport Innovation Campus, Health Technology Park, Philips Healthcare Campus.
External and Internal Accessibility	External: Eindhoven Airport, A2 Highway, Railway, broadband infrastructure, etc. Internal: HOV, Slow lane project, northeast corridor project, etc .
Human Capital	
Quality of Place	City park, public and culture facilities, green surrounding, inner city redevelopment projects, etc.
Education and Training Institutes	International School Eindhoven (2009)

Table 25
High-tech spatial developments in Eindhoven city-region

In 1998 Philips established High Tech Campus as a single spot to relocate all its R&D activities. In 2003 Philips opened up the campus to other technology companies, sharing its facilities and resources in order to create an open and innovative environment. This attracted numerous innovative companies—both large and small—to locate within the campus. In light of its success, the local governments in the city-region have recognised that the role of other powerful players in campus development is crucial.

The Spatial Programme Brainport—the regional spatial framework—states that the role of government in the development of the campus is to facilitate and offer space

for powerful players to develop campus-like terrains, to lead the campuses to be more accessible, attractive and visible to local people and to weave-in the urban network (SRE 2009, 48–49). In other words, 'the market determines knowledge concentrations (campuses). The government facilitates.' (38). From a selective and strategic perspective, in 2010 the local governments commissioned Buck Consultants International to undertake an investigation into campus developments and initiatives in the city-region, *Op weg naar een Brainport Campussenstrategie* (Towards a Brainport campus strategy), to identify campuses that are or have potential to be highly important for regional high-tech development. The governments now provide preferential support to the identified campuses.

In practice, there are three ways to establish a campus. First, a private R&D campus-like terrain that only belongs to one organisation or high-tech firm opens up and transforms into an open innovation environment, such as High Tech Campus, TU/e Science Park, Philips Healthcare Campus and Health Technology Park. Most of the time, the firm or organisation has purchased the land and must negotiate with local authorities concerning the planning content, infrastructure and other impacts. It is clear that the establishment of spatial frameworks and the improvement of external and internal accessibility are the major responsibilities of government, but the firms need to do the rest on their own in the development process of a campus.

Second, the local governments facilitate the transformation of an existing industrial site into a campus by collaborating with lead companies located on the site, by lobbing the national government to establish or relocate knowledge infrastructures (e.g. TNO Centre for Industrial Research), and by improving the external accessibility and quality of public space, such as High Tech Automotive Campus. The third mechanism is also a government initiative in which a municipality purchases land and cooperates with high-tech firms either by leasing the land to them or establishing a joint company with them to develop a campus, such as the Brainport Innovation Campus (van Zeeland 2012b). In the second and third mechanisms, the local governments play a more active role. However the first mechanism is the most common approach to campus development in the Eindhoven city-region.

§ 6.2.3 Summary

The three successive strategic economic programmes have led the Eindhoven city-region towards high-tech development. The local governments and governmental agencies, such as the SRE and NV REDE, play a leading role in promoting high-tech development by providing funding and space for the establishment of R&D institutes and innovation centres and by setting clear spatial frameworks and enhancing external

and internal accessibility for the campus developments. But the local governments have acknowledged that the key to promoting high-tech development is close collaboration among different levels of government, universities, R&D institutes and lead high-tech firms, and the major role of local government is to coordinate and facilitate the collaboration.

§ 6.3 High-tech Spatial Development Policy in Taiwan

For Taiwan the fundamental factor that created the conditions for economic growth was 'systematic and comprehensive state intervention in the economy, as well as state's strategic guidance of the performance of national and multinational companies located on the shores of its territory' (Castells 1992, 34). From the 1950s to the 1980s the leading department in the Taiwanese central government was the 'economic development' sector, whose plans had a strong spatial dimension and an overwhelming power to lead and affect national spatial planning (Hsia and Chang 1995). For example, in the 1960s they invented the notion of Export Processing Zones (EPZs) to promote labour-intensive and export-oriented industries and successively established six EPZs nearby major ports in central and southern Taiwan. In the early 1970s, they carried out the Ten Major Development Projects to augment railway, airport, port and other basic infrastructure as a foundation to develop capital-intensive import-substitution intermediate industries (CEPD 2011b). Those initiatives were all based on the planning rationality of technocrats.

It is no surprise that since the late 1970s Taiwan had adopted state-led science park development as the key instrument to trigger high-tech economic development. However, due to socio-political transformation in the past three decades, the internal logic guiding the science park approach has changed from a single technopole strategy to a technopolis programme (Hsu 2010). There has been more room for local governments and the private sector to participate in science park development, although the central government still holds most of the resources. I introduce the background and evolution of Taiwanese science park policy in the following section.

§ 6.3.1 Background of Taiwanese Science Park Policy

The decision of the Taiwanese government to adopt the science park approach derives from three major motivations at the time. First, from a political viewpoint the

development of a science park can enhance international image, attract highly skilled people back to Taiwan, and promote industrial innovation. Second, from an economic perspective a science park can systematically develop the industrial capacity to enter into international markets that need high quality goods. Finally, a science park can enhance the quality of high-tech human resource development and provide jobs for highly skilled people (Taiwan Provincial Government 1981). In order to fulfil its three motives, the Taiwanese government created a particular model for its science park developments. The three major planning concepts outlined in the model have had huge effects on the future development of science parks and their relation to surrounding areas, from a spatial planning and governance perspective and at both the urban and regional level. First, the design of the park is like a new town. The infrastructures and services provided by the park are not only for satisfying the demands for production activities but also for creating a good environment to attract high-tech people and their family to stay (Lin 2010).

Second, based on the exporting processing zone experience, the science park in Taiwan is planned as a free trade zone[11] integrating elements of science and technology.[12] Specifically, it is a large-scale science-based industrial park containing not only R&D activities but also mass production. Third, in addition to several particular financial incentives, the park also provides tenant companies one-stop services, including planning management and evaluation, talent cultivation, subsidies for R&D, investment services, labour affairs, medical and health care, civil engineering, environmental protection, land planning, landscape management, information networks, fire prevention and disaster relief, as well as security management (SPA 2010a).

The one-stop services can help tenant companies to avoid complicated administrative procedures, which normally involve a wide range of governmental agencies on different levels of government, and thus reduce their operational risk and cost. However, the provision of one-stop services implies that within the scope of services the tenant companies can bypass the supervision of local governments via the Science Park Administration (SPA), which was founded and funded by the central government under the National Science Council. For example, the SPA has a prevailing position in deciding the masterplan and detail plans of the park, and within the district the SPA also has the

11 One of the tax incentives the enterprises located in the science park can enjoy is duty-free import of machinery, equipment, raw material and semi-finished products.

12 An enterprise has to be officially approved by the Park Investment Supervisory Committee for establishment in the park. The expense of research and development of the enrolled park enterprise shall remain a significant portion (around 30%) of its total investment and the research and development personnel of the enrolled park enterprise shall remain a significant portion (around 30%) of its total staff (Su 2010).

authority to licence the building construction of tenant companies. In Taiwan, both administrative powers are supposed to be under local governments' supervision. In short, the planning concepts based on new town and EPZ models and the provision of one-stop service constitute the park as an *enclave*.

Following the planning concepts, the first science park, Hsinchu Science Park (HSP), was selectively and strategically developed in Hsinchu area, where one of the most important national research institutes and two national universities are located. This arrangement aimed to strengthen the linkages between the state, research institutes, universities and high-tech industry regarding flows of knowledge, information and human resources. Such an initiative has successfully stimulated national and local economic development since the late 1980s (Lin 1997) and led to the second economic 'take-off' for Taiwan (Tsai and Cheng 2006, 54). Under the full support of the state, two high-tech industries—integrated circuits (IC), and computers and their peripheral products—started maturing and some companies have since become global players, such as Taiwan Semiconductor Manufacturing Co. (TSMC) and Acer.

§ 6.3.2 Evolution of Taiwanese Science Park Policy

Due to the success of the HSP development, the land demand for high-tech industrial development rapidly increased in the 1990s, inciting the central government to look for other potential science park sites in Taiwan. At the same time, Taiwan encountered a huge socio-political shift—from a party-state authoritarianism to a liberal democracy. Since the state was losing its arbitrary power and had to gain local factions' and business groups' support, the state could no longer play a strong leading role in economic policy-making (Chen 1995; Hsu 2010).

On the other hand, the HSP's success and its huge economic spillovers let local governments believe that the development of a science park could trigger local economic development and promote local industrial restructuring processes, so almost every local government asked the National Science Council to develop a science park in their territory (Lin 2010). Considering the political support of local factions and land demand pressures, the policy of science park development reoriented to a technopolis programme, concealed behind the slogan of balancing regional development. As a result, another eleven science parks have been successively designated along the national highway around Taiwan (see Figure 24). This marks the shift of science park policy from a single technopole strategy to a technopolis programme.

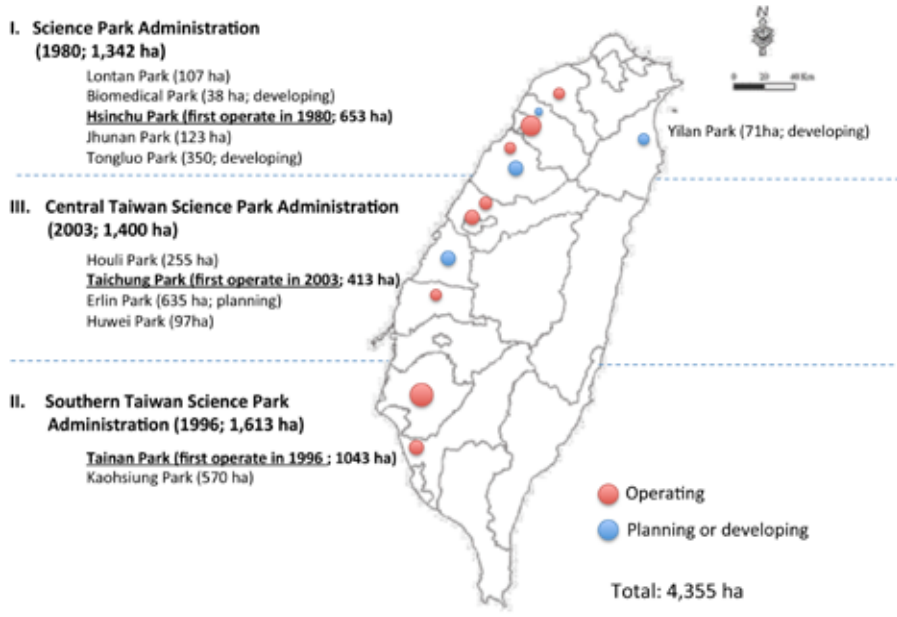

Figure 24
Distributions of science parks in 2010 (based on SPA 2011)

This shift has not only influenced the national spatial-economic structure and impacted local landscape and land development, but also has highlighted the changing role of the central government in economic development. For example, comparing the development of HSP with the Southern Taiwan Science Park (STSP) and the Central Taiwan Science Park (CTSP), the major promoter in facilitating the development shifted from the state to local government in the 1990s, and again from local government to industry in the 2000s (see Table 26). Different from the relationships between the state and the local governments in the development process of the HSP, the Tainan county government played an active role in the development process of the CTSP, because the Magistrate of the Tainan county government considered that the science park development could promote local economic development and increase his legitimacy as the elected head of the county.

Under the influence of neoliberalism, the major promoters of the STSP development became high-tech firms, especially some large firms that had been located in the HSP and sought land to expand their production capacity. This has led to a debate on the legality of land expropriation for science park development. For example, the location of the CTSP Erlin site was actually chosen by the AU Optronics Corporation in 2008. The role of government was to assist in all the legal procedures, including land use change, land expropriation, environmental assessment, and so on (Wang 2009). However, the mechanism to acquire land for the development or extension of a science park is

expropriation, which is an extreme form of limitation of property rights. According to article 3 of the Land Expropriation Act in Taiwan, the state can expropriate private land for public interest purposes. People challenged the legality of the land expropriation and argued that it was not reasonable to take away certain people's property to benefit a particular consortium under the guise of public interest (Chu 2009).

Park (Year)	Central Government	Local Government	Industry
HSP (1980)	Major promoter	Co-operator	Co-operator
STSP (1996)	Actively co-operator	Major promoter	Actively co-operator
CTSP (2003)	Co-operator	Actively co-operator	Major promoter

Table 26
The major actors in the series of science park developments (source: Wang 2009, 194)

The science park approach has fulfilled the three major motives discussed above and has led Taiwan to the global market. Nonetheless, it has created many issues for Taiwanese society, such as environmental pollution, water shortage, local social-economic polarisation, a divide of spatial governance, and heavy financial burden in developing successive science parks.[13] Some people even wonder whether the contributions of science parks to the local economy are truth or myth (Lin 2010) and others doubt the necessity of developing more science parks at the expense of local society and environment (Lu 2010). The farmers' and environmental movements in central Taiwan since the late 2000s are good examples. The primary appeal of the farmer's movement is to resist the indiscriminate farmland expropriation for use by science park developments or extensions, while the environmental movement asks for a better proposal for some of the new developments in order to reduce the impact of water supply on local farmland. These appeals indicate that for Taiwanese civil society such economic developments are no longer a self-evident national interest. That is to say, the state can no longer use economic development as a means to legitimise its authority. Economic development should not be the only concern in the political agenda and decision-making. Taiwanese people are now asking for more.

13 According to a report of the National Science Council (2011) to the Legislative Yuen, the technopolis programme approach has not only overloaded the supply of high-tech industrial land but also significantly increased the financial burden on the Operation Fund of the Science Park. In the end of 2012, the debt will reach NT$ 123.4 billion (around 3.25 billion euro). Every year the HSP will have more than NT$3.5 billion net income for the investment in fixed assets and the repayment of the debt. The debt of the HSP will not be paid off until 2040.

§ 6.3.3 Summary

Due to the changing socio-political context, since the end of the 1990s science park policy in Taiwan has shifted from a single technopole strategy to a technopolis programme. Local governments and large high-tech firms have replaced the role of central government, becoming the major promoters in facilitating science park development. Nonetheless, the central government retains an essential role, because National Science Council of the Executive Yuan has legitimacy to establish and manage science parks according to the Act for Establishment and Administration of Science Parks. Further, the technopolis programme has caused a severe financial burden and overloaded the supply of high-tech industrial land. Since expropriation is the only mechanism to acquire land for the development or extension of a science park, a debate on the legality of land expropriation for science park development has emerged.

§ 6.4 High-tech Spatial Developments in Hsinchu Region

§ 6.4.1 Socio-economic Context: Large Externalities of the HSP

The Hsinchu city-region is considered the technology and innovation hot spot of Taiwan, due to its high economic performance in the ICT industry. The emergence of the Hsinchu high-tech city-region followed the rapid development of Hsinchu Science Park (HSP), which was established by the Taiwanese government in 1980 to drive national economic growth and industrial upgrading. The HSP has not only achieved the national goal, but also been recognised as one of the most successful technopoles in the world (Castells and Hall 1994). Its output value in 2010 was around 29,673 million euros, which represents 9.1 per cent of the GNP of Taiwan.

In 2011, more than 148,000 people worked in the HSP and most of them lived in the city-region with their families. Since the 1990s local population has also exhibited enormous growth, from 698,918 to 937,693 inhabitants. The strong agglomeration forces have created enormous pressure for the supply of land and public investment in the surrounding area and forced the local governments to initiate spatial planning and land development projects to accommodate the housing demand and to improve local public facilities and business services (see Figure 25).

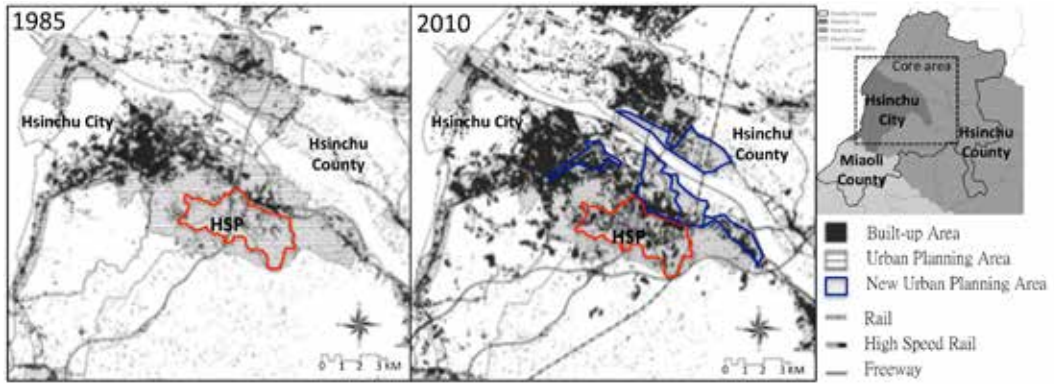

Figure 25
1987; Urmap website: http://www.urmap.com/ [Accessed in October 2010])

The success of the HSP has attracted so many knowledge workers to the region that the local demographic structure and income distribution have been influenced significantly. As shown in Table 27, in 2011 there were 477 high-tech companies located in the HSP with total corporate sales of 25,865 million euros (SPA 2012), around 30.3 per cent of the revenue of Taiwan's entire manufacturing sector. This contributes to the average household income of Hsinchu city and Hsinchu county, which were respectively ranked 2nd and 3rd nationwide in 2011 (CEPD 2012), while in 1980 they were ranked 7th (CEPD 1981). However, the gap between rich and poor in Hsinchu city is the greatest among the seven big cities in Taiwan (see Table 28). An increasing socio-economic polarisation triggered by the HSP development has been recognised since the end of the 1990s.

Year	Companies	Employees	Corporate sales*	Domestic patens	Revenue of manu-facturing sector in Taiwan*(**)	Population in Hsinchu City and County
2011	477	148,714	25,865	2,510	85,253 (30.3%)	937,693
2010	449	136,548	29,673	2,043	88,775 (33.4%)	928,359
2005	382	114,836	24,698	2,343	78,003 (31.7%)	868,369
2000	289	102,775	23,233	2,366	62,705 (37.1%)	808,152
1995	180	42,257	7,480	532	45,393 (16.5%)	748,832
1990	121	22,356	1,638	74	34,063 (4.8%)	698,918
1985	50	6,670	263	-	22,025 (1.2%)	670,576
1980	7	-	-	-		641,937

Note:* Million euros (Exchange rate: NT/euro=40); ** Corporate sales of the HSP/Revenue of Taiwan's manu-facturing sector× 100%.

Table 27
Industrial development in the HSP
(Source: Hsinchu Science Park Yearly Report 2009, 2010b, 2011, 2012; Urban and Regional Development Statics 1981, 1986, 1991, 1996, 2001, 2006, 2011; the Directorate General of Budget, Accounting and Statistics (DGBAS) of Executive Yuan website: http://eng.stat.gov.tw/mp.asp?mp=5 [Accessed in April 2012])

Index		Taipei City	Kaohsiung City	Taichung City	Keelung City	Hsinchu City	Chiayi City	Tainan City
Area (Km^2)		272	154	163	133	104	60	176
Population (million)		2.63	1.51	1.04	0.39	0.39	0.27	0.76
Civilian education level above university (%)	2006	27.80	18.74	19.99	13.96	**22.22**	16.59	19.33
	2001	18.08	11.01	12.28	7.94	**13.90**	10.33	10.57
Average disposable income per household (Euro*)		31,560	24,252	24,231	19,561	**29,282**	20,017	21,299
Gap between rich and poor** (multiple)	2005	4.78	5.58	5.39	5.74	**7.35**	6.48	6.43
	2000	4.32	6	4.49	4.71	**6.91**	5.75	4.93

Note:* Million euros (Exchange rate: NT/euro=40);** The average income of the richest twentieth of the population/ The average income of the poorest twentieth of the population.

Table 28

Statistics of the seven biggest cities in Taiwan (2006)
(Source: Taipei City Weekly Statistics Report 2007; Urban and Regional Development Statistics 2007, available at http://www.cepd.gov.tw/dn.aspx?uid=4907 [Accessed in May 2012])

It is a love and hate relationship for the local governments, because the HSP development does promote local economic development by attracting varieties of goods and workers/ people to the region, but its success also brings many environmental impacts on surrounding areas, such as traffic congestion, environmental pollutions, shortages supply of local facilities and housing, and so on. Although this is the duty of the local governments to deal with the externalities of the HSP development, they are rarely involved in the decision making of science park development. This has caused increasing tensions and contradictions between the local governments and the HSP, consisting of the SPA as well as its tenant companies.

§ 6.4.2 High-tech Spatial Developments in Hsinchu City-region

The development of the Hsinchu high-tech city-region is predominantly state-led. As shown in Table 29, most of the spatial elements of high-tech development are located in the HSP special district and provided by the national government. Many of the lead high-tech firms in the HSP, such as the UMC and the TSMC, are spinoffs of the Industrial Technology Research Institute (ITRI), a nationally funded R&D organisation specialising in applied research and technical services. As for innovation centres/incubators in the city-region, all of them were established by the national R&D institutes and universities. Functional divisions between national and local governments are clear. The central government is in charge of global production through investing in collective production infrastructure and making preferential policy inputs to attract high-tech industrial investment and serve high-tech industries, while the local governments take responsibility for the provision of collective consumption goods, including local transport and public facilities, environmental management, and urban development (Chou 2007).

However, since the 2000s Hsinchu county government and National Chiao Tung University (NCTU) have started to play a more active role in high-tech spatial development. In 1999 the NCTU proposed the Taiwan Knowledge-based Flagship Park (TKFP) urban development project to the Hsinchu county Government with an attempt to enhance their competitiveness and to work towards the status of one of the top universities in the world by acquiring new campus lands nearby their main campus, the HSP as well as the High-speed Rail Hsinchu station. At the same time, the Hsinchu county Government expected that the High-speed Rail Hsinchu Station Special District would be developed quickly and development demand for its surrounding non-urban land would be triggered as well because of the enormous housing demand of the HSP development (see Figure 25). An urban land use plan was needed to regulate and direct the potential land developments in the area, but the legal process consumed much time and money and the county government did not have enough budget and resources to conduct the planning project. As a result, when the NCTU proposed the TKFP project and expressed their willingness to be responsible for the planning funds in return for campus land free of rent, the county government was more than happy to accept their proposal (Chen 2011; Li 2011; Lin 2011; Liu 2011; Wu 2011).

Spatial Elements	Hsinchu City-region
R&D Capital	
Universities	National Chiao Tung University (1958), National Tsing Hua University (1956)
R&D Institutes	– Located in HSP special district: Industrial Technology Research Institute (1973), National Synchrotron Radiation Research Centre (1993), National Applied Research Laboratories (2003) – Other: Food Industrial Research and Development Institute (1965)
Lead High-tech Firm	UMC (1980), TSMC (1987), AUO (1996), etc.
Innovation Centre/Incubator	Incubation Centre of Industrial Technology Research Institute, Innovation Incubation Centre of National Chiao Tung University, National Tsing Hua University Innovation Incubator.
Relational Capital	
Science/ Technology Parks	– National Science Park: Hsinchu Science Park (1980), Hsinchu Biomedical Science Park (2011) – Planning stage: Taiwan Knowledge-based Flagship Park
External and Internal Accessibility	– External: Taiwan Taoyuan International Airport, High-speed rail Hsinchu station, railway, highway, optical networks, etc. – Internal: road widening projects around HSP, Hsinchu light rail development plan, etc.
Human Capital	
Quality of Place	Environmental improvement of Hsinchu inner city, etc.
Education and Training Institutes	National Experimental High School (1983) located at Hsinchu Science Park, including elementary department and bilingual department.

Table 29
High-tech spatial developments in Hsinchu city-region

The NCTU is one of the best universities in Taiwan and most of the knowledge workers and high-tech entrepreneurs in the HSP graduated from NCTU. The county government considered that the participation of NCTU would help to gain the support of high-tech industries as well as the national government and thus guarantee success of the high-tech oriented planning project proposal. In addition to the good relations with the high-tech industries and the national government, the biggest advantage was that the NCTU brought money and new planning knowledge into the project (Li 2011; Liu 2011). However, the initiative is not going smoothly for two reasons. First, despite the setting up of a covenant between the NCTU and the county government, the legitimacy of the NCTU to be in charge of the operation of spatial planning is weak. Second, although the project has been identified as a part of the *National Development Plan*, it was initiated by the NCTU with the purpose to acquire new campus land for free. People have criticised this intention—as a national university they should have focused more on research and education rather than trying to gain profits from land development. As of 2012, the masterplan and detail plans of the project still remain in the deliberation process of the Urban Planning Committee at the national level.

§ 6.4.3 Summary

For planning authorities in Taiwan, the role of spatial planning is limited to providing a legal base to acquire land for public facilities and/or high-tech related industrial activities and to regulating and/or facilitating land development. This has led to a blueprinted and project-oriented planning style. The TKFP project is a result of close collaboration between Hsinchu county government and the NCTU. This is a new approach to science park development. The initiative shows the changing interrelationships between the central government, local governments and other sectors. The role of the central government has been minimised but remains essential.

§ 6.5 Comparisons

In both countries, to promote high-tech economic development has been the priority on the political agenda. I summarise the spatial elements of high-tech development in the two city-regions in Table 30.

Spatial Elements	Eindhoven City-region	Hsinchu City-region
R&D Capital		
Universities	E	E
R&D Institutes	H	E/H
Lead High-tech Firm	E	H
Innovation Centre/Incubator	H	H
Relational Capital		
Science/ Technology Parks	E/H	H
External and Internal Accessibility	E/H	E/H
Human Capital		
Quality of Place	E/H	H
Education and Training Institutes	H	H

Note: 'E' means existing elements (before high-tech development policy); 'H' means elements have been provided or are planned due to high-tech development policy.

Table 30
High-tech spatial developments in the two city-regions

According to the three principal components, I compare how the governments in these two case study areas provide the spatial elements of high-tech development in the following sections.

§ 6.5.1 Spatial Mechanisms to Enhance R&D Capital

To locate R&D institutes in a science park/campus has been considered as the major strategy of high-tech development in these two regions and the central governments play an essential role in establishing knowledge infrastructures, including universities and R&D institutes. Both in the Netherlands and Taiwan, the top research universities and R&D institutes are funded by the central government, such as the TU/e and the TNO in Eindhoven and the NCTU, the NTHU and ITRI in Hsinchu. They are the major actors in the regional as well as national innovation system. Their existence has profound influence on high-tech spatial development in both city-regions.

Nonetheless, there are two major differences between the two city-regions regarding the ways in which knowledge infrastructure is provided. First, except for the TNO, most of the R&D institutes in the Eindhoven city-region are the result of close collaboration between local government, universities, R&D institutes and lead high-tech firms. For example, the Embedded Systems Institute was founded by ASML, Océ, Philips and TNO along with Delft University of Technology, Eindhoven University of Technology and University of Twente. Foundation for Fundamental Research on Matter relocates most of its Rijnhuizen Institute for Plasma Physics to TU/e Science Park with the support of TU/e and the provincial government (Foundation for Fundamental Research on Matter 2010). On the contrary, all of the R&D institutes in the Hsinchu city-region are state initiatives.

The second is the establishment and management of innovation centres/incubators. In Hsinchu, innovation centres/incubators are part of the facilities and services of the two universities and ITRI. In the Eindhoven city-region, the innovation centres/incubators are established and managed by the regional development company. In the past, it was the NV REDE. Since 2010, it has been the Brainport Development NV. Its shareholders include the Brainport Foundation (50%), the SRE (25.9%), Eindhoven municipality (15.2%), Helmond municipality (5.5%) and Veldhoven municipality (3.4%) (Brainport Development 2012). Brainport Foundation acts as the board of directors of the Brainport Development NV. The board of the Brainport Foundation is comprised of twelve representatives from the governments, knowledge institutes and business community. Each sector has four representatives on the board. The mayor of Eindhoven chairs the board. Nonetheless, the funding of the regional development company is mainly from the SRE and the three municipalities (Brainport Development 2012). This implies that

in the Eindhoven city-region there is close collaboration between local governments, knowledge institutes and lead high-tech firms in enhancing R&D capacity, but the role of local governments, especially the SRE, is crucial as coordinator and facilitator in building relationships for high-tech spatial developments.

§ 6.5.2 Spatial Mechanisms to Enhance Relational Capital

The improvement of internal and external accessibility and the development of science/technology parks have been considered as the most effective spatial strategies to enhance relational capital in these two city-regions. The improvements to accessibility in both cases are mainly based on the support of their central governments. For example, in the Netherlands, *Meerjarenplan Infrastructuur, Ruimte en Transport* (MIRT, Multi-Year Plan for Infrastructure, Spatial Planning and Transport) is the major instrument that provides a platform for the central government, provincial governments and municipalities to coordinate national investment in both infrastructural and spatial developments, to balance national interest and projects with locals interest and projects (van Haegen 2012).

Regarding the development of science/technology parks, although both countries have identified science park development as a crystallisation point to stimulate high-tech industrial clustering, there are four significant differences in mechanisms between these two countries. The first is the definition of science park, which has influenced the ways that the governments allocate resources to support science park development. In the Netherlands most of the science parks are initiated by the private sector or universities, sometimes with the support of provinces and/or municipalities. The central government only identifies and invests in the 'campuses' that are of national importance or have the potential to be of national importance as a basis to formulate high-tech economic strategies (Ministerie van Economische Zaken 2010a). The campuses have to have four essential elements, including a focus on R&D activities, a physical location of high quality firms and research facilities, the presence of manifest knowledge carriers, and an open, innovative environment.

In Taiwan the establishment and administration of science parks must be governed by the provisions of the Act for Establishment and Administration of Science Parks. According to the act, The National Science Council (NSC) of the Executive Yuan may select a suitable site and apply to the Executive Yuan for their approval to establish a science park for the purposes of attracting high-tech industries and professionals, encouraging the research and innovation of domestic industries and enhancing the technology of local high-tech industries. The NSC must establish science park administrations in the science parks to oversee the management of the parks and provide the park enterprises

with various services. In other words, science park developments in Taiwan are state-led. All of the park sites are of course considered to be of national importance.

However, since the demise of the authoritarian state in the late 1990s, the decision regarding the location of a science park has huge political implications, because the governing party has to gain local support and local governments believe that science park development can trigger local economic growth and industrial upgrading. This has led to a technopolis programme approach. As a result, the supply of high-tech industrial land has been overloaded and the financial burden on the Operation Fund of the Science Park has significantly increased. The result shows that the Taiwanese government has chosen a less systematic and selective approach to conduct science park development since the 2000s.

The second significant difference is the role of government and the functional divisions between different levels of government in relation to science park/campus development. In the Netherlands the role of the central government is to identify top sectors, to improve the business and research climate in general, to realise and provide advanced research facilities, and to improve accessibility and quality of the campuses in the international and national context. The major tasks for the provinces and municipalities are to facilitate campus initiatives, to lobby the national government and the EU, to widen residential options for knowledge workers and to shape better relationships between the campuses and cities (Advies Platform Randstad 2040 2009; Ministerie van Economische Zaken 2010c; Ministerie van Economische Zaken 2010a). In Taiwan the central government is the party who initiates, develops and manages the science park and the local government is responsible for the supply of collective consumption goods in the surrounding areas. Specifically, the Dutch government assists in the development of a science park rather than undertaking the development itself, as is done by the Taiwanese government.

The third significant distinction between Taiwanese and Dutch science park approaches is the relation between the park/campus and its surroundings from a spatial planning perspective. The Dutch government tends to see the campuses and their surroundings as a whole and aims to interweave the campuses with their surrounding urban fabric from both physical and non-physical perspectives. Negotiation and coordination between the campuses, high-tech industries and the governments are thus considered essential to achieve this goal. This helps to build the three key soft infrastructures of high-tech space development—including the R&D capital, the relational capital and the human capital—in the first place and forms a better starting point for urban and regional governance.

Different from the Dutch approach, the role of spatial planning in science park development is weak in Taiwan, because the location and establishment of science parks are dominated by the central government from a distance. The underlying logic

of science park development and management in Taiwan makes the science park an enclave. Such a heavily institutional design does provide a highly efficient environment to serve high-tech industries, but also has caused severe conflicts between park administration, local governments and social organisaitons. Although formal and informal channels for cooperation have increased and the tensions among them have been reduced to a certain degree, the separation of governance between the parks and their surroundings remains. Nonetheless, the new initiative of the TKFP project intends to create an integrated environment between the new science park, university campus and its surroundings. The planning result remains uncertain, but the project has shown an alternative way of science park planning and development in Taiwan.

Finally, 'cluster effects' of high-tech industry have been considered as the engine of local economic growth in these two city-regions, but their spatial patterns of high-tech development clustering are very different. This relates to the differences in their definition and scale of science park/campus. As shown in Figure 26 and 27, in the Eindhoven city-region the industrial clustering pattern tends to be polycentric and the science parks/campuses scatter in the core area along the highways. The size of the science parks/campuses mostly is smaller than 100 hectares. Each science park/campus may focus on one particular field of R&D and the role of the science park/campus is expected to facilitate clustering of its relevant industries.

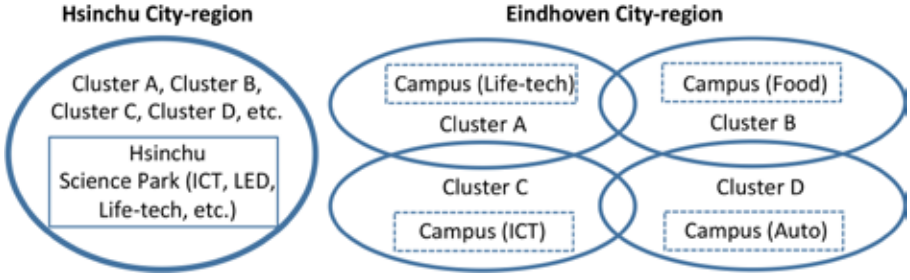

Figure 26
Spatial patterns of high-tech clustering in the two city-regions

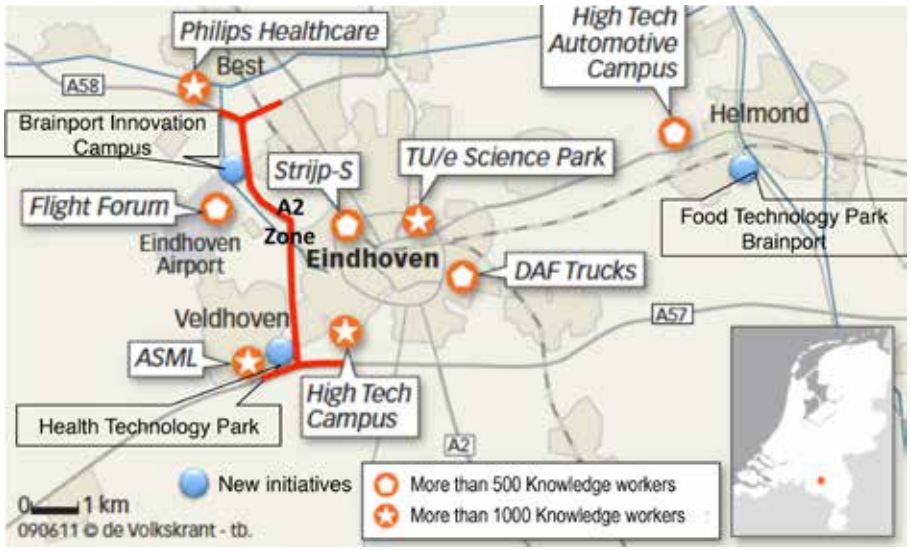

Figure 27
Distribution of Science park/campus in Eindhoven City-region

On the other hand, the industrial clustering pattern in the Hsincu city-region tends to be monocentric. The science park development is dominated by the Science Park Administration under the supervision of the NSC. According to the national technology policy, the HSP focuses on more than six high technologies, including integrated circuits, computer and peripherals, telecommunications, optoelectronics, precision machinery and biotechnology.

The HSP is actually a large-scale science-based industrial park containing not only R&D activities but also mass production. The size of the HSP is around 650 hectares, which is much larger than the size of the science park/campus in Eindhoven city-region. The industrial networks and clustering effects have formed in the Hsinchu city-region, but the formation mainly relies on the development of the HSP. For example, following the rapid growth of the HSP, many industrial companies, in relation to the HSP's high-tech firms, have gradually replaced traditional industries as the major industries of the Hsinchu Industrial Zone, an old industrial district managed by the Taiwanese Industrial Development Bureau, Ministry of Economic Affairs (see Figure 28). Due to the expansion demand of the HSP, Jhuna Park was established in 2000 along the national highway, although it is actually a satellite site of the HSP rather than an independent science park.

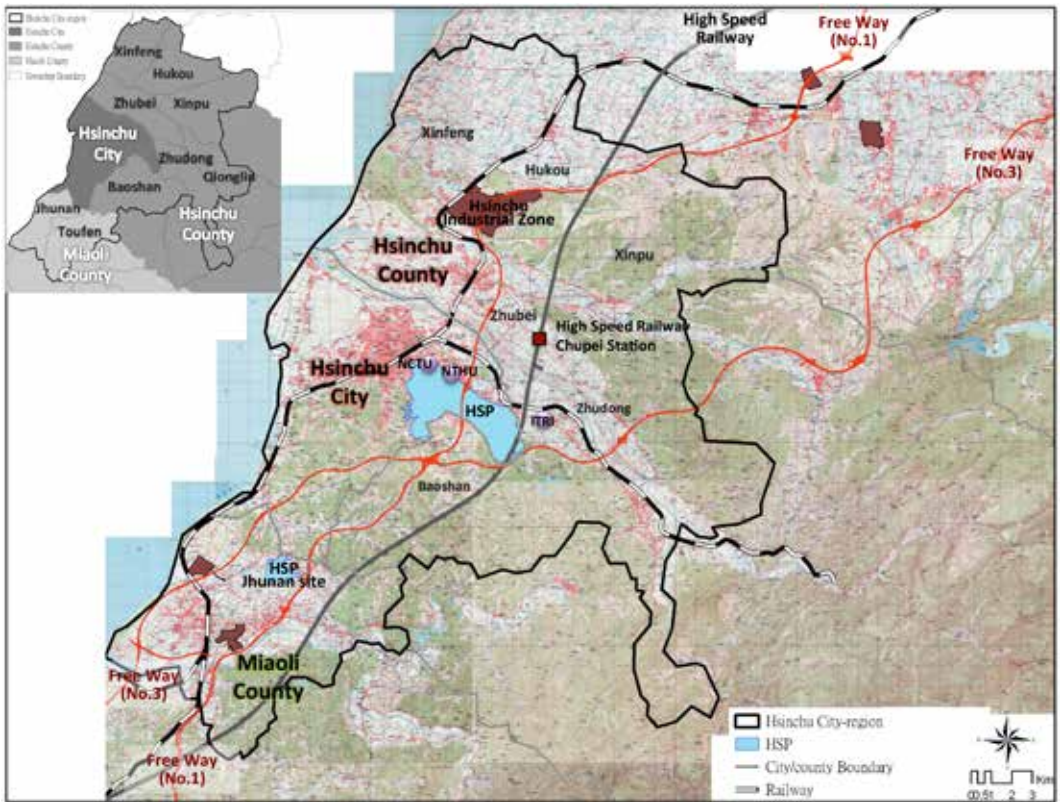

Figure 28
Functional networks of Hsinchu high-tech city-region

§ 6.5.3 Spatial Mechanisms to Enhance Human Capital

Both city-regions try to provide adequate facilities to fit the living demands of knowledge workers. For example, there are international schools in both regions for the children of knowledge workers. Spatial plans in both city-regions emphasise the importance of spatial quality in attracting and retaining knowledge workers. For example, the Spatial Programme Brainport (SRE 2009, 50) has stated that:

The objective is to search for a[n] attractive combination between nature, agriculture, recreation, living and working…Landscapes are robust (thematic) green areas to which new functions are carefully added, in a very low density and with respect for nature. These reserves have a high spatial quality and control is co-ordinated, often in conjunction with the agrarian sector. The landscapes offer knowledge workers a place for repose, space, reflection and recreation in close proximity to the city.

The TKFP project in Hsinchu also plans to provide 20 hectares of residential area for the development of an 'international village community' in accordance with the Technological Talent Development Policy of Executive Yuan (Hsinchu County Government 2011).

The quality of place is highly subjective and it is difficult to evaluate and compare, especially across different national cultures and environmental conditions, but there is one major difference that can be recognised regarding the underlying logic of creating quality of place. For the Taiwanese government, there is a distinction between knowledge workers and local residents regarding the conception of living quality, so they plan to develop a particular 'international village community' for the knowledge workers. In contrast, the Dutch government acknowledges that '[k]nowledge workers do not have specific housing needs and are part of the regular housing market.' (SRE 2012, 2; original in Dutch, translated by the author) The key point is to provide a variety of housing choices to both knowledge workers and local residents from high to low density, from urban to rural areas.

§ 6.5.4 Remarks

The governments in both cases play an active role. But the emergence of the Hsinchu high-tech city-region fully relies on input from the Taiwanese national government, while the development of Brainport Eindhoven depends more on collaboration between municipalities in the form of regional governance. While the Taiwanese government tends towards a provider style of policy, the Dutch government prefers a collaborative style of policy. The Dutch government adopts a more strategic and selective approach to high-tech spatial development. The provision of the spatial elements is based on close collaboration among different levels of government, knowledge institutes and lead high-tech firms.

In Taiwan, unlike the Dutch approach, most of the spatial elements in relation to high-tech development are provided by the national government. Most of the necessary resources for high-tech development are also mastered by the national government. This approach is rather efficient and effective in terms of high-tech development, but it also has created large externalities on surrounding areas and resulted in conflicts and tensions between the national government and the local governments in the Hsinchu city-region.

In short, the systematic comparisons undertaken in chapters four, five and six together form an in-depth understanding of the two case study areas in terms of their socio-political context, spatial planning systems and high-tech spatial development policies.

This is useful for investigating how the governments use the spatial planning system and tools to facilitate, induce, and/or support high-tech development, and for exploring the factors that shape the practices of high-tech spatial planning and development in these two city-regions. This is further discussed in the next chapter.

7 High-tech Oriented Spatial Planning and Governance in Eindhoven City-region and Hsinchu City-region

In the previous chapter, I explored high-tech policy in the Netherlands and Taiwan as well as high-tech spatial development in the Eindhoven and Hsinchu city-regions. I found that the governments in these two countries and city-regions play an active role in conducting and/or facilitating the development of high-tech spatial elements, including R&D institutes, innovation centres, science and technology parks, good accessibility, and quality of space, although the functional divisions between different levels of government vary. However, these high-tech spatial elements necessarily have spatial effects on the surrounding areas, and spatial planning must play a role in anticipating and/or mediating the implications from a more comprehensive perspective.

Spatial planning is about providing frameworks and principles for spatial development and coordinating policies across sectors. Although the scope of spatial planning differs, in most countries the key function of contemporary spatial planning is to manage spatial development and organisation in a particular place(Healey 2006; United Nations Economic Commission for Europe 2008; Dühr et al. 2010). A set of governance practices occur in the spatial planning process 'for developing and implementing [spatial] strategies, plans, policies and projects, and for regulating the location, timing and form of development.' (Healey et al. 1997, 4) Specifically, I use the term 'spatial governance' to refer to the part of spatial planning activities that mainly involve the mobilisation of needed resources and actors to deal with spatial planning issues and achieve goals of spatial planning in a particular place.

On the basis of this understanding, in this chapter I focus more on how the governments conduct, facilitate and coordinate high-tech spatial developments and deal with the spatial issues generated in the process through spatial planning and governance. I first review the practices of spatial planning and governance in the Eindhoven and Hsinchu city-regions and identify the significant similarities and differences of the spatial planning and governance practices between the two case study areas. According to the findings of the previous three chapters, I then explore the major institutional factors that contribute to the differences in order to answer my research questions.

§ 7.1 Brainport Eindhoven

The concept of Brainport embodies a shift in Dutch spatial planning doctrine. In the past two decades the focus of Dutch national spatial policy has shifted from housing supply and allocation to area-based economic development through an infrastructure network approach. Spatial planning policy and economic development policy are strategically integrated, addressing both the roles of regions and urban networks. At the same time, it has been broadly accepted that regions have to stand on their own. Provinces and city-regions become major facilitators of economic development. Since 2004 the Eindhoven city-region has been recognised as one of the core economic areas and urban networks on the national level, because the region is highly prominent both nationally and internationally in the field of research and development (Ministry of Housing, Spatial Planning and the Environment et al. 2004; Ministerie van Economische Zaken 2004). The recognition not only indicates the full support of the Dutch national government, but also affirms the common interest and key agenda of the Eindhoven city-region. In this section, I first outline major spatial frameworks and planning concepts of Brainport Eindhoven and introduce its governance approach to realising the spatial policies of Brainport Eindhoven. Then, I demonstrate the spatial issues and consequences of the development of Brainport Eindhoven in 2012.

§ 7.1.1 Spatial Planning Concepts of Brainport Eindhoven

Spatial Programme Brainport and Brainport Avenue are the most important high-tech oriented spatial planning policies in the Eindhoven city-region. They together form the spatial framework of the city-region. I respectively summarise their functions and major planning concepts in the following sections.

A Spatial Programme Brainport

In 2009 Spatial Programme Brainport was formulated on the basis of a social-spatial study, *Het Geniale Landschap* (the Ingenious Landscape) initiated in 2007 by the SRE together with Eindhoven Municipality, Helmond Municipality and Province Noord-Brabant. The study aimed to supplement the spatial component of Brainport, because the Brainport agenda and its relevant initiatives mainly derived from an economic perspective and had little notion of how to create spatial conditions that can further strengthen the Brainport development (Urban Affairs and vhp 2007). The function of the social-spatial study was to recognise a set of spatial opportunities and to formulate scenarios for the Brainport development as a starting point to stimulate public debate

and to build consensus. In 2009 the SRE in cooperation with the URBACT II[14] programme translated the study into the Spatial Programme Brainport containing a set of concrete projects and area developments within the framework of the Regional Structure Plan Eindhoven City Region.

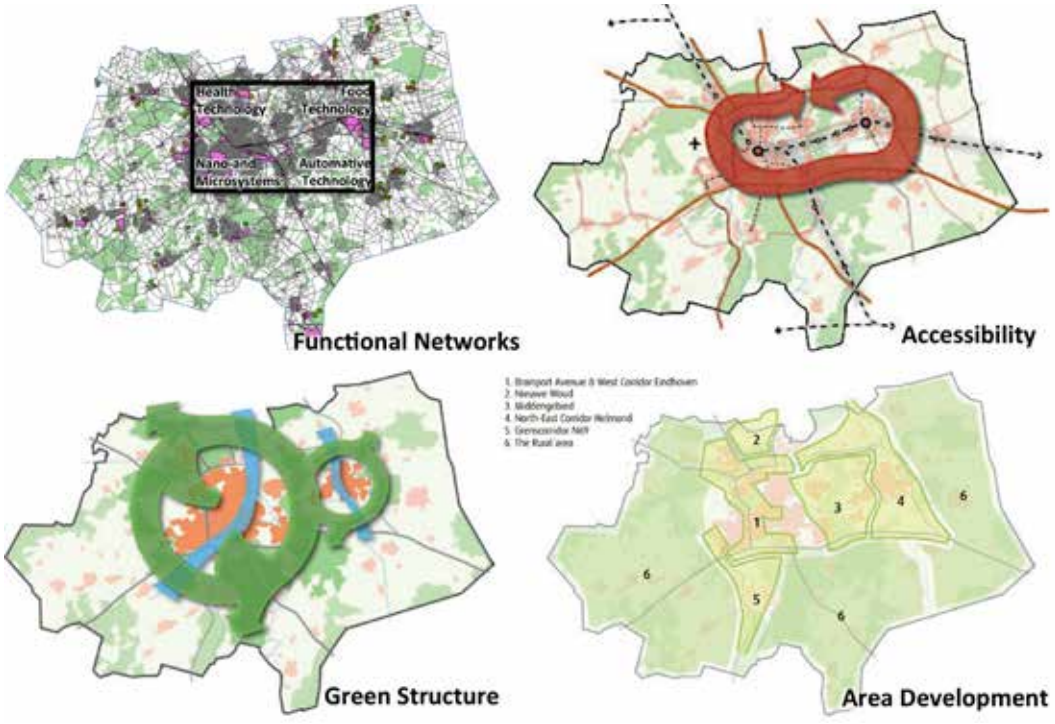

Figure 29
Spatial frameworks of Eindhoven city-region (Source: SRE 2009, 17, 22, 24, and 28)

The two major functions of the Spatial Programme Brainport are to supplement the spatial component of Brainport and to form the basis for gaining regional support and attracting investors. As shown in Figure 29, in the Spatial Programme Brainport the priorities are functional networks, including internal and external accessibility among clusters, and a regional green structure. Within the functional networks and

14 URBACT is a European exchange and learning programme and is jointly financed by the European Union (European Regional Development Fund) and the Member States.

the green structure, Eindhoven city-region is divided into six development areas, including 1) Brainport Avenue, 2) Nieuwe Woud (experimental residential area with green landscape), 3) Middengebied (regional green landscape), 4) Northeast corridor Helmond, 5) Grenscorridor N69 and 6) rural areas. These form the fundamental spatial framework of the Eindhoven city-region.

However, the content of the spatial programme is dynamic and flexible. Every year, the Executive Committee of the SRE draws up a list of projects within the spatial framework. The projects have to fit the four supplementary criteria formulated in the spatial programme. These are: supra-local/(sub)regional character, high spatial quality (usage value, perceptive value and future value), modernisation/innovation character, and having high potential for implementation in the short term (SRE 2009, 41). Projects that have been implemented can be removed from the list and new projects that meet the criteria can be added in the list as well. This implies that the Spatial Programme Brainport does not present an endpoint to reach but rather a dynamic process of strategic planning.

B Brainport Avenue Nationally Important Project

De geniale Brainport locatie (the ingenious Brainport location) indicates a cohesive vision and framework for local development within the A2-zone in the Eindhoven city-region and has been recognised as a nationally important project—the Brainport Avenue project (SRE et al. 2008, 6). A nationally important project has the function of coordinating the actions of various national government departments and all levels of government. It forms a basis for reserving funding, around 75 million euros, from the budget of the *Nota Ruimtebudget*[15] (National Spatial Strategy) (SRE et al. 2008; Enno Zuidema Stedebouw 2008).

Since the *Regional Structure Plan* the Eindhoven City-region put forth in 2005, the A2-zone has been identified as the 'top-technology-axis' as well as the 'showcase' of Brainport Eindhoven due to its high concentration of R&D activities and good international and national accessibility (SRE and Province Noord-Brabant 2005, 134,137). Many high-quality science parks and high-tech industrial parks—including High Tech Campus, ASML, Philips Medical Systems, Flight Forum, and so on—are located in the A2-zone

15 The budget of the National Spatial Strategy from 2008 to 2014 is around one billion euros (Ministry of Transport and Water Management 2010). In 2010 the Dutch government in total invested around 11 billion euros in physical development (336-337).

and are easily accessible from the national highway and rail networks as well as the Eindhoven Airport (see Figure 30 and Figure 27 in section 6.5.2).

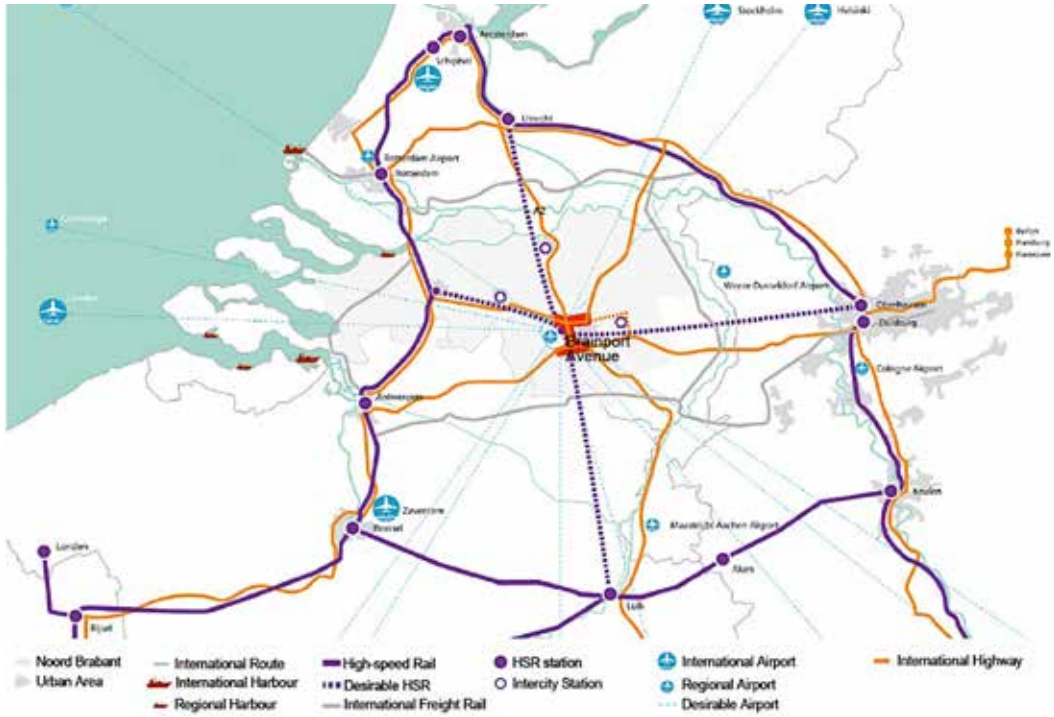

Figure 30
International accessibility of Brainport Avenue (Source: Enno Zuidema Stedebouw 2010, 5)

In order to secure the regional ambition and avoid 'cluttering' development in the area, the *Samenwerkings-verband Regio Eindhoven* (City-region Eindhoven, SRE) together with the municipalities of Best, Eindhoven, Son en Breugel, Veldhoven and Waalre, where the A2-zone is located, formulated the development programme in 2008. The programme consists of several development projects, including Slowlane A2, Landelijk Strijp, De Run, T-campus, Strijp S, Station Area, and so on (see Figure 31). On the basis of the spatial framework of the Eindhoven city-region, the showcase of Brainport Avenue and a good balance between red (urban) and green space are the two major planning principles of the Brainport Avenue. As shown in Figure 32, within the red and green structure, five development areas are identified according to their landscape characteristics, including Mozaiek, Park, Avenue, Dommel and Bos. The spatial developments located in the five areas have to respect the particular landscape characteristics of the areas in order to provide attractive and varied scenes along the A2 Highway (Buck Consultants International and Fakton 2009; SRE et al. 2008).

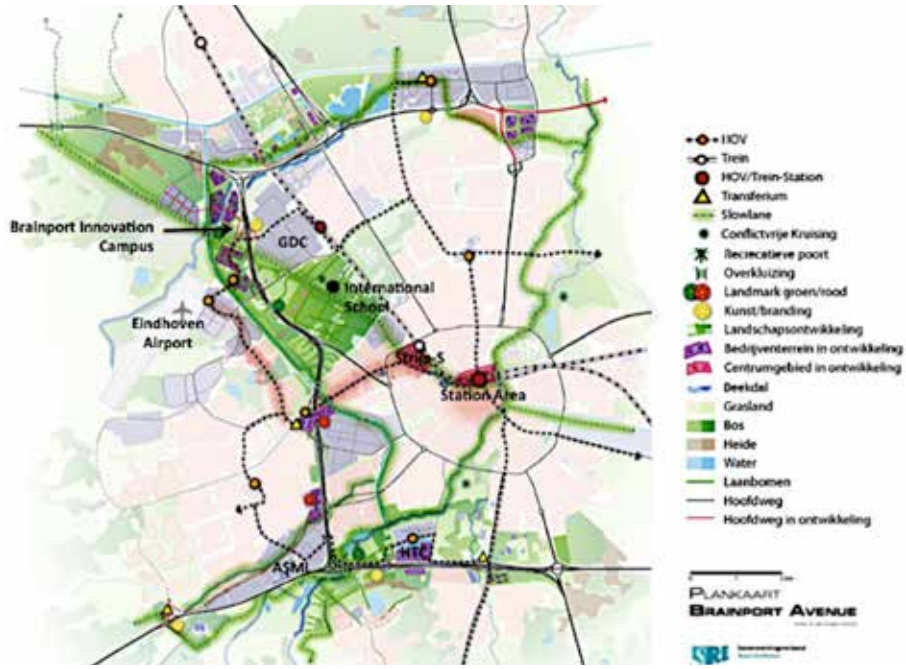

Figure 31
The spatial framework of Brainport Avenue (Based on Buck Consultants International andFakton 2009, 29)

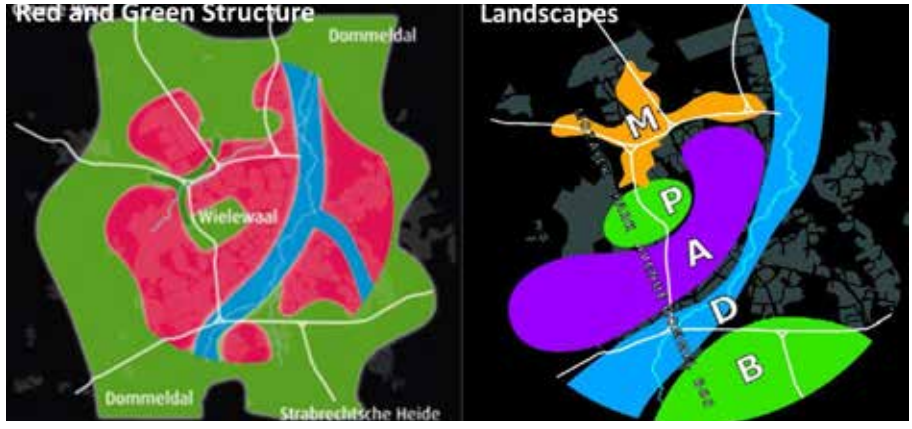

Figure 32
The spatial concepts and framework of Brainport Avenue (Based on SRE et al. 2008, 31, 51)

The development of Brainport Avenue consists of many development projects, which involve various stakeholders and are implemented by different municipalities where the projects are located. The progress of each development project is different. Some are

quick and some are slow. In order to keep the spatial quality, on the basis of the two planning principles in 2010 the SRE in consultation with the five involved municipalities has established an evaluation framework, Brainport Avenue: Criteria for Spatial Quality, and a spatial quality advisory team to monitor future developments in the A2-zone (Enno Zuidema Stedebouw 2010).

§ 7.1.2 Spatial Planning and Governance Approach of Brainport Eindhoven

Spatial Programme Brainport and *De geniale Brainport locatie* are non-statutory planning documents, but they demonstrate agreements of spatial planning and development among government agencies involved in the Brainport development. The agreements are underpinned by intensively vertical and horizontal collaboration and consensus building between different governmental agencies, including the SRE, municipalities and municipal councils, Ministry of Economic Affairs, Province Noord-Brabant, and so on. In the process, local authorities, including the SRE and the involved municipalities, play a crucial role in promoting, shaping and mobilising needed resources to realise the planning goals of Brainport Eindhoven.

Regarding the functional divisions between the SRE and the municipalities in the development of Brainport Eindhoven, there are three key principles. First, the responsibility to realise the development projects contained in *Spatial Programme Brainport* and Brainport Avenue programme actually belongs to the municipalities, where the projects are located, rather than the SRE (SRE et al. 2008). Second, a development project is undertaken by the SRE or province, only when the project crosses municipal boundaries, such as the construction of Slowlane A2, a cycling path along the A2 highway connecting all the development projects. Third, the SRE will not intervene in local decision-making, unless the decision will influence the development of the Eindhoven city-region as a whole. The mechanisms the SRE uses to intervene in local decisions are negotiation, mediation and giving advice. The municipalities have the competence to make the final decision.

Since 1993 the SRE has played the most important role in coordinating various topics regarding the issues of spatial planning, traffic, transport, housing, environment, education, health, culture, recreation, tourism, and socio-economic affairs at the city-regional level. However, since the enforcement of the new Spatial Planning Act (Wro) in 2008, the SRE has lost the authority to formulate statue plans, such as the regional structure plan. This has forced the SRE to play a more active role and to apply a new approach, an open network approach, to realise its ambitions for spatial planning.

In the new approach scheme, the SRE acts not only as a coordinator, like before, but also as a network broker and facilitator in the spatial planning and governance process of the Brainport development. The SRE helps relevant actors connect to each other and assists the actors, including governmental and non-governmental agencies, who have similar interests in forming informal collaboration groups and/or formal regional partnerships according to particular issues and/or goals of spatial planning (van Zeeland 2012ba 2012b). For example, the SRE assists relevant municipalities in forming the *Samenwerking Stedelijk Gebied Eindhoven* (Eindhoven Urban Area Cooperation) and the *Campusgemeenten* (Park Cities). The former consists of eight municipalities aiming to deal with the allocation and development of social housing and industrial sites around the city of Eindhoven. The latter is a new alliance aiming to strengthen the development of high-tech campuses, so it involves four municipalities, including Eindhoven, Helmond, Veldhoven and Best, who are in the core innovative area of the city-region (van den Hoogenhof 2012).

At the municipal level, municipalities apply a 'cluster approach' to involve local stakeholders and manage different relationships clustered around issues and topics of each particular development project in order to build/seek local consensus on the goals of the project (van Eert 2012). I take the development of the Brainport Innovation Campus, one of the most important development projects of *Spatial Programme Brainport* and Brainport Avenue, as an example to demonstrate the spatial planning and governance approach of the SRE and the municipalities, because it shows the common spatial planning and governance practices in the spatial planning and development process of Brainport Eindhoven both on the regional and local levels, and involves not only governmental agencies but also the market and civil society.

At the end of the 2000s, the SRE and Eindhoven municipality recognised the potential to develop the BeA2 business site (the location of Brainport Innovation Campus) as a campus to accommodate high value-added knowledge and technology industries because of its attractive landscape and strategic location (see Figure 33) (SRE et al. 2008, 88). With the support of Brainport Development NV, the SRE consulted with lead high-tech firms in the Eindhoven city-region, such as ASML, Philips, etc. about the proposed development. In the consulting process, the SRE recognised the spatial demands of the suppliers of the lead firms. Several high-tech suppliers expressed their interests to locate in the campus in order to be closer to their customers, the lead high-tech firms. The planning concept of Brainport Innovation Campus thus emerged.

Figure 33
Distribution of business sites in the A2-zone (based on SRE et al. 2008, 26)

On the one hand, the SRE together with the Brainport Development NV helped the establishment of an industrial association of the suppliers—the Brainport Industries (van Leest 2012; van Zeeland 2012a; 2012b). On the other hand, they introduced the association to Eindhoven municipality and promoted the collaboration between the association and Eindhoven municipality in developing the new campus(van Eert

2012; van Zeeland, 2012a; 2012b). Since the former *bedrijventerreinen structuurvisie* (structure vision of business sites) of Eindhoven city-region published in 2000, the BeA2 has been identified as an area that has potential to be developed as a business site. In line with the structure vision, Eindhoven municipality has systematically purchased most of the land during the past ten years and continuously negotiate with the remaining landowners, who own the rest of the land within the BeA2 site. Since a consensus was reached in *De geniale Brainport locatie*, agreeing to develop the BeA2 as a campus for high-tech industries, and since the Eindhoven municipality has bought most of the land, the municipality is welcoming the SRE's proposal to collaborate with Brainport Industries in developing the BeA2 business site as the Brainport Innovation Campus.

Nonetheless, it is clear for the Eindhoven municipality that Brainport Innovation Campus is one of the key components of the Brainport Avenue development programme from a national and regional perspective, but from a local perspective its relation to the development and spatial quality of its surrounding area, Landelijk Strijp, and the support of local stakeholders are also important. Specifically, Brainport Innovation Campus is a development project that is nested in different levels of spatial planning policies and practices. In addition to Spatial Programme Brainport and Brainport Avenue development programme, in 2008 the Eindhoven municipality formulated a development vision for Landelijk Strijp, where Brainport Innovation Campus is located, aiming to seek synergy among the various developments as a means to achieve better spatial quality and integral land use in the area of Landelijk Strijp (see Figure 34)(Enno Zuidema Stedebouw 2008).

The vision was formulated through intensive collaboration between the representatives of different stakeholders, including involved government agencies, Brainport Industries, residents, landowners, social organisations, and so on. In the beginning, Eindhoven municipality invited all the representatives of stakeholders together to seek common development goals for Landelijk Strijp. After reaching consensus on the common goals and planning principals, Eindhoven municipality divided the stakeholders into twenty clusters according to which topics and issues of spatial planning were most related to certain stakeholders in order to govern the relationships and collaboration in a more effective and efficient way (van Eert 2012).

Regarding the project of Brainport Innovation Campus, Eindhoven municipality plans to cooperate with Brainport Industries either by leasing the land or directly involving in Brainport Innovation Corporation, which is a company in charge of the development and management of Brainport Innovation Campus, as one of the shareholders. The SRE and Eindhoven municipality lean more towards the latter form of cooperation (van Zeeland 2012a). However, the planning content and implementation mechanisms of the project are not yet certain. Only when Brainport Industries makes a formal commitment to participate in the development of the project will a *bestemmingsplan* (municipal land use plan) of the Brainport Innovation Campus will be drafted according to the result of

the negotiation, thus entering into the legal procedure. But as of May 2012, Eindhoven municipality remains in waiting for the commitment of Brainport Industries (van Eert 2012).

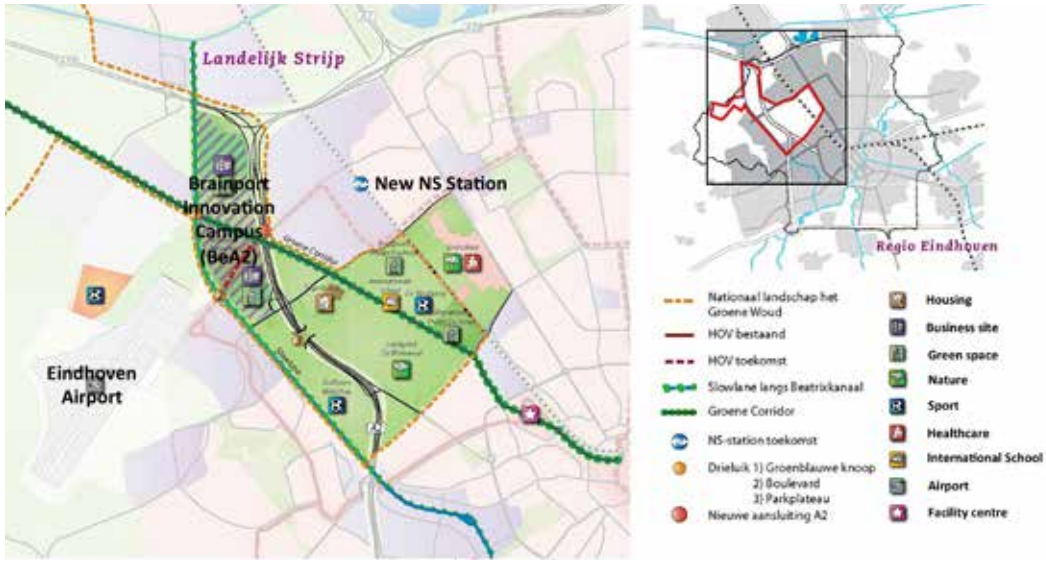

Figure 34
Development vision of Landelijk Strijp (Source: Landelijk Strijp Boucher, Eindhoven municipality 2008)

Although the results of the developments of Landelijk Strijp as well as Brainport Innovation Campus are still full of uncertainties, the way of practicing spatial planning and governance in the case study demonstrates the common spatial planning and governance practices in the Eindhoven city-region since the late 2000s. The role of SRE is to consider the spatial quality and development of the Eindhoven city-region as a whole. On the basis of the consideration, the SRE facilitates and shapes the collaboration on a regional level, while the municipality pays more attention to local spatial quality and consensus building.

The planning and governance approach taken in the Brainport development embodies a relational perspective, whereby attention is put on the way to link, manage and mobilise the relationships clustered around various spatial issues and topics at different levels of spatial planning. In the process, several non-statue plans, such as *Spatial Programme Brainport*, *De geniale Brainport locatie*, and the *Development Vision of Landelijk Strijp*, are employed as a strategic instrument to stimulate debate, involve stakeholders and build/seek consensus on development goals of particular places/projects, but also to mobilise needed actors and their resources to achieve the goals.

In the planning process of the Brainport Eindhoven development, the *bestemmingsplan* is the result of negotiation and coordination between different levels of government, industrial investors, and other stakeholders. It can be seen as a record of an agreement between different interests rather than a means to regulate spatial development. This is in accordance with the Dutch planning tradition at the municipal level (for details please see section 5.1).

§ 7.1.3 Spatial Consequences: A Huge Oversupply of Industrial Land

Industrial land development, including science parks and technology parks, is one of the critical spatial elements of high-tech development. How to provide sufficient and adequate land for industrial use is one of the biggest spatial issues in the development process of a high-tech city-region. Through the establishment of the SRE, the twenty-one municipalities in the Eindhoven city-region have a long tradition of collaboration on various topics, which include industrial land supply. Once in a while, the SRE collaborates with provincial government to conduct investigations of industrial land demand in consultation with *Brabant-Zeeuwse Werkgeversvereniging* (Brabant-Zeeuwse Employers Association, BZW) and *Kamer van Koophandel Brabant* (Chamber of Commerce Brabant, KvK) and distributes the projected demand for industrial land to the sub-regions of the Eindhoven city-region. According to the distribution, the twenty-one municipalities in the Eindhoven city-region propose where the industrial land should be located and implemented it (van Zeeland 2012b).

On the basis of a consensus between the SRE, provincial government and the municipalities, an agreement will be reached in the form of regional industrial policy together with a spatial framework of industrial land development, such as the *Regionale Bedrijventerrein Structuurvisie 2000* (Regional Structure Vision of Business Site Development) and the *Regionale Agenda Bedrijventerreinen 2008* (Regional Agenda of Business Site Development). In other words, the industrial land supply policy in the Eindhoven city-region is not based on a collection of land development projects initiated by each municipality, but rather on an intensive negotiation and coordination process. It is an agreement between the municipalities, the SRE and the provincial government.

However, due to the global financial crisis of 2008 and changing working conditions, such as teleworking at home, the municipalities in the Eindhoven city-region have encountered a huge oversupply and a serious financial issue in relation to the development of industrial land. According to the regional agreement of business site development announced in 2012, until 2020 the demand for new industrial land in the Eindhoven city-region is 353 hectares but the planned industrial land supply is 951 hectares. In other words, oversupply of industrial land is 599 hectares, most of which

(around 461 hectares) is located in the core area of the Eindhoven city-region (SRE and Provincie Noord-Brabant 2012). In order to deal with the issue, a 'traffic light' model has been developed as a basis to seek consensus among the province, the SRE and the municipalities.

According to the model if a municipality has already constructed the infrastructure of the planned industrial land, such as the roads, the development project is recognised as green and the municipality can keep working on the development. If the municipality has only purchased the land but not yet conducted the infrastructure development, the project is recognised as orange—and may or may not be developed after 2020. If the land has not yet been bought by the municipality, it is recognised as red—will not be developed. But if it has been recognised as a 'campus', which is a nationally or regionally important science or technology park development, such as Brainport Innovation Campus, it is always recognised as green—can be developed. However, it is difficult to deal with the issue in practice, because the municipalities have bought most of the land, which was planned to accommodate the future industrial land demand. The municipalities now need to pay the interest and most of them have serious financial problems (van Zeeland 2012a). As of May 2012, there remains 422 hectares of the land for which it has yet to be decided if development with occur or not, because the municipalities, the SRE and the provincial government have not yet reached a consensus. However they are intensively working together to search for resolutions and support from the central government and other stakeholders.

The oversupply issue in the Eindhoven city-region shows two conventional challenges in high-tech development. These are: mechanisms to keep a proper balance between industrial land supply and demand, and to stimulate private investment in industrial land development. First, industrial land supply policy in the Eindhoven city-region is based on intensive negotiation and coordination between provincial, regional and municipal governments and regional business communities. It is difficult to predict long-term global economic cycles and industrial land demand, but the long tradition of collaboration in the Eindhoven city-region does gradually generate knowledge resources (intellectual capital), network resources (social capital) and power base (political capital), which link to 'institutional capacity', to develop strategic spatial planning activities and involve various stakeholders to deal with the challenge (Healey 1997).

Second, there are two major mechanisms to provide industrial land in the Eindhoven city-region. First, according to the agreement of regional industrial land supply, a municipality buys the farmland that has been designated and sells it to firms (rarely to be developers) with some rights. The *bestemmingsplan* is made according to the result of the negotiation. Another approach is that firms buy the land and negotiate with the municipality to formulate a new *bestemmingsplan* for the site. The first mechanism is the most commonly used approach to provide industrial land in the city-region, and it has created a severe financial burden for the municipalities since the crisis of 2008 (van

Zeeland 2012a). Under this context, the municipalities can no longer play the role of provider. The SRE has started to encourage municipalities to cooperate with the private sector to develop the sites as in the case of Brainport Innovation Campus.

Recently, an alternative approach has emerged in the city-region. The municipality of Best is calling for private investment to develop a specific area as an industrial park. If a private party has an interest in developing the land, it first has to submit a plan and the municipality will check if the plan is sound. In the process, the party has to deal with the issues of land ownership on its own. After the negotiation processes, the municipality will prepare a *bestemmingsplan* for the industrial park (van Zeeland 2012a). In this approach the municipality plays a less active role. The municipality tries to shift the risks to the investor, but it is not yet known if any party is willing to invest in the industrial land development, especially when facing economic decline. The challenge for the government might be how to involve and cooperate with powerful players in spatial development and to take risk management into consideration.

§ 7.1.4 Remarks

Since the end of the 2000s the dominant high-tech spatial planning and governance style in Eindhoven city-region has a tendency to shift from a provider style to a collaborative style. This can be observed from recent high-tech oriented spatial planning and governance projects in this city-region, such as *Spatial Programme Brainport*, *De geniale Brainport locatie* and the *Development Vision of Landelijk Strijp*. However, it is important to keep in mind that even within one government more than one planning style may exist according to the planning context. Hence, even if a dominant planning style can be identified, exceptions will always occur. In this research, I more address the changing style of spatial planning and governance in relation to high-tech spatial development.

This shift mainly relates to two events occurring at the end of the 2000s—the promulgation of the new Dutch Spatial Planning Act (Wro) and the financial crisis. First, in 2008 the Wro came into effect. Since then, the streekplan (regional plan) formulated by the SRE and provincial government has lost its legal status. A *structuurvisie* (structure vision) and *Verordening Ruimte* (spatial regulation) become the major legal planning instruments on the city-regional and provincial level. The SRE and the provincial government has lost the power to approve *bestemmingsplan* (municipal land use plans), but they still tend to play an active role in city-regional planning, so the SRE and the provincial government change their way of spatial planning and governance to a more collaborative style.

Second, before the financial crisis, the most comment approach to provide industrial land in the Eindhoven city-region was that—municipalities bought the farmland and sold it to firms with some rights. The firms would develop the industrial land rather than the municipalities themselves. But after the crisis, the situation has changed. Due to the financial burden, the municipalities can no longer play an active role to provide industrial land. The SRE also encourages municipalities to cooperate with the private sector to develop industrial land. The oversupply of industrial land and financial burden of municipalities in Eindhoven city-region could be seen as a legacy of provider style of spatial planning and governance, but also as one of the triggers that leads the shift of the dominant style of high-tech oriented spatial planning policy from the provider style to the collaborative style in Eindhoven city-region.

Nowadays, the spatial planning and governance approach of Brainport Eindhoven development has a dynamic and flexible character. Spatial plans and development projects at different levels and scales are nested within each other by recursive coordination and communications among different governmental agencies and stakeholders. One the one hand, the spatial focus provides a clear agenda that can promote coalition building and the obtaining of resources. On the other hand, the recursive process generates intellectual capital, social capital and a political base, leading to an increase of 'institutional capacity'. This is why the SRE and the municipalities can gain support from the EU and the Dutch central and provincial governments, involve various regional actors, and coordinate relevant sectoral policies for the development of Brainport Eindhoven as well as deal with new issues, such as the oversupply of industrial land.

§ 7.2 Hsinchu High-tech City-region

Since the beginning of the 1990s the local governments have started to initiate several spatial planning and development initiatives to mediate the large demand for the development of local facilities, housing, and accessibility resulting from the Hsinchu Science Park (HSP) development. Figure 35 illustrates the distribution of the major initiatives in the Hsinchu city-region in the form of an urban planning masterplan project.

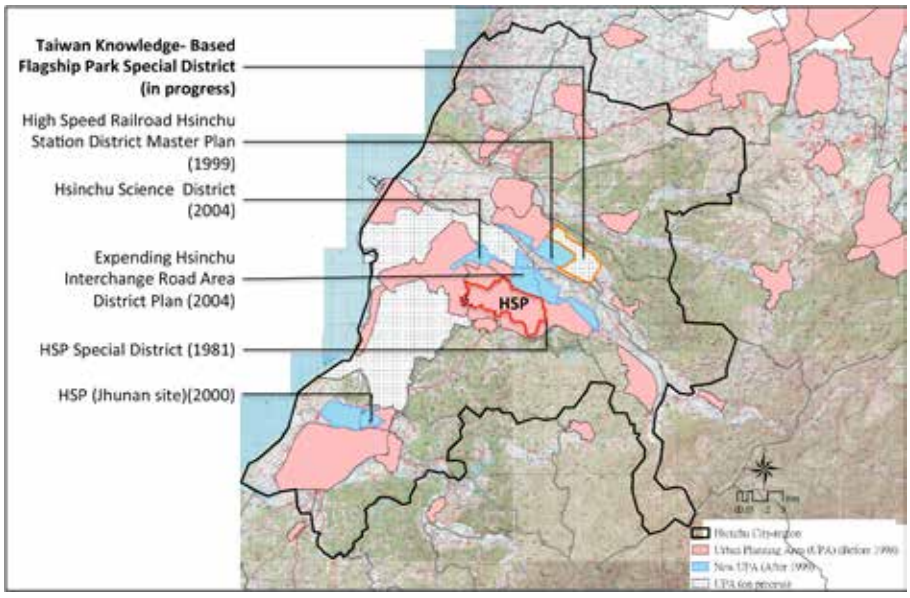

Figure 35
Urban planning masterplans in Hsinchu city-region

Most of the new initiatives are project-based planning without guiding frameworks. This is in accordance with the Taiwanese planning tradition. However, the role of different levels of government is changing in the practices of spatial planning and governance. Different from the HSP development, other actors are involved in the process. In this section, I first outline major spatial planning and governance practices in the city-region. Then, I demonstrate the spatial issues and consequences of high-tech development in the Hsinchu city-region.

§ 7.2.1 Spatial Planning in Hsinchu High-tech City-region

In addition to the HSP development project in the 1980s, the *HSC Development Plan* in the 1990s and the Taiwan Knowledge-based Flagship Park development project in the 2000s were the two most important spatial planning and development projects in the Hsinchu city-region that had been brought into the national economic development plan. These two high-tech spatial planning initiatives also reflect the changing role of central government in science park development in the 1990s and 2000s, from the major promoter and developer to the essential co-operator. I summarise the origins and planning concepts of these two initiatives in the following sections.

A HSC Development Plan

The *HSC Development Plan* was the only plan at a city-regional scale in the Hsinchu city-region. It aimed to strengthen further the HSP's competitiveness by coupling with the increasing land demands for industry and housing and enhancing the quality of the business climate and living environment. Its major function was to guide all sectoral development plans in the Hsinchu city-region to achieve this goal. In the beginning the primary actors consisted of local governments, the Science Park Administration (SPA), the Industrial Technology Research Institute and the two national universities adjacent to the HSP (Chen 2001). In 1990 the Executive Yuan, the highest administrative body of Taiwan, brought the project into the *11th Six-year National Development Plan* and designated the National Science Council (NSC) and the Taiwanese provincial government in charge of the planning. This minimised the role of local governments and knowledge institutes. The interaction mode among the major actors thus became hierarchical, because the central government had much more power than the other actors and wanted to dominate the planning direction.

Nonetheless, the project was originally initiated by local governments and knowledge institutes. This allowed them the chance to participate in the decision-making from the very beginning, but their proposals could be adopted only when they complied with the major aim of the central government—to strengthen the competitiveness of the HSP and enhance its development. The priority of the central government was clearly shown in the planning concept. The planned area was classified into two categories: the HSP, and the ancillary area of the HSP (SPA and TPG 1993 Vol1:6–29). As shown in Figure 36, the science belt referred to the core area of the HSP development and the living belt and conservation belt were considered as ancillary areas of the HSP. Spatial development in the living belt and conservation belt was conditional and regulated. Major public investment was allocated in the core area.

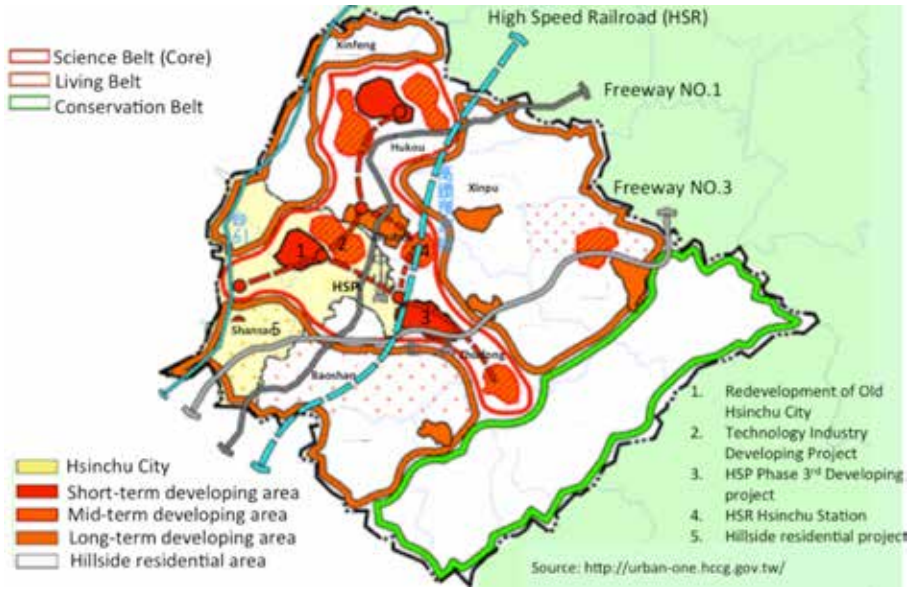

Figure 36
Spatial concept of Hsinchu Science City Development Plan (based on SPA and TPG 1993, 10-16)

At the end of the 1990s governmental and fiscal structures were reorganised. The Taiwanese provincial government was downscaled in 1998. While most of its competences were ceded to the national government, some were devolved to local government. One of the major promoters of the *HSC Development Plan* thus disappeared. At the same time, the national government reoriented the policy of science park development from a single technopole strategy to a technopolis programme. The policy reorientation led the SPA to busy itself with new science park developments and withdraw its role from the regional science city plan, because for the SPA, on account of its duties, the priority of the plan was to search for new land to accommodate high-tech industrial activities rather than to promote regional development. The reorganisation and changing policy undoubtedly declared an end to the plan. The outcome increased the tensions and conflicts between the local governments and the SPA, and led to the collapse of the emerging multi-level governance in the city-region.

Although in the planning process of the *HSC Development Plan* the interactions between different levels of government remained hierarchical, the bottom-up origin of the initiative allowed regional actors, including local governments and knowledge institutes, a chance to participate in the decision-making in the early stages. Their early planning concepts garnered a certain degree of consensus on the part of the regional actors and some of the concepts were retained in the development plan, forming follow-up spatial planning and development projects at the end of the 1990s and the beginning of the 2000s, such as *Hsinchu Science Special District Masterplan*, *Expending Hsinchu*

Interchange Road Area District Masterplan, and so on (see Figure 35). However, the *HSC Development Plan* was formulated as a blueprint, but no one was in charge of the implementation of the plan after the reorganisation of governmental structure and the reorientation of science park development policy at the end of the 1990s. Therefore, the plan was terminated, although it was not yet completed. Since the 2000s, local governments have abandoned the *HSC Development Plan* and sought other possibilities to deal with the externalities of the HSP development, such as the establishment of the Governor Forum[16] in 2002.

B Taiwan Knowledge-based Flagship Park development project

Within this context, the planning initiative of the Taiwan Knowledge-based Flagship Park (TKFP) Special District has no significant interrelationship with the *HSC Development Plan*. It has been identified as a nationally important project involving different levels of government and one knowledge institute in the planning process. However, the TKFP project can only be considered as a local initiative land development project (446 hectares), because there is no substantial support from the national government, although it has been included in the national economic development plan. The TKFP project is a bottom-up initiative dominated by two local actors—the National Chiaotung University (NCTU) and the Hsinchu county government.

In 1999 the NCTU proposed the TKFP project to the Hsinchu county government as an attempt to enhance their competitiveness and to work towards the status of one of the top universities in the world by acquiring new campus lands nearby their main campus, the HSP as well as the High-speed Rail Hsinchu station. At the same time, the Hsinchu county government expected that the High-speed Rail Hsinchu Station Special District would be developed quickly and the development demands on its surrounding non-urban land would be triggered as well because of the enormous housing demand of the HSP development (see Figure 25 in section 6.4.1). An urban land use plan was needed to regulate and direct the potential land developments in the area, but the legal

16 In March 2002 the Director General of SPA invited the mayor of Hsinchu city, the magistrate of Hsinchu county and the chairperson of the Allied Association for Science Park Industries to hold the first Governor Forum. During the forum, they reached a consensus and agreed to strive for funds from the national government (Lin, 2007). In 2003 the national government approved a new administrative regulation, the Principles for the Allocation of Science Park Subsidy for Local Development, to establish annual funding based on the Operation Fund of the Science Park Administration to subsidise local development located within three kilometres from the boundary of the HSP. The establishment of the subsidy indeed solidified the collaboration (Jhan 2008; Lin 2007), but it also led the scope of the agenda to be very limited. Since then, to negotiate the distribution of subsidy and to mediate the jurisdictional conflicts have been the major topics in the forum.

process consumed much time and money and the county government did not have enough budget and resources to conduct the planning project. As a result, when the NCTU proposed the TKFP project and expressed their willingness to be responsible for the planning funds in return for campus land free of rent,[17] the county government was more than happy to accept their proposal (Wu 2011; Liu 2011; Li 2011; Lin 2011; Chen 2011).

The NCTU is one of the best universities in Taiwan and most of the knowledge workers and high-tech entrepreneurs in the HSP graduated from NCTU. The county government considered that the participation of NCTU would help to gain the support of high-tech industries as well as the national government and thus guarantee success of the high-tech oriented planning project proposal. In addition to the good relations with the high-tech industries and the national government, the biggest advantage is that the NCTU brought money and new planning knowledge into the project (Liu 2011; Li 2011). In contrast with the HSP development, the masterplan of the TKFP Special District not only is devoted to the development of high-tech economy, but also strives for quality of place. For example, one of its major planning strategies is to establish comprehensive networks of green and water structures by using existing irrigation systems, historical buildings, small temples, and certain public spaces in relation to the culture identity of local residents (see Figure 37). This strategy shows an attempt to take both local environmental and cultural aspects into consideration in the planning process.

17 According to article 4 of Land Expropriation Act in Taiwan, zone expropriation can be carried out, when all or part of a newly established urban area is to undergo development and construction, so the Hsinchu county government can apply zone expropriation to develop the TKFP. According to article 55-2 of the Equalisation of Land Rights Act, after planning and preparation, lands in lieu of compensation shall be given to the original owners. But the competent authorities may allocate a part of the land, which is located within the area of zone expropriation, to government agencies for public facilities as indicated in the expropriation plan. Since the NCTU is a national university, a higher education administrative authority under the jurisdiction of the Ministry of Education in Taiwan, it is possible for the NCTU to acquire the campus land for free after zone expropriation according to the law.

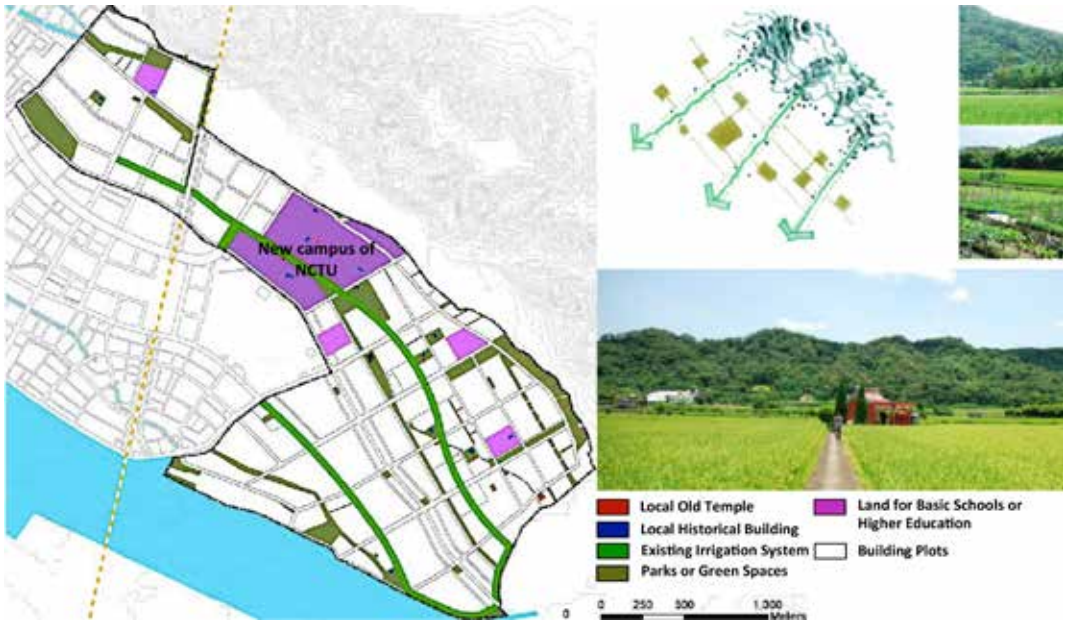

Figure 37
Green and water structures of the TKFP Plan (Source: Hsinchu County Government 2011, 91. 114)

§ 7.2.2 New Spatial Planning and Governance Approach in Hsinchu City-region

The HSP development project in the 1980s, the *HSC Development Plan* in the 1990s and the TKFP project in the 2000s are the three most important high-tech oriented spatial planning and development projects in the Hsinchu city-region. The HSP project and the *HSC Development Plan* were dominated by the central government. Their planning style was hierarchical and technocratic. The central government acted as a provider and imposed the plans on the city-region. The role of other actors was very minor. But the situation has gradually changed since the end of the 1990s.

The Taiwan provincial government was downscaled in 1998. Together with the release of the Local Government Act in 1999, some of the administrative powers and responsibilities have been devolved to the local governments, including spatial planning, environmental protection, and so on. The devolution increased bargaining leverage of the local governments in spatial planning and governance. After the end of the *HSC Development Plan* and the administration reorganisation and devolution, the local governments have tried to formulate a series of spatial planning and development initiatives to deal with the externalities of the HSP development on their own. However, compared to the central government, knowledge, networks and political resources of

the local governments are relatively limited. They also lack experience in planning and developing high-tech spaces, so it is necessary for them to cooperate with other powerful actors in the city-region.

As a result, since the 2000s some alternative spatial planning and governance approaches have emerged. The local governments adopt a 'contract network' approach, which links actors through agreements, contracts, or joint ventures based on the consent of the involved actors, so joint gains across the involved actors are a necessary condition (Feiock 2009). This approach is project-based. In the contract network, relationships are based on bilateral exchanges between involved actors. Decision-making is based on individual bargaining rather than broad consensus building. I take the TKFP project as an example to demonstrate the alternative spatial planning and governance approach to high-tech spatial developments in the Hsinchu city-region. After the NCTU proposed the TKFP project to the Hsinchu county government, in 2000 an agreement was signed between the two parties to co-develop the non-urban land in search for new opportunities for Hsinchu.

As shown in Table 31, the agreement specified the functional divisions between the county government and the NCTU, and indicated that the Hsinchu county government would be the major implementer of the project in charge of zone expropriation and the legal administrative procedure after the promulgation of the legal plan according to the law. The NCTU was responsible for the operation of spatial planning in the legal planning procedure. This type of functional division was very unique in Taiwan, because the operation of spatial planning should be part of the autonomies and duties of local governments. It was the first time a local government authorised a national university to conduct a spatial planning project, an experiment that has brought many advantages and disadvantages.

Responsibilities	Hsinchu County Government	NCTU
Work Items	– To provide administrative support and assist in holding relevant meetings. – To delineate planned area. – To undertake zone expropriation.	– While promoting the project, the NCTU should assign a particular person in close contact with the county government to inform the working process and content, exchange opinions and discuss relevant issues. – To prepare relevant legal plans and maps to go through the legal planning procedure. – Topographic survey. – Environmental impact assessment.
Finance	To cover the costs related to zone expropriation and relevant administrative procedure.	To cover the costs related to: 1. Holding international seminars, workshops, conferences and over sea study tours; 2. Preparing relevant legal plans and maps; 3. Conducting topographic survey and environmental impact assessment.

Table 31
Functional divisions in the TKFP project (based on Source: Xu 2004)

Year	Planning Maps	Notes
2002		The first conceptual plan of the TKFP was formulated to gain the support of the central government to accept the planned area. The planned area is 1,235 hectares and divided into two development phases. The first phase development area is 450 hectares, including 82 hectares high-tech industrial area, 40 hectares university campus, and 382 hectares residential area. The remaining 772 hectares will be developed eventually. In order to maintain the local living context, most of the irrigation system and all of the local historical buildings and small temples are preserved in their original places.
2007		In 2007, the Regional Planning Committee at the central government level accepted the conceptual plan, but the committee only accept the first phase development area as urbanised area and removed the remaining area from the plan, so the planned area was reduced to 447 hectares.
2010		According to suggestions of the landowners and Urban Planning Committee at the local and central governments, the planning content has been revised several times. 3.8 hectares Haka Agriculture and Recreation Zone has been added to the plan, because some landowners tend to keep engaging in farming after the development.

Table 32
The course of spatial planning of the TKFP project (Source: Hsinchu County Government 2002; 2007; 2010)

Beyond the good relations with the high-tech industries and the national government, the biggest advantage is that the NCTU brought both funds and new planning knowledge to the project. Based on the support of international professionals, the planning team of NCTU decided to experiment with participatory planning—a planning mechanism that had never really been applied at an urban scale in Taiwan. As shown in Table 32, the

planning content of the project actually presents a dialogue among different sectors. The interaction modes tend to be horizontal negotiations among the county government, the NCTU and landowners. The NCTU also plays an essential role to conduct vertical networking with relevant government agencies on higher levels.

However, the initiative is not going smoothly based on two reasons. First, despite the setting up of a covenant between the NCTU and the county government, the legitimacy of the NCTU to be in charge of the operation of spatial planning, is weak. Second, although the project has been identified as a part of the *National Development Plan*, it was initiated by the NCTU with the purpose to acquire new campus land for free. People criticised the NCTU's intentions and considered that as a national university they should pay more attention to research and education rather than try to gain profits from land development. As of 2012, the masterplan and detail plans of the project are still in the deliberation process of the Urban Planning Committee at the national level. This shows a challenge in spatial planning and governance. The question is whether the decision-making process is accountable and meets the principles of social justice, when the local governments try to cooperate with other powerful actors by offering some incentives.

§ 7.2.3 Spatial Consequences: Increasing Urban Sprawl in Hsinchu City-region

Many studies have shown the industrial clustering effects of the HSP on surrounding industrial zones along the National Freeway No.1, such as Hsinchu Industrial Zone in Hukou. A functional city-region has formed and been connected by dense flows of industrial activities, people and information (Hsieh et al. 2005; Hu et al. 2005a; Hu et al. 2005b; Chou 2007; Hsieh 2008). On the other hand, the spatial organisation of the city-region has a tendency towards urban sprawl due to three interrelated factors, including landscape constraints, land supply shortage for housing and industrial development, and the farmland release programme in non-urban areas.

First of all, the HSP is located in a valley surrounded by hills. Since the end of 1980s the industrial land supply of the HSP could no longer satisfy the growth demand of the high-tech industries. As the exploitable land adjacent to the park is scare, it became necessary for the Science Park Administration (SPA) to look for new land in surrounding areas to accommodate the demand. At the end of the 1990s, a 123 hectares satellite site was finally designated in Jhunan, Mioali county (see Figure 28 in section 6.5.2). Following the expansions, the economic effects of the HSP have extended beyond the Hsinchu area. This has further promoted the development of the Hsinchu high-tech city-region in terms of the functional relation and regional economic integration in those areas (Chou 2007).

Secondly, the increasing land demand for high-tech industrial development and housing has triggered housing development in non-urban areas. National land resources in Taiwan are divided into two management systems—the urban development land system and non-urban development land system. The Urban Planning Act and the Regional Planning Act respectively regulate the two systems. According to the acts, local governments need to spend more than ten years going through all the legal procedures of the two systems to initiate new urban development projects (for details please see section 6.2). It is difficult for local governments to provide adequate land for housing and industrial land development in time.

Thirdly, since 1995 the national government has launched a farmland release programme in response to the impact of accession to the World Trade Organisation (WTO) on agricultural industry. The restrictions on the sale and purchase of farmland have thus been eased. A farm cabin is permitted to be built on every piece of farmland, and the maximum building area is ten per cent of the total farmland. This has encouraged the sprawl of rural development surrounding metropolitan areas, especially in the Hsinchu city-region. From 2000 to 2010, more than 225 hectares of farmland located in Hsinchu county have applied for the construction of a farm cabin. This is around 53 per cent of the total area of farmland in Taiwan that has applied to build a farm cabin in Taiwan (Control Yuan, R.O.C 2010). Besides, there is no clear spatial framework as reference to guide the decision-making of each application for a farm cabin construction. This has led to severe urban sprawl in the city-region, but there is no adequate mechanism to deal with the issue.

§ 7.2.4 Remarks

For planning authorities in the Hsinchu city-region, the role of spatial planning is limited to provide a legal base to acquire land for public facilities and/or high-tech related industrial activities and to regulate and/or facilitate land development. Their capacity to link various sectoral policies to spatial planning is weak. The dominant style of spatial planning and governance in the city-region is in accordance with the Taiwanese planning tradition—blueprinted and project-oriented planning.

The *HSC Development Plan* was the only plan at a city-regional scale in the Hsinchu city-region but the reorganisation of government structure and the changing science park policy led to the end of the plan and the collapse of the emerging multi-level governance in the city-region. The TKFP project is a result of close collaboration between Hsinchu county government and the NCTU. This is a new approach to spatial planning and development in the Hsinchu city-region. The initiative shows the changing interrelationships between the central government, local governments and other

sectors. The role of central government has become minor but remains essential in the development of the Hsinchu high-tech city-region, because the spatial planning system in Taiwan is hierarchical and centralised.

Moreover, due to the blueprinted and project-oriented planning style, spatial planning in the Hsinchu city-region is rather fragmented and lacks a common vision for the city-region as a whole. The land supply shortage for housing and the national farmland release programme have led to severe urban sprawl in the city-region. It may be necessary to conduct spatial planning at the city-regional level to provide clear spatial frameworks to guide the developments in both urban planning areas and non-urban areas.

§ 7.3 Comparisons

Through reviewing the practices of spatial planning and governance, I found three major similarities in the development process of these two high-tech city-regions. First, although the local governments in these two city-regions are inclined to play an active role in the spatial planning and governance of high-tech spatial developments, they recognise the necessity to collaborate with other powerful high-tech players in the city-region, such as universities, R&D institutes and/or high-tech firms, in order to bring in not only money, but also knowledge, networks, and political resources to achieve particular planning goals. This also relates to the second similarity—creation of new institutional arenas for collaboration, such as a strategic alliance regarding a specific spatial issue, or a steering group or a development corporation of a particular development project/programme that consists of various stakeholders.

Third, they both adopt the concept of an interactive innovative model and try to take advantage of cluster effects in the high-tech spatial development. For them, it is important to provide adequate industrial land in close proximity to existing R&D clusters with good accessibility, because they expect that knowledge generation is not limited to the R&D activities within universities, R&D institutes, and lead high-tech firms, but also in the interaction process between upstream suppliers and downstream customers in a value chain and between the lead firms and their support networks. Particularly, in these two city-regions, R&D and production, sales and services activities coexist and complement each other. That is why the local governments in these two city-regions are trying their best to provide new industrial land in their core area of high-tech spatial development (see Figure 38). However, this also creates a dilemma for the local governments. That is, how to keep a proper balance between land supply and demand for industrial land development in the process of high-tech development, a conventional challenge in spatial planning and governance practices.

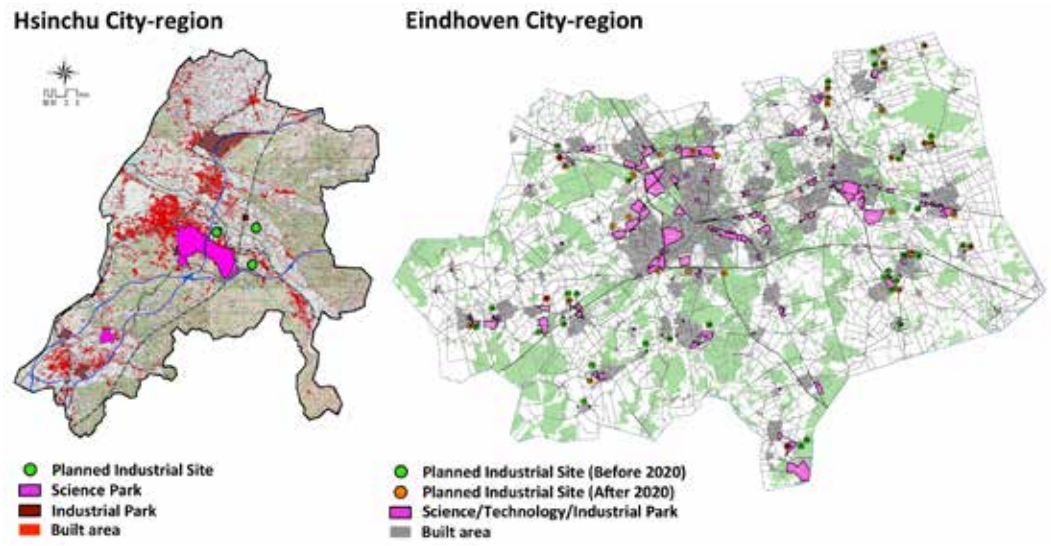

Figure 38
Industrial site development in the Eindhoven and Hsinchu city-regions (the right figure is based on SRE and Provincie Noord-Brabant 2012)

Despite the similarities, several significant differences exist in their spatial planning and governance practices. I demonstrate the differences according to three aspects, including the dominant style of spatial planning, the mechanisms of spatial governance and the spatial pattern of industrial land development. On the basis of the previous three chapters, I discuss the major institutional factors that contribute to the differences in the following sections.

§ 7.3.1 Dominant Style of Spatial Planning

The dominant style of high-tech oriented spatial planning policy in both city-regions has a tendency to shift from the provider style to the collaborative style, but the governments in the Eindhoven city-region adopt a framework-based planning approach, while the governments in the Hsinchu city-region apply a project-based planning approach. The difference mainly results from the differences of spatial planning doctrines and legal planning systems in these two countries.

As discussed in chapter five, the legal planning systems in these two countries are designed as plan-led, but the planning practices in the Netherlands are more strategic, selective and development-led. The governments in the Eindhoven city-region follow the doctrine. They formulate strategic plans or spatial frameworks at different levels and

scales as a basis to seek and build consensus between stakeholders and use the strategic plans or frameworks to guide, facilitate and coordinate project developments. A strategic plan or spatial framework is temporally dynamic rather than an endpoint to be reached.

There are recursive interactions between strategic plans/frameworks and development projects, so spatial plans and development projects at different levels and scales can nest within each other. The recursive interactions between different levels of government agencies and various stakeholders are based on the Dutch administrative tradition—a decentralised unitary state. Collaboration and consensus building/seeking are common practices for the governments when formulating policy.

In contrast, there is no strategic planning tradition at the city-regional and urban level in Taiwan. The Taiwanese central government tried to ask city and county governments to propose county/city comprehensive development plans at the end of the 1980s, but formulating these type of development plans became a formality for the city and county governments, serving the requirement of the central government rather than acting as a new planning instrument to guide the spatial developments in the city or county as a whole (for details please see section 5.3).

Although in the end of the 1980s and the beginning of the 1990s the governments in the Hsinchu city-region did try to formulate the *Hsinchu Science City Development Plan* to provide a spatial framework at the city-regional level, it was hardly considered as a practice of strategic planning based on two reasons. First, it was considered as a blueprint plan used to guide public investments in the city-region. In other words, the plan tried to indicate an endpoint to be reached by the different levels of government. Second, the central government played a dominant role in the plan-making process. The decision-making regarding the plan was very hierarchical rather than collaborative. Since the end of the plan at the end of the 1990s, the dominant spatial planning style in the city-region has returned to the project-based approach. There is no other updated plan at the city-regional level as reference for decision-making in each new development initiative.

In short, the dominant style of spatial planning in the Eindhoven city-region is framework-based and collaborative. It is so strategic and flexible that it may be easier to meet the nature of high-tech industry—a high degree of market volatility. However, this style of planning lacks legal certainty for the landowners, because the legal procedure of a *bestemmingsplan* (municipal land use plan) is the final stage of spatial planning. A strategic plan or spatial framework does not guarantee the final result of the *bestemmingsplan*. This increases the risks of spatial development not only for the landowners and developers but also the municipality, because in most of the cases the municipality purchases the land beforehand.

On the other hand, the dominant style of spatial planning in the Hsinchu city-region is blueprinted and project-based. Since the end of the 1990s, the local governments in the Hsinchu city-region have started to play a more active role in high-tech development and tried to involve other powerful players in the city-region to conduct high-tech oriented spatial development. This has led to a more collaborative spatial planning approach. But the Taiwanese planning system lacks flexibility. The legal planning procedure is too complicated and too long to meet the large land demands of the housing market and industrial development. In addition to the failure of land use control in non-urban areas, the city-region has faced an emerging issue of urban sprawl.

§ 7.3.2 Mechanisms of Spatial Governance

In relation to the shift of high-tech oriented spatial planning policy in both city-regions, various institutional arenas have developed to accommodate the new collaboration. Nonetheless, they use different spatial governance approaches to formulate and implement their high-tech spatial policies, strategies, plans and projects. The governments in the Eindhoven city-region mainly apply the open network approach at the city-regional level and the systematic cluster approach at the municipal level, while the governments in the Hsinchu city-region adopt the contract network approach. Specifically, planning decision-making in the Hsinchu city-region is based on individual bargaining of each particular project rather than on broader consensus, as occurs in the Eindhoven city-region. The difference not only relates to their dominant planning styles, but also their particular regional culture characteristics and historical experiences.

Various official documents and reports of the Eindhoven city-region keep emphasising their regional culture of cooperation and trust, such as *Afstand en betrokkenheid: Perspectieven op duurzame gebiedsontwikkeling* (Distance and engagement: perspectives of sustainable area development) (Horlings et al. 2009, p.126), *What's Next? Brainport Eindhoven Region Aligning Smart and Strong* (Brainport Eindhoven 2011) and so on. In an article in *Stedenbouw en Ruimtelijke Ordening* (Urban and Spatial Planning Magazine), Wim van de Donk, the *Commissaris van de Koningin* (Queen's Commissioner) of Noor-Brabant Province, also states that the long-term rooted socio-cultural capital of open-minded cooperation and trust are the key factors of the success of Brainport Eindhoven (van de Donk 2011). In a personal interview with the project manager of Landelijk Strijp in the Eindhoven municipality in May 2012, he also pointed out that 'in this area, in Brabant, we have a culture putting our strength together, not individually… we are always companion and try to make things happen, so for us it is usual to interact in that way with all stakeholders.'

In fact, the emergence of a collaborative culture in the field of regional governance and spatial planning in the city-region can be traced back to the formation of the *Samenwerkingsverband Agglomeratie Eindhoven* (Collaborative Agglomeration Eindhoven) in 1964 due to a need for planning rapid and uncontrolled growth around Eindhoven at that time (van der Veer 1998). The emphasis on cooperative culture is not only a strategy to build Brainport's identity and a way to brand the city-region, but also a key value that the governments in the city-region are eager to build and practice in the formulation and implementation processes of Brainport policies, strategies, plans, and projects. This can be seen in the establishment of the Brainport Foundation, which consists of representatives of the local governments, knowledge institutes and business community as a platform and a collaborative body to determine the development strategies of Brainport Eindhoven, but also in the spatial planning and governance practices of Spatial Programme Brainport and the Brainport Avenue project.

In contrast to the Eindhoven experience, the formation of collaborative culture in Hsinchu city-region is not smooth. The termination of the Hsinchu Science City Development Plan at the end of the 1990s has led to the collapse of the emerging multi-level governance and collaboration in the Hsinchu city-region. The Governor Forum has been established since 2002 as a platform to mediate the jurisdictional conflicts between the local governments and Science Park Administration (SPA), but the routine meeting hardly cultivates mutual reciprocity, trust and collaborative norms in the regional arena due to historical experience. The major motivation for the SPA to initiate the Governor Forum is to appease local discontent, so the SPA considers the forum as an occasion for 'social interactions' (Yen 2011). The local governments see the meeting as a platform to negotiate the allocation of the subsidy with the SPA rather than 'as some kind of cooperative forum for promoting regional potentialities, in which all relevant stakeholders in the region…meet, negotiate, and decide upon planning policies and their implementation' (Chou 2007, 1398).

Despite the fact that the local governments have sought cooperation with other powerful actors in the Hsinchu city-region since the 2000s, the culture of collaboration is in its infancy and the interactions between regional actors are limited to particular projects. Whether this kind of collaboration can provide an opportunity to develop trust and reciprocity among regional actors, to increase institutional capacity of the local governments and to promote the development of spatial governance networks in the city-region remains to be observed.

§ 7.3.3 Spatial Patterns of Industrial Land Development

The governments in these two city-regions see the development of science parks/ campuses as a way to stimulate the development of industrial clusters and try to take advantage of cluster effects by providing adequate industrial land. As shown in Figure 38, most of the industrial sites, including science/technology parks and industrial parks, in these two city-regions are located in close proximity to highway exits.

Nonetheless, the industrial sites in the Eindhoven city-region are relatively smaller in size and are more evenly distributed. For example, the average size of the sixty-two new proposed industrial sites in the Eindhoven city-region is around 15 hectares and the largest one, in Helmond, is 60 hectares (SRE and Provincie Noord-Brabant 2012). Regarding existing industrial sites, the biggest industrial site is the Hurk Eindhoven, which is 205 hectares and the largest campus (science park) is High Tech Campus, which is 103 hectares. But in the Hsinchu city-region, the size of the Hsinchu Science Park is 653 hectares and the Hsinchu Industrial Park is 517 hectares. The proposed industrial land development projects are always a part of new town development projects, such as the TKFP project, which also consist of urban land development for housing, commerce and other urban functions.

The differences may mainly result from their geographical conditions and their proactive planning powers to influence land use directly. First, as shown in Figure 38, the allocation of spatial developments in the Hsinchu city-region is constrained by its hilly terrain. Second, compared to the Taiwanese government, the Dutch government has relatively limited proactive powers to implement a land use plan. Dutch public law authorises the Dutch municipalities the power of expropriation and pre-emption, but they rarely use these proactive powers. In practice, the Dutch municipalities actively involve land development activities by purchasing land beforehand. The Taiwanese government, in contrast, can not only expropriate private land according to its current land value publicly announced by the government, but also conduct zone expropriation and urban land consolidation to acquire land for public undertakings, to implement national economic policies or to execute the urban planning detail plan. As a result, the scale of land development projects in Taiwan tends to be much bigger than in the Netherlands (for details please see chapter six).

§ 7.3.4 Remarks

According to the typology I proposed in chapter three (see Table 15), since the end of the 2000s the dominant style of high-tech spatial planning and governance in the

Eindhoven city-region has shifted from the provider style of framework-based approach to the collaboratively framework-based approach, while in the Hsinchu city-region is shifting from the provider style of project-based approach to the collaboratively project-based approach. The comparative analysis shows that the influences of national spatial planning systems and of the regional socio-cultural and historical contexts on high-tech spatial planning and governance practices of these two city-regions are obvious and direct. But this does not mean that they are the only factors. According to the findings in chapter four and five, other institutional variables do have effects on the national spatial planning systems as well.

The high-tech spatial policies in the Netherlands and Taiwan also create particular conditions for high-tech spatial planning and governance in these two city-regions. For example, the success of gaining support from the Dutch national government for the development of Brainport Eindhoven further encourages the collaborative culture in the Eindhoven city-region. The formation of the Hsinchu high-tech city-region is derived from the state-led high-tech development, but the development has also created a huge institutional barrier to regional governance and spatial planning due to the large externalities and the enclave design of the park (for details please see chapter six). Additionally, the alternation of national science park policy also triggers local governments to seek a more collaborative approach in high-tech spatial development.

PART 4 Conclusions and Reflections

8 Conclusions and Reflections

In the past three decades, numerous high-tech city-regions have emerged with the rise of new high-tech industries across the world. Many of them have been specifically supported by national technology policies—in developed or developing countries—implemented to trigger economic growth and to enhance global competitiveness at the national and/or city-regional level. These policies have involved the development of high-tech spaces—including research science/technology parks, innovation centres, science cities, high-tech city-regions, and so on—albeit in different ways. The motivation of this research is to understand the role spatial planning and governance has played in the development process of a high-tech city-region and to explore how the means and practices of spatial planning and governance are shaped by certain institutional factors when dealing with spatial issues of high-tech development. This chapter completes the research by answering the guiding research questions and by reflecting on the comparative study of high-tech spatial planning and directions for future research.

§ 8.1 Main Empirical Findings

This section consists of four subsections. Each of them answers one of the first four research questions proposed in chapter one. Together they present the main empirical findings of this research. The third and fourth subsections also answer the final research question, which is in relation to the identification of major institutional factors that shape high-tech spatial planning and governance mechanisms.

In the first subsection, I present how the principal components of high-tech development identified in chapter two are conceptualised by the governments in the two case study areas. Then, I outline the major differences between the Dutch and Taiwanese spatial planning systems and discuss how the differences relate to the institutional variables according to the findings in chapter four and five. The first two subsections provide fundamental knowledge to investigate the major factors that shape the forms and means of high-tech spatial planning and governance in the two city-regions.

In the third subsection, I summarise the major similarities and differences of the spatial mechanisms for high-tech development between the Eindhoven city-region and the Hsinchu city-region. Based on the findings of the first subsections, I analyse the major institutional factors lead to differences between the two cases. Finally, I sketch out the major similarities and differences of high-tech spatial planning and governance approaches

between the two case study areas, and discuss the major factors that influence how the governments use the system and tools of spatial planning and governance to mobilise resources and actors to deal with the spatial issues of high-tech development.

§ 8.1.1 The Principal Components of High-tech Development

In chapter six, I reviewed the provision of the principal components and discussed how governments perceive the principal components in the two case study areas. I found that the governments in the two cases do try to provide the principal components I identified in chapter two, but how they conceptualise the principal components has some differences. The most significant differences can be observed through how they define the nationally important science park/campus and how they perceive the living demands of knowledge workers.

First, the Dutch national government identifies nationally important science parks as 'campuses', when the parks meet four criteria, including a focus of R&D activities, a physical location of high quality firms and research facilities, the presence of manifest knowledge carriers, and an open innovation environment. In Taiwan, nationally important science parks are all state-led initiatives. An enterprise has to be officially approved by the Park Investment Supervisory Committee for establishment in the science park. The science park in Taiwan is actually a science-based industrial park containing not only R&D activities but also mass production. This implies that the innovation models underlying the planning concept of the Dutch and Taiwanese science park policies are different, although their core concern is the same. That is, to promote R&D activities and enhance innovation capacity.

Second, the governments in the two city-regions both try to provide adequate facilities to fit the living demands of knowledge workers, but how they understand these demands is different. I take how they perceive the housing demands of knowledge workers as an example. The Dutch government acknowledges that the housing needs of knowledge workers are part of the regular housing market, but for the Taiwanese government, there is a distinction between knowledge workers and local residents regarding the conception of living quality. For example, they plan to develop an 'international village community' catering only to the knowledge workers.

Overall, the comparisons of the two cases have shown that how the government conceptualises the principal components may be different from country to country and the different conceptualisation will influence both the content of and the mechanisms used to implement the policy and strategy. This will be further discussed in the third subsection.

§ 8.1.2 Factors that Shape Spatial Planning Arenas

In chapter four and five, I have respectively outlined and compared the socio-political contexts and spatial planning systems in the Netherlands and Taiwan on the basis of the analytical framework built in chapter three. As shown in Table 33, the constellation of primary actors and the degree of public participation in the decision-making process of spatial planning have strong relations to two institutional variables: the model of society and the administration system.

Arena	Major Differences	Significant Factors
Actor Constellations	– Constellation of primary actors – Public participation	– Model of society – Administration system
Action Orientations	– Belongings of land value increment – Government's approaches to take development initiatives – The relationship between property rights owners and the government – Compensation principles	– Conceptualisation of rights in land
Actor (Government) Capacities	– Means to influence land use/ development directly	– Conceptualisation of rights in land
	– Interaction mode/distribution of power in the planning system – The way to keep consistency of planning policy on all level	– Administration system

Table 33
Major Differences of the Dutch and Taiwanese planning arena

The Netherlands is a decentralised unitary state with a multi-party democratic system. Important policy-making is based on broad consensus among different levels of government and stakeholders. Taiwan is known as a developmental state with a hierarchical nature. Although the political system in Taiwan has shifted from a party-state authoritarianism to a two party democratic system in the past two decades and the role of civil society in policy making has been increasing, the legacy of authoritarians and economic-oriented policy-making remains in the spatial planning system. It is no surprise that the *bestemmingsplan* (Dutch municipal land use plan) has to be approved by municipal council rather than a planning commission as it does in the Taiwanese planning system. The planning commission in Taiwan mainly consists of administrative officers and experts rather than representatives of local residents.

The conceptualisation of rights in land is the most significant institutional variable that underlies actors' action orientations in the process of plan-making, because the conceptualisation of rights in land in a country has a strong effect on the institutional design of government's means to influence land use/ development directly and of government's approaches to take development initiatives. This also influences how the government and stakeholders measure their benefits and costs when a planning decision is made. For example, in the Netherlands land value increment belongs to the property owners, because according to the spirit of the Dutch Constitution the landowners owns the current and future rights and interests in land. In contrast, equalisation of land rights is one of the core values of the Taiwanese Constitution. According to this core value, the protection of rights in land should be controlled on the basis of statutory powers. If the land value increment does not derive from the application of labour or capital of the owners, it should belong to the public. This gives the Taiwanese government more proactive powers and room to intervene in land use and land development.

Regarding locus of spatial planning powers, despite the fact that several new planning instruments introduced by the new Dutch planning law have increased the planning powers of the national and provincial governments, in practice the national and provincial governments follow the principle—decentralised if possible, centralised if necessary. The principle is in accordance with the root of the Dutch administration system—a decentralised unitary state. On the other hand, the spatial planning system in Taiwan is very hierarchical and centralised when compared with the Dutch planning system. The planning commission at the national level plays a determinant role in the decision-making of a spatial plan, including the regional plan and the urban planning masterplan. The institutional design of the Taiwanese spatial planning system is consistent with the unitary and hierarchical nature of its administration system.

§ 8.1.3 Spatial Mechanisms to Enhance High-tech Development

In chapter six, I reviewed and compared the spatial mechanisms to enhance high-tech development in the Eindhoven city-region and the Hsinchu city-regions. According to the principal components of high-tech development identified in chapter two, I summarise the major similarities and differences between the two city-regions in Table 34.

As shown in Table 34, the governments in the two city-regions have been using a range of spatial mechanisms to enhance the three principal components, including R&D capital, relational capital and human capital, to achieve the goal of high-tech development and economic growth. However, two major differences can be recognised in their spatial mechanisms. First, the establishment of knowledge institutes and science parks/ campuses in the Netherlands is a result of close collaboration between public and private

sectors, but in Taiwan it is a state-led initiative. The Taiwanese central government has mastered most of the resources for high-tech development and considers that it holds the major responsibility for high-tech development, rather than the local governments. This is correlated to the characteristic of a developmental state.

Principal Component		Spatial Mechanisms
R&D Capital	*Similarity*	– The establishment of knowledge institutes, such as R&D institutes and innovation centres/incubators, has been considered as a precondition of high-tech development.
	Difference	– Relative roles of the public and private sectors in establishing knowledge institutes, especially the role of central government.
Relational Capital	*Similarity*	– Good internal and external accessibility has been considered as a precondition of high-tech development. – The development of science/technology parks has been recognised as the most effective spatial mechanism to induce and support clustering of high-tech industries. – The provision of industrial land in close proximity to existing R&D clusters with good accessibility is strategically important for the government to take the advantage of cluster effects.
	Difference	– Relative roles of the public and private sectors in establishing science parks/campuses, especially the functional divisions between different levels of government. – The conception of science park/campus development
Human Capital	*Similarity*	– Special living demands of knowledge workers are taken into consideration, such as international (basic) schools.
	Difference	– Government's perception of the living demands of knowledge workers.

Table 34
Comparisons of the spatial mechanisms in the two city-regions

Second, although they both consider science park/campus development as a strategically important instrument, which can be a crystallisation point to stimulate high-tech industrial clustering in the city-region, the conception of science park/campus development in the two city-regions is different. In the Eindhoven city-region, most of the science parks have been initiated by private sectors or universities since 1998. The governments put more effort into the 'campuses' that have been considered as nationally and/or regionally important science parks.

In contrast, in the Hsinchu city-region the development of science parks is mainly a government initiative. Except for the on-going initiative of the Taiwan Knowledge-based Flagship Park, all of the science park developments in the city-region are state-led, such as the HSP and Jhunan Park. The state-led science park developments are actually large-scale science-based industrial parks consisting of not only R&D activities but also mass production. The different conception of science parks/campuses in the two city-regions

may result from their different historical roots and their *technological capacities* when the science park/campus policies were formulated.

The science park development policy in Taiwan was formulated in the late 1970s. At that time, the industrial capacity was weak and a national innovation system was not yet developed. In fact, there was no firm that could be recognised as 'high-tech'. Under this context, the major mission of the science park development was to promote industrial upgrading and 'leapfrogging' economic development. It was expedient to establish a science-based industrial park consisting of R&D activities and mass production when considering the stage of technological development of Taiwan at that time. Since then, the prototype of the Taiwanese science park has formed and influenced the trajectory of science park development in Taiwan.

On the other hand, in the Eindhoven city-region the first science park, High Tech Campus (HTC), was established by Phillips in 1998. At that time, Phillips had been a large international firm with high R&D capacity for decades. It relocated all of its R&D activities and facilities to the HTC and in 2003 decided to open up the campus to other technological companies in order to create an open innovation environment in the campus. This has attracted many innovative companies—both large and small—to locate in the campus. The success of the HTC has had a huge effect on the conception of science parks/campuses in the Eindhoven city-regions, as well as the entire Netherlands, and influenced their approach to science park/campus development.

Through comparisons of the Eindhoven and Hsinchu city-regions, I recognise that the way the governments conduct, facilitate and/or support the provision of the spatial elements for high-tech development is not only influenced by their socio-political context (e.g. model of society and administration system), but also by their historical roots of high-tech policy formulation, which are in relation to their technological capacities at that time. However, one aspect has to be highlighted. Although current and future high-tech development trajectories have been shaped by the *prior* conceptualisation of the spatial mechanisms and the correlated development of institutions, the changing context (e.g. technological development and socio-political transformation) can possibly intervene and rearticulate current conjectures towards a new trajectory.

In other words, institutional factors and the spatial mechanisms that shape the institutional factors are dynamic rather than static. The dynamics can be observed in the changing science park policy in Taiwan—from a single technopole strategy to a technopolis programme—and the changing role of the national government in science park development—from a major promoter to a co-operator (for details please see section 6.3).

§ 8.1.4 Spatial Planning and Governance of High-tech Spatial Development

In chapter seven, two major similarities of the spatial planning and governance practices between the two city-regions were identified: the demand for collaboration and the creation of new institutional arenas. The local governments in the two city-regions tend to play an active role in high-tech spatial developments, but they both recognise the necessity to collaborate with other powerful high-tech players (e.g. universities, R&D institutes and high-tech firms) to bring necessary resources to accomplish their development goals. Their common strategy is to create new institutional arenas for the collaboration.

Further, although the high-tech spatial policy styles in the two city-regions both have a tendency to shift from the provider style to the collaborative style, their spatial planning and governance approaches to high-tech spatial developments are very different. I summarise the major differences, their spatial implications and the institutional variables relating to the differences in Table 35.

Major Difference	Significant Factors	Spatial Implications
– Dominant Style of high-tech oriented spatial planning (Framework-based vs. project-based)	– Administration system – Legal spatial planning system (including land management system) – Planning doctrines (present the attributes of a particular planning community)	– The spatial relation between each science park/campus development and their surroundings
– Spatial Governance Mechanism (Open network vs. contract network)	– Dominant spatial planning style – Regional culture characteristics – Historical experience	– The capacity of spatial planning to anticipate and mediate the spatial consequences and effects of a high-tech spatial development at different scales

Table 35
High-tech spatial planning and governance of the two cases

The governments in the Eindhoven city-region adopt a framework-based planning approach. The governments see the formulation of strategic plans or spatial frameworks at different levels and scales as their major planning instrument. The nature of the strategic plans and the spatial frameworks is temporally dynamic. They do not intend to present an endpoint to be reached. On the contrary, strategic plans or spatial frameworks are used as a tool not only to guide, facilitate and coordinate project developments, but also to seek and build consensus between stakeholders.

In other words, the formulation of the strategic plans and spatial frameworks is a part of the process of consensus building. This correlates to the Dutch administrative tradition, spatial planning system and doctrines. When formulating policy and making planning decisions, collaboration and consensus building/seeking are common practices for the governments. On the basis of the framework-based planning approach, the Dutch governments tend to see the science parks/campuses and their surroundings as a whole and aim to interweave the science parks/campuses with their surrounding urban fabric from both a physical and non-physical perspectives. This is very different from the 'enclave' character of Taiwanese science park developments.

The governments in the Hsinchu city-region apply a project-based blueprint approach. This is in accordance with the dominant planning style in Taiwan, which has been shaped by the Taiwanese centralised planning system and dual land management system. The dual land management system makes a clear distinction between urban planning land and non-urban land. This has led Taiwanese spatial planning to a fragmented project-oriented planning approach, by which planning decisions are made case-by-case and it is difficult to take the interrelationships among different developmental initiatives into considerations. Further, a range of proactive planning powers has been given to the governments to implement various development projects on the basis of the legally binding urban planning detail plan (for details please see section 5.3). The governments and planning authorities are thus inclined to see a spatial plan as an endpoint to be reached, a blueprint style of planning.

Regarding the spatial governance approach, the governments in Eindhoven city-region mainly take the systematic clustering approach at municipal level and the open network approach at city-region level. The former approach is mainly used to seek and build local consensus, while the latter approach is employed to bring powerful players and necessary resources into planning arenas to deal with particular spatial issues and to achieve certain planning goals. Practice of the open network approach has increased the institutional capacity of Eindhoven city-regions in anticipating and mediating the spatial consequences and effects of high-tech spatial developments at different scales.

On the other hand, since the 2000s the governments in the Hsinchu city-region have applied the contract network approach in their spatial governance practices. This approach is project-based. It links actors through agreements, contracts, or joint ventures based on individual bargaining of each particular project. It is obvious that the governance approach taken by the governments in the city-region correlates to its dominant planning style.

Additionally, the particular regional culture characteristics and historical experience of a city-region also have effects on the governance approach taken. For example, a regional culture of cooperation and trust has existed in the Eindhoven city-region for a long time. The emphasis on cooperative culture is not only a strategy to build Brainport identity and a way to brand the city-region, but also a core value the governments in the city-region

are eager to build and practice in spatial planning and governance activities. Several historical events have further encouraged the collaborative culture in the Eindhoven city-region, such as the success of gaining support from the EU and the Dutch national government for the Stimulus programme in the 1990s and for the development of Brainport Eindhoven in the 2000s. The collaborative culture underlies their practice of an open network approach.

§ 8.2 Conclusions

In light of the in-depth study of the two city-regions and the conclusions of each chapter, three principles and subsequent challenges can be recognised for the development of a high-tech city-region, which I summarise in the following sections.

§ 8.2.1 The Provision of the Three Principal Components

Both cases I selected have been recognised as important innovation hot spots not only on the national scale but also on the international scale. I have found that the governments in these two city-regions both have been aware that the provision of the high-tech spatial elements—including universities, R&D institutes, high-tech firms, innovation centres, science/technology parks, good accessibility, well-functioning education and training systems, and quality of place—is the precondition for high-tech development, but their successes rely on synergy between various spatial and aspatial elements of R&D capital, relational capital and human capital rather than on physical developments alone.

Moreover, the conception of the principal components is not static. It may change through time and space and be influenced by contemporary technological development and dominant discourses about innovation models and high-tech development. I use the evolution of the innovation model as an example to explain the dynamic nature of the principal components and their spatial implication. As discussed in chapter two, in the 1960s and 1970s the dominant innovation model was a science push model. At that time, it was broadly accepted that scientific and applied research activities could be spatially separated from production and diffusion activities. On the basis of the linear innovation model, some research parks, science parks and science cities, which only consisted of research activities, were established, such as Cambridge Science Park in the UK, Sophia Antipolis in France, Tsukuba Science City in Japan, and Deadok Innopolis in Korea.

Later on, an interactive innovation model was proposed. Innovation in this model is understood as a social process of 'learning by doing' and 'learning by using' that is based on tacit knowledge, a model that emphasises the role of socio-cultural structures and the interactions among local firms and institutes in technological development. The discourse has underlain the development of technology parks and high-tech city regions. Since the beginning of the 2000s, an open innovation model has been introduced. The open innovation model addresses the utilisation of not only internal but also external knowledge to create value and increase the effectiveness of R&D activities. The model is labelled as an open innovation paradigm because there are many ways for ideas to flow into the innovation process as well as to flow out into markets through R&D outsourcing, licensing or spin-offs. The open innovation discourse has influenced the definition of nationally/regionally important science parks in the Netherlands and the Eindhoven city-region.

Policy makers and planners need to acknowledge the dynamic nature of the principal components and be aware of their spatial implications. Learning lessons from other places is important, but a questionable assumption of easy high-tech policy transfer should be avoided. The in-depth case study conducted in this research has shown that success factors vary between places according to their particular circumstances, which are characterised by certain institutional variables, such as cultural attributes, socio-economic conditions, technology capacity, administration system, policy style, spatial planning system and other sectoral policies.

§ 8.2.2 Close Collaboration among Government, Knowledge Institutes and Firms

A wide range of know-how for high-tech development—such as generation of valuable knowledge, mastery of technology trends and market dynamics, accessibility to international market, production and knowledge networks, and so on—are mastered by knowledge institutes and high-tech firms, so it is necessary for the governments to collaborate with them in the high-tech development process. The key to building tight relationships between the three parties is to seek a common vision, to establish mutual trust and to form a collaborative culture by creating opportunities for constant cooperation and contact. To develop new institutional arenas is a good strategy. The establishment of the Brainport Foundation in the Eindhoven city-region is a good example.

However, the creation of new institutional arenas will make possible new alliances and realignments of power to influence the decision-making of spatial planning and development. Issues related to accountability and social justice may emerge in the new governance practices. For example, the Regional Council of the SRE in the Eindhoven

city-region is comprised of a representative of each participating municipality and the representatives are the *burgemeester* (mayor) of the municipality or a member of the municipal executive board. In the Netherlands, a mayor is appointed by the cabinet and the member of the municipal executive board is appointed by the municipal council, so the representatives of the municipalities in the regional council are administrators rather than elected officials. In view of this, some municipal councillors in the Eindhoven city-region doubt the democratic accountability of the SRE and criticise its lack of transparency in decision-making, although they identify the achievements of the SRE in promoting regional collaboration, lobbying, and so on.[18] Similar criticism may be directed at the operation of the Brainport Foundation.

In terms of spatial planning and development practices, once the governments decide to play an active role in collaborating with other powerful actors (e.g. universities, high-tech firms, etc.) to develop high-tech spaces, two other issues may emerge. First, there are risks in the development process and expected (financial) surplus when land is developed. How to manage the risks and reasonably share the benefits and costs with the other actors is a practical question for the governments. Second, if the governments and the powerful actors decide to develop the high-tech space together, they may work 'hand in glove' for mutual benefits and corporatism may develop due to the tight relationship. This may influence the fairness of planning decision-making. Some decisions may be made at the expense of local society, the environment or certain individual rights.

The development project of the Taiwan Knowledge-based Flagship Park (TKFP) in the Hsinchu city-region provides an example of this situation. In this case, the local government is cooperating with the National Chiaotung University. They reached an agreement that the university is responsible for the planning funds and gaining support from national government and high-tech industry. In return, the local government has to allocate campus land to the university for free after zone expropriation. The initiative is not proceeding smoothly through the legal procedure of the planning system at the national level. One of the reasons is that people criticise the intention of the university and consider that as a national university they should pay attention to research and education rather than to gaining profits from land development.

18 In 2010 Daniëlle van Lith, a municipal councillor in the Eindhoven city-region, criticised the direct accountability and a lack of transparency of the SRE in decision-making in the VNG Magazine. VNG is an association of the Dutch municipalities. It works as a platform for the Dutch municipalities. (http://www.vngmagazine.nl/weblog/706/hoera-afschaffing-van-de-wgr ; accessed in November 2012)

In short, when the governments try to cooperate with other powerful actors to achieve the goals of a high-tech spatial development, it is crucial to consider whether the decision making process is transparent and accountable, and meets the principles of social justice. The effectiveness and efficiency of the high-tech spatial planning and development should not be the only concerns. The governments should keep social and spatial justice in mind and seek to achieve a fairer distribution of side effects of the development and safeguard the public/civic interests at the same time.

§ 8.2.3 To Anticipate and Monitor the Externalities of High-tech Development

The provision of the high-tech spatial elements has spatial effects on the surrounding areas, such as traffic congestion, a shortage of local public facilities, imbalance between land supply and demand for housing and/or industrial land, and so on. In order to reduce the unintentional spatial impacts, it is necessary to anticipate and monitor continuously the externalities of the high-tech development from a more comprehensive perspective.

I summarise the spatial effects of the Dutch and Taiwanese high-tech spatial developments in Table 36 as an example to demonstrate the possible externalities of high-tech development. Learning from the two case study areas, I have found that although the Dutch and Taiwanese governments take different approaches to science park/campus development, they both encounter the issue of potentially oversupplying high-tech industrial land at the national level. In the Netherlands, from 2009 to 2012, the number of campus developments and initiatives rapidly increased from 55 to 74, but eleven of them will not be realised due to the impact of the Eurozone crisis. In Taiwan, following the success of the HSP development, many local governments have asked for the development of a national science park. As of 2012, another eight science parks have been established, three are in the developing stage and one is in the planning stage.

	The Netherlands	Taiwan
Major Attributes/ Differences	– Identification of national importance (area-based and selective) – Cluster approach on the basis of campus development, but the major responsibility is on the provinces and municipalities	– State-led science park development (technopole planning) – The state has control over most of the resources for high-tech development – Cluster approach on the basis of national science park development with an 'enclave' characteristic
Outcomes	*Positive* – Efficient allocation of resources according to local conditions – Encouraging inter-municipal collaboration	*Positive* – Effective integration of resources – The provision of highly efficient business environment for high-tech firms
	Negative – Municipalities in the Eindhoven city-region are facing a heavy financial burden in developing industrial sites	*Negative* – Operational fund of the Science Park is facing a heavy financial burden – A separation of spatial governance hinders regional collaboration
Spatial Effects at National Level	– A rapid increase of campus developments and initiatives, but some of them will not be realised	– A mushroom growth of science park development around Taiwan. – An oversupply of high-tech industrial land
Spatial Effects at Regional Level	– Polycentric industrial clustering pattern – The success of High Tech Campus has led to a mushroom growth of science park/campus developments in the core area – A huge oversupply of industrial land in the city-region	– Monocentric industrial clustering pattern – A rapid increase in population has created enormous pressure for the supply of housing and public facilities – Urban sprawl

Table 36
Dutch and Taiwanese high-tech spatial developments

At the city-regional level, the situation is different in the two city-regions. In the Eindhoven city-region, after the success of High Tech Campus, six science parks/ campuses have been established or are in the planning stage, since the late 2000s. In addition to the science park/campus development, there is a serious issue of oversupplying industrial land. This has caused many of the municipalities in the city-region to face a heavy financial burden. In contrast, the success of the HSP development has led to a rapid increase in population and created enormous pressure for the supply of housing and public facilities in the Hsinchu city-region. But the local governments could not provide adequate land to meet local housing demand in time due to the centralised spatial planning system. Besides, there is no proper planning instrument to manage the non-urban land. As a result, the rapid growth has led to a severe urban sprawl issue in the city-region.

One successful instance of a high-tech spatial development may lead to a mushroom growth of science park developments and result in an oversupplying of land. Policy makers and planners have to be aware of the possible spatial consequences. On the other hand, both cases have shown that the issue of imbalance between land supply and demand for housing and/or industrial land may have been embedded in the spatial planning systems for a long time. So some people may argue that high-tech development is merely a trigger of this deeply rooted issue. Nevertheless, the way the governments use spatial planning instruments also has effects on the result. It is crucial to learn from the experience and anticipate the unintentional spatial effects.

§ 8.3 Methodological Reflections

Methodology has been the key issue in this research. Because I consider that high-tech development has been a global phenomenon for decades, a global view was necessary for this research. This was the reason I selected two case study areas respectively located in Europe and Asia. When considering the issues of policy transfer and lesson-drawing, I decided to conduct a comparative study in order to investigate the major factors that shape the spatial mechanisms for high-tech development and learn from the cases in a more cautious way. The main question became how to establish a generic analytical framework to expose the factors systematically and learn from the comparisons.

The general framework for institutional analysis proposed by Ostrom provided a very comprehensive and operational foundation for me to develop the generic comparative framework, which consists of a set of institutional variables according to previous comparative research of spatial planning systems and practices. Several typologies and categorisations in relation to the institutional variables, such as welfare state regimes, policy styles, planning instruments, and so on, are employed to describe better and compare the particular socio-political contexts and planning systems of the two case study areas. After conducting the whole research, I now make some reflections on the value of comparative research and the analytical frameworks established in this research in the following sections.

§ 8.3.1 Restating the Value of Comparative Research

It is not appropriate to expect that good practices and policies of a particular place can be directly transferred to other places and have the same effect. The value of comparative

research is to help learn from other cases in a more cautious way. For example, the introduction of framework-based collaborative planning may help the governments in the Hsinchu city-region deal with the large externalities of the HSP development, effectively guide spatial development and curb urban sprawl. But it is difficult to encourage the local governments to apply the framework-based planning style due to two interrelated institutional constraints—the dual land management system and the highly centralised planning system.

The dual land system has two different types of land use and control systems—urban planning system and non-urban land system. There is no adequate mechanism to manage the development in the non-urban areas. In order to have better management, it is common for the local governments to change the non-urban land to urban planning land through initiating new urban development projects. But the local governments often need to spend more than ten years to complete the legal procedure, so in order to strive for timeliness the local governments are eager to submit draft plans to the legal procedure but not to seek consensus and anticipate the externalities and interrelationships between projects beforehand.

Further, in the legal planning procedure the national government plays a determinate role and its planning decisions are made case-by-case at a distance. This is also unlikely to encourage local governments to adopt the framework-based planning approach. Nonetheless, this does not mean that the local governments in the Hsinchu city-region can never adopt the framework-based approach. I only want to point out that the support of the national government for the adoption is crucial in Taiwan.

Specifically, it is necessary to identify the implicit assumptions and institutional factors that shape a particular planning system but are often taken for granted, in order to draw lessons from other countries and find a way to improve the system. This shows another value of the comparative research. That is, to increase mutual understanding between the scholars, planners and policy makers of studied countries and create a platform for them to exchange their knowledge and experiences. I hope that the result of this research can inspire Dutch and Taiwanese scholars and practitioners in the field of spatial planning to learn from each other and to reflect on their planning practices.

§ 8.3.2 Reflections on the Analytical Frameworks

The concept of multiple institutional layers identified by Ostrom was particularly useful for this research (see Figure 4 in section 1.4.2 B and Figure 14 in section 3.1). This had led me to explore systematically the major institutional variables that may have effects on spatial planning systems and practices. Together with the analytical framework I

established in chapter three (see Table 11 in section 3.3.2)—which was mainly based on the general framework for institutional analysis introduced by Ostrom and the actor-centred institutional framework proposed by Scharpf—in chapter five I investigated the major institutional factors that have shaped the action situations of spatial planning. On the basis of this, I explored how the practice of high-tech spatial planning and governance in relation to the particular action situations of spatial planning in the two city-regions in chapter seven. The findings have shown that the concepts of institutionalism are very useful for the establishment of a generic framework that is not tied to a specific place or case.

However, the frameworks of institutional analysis I established on the basis of the institutional concepts of Ostrom and Scharpf implied a temporarily fixed situation for analysis. While this created an easier situation for analysis, it was difficult to use the frameworks to investigate and explain the dynamic interrelationships between the changing institutional contexts and decision-making regarding high-tech spatial planning at a specific place and time. Further, institutional factors were often interrelated and it was hard to clarify the causality. For this reason I adopted a *diachronic approach* to complement the empirical study in part three, in order to understand the influences of prior institutional development and specific episodes on later policy/decision-making and action-taking.

In short, the analytical frameworks built upon Ostrom's and Scharpf's frameworks worked well in the comparative study of this research. But in the future if other studies consider applying the frameworks from this research, the effect of historical path dependency has to be taken into consideration.

§ 8.4 Directions for Future Research

In this research, I fill a gap between the high-tech development and spatial planning literature by exploring the spatial effects of high-tech development and the role that spatial planning may play in the high-tech development process through an in-depth comparative study of the Eindhoven city-region in the Netherlands and the Hsinchu city-region in Taiwan. Despite the fact that this research contributes to knowledge development in the field of high-tech development and spatial planning, a wide scope of issues still needs to be explored further. In view of the challenges that I have addressed in section 8.2, giving priority to understanding the critical issues for the spatial effects of high-tech development would deepen understanding of high-tech development and its wider implications, but also of the nature and operation of spatial planning and governance. I present those issues in the following sections.

Role of the government in developing a science/technology park

It is a dilemma for governments regarding the balance of land supply and demand for science/technology park development, which has been seen as one of the most effective instruments for pursuing high-tech development. However, science/technology park development is unlikely to bear fruit in the short term, but rather taking as long as two or three decades. In the development process, the timing and growth pattern of science/technology park development will be influenced by many internal and external variables, such as historical development of technological capacities, the wider economic cycle, and so on.

In some places and times, governments may need to play a more leading role to conduct or facilitate the development, for example, when there is no other existing powerful high-tech actor, as the Taiwanese government faced in the 1970s, or there is an economic downturn, as the Dutch government has been facing since the Eurozone crisis. Based on this understanding, two more questions are raised. First, what role should the governments play in developing a science/technology park in different circumstances? Second, if the governments need to play a leading role, how do they conduct or facilitate the development of a science/technology park and manage the risks following the development at the same time?

Governance mechanisms of high-tech spatial developments

Following the two questions regarding the role of government in developing a science/technology park, broader issues in relation to the governance mechanisms of high-tech spatial developments appear. As shown in this research, there is a demand for the government to consider how to collaborate with various public and private agencies and govern the complex relations among them when realising a high-tech spatial development project in a particular place. A range of governance mechanisms may be developed according to specific regional/local circumstances. This raises two major questions regarding the institutional design of governance mechanisms.

The first is how to develop governance mechanisms that can increase the 'institutional capacity' of the particular place—which link to the generation of knowledge resources (intellectual capital), network resources (social capital) and power base (political capital) in the governance process. This capacity is expected to be helpful for promoting regional/local potentialities, coordinating different interests and overcoming future challenges of high-tech development. At the same time, another important question has to be considered. That is, how to seek for achieving a fairer distribution of side effects of a high-tech spatial development and safeguarding the public/civic interests at the same time. This involves issues of power relations, social justice and accountability of the institutional design, which are worthy of further investigation.

Wider generalisations about high-tech development and its implications

In this research, I have examined in detail cases in the Netherlands and Taiwan, which respectively present two different high-tech development modes. The research results have shown the dynamic nature of the principal components of high-tech development. The value of comparative research is significant, but in a small-scale comparative study it is difficult to make wider generalisations. Furthermore, the research results highly depend on the case selection, because the comparisons are made in a relative sense between the two cases. Therefore, comparative studies looking at more cases in different countries are needed. I expect that more cases can be studied, compared and generalised on the basis of the comparative frameworks of this research. More general conclusions regarding the nature of high-tech development and its wider implications can be drawn in the future.

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Index of Tables and Figures

A I A List of Interviewees

Eindhoven City-region				
Sector	**Unite**	**Position**	**Name**	**Date**
Government	SRE	Senior Advisor of Spatial and Housing Policy; Programme Manager of Brainport Avenue	J.A. Jean van Zeeland	2012-02-15 2012-11-14 (Eindhoven)
	Gemeente Eindhoven	Senior Urban Designer	Cees Donkers	2011-11-24 (Eindhoven)
	Gemeente Eindhoven	Programme Manager of Spoorzone	Jos Roijmans	2012-03-01 (Eindhoven)
	Gemeente Eindhoven	Programme Manager of Landelijk Strijp	Gerwin van Eert	2012-05-24 (Eindhoven)
	Gemeente Veldhoven	Strategic Policy Advisor	Marjan van den Hoogenhof	2012-05-29 (Veldhoven)
Regional Devel-opment Company	Brainport Develop-ment NV	Manager of Strategy and Public Affairs	Edgar van Leest	2012-05-29 (Eindhoven) 2012-12-07 (E-mail)
Science Park	High Tech Campus	Manager of Business Development & Communication	Bert-Jan Woertman	2012-05-23 (Eindhoven)
Hsinchu City-region				
Sector	**Unite**	**Position**	**Name**	**Date**
Government	Science Park Adminis-tration	Director General	Tzong-Ming YEN	2011-10-13 (Hsinchu City)
	Hsinchu City Gover-nment	Deputy Director of Department of Urban Development	Chun-Yu WEI	2011-10-17 (Hsinchu City)
		Ex-director of Depart-ment of Urban Development (2002.01-2010.01)	Chiu-Jung HUANG	2011-10-11 (Hsinchu County)
		Ex-director of Depart-ment of Urban Development (2000.01-2002.01)	Charles Ching-Rong LIN	2011-09-22 (Tainan City)
	Hsinchu County Gover-nment	Director of Department of Internati-onal Economic Development	Sian-Sheng LIN	2011-10-12 (Hsin-chu County)
		Deputy Director of Department of Interna-tional Economic Develop-ment	Wei-Chih CHEN	2011-10-11 (Hsinchu County)
		Secretary of the Hsinchu County Chief Executive Office	Yu-Chao WU	2011-10-12 (Hsinchu County)
Industry	Hermes-Epitek Corp (located in the HSP)	General Manager of Hermes-Epitek Corp; Vice President of Taiwan IC Committee Board	Chin-Yung SHU	2011-10-13 (Hsinchu City)
University	National Chio-Tung University (NCTU)	Coordinator of Puyu Development Plan and New Campus Force, NCTU	Chien-Cheng LIN	2011-10-17 (Hsinchu County)

Sector	Unite	Position	Name	Date
Other	Urban Planning Committee, Ministry of Interior	Professor of Graduate Institute of Urban Planning, National Taipei University	Tsu-Lung CHOU	2011-09-28 (Taipei City)
	Planning Consultant	Coordinator of Taiwan Knowledge-based Flagship Park Project (Puyu Plan) since 2000	Zi-Yao LI	2011-09-29 (Taipei City)
	Local Social Organisation	Chairman of Jhu-Bei Puyu Self-help Association	Chin-Jung TSENG	2011-10-17 (Hsinchu County)

Curriculum Vitae

Wei-Ju Huang was born in Taiwan. From 1997 until 2001 she studied urban planning at National Cheng Kung University in Taiwan. After obtaining her Master of Urban Design degree in 2003 from Pratt Institute in New York City, she worked for Tainan City Hall and Metropolitan Consultants Inc. in Taiwan until 2007. Metropolitan Consultants Inc. is one of the leading urban planning and design companies in Taiwan, where she had the chance to manage several significant planning and design projects. Her work experience has not only given her considerable expertise in the practice of urban planning and design, but also has led her to understand better the challenges facing Taiwanese cities and the limitations of planners and designers.

In light of this understanding, she decided to devote herself to exploring sophisticated approaches to help urban planners and designers deal with contemporary spatial planning issues. She started her PhD research at the Spatial Planning and Strategy Chair of the Urbanism Department, Delft University of Technology in 2009. During the four-year research period, she engaged in teaching and organisation activities in the chair, but also disseminated her research results through academic meetings, congresses and academic journals. She has been awarded several scholarships to support the PhD research, including 2009 DELTA / NTIO Joint Environmental Scholarship from the Delta Electronics Foundation, 2010 MOE Scholarship for Doctoral Program from the Ministry of Education, R.O.C., and 2012 Doctoral Dissertation Fellowship from the Chiang Ching-kuo Foundation for International Scholarly Exchange.

Her experiences in the United States, Taiwan, and the Netherlands have provided the opportunity to recognise how different spatial planning and urban design systems shape the planning practices and spatial organisation of particular places. She has also cultivated her abilities to understand and adapt to different institutions and cultures, and to communicate and cooperate with people from different countries. This multinational experience has been invaluable and forms the core of her research interests.