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Multiple Smart Cities: The Case of the Eco Delta City in South Korea

Dongho Han [1] and Ji Hyun Kim [2,*]

[1] Bartlett School of Planning, University College London, London WC1H 0NN, UK; dongho.han@ucl.ac.uk
[2] Department of Urban Planning & Engineering, Pusan National University, Busan 46241, Korea
* Correspondence: jikim@pusan.ac.kr

Abstract: This paper follows the urban development process of the Eco Delta City (EDC) in South Korea, a new waterfront development demonstrating the concept of a smart city. The investigation focuses on the mobilisation process under the framework of assemblage thinking: the way in which the smart city concept was applied to the project and the relational moments that delayed and stopped the process. This qualitative research with the case study and ethnographical tradition of analysis was conducted with data from diverse archival sources and interviews. By dissecting the network of EDC development, the analysis finds that the smart city mobilisation emerged from the complex actor-relations rather than from the top-down policy, and the initially brought smartness framed by the government was not accepted intactly but was contested, affiliated and compounded by the actor-relations. This study also verifies that the assemblage approach is a suitable tool in managing and evaluating policy mobilisation because it is affected by the local context and actor-relations rather than just imitation and direct application.

Keywords: smart city; policy mobility; assemblage thinking; actors; eco delta city

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Citation: Han, D.; Kim, J.H. Multiple Smart Cities: The Case of the Eco Delta City in South Korea. *Sustainability* **2022**, *14*, 6243. https://doi.org/10.3390/su14106243

Academic Editors: Tianren Yang, Mengqiu Cao, Claire Papaix and Benjamin Büttner

Received: 28 March 2022
Accepted: 17 May 2022
Published: 20 May 2022

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1. Introduction

The concept of the 'smart city' has followed in the footsteps of sustainability discourses and has also become a major ubiquitous leitmotif on urban development [1]. The extent of its meaning has been expanding for the last decade and the frequency of searches for 'smart city' has been increasing since 2010 [2]. Discussions are taking place across broad areas such as urban development, urban regeneration, climate change, and participation [3]. Currently, the concept seems to have become the final solution for urban problems and has become a window through which to view the cities of the future. However, there is also growing recognition that we lack a comprehensive understanding of how we are utilising and managing the smart city concept in the real-world urban space, specifically in the contexts of diverse societies. Joss et al. [1] argued that the smart city can be considered a 'global discourse network' and a collective of locally contextualised yet globally interconnected discourses. The smart city idea is important but understanding the local application of 'smartness' is critical for its utilisation in urban development and management. Recent analyses have found that policy-making processes involve complex adaptation and reproduction, rather than the simple repetition or imitation of an idea [4,5]. For example, the industrial structure [6] or the institutional fabric [7] of a society could bring the unique application pattern of policy, idea, and development models. This paper tries to reveal a lesson from a smartness mobility case in the South Korean urban development context.

The South Korean government, following the success of Songdo and several other smart city developments, is attempting to increase its urban development/managing ability with the smart city concept and 4th industrial technologies. Since the 1990s, the South Korean government has integrated 'ubiquitous city (U-City)' development with internet communication technology (ICT) and has undertaken active legislative action to uphold

the U-City development. In 2017, the U-City Act was changed into a new smart city act, an 'Act on the Promotion of the Smart City Development and Industry'. Based on legal and administrative support, diverse parts of urban development and comprehensive urban planning have been established under the smart city concept. The South Korean government aspires to create a verified smart city development package and to export knowledge and technologies to other countries wishing to develop smart cities [8,9]. This paper follows the urban development process of the smart city district of the Eco Delta City (EDC) in South Korea, a new waterfront development led by the government's goal but with the various aspirations of multiple actors.

The smart city mobilisation of EDC has specificities and significant meanings for a single case research in the sense that this is a government-led top-down project with diverse aspirations of the actors involved, which results in a fuzzy and blurred concept of the smart city. An investigation into an in-depth understanding of the process of fuzziness of the worldwide and imposed smart city concept can provide a significant insight into the mobilisation process. In terms of this, this research treats the EDC case as 'a potential exemplar of some general law or principle that applies across time and space [10]' and tries to extract significant ideas and implications.

An assemblage perspective as a main analysis framework was applied in this paper to highlight these complex relations in the process between the involved actors, and to see the influences of the government-led and developmentalism context of a society on smart city mobility. The assemblage perspective is sensitive to the non-linear and changing association, which is ideally suited to revealing the characteristics of social and material relations and their productions. To rectify the lack of understanding how this globally integrated discourse is applied in a particular local system and to understand what a particular practice offers in terms of paradigm mobility, this article investigates the whole process of smart city development. The advantage of an assemblage perspective—how a certain entity is produced out of heterogeneous relations—is applied to track the transformation of a broad, unsettled idea (smart city) into a specific local context. This research focuses on the application process in the planning system and follows the different aspirations of actors that are interrelated with each other during the smart city urban development.

The analysis is based on the results of nine semi-structured interviews with key participants in the project and the archival data. Face-to-face interviews were conducted between 2018–2019, which aimed at producing the contextual understanding and the actor relations that enabled and shaped the application of the smart city concept. Three questions are addressed in this research:

- How is the smart city paradigm (smart city) empowered by the local (political/economic) actor's aspirations?
- How do different conceptualisations of smart cities affect the process of smart city mobility?
- How did South Korea's government-led developmentalism characteristics [6,11] affect the smart city adaptation process?

This investigation of EDC indicates how to utilise the globally debated smart city concept within specific types (government-led) of development systems and gauges. By dissecting the intertwined network of development processes and by examining the interrelations between the inside actors, a detailed understanding of how a broad idea is stabilised (and transformed) in a particular condition can provide implications for managing urban development processes.

2. Smart Cities of South Korea

2.1. Discourses of Smart City

The smart city concept is thought to have originated from the term 'smart growth' [12], referring to the need to make cities more compact with less ground waste, an idea which was influenced by 1980s US New Urbanism [7]. The term 'smart' was adopted by ICT infrastructure and innovation for managing cities, particularly with the 'intelligent city' debates [13]; thus, ICT industries such as Cisco [14], IBM [15], and Siemens [16] have

adopted the phrase for integrating urban infrastructure and complex information services. The smart city, led by large corporation technologies, is particularly noticeable in the US. However, in most European countries, the human-centric perspective of ICT-driven urban innovation and development, and the balanced combination of human, social, cultural, environmental, economic and technological aspects, are emphasised [17].

There are various types of smart city literature across the world. Numerous scholars have focused on articulating the meaning of 'smart city' by connecting the concept with its practice [7,18–20]. Through the smart technologies surrounding urban areas, Batty et al. [21] argued that 'cities can only be smart if there are intelligence functions that are able to integrate and synthesise these data to some purpose.' By creating technology-based innovation in the planning and development stages, cities become not just attractive but intelligent. Intelligent cities enable urban data to be measured, analysed, and integrated and utilise the outcomes of such data in policy- and decision-making processes. Komninos [13] defined this aspect of intelligent and smart cities as 'a metaphor of the city', which enables us to understand the physical city through its virtual representation. For instance, to improve services, management, and governance within a city, the smart co-operative framework, which uses information technology in an individual professional field, was suggested. This ultimately sought to achieve a sustainable development approach [22].

The idea of sustainability is one of the main themes in smart city discourses. Diverse applications by using Information and Communication Technologies (ICT) and Internet of Things (IoT) in smart city case studies are explored and thoroughly investigated [23].

Regarding social sustainability, Chang et al. [11] discuss the reshaping of power dynamics in urban governance made by smart urbanism. Irvine et al. [24] suggested a future smart city case study by providing design visualizations of alternatives and emphasised the importance of integrating community familiarity. Moreover, real-time data management (based on data-driven smart applications) in the smart city will become a much more important method for public participation, focusing on human and social capital in the future [25].

Harrison et al. [26] focused on the economic sustainability of the smart city in competition with countries, cities and even neighbours, focusing on the conservation of resources and local identities. The idea of the smart city also encourages 'creative classes [27]' to support environmental sustainability. Dubuque, Iowa, in the US, is a successful example of this [28]. In terms of Asian case studies, by comparing smart city development characteristics, such developing renewable energy systems, efficient energy use, and citizen participation policy, such as in Japan and China, Su et al. [29] argue the significance of Asian countries' sustainable applications and practices.

To achieve a sustainable smart city, research into smart city management has had attention paid to it. A bottom-up approach was emphasised for the robustness of the framework in smart sustainable development. This was particularly proved by the evaluation of sustainability outcomes in Shenzhen, China and Greater Manchester, UK [30]. As a type of management approach, measuring the level of sustainability in smart cities is a theme in which scholars have been interested. A standardised framework from the public's perspective was introduced [31]. This research highlights that the infrastructure of a smart city can be regarded as a new commodity for a city, as well as a means of improving the quality of citizens' lives. However, the assessment should be tailored to be sophisticatedly dependant on the cities' particular visions and on their priorities for achieving their objectives [32].

2.2. Applications in South Korea

Smart city adoption in South Korea has followed two tendencies: a developmentalism tradition and a government-led policy-making character [33,34]. In South Korea, the term 'smart city' came to be used as a substitute catchphrase for 'ubiquitous city', which had been used for the mainframe of new urban development. It was first mentioned during the development of Centum City in 2003 under the name of U-City (Ubiquitous City). The concept of a U-City was defined as an urban space of the future where ubiquitous

technology was embedded into space to build urban functions more efficiently and to improve citizens' quality of life [35].

> *"Actually, it [the idea of the smart city] began by my suggestion under the name of U-City. Due to the successful delivery of Centum City, I believed that the city of Busan should prepare for the new urbanism era. However, since it required a great amount of funds, the city government could not support the project"*
>
> *(Interview with a former officer of Centum City Development Department of Busan Metropolitan City, 2018)*

In 2017, the South Korean government established the Smart City Special Committee as a sub-institution of the Presidential Committee of the 4th Industrial Revolution (PCFIR); the term 'U-City' was substituted for 'smart city' in official government documents. A smart city is typically defined as 'a city—particularly urban infrastructures—which provides citizens with effective and efficient urban services by using IoT and ICT technology [9]'. This shows South Korea's technology-based, corporate smart city model [17], which was initiated and driven mainly by the central government.

However, the South Korean government asserts that the U-City and smart cities share characteristics, but that there are two significant differences between them [9,35]: The U-City is a government-led urban regeneration idea, while a smart city project is implemented and managed by multiple actors. The government suggests that smart cities can resolve not only the country's traditional urban problems, but can also prevent unexpected future issues (e.g., an ageing society, shrinking city, etc.) It also criticises the construction-led U-City, which has not been as productive as the national government expected.

Furthermore, in Korean smart cities, Jo et al. [36] argue that the emerging smart industries, such as smart buildings and smart vehicles, should become anchor industries, which create value chains of new industries for the sustainable development of other industries.

3. The Mobilisation of the Smart City from the Assemblage Perspective

3.1. Policy Mobility

Many circuits of knowledge and policy frameworks have been investigated to date. Although the circulation process has become a common activity in the current era, it has been interpreted using diverse approaches. For instance, lesson-drawing defines the actors, knowledge and space where the process occurs and where the mechanism of the circulation is processed. Policy convergence and policy transfers categorise a few mechanisms of the circuits of knowledge and policies. In policy transfer scholarships, policies are regarded as 'fully formed, off-the-shelf policies' [37], which are completely delivered from one context to another by understanding the transfer in abstract terms, as a 'dissocialized movement' [38]. The world, however, consists of complicated networks and relationships surrounded by vague boundaries and changeable contexts. The complex nature of the knowledge and policy circulation process cannot be reflected accurately through the lens of traditional theories. Furthermore, a complete transfer without any loss or conflict cannot exist in the real world. Since policymaking is often complex, the detailed content of the policy and the idea of the circulation processed in the conventional concept are under-emphasised [39].

This has led to a reconceptualisation of circuits of knowledge and policy, not as static (with linear causality), but as constituted through relations and interactions [40], particularly in the fields of social science and human geography [41,42]. Such relational thinking results in urban scholars considering cities as the sites of multiple flows of people, commodities, information and networks that are constantly interacting [43]. Healey [44] extended this by suggesting that post-modern society is recognised as a dynamic complexity with diverse contingencies in urban conditions. Under neoliberalism, contemporary urban areas can be (re)produced by a network of histories, socio-political structures, social relationships, movements of labour and capital, and communications with cross-scale governance, rather than a conventional place containing a set of boundaries with categorised actors.

Consequently, a relational thinking approach leads geographers to investigate urban issues concerning flows and networks, the dynamic over the static, and interactions over objects.

In contrast to the common conceptualisation of knowledge and policy circulation, which only focuses on territorially, politically, and socially bounded states, the policy mobilities approach emphasises various scales of unbounded entities (as crucial circulatory infrastructures such as states or state actors). This brings about a greater analyses of the knowledge and policy circulation process concerning the trans-national and trans-local constitution of institutional relations, governmental hierarchies and policy networks. Such inter-scalar conditioning of governance, through which knowledge and policy models move and in which they mutate, results in an assemblage of policy models—bundles of knowledge and techniques purposefully gathered together for particular reasons—and expertise drawn out of circulation and gathered in the local context. As policies circulate, they usually not only change and mutate over time and through interactions but also become coherent fixed entities through a process of assembling, disassembling, and reassembling [45].

The rise of neo-liberalism has translated into a series of reforms and initiatives aimed at minimising government intervention in the delivery of urban planning and development [46]. On the other hand, the role of private investors has increased. For instance, the Global Intelligence Corps (GIC) plays a fundamental role in the global circulation of ideas regarding urban planning and design, because of the growing demands for their services across the world [47]. There is also a lack of investigation, which focuses on external stakeholders. Stakeholders do not have equal rights and powers within the governance system of urban planning [48]. Although the external stakeholders do not impact on the urban planning project directly, the analysis of their indirect implications on the project helps to address the delivery of it and to understand its outcomes more deeply [49].

3.2. Assemblage Perspective

The assemblage perspective, along with its cousin actor-network theory (ANT), views everything around us as continual inter-relations between texts and readers. Society, culture, community, built environment, and space are enacted into multiple meanings throughout discursive and non-linear relations. In approaching the subject, there are no pre-defined terms or pre-defined knowledge; the assemblage approach simply pursues and draws what the network relations are producing. An ANT initiator, Latour [50], noted that, if we must examine the controversial knowledge or a proposition that appears to be stabilised, then we must go upstream and examine their complex internal relations. Learning how actors are 'translated' to produce or act as something, how these actor relations emerge and through which processes the relations produce regular outputs (stabilisation) bring insights on to a given subject.

One of the advantages of assemblage thinking applied in planning studies is a framework that enables us to follow the process of a certain policy, planning intention and design with their element associations. By revealing actors and the way they affect each other in a certain direction, assemblage thinking advances our understanding of how an intention has changed and evolved and sometimes illuminates the material actors that are small yet significant in the process.

In the mobilisation of policy, actors are not isolated but are group members of an assemblage. Within it, they attempt to adapt new policies and schemes into local context by '(un)consciously (re)shaping existing and/or new institutional arrangements, norms, and power relations [51]'. Prince [5] explained that assemblage thinking can be applied in two different ways through policy mobility studies: one concerns how the city stretches beyond its territorial boundaries through urban policies as an empirical object and the other is a methodological adaptation of how a policy is constructed, used, adapted, and rejected out of the various objects. Hence, the assemblage approach is good for transforming abstract social influences into material realm entities and it can distinguish between the different network bodies that are central to the discussion of the different enactments of the network.

3.3. Research Gap

Since policy mobility is a comparatively comprehensive approach, it helps to look at how things happen and emerge carefully. Moreover, with the network relations between actors and the multiple enactments of networks, assemblage thinking describes the whole subject as it emerges from its complex parts. On this background, a plethora of research has reviewed diverse types of cases by exploring various levels of governance, as well as actors and their relations within a state's broader policy process and policy priorities. For instance, the mobilisation of policies and programmes—such as urban regeneration [52–54], Eco-cities [55], Smart cities [7,17] and Business Improvement Districts [56–58]—are analysed and thoroughly discussed.

Policy mobility literature's importance lies in specific details that pinpoint what enables policy mobility, such as inter-relationships. For example, as far as a wider range of actors are considered in the policy mobility, the delivery of urban planning—under the concept of 'smart city' in this research—is understood and addressed in a much more sophisticated way. In the conventional knowledge and policy circulation literature, the idea of power is something embedded in specific people, places or institutions, such as mayors, politicians, and departmental representatives. In this circumstance, only a few specific actors who played a certain role in policy mobility were analysed. Through the lens of policy mobility, however, it is believed that power could be extended outwards through networks across a flat surface. In this way, it is far more dispersed and diffused [59]. This requires the investigation of a wide range of actors surrounding the mobilisation of ideas and knowledge.

In relation to this, the research focuses on the moment when the actor-relations bend the smart city development process. It will examine what actors are involved and how they affect one another to produce a certain type of space. Indeed, both complex partial relations and overall processes are empirically examined and described.

4. Research Method

The objective of analysis is an in-depth understanding of the case that is a government-led development project with a clearly defined smart city concept, which becomes multiple and floated during the process. The analysis process is based on the qualitative approach and with the case's unique setting, the top-down smart city framework and its dissolution, it is an intrinsic type of qualitative case study [60]. However, in terms of the means of analysing data and presenting the case, it is also in the conventional mode of the ethnographical tradition (Figure 1) [60,61].

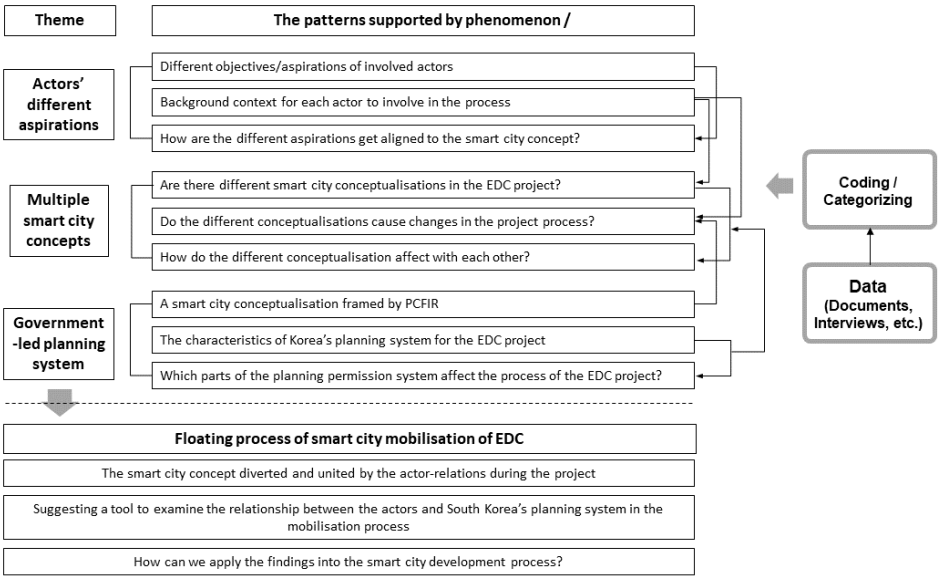

Figure 1. Analysis framework (source: author's own).

This study examines actors (humans, organisations, bureaus, etc.) and their mutual influences on the smart city district of the EDC development. The central government of South Korea performs a multileveled decision-making process on the implementation of large-scale urban development, with the EDC and pilot smart city development in the same category. The assemblage approach analyses the strategic policy-making process regarding urban development and its relation to the adaptation of global policy and how it is projected, transformed and equipped in the physical strategies of the development scheme, in line with South Korea's planning system.

This analysis is based on the results of nine semi-structured elite interviews with key participants in the process. The interviewees were categorised into two groups: the interviewees involved with national and regional-level relations and those concerned only with EDC (Table 1). The former group explored the mobilisation process of urban policy regarding urban regeneration in the local area, while the latter group addressed individual efforts concerning urban regeneration projects. The interviews were conducted face-to-face between 2018 and 2019. The documents used for the analysis included official publications by Busan Metropolitan City Council (BMCC), Busan Development Institute, Busan Port Authority and the Korea Water Resources Corporation. Local newspapers, news magazines, newsletters, and websites were also used (Table 2).

Table 1. Interviewees.

Category	Description	The Number of Interviewees
Central government	Presidential Committee on the Fourth Industrial Revolution (PCFIR)	1
Local government	Busan Metropolitan City Council (BMCC)	1
Government-led research Institute	Busan Development Institute (BDI)	1
Public Corporation	Korea Water Resources Co. (K-Water) Busan Metropolitan Corporation (BMC)	1 2
Educational institute	Public/Private universities	3
Total		9

Table 2. Archival data for the EDC project.

Type	Name	Author
Archives	Busan Metropolitan City's supplementary planning guidance on planning practice	Busan Metropolitan City
	Environmental Policy in South Korea—Problems and Perspectives	Konrad A. S.
	Busan Smart City Visions & Strategies	Busan Metropolitan City
	Administrative Audit and Inspection	BMC
	Busan Eco-delta City Construction Technology Masterplan Guides for Special District	K-Water
	Smart City Strategies	PCFIR
	The 3rd Smart City Master Plan 2019–2023 (National)	Ministry of Land, Infrastructure and Transport (MOLIT)
Newspapers (local)	Busan Ilbo	-
	The Kookje Daily News	-

Table 2. *Cont.*

Type	Name	Author
Newsletters and Websites	www.busan.go.kr (accessed on 1 May 2018)	Busan Metropolitan City
	www.bdi.re.kr (accessed on 1 May 2018)	Busan Development Institute
	www.busanpa.com (accessed on 1 May 2018)	Busan Port Authority
	www.kwater.or.kr (accessed on 1 May 2018)	Korea Water Resource Co.
News magazines	Dynamic Busan	Busan Metropolitan City

5. Actor Network: Why Do They Need a Smart City?

5.1. Eco-Delta City (EDC)

EDC is located in Gangseo-gu, on the west side of Busan, South Korea (Figure 2). Gangseo-gu was an underdeveloped area of Busan which was not properly developed until 2010, as both the building height restriction for Gimhae International Airport and the green belt obstructed the urban development process. This issue was resolved by the Ministry of Land, Infrastructure and Transport (MOLIT) through the Nakdong River maintenance programme. In 2010, the urban regeneration project near the waterfront area was planned and named the 'Eco Delta City' (Table 3). Two years later, BMCC, BMC (Busan Metropolitan Corporation is the local government agency for supplying housing and land and developing urban areas within Busan Metropolitan City), and K-Water (also called the Korea Water Resources Corporation is a national government agency for comprehensive water resource development and provides both public and industrial water in South Korea) agreed to act as the main developers through the implementation of the EDC project. During the planning stages, BMCC applied to the central government bureau, MoLIT, for the national pilot smart city project; the central part of the EDC was finally designated as one of two national pilot projects by the national government. Site construction began in 2019, aiming to create 2.2 km^2 of smart city for 3380 households with 8500 residents as a national pilot smart city project (Table 4).

Figure 2. The location of EDC (source: K-Water).

The key advantages of the site are that it can utilise water and the water-scape, it has good accessibility (Gimhae International Airport, Busan Port and Busan Railway Station), and it is surrounded by traditional industrial clusters within the area of Busan Metropolitan City. Such circumstances create a synergetic effect by accelerating cooperation between private firms and young knowledge workers in the fields of IoT, ICT, and computer science to settle in EDC. Urban planners expected so that the agglomeration of diverse industries would prevent the pattern of the ever-decreasing population by gathering various types of labor from outside Busan Metropolitan City [62].

Table 3. Summary of EDC.

EDC		Smart City: National Pilot Project	
Location	Gangseo-gu, on the west side of Busan, South Korea		
Area	11.77 km^2	Area	2.2 km^2
Period	2012–2023		
Population (aim)	75,100 (30,000 households)	Population (aim)	8500 (3380 households)
Land usage	Residence, Commercial, Research and Development, Logistics	Facilities	Waterfront area, Convention centre, Shopping centre, Marina
Total	K-Water, BMC, Busan Metropolitan City		

Table 4. Key stages of EDC's development.

Date	Planning Process
Feb. 2012.	Agreement made for development by K-Water and BMC
Dec. 2012.	Revision of urban management plan—release green belt area by MoLIT
Dec. 2012.	Designation of the waterfront area
Sep. 2013.	Beginning of land compensation in Myeongji-dong
Sep. 2014.	Change of designated waterfront area and issue for construction document
Oct. 2014.	Beginning of land compensation in Guangdong-dong
Jul. 2015.	Beginning of land construction for areas 1–4 (Myeongji-dong)
Jun. 2016.	Beginning of land compensation in Daejeon-2-dong
Nov. 2016.	Beginning of land construction for 2–2 areas (Guangdong-dong)
Jun. 2017.	Change of designated waterfront area and change of construction document
Jan. 2018.	Designation of National Pilot Smart City
Jul. 218.	Establishment of master plan draft for Smart City
Nov. 2018.	Business information session held for areas 2–4 (Guangdong-dong)
Dec. 2018.	Establishment of the master plan (final) for Smart City
Aug. 2019.	Issue for construction document (2nd revised)
Dec. 2019.	Beginning of land construction for area 3 (Daejeon-2-dong)
Dec. 2023.	Completion stage

5.2. Different Aspirations between Actors

5.2.1. K-Water

There were three developers involved in the EDC project: K-Water, BMC, and BMCC. However, there were two different aspirations in the group: K-Water had a financial aspiration and the other developers had a long-term goal to revitalise the area. K-Water has been in financial loss for a long time. Both the enactment of the 'Special Act on the Utilization of Waterfronts', which enabled K-Water to be the only authorised developer of the waterfront area, and the central government's financial support, caused the organisation to initiate the EDC project.

> *"Under the Myung-bak Lee administration (particularly in 2012), there was additional budget, 800 billion Korean won, which has to be consumed under the administration. So, the administration gave the budget to the K-water since it suffered from its financial problems. When the K-Water recovered its enterprise soundness, it determined to invest a property-led urban development under its authorization. It is the very start of Eco Delta City project. Anyway, whatever the concept of the urban development is, the government-led corporation will spend the budget for the site and urban infrastructure construction"*
>
> *(Interview with former external master planner, 2019).*

5.2.2. BMCC/BMC

For BMCC, the development of the Gangseo-gu area was a great opportunity. Since 1996, the population of Busan has been decreasing, transforming it into an 'ageing society' in 2002, with the lowest level of fertility among the cities of South Korea; the city will become a super-aged society by 2022. There is also concern regarding the decreasing number of the working-age population and the loss of many knowledge workers. Additionally, economic growth has slowed (Figure 3). Due to the diminution of Busan's global competitiveness, small- and middle-sized local enterprises face global challenges, which has impacted the unemployment rate. Thus, located in the western periphery of South Korea and with the high potential area of Busan having always been under developmental pressure, BMCC and BMC were motivated to develop the area. Thus, there was no reason to reject the pilot project, which would help establish an innovative industrial ecosystem, thereby attracting young knowledge workers.

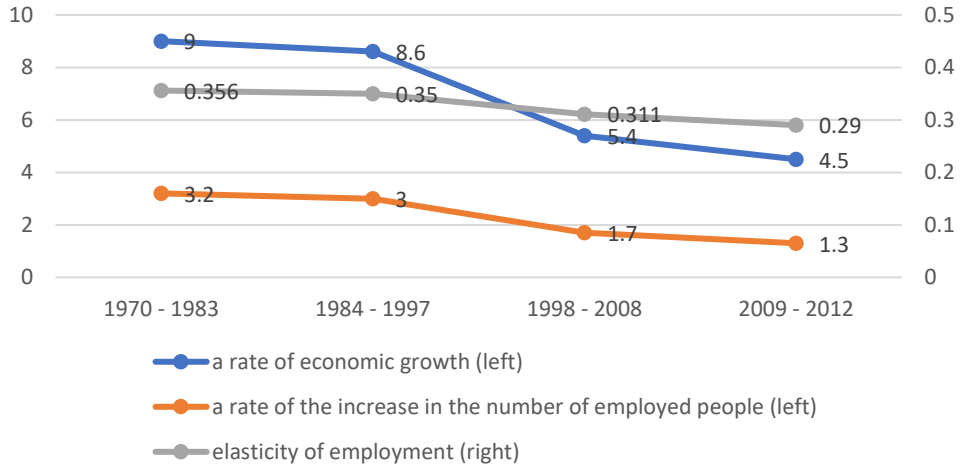

Figure 3. Unemployment rate in Busan.

5.2.3. PCFIR

PCFIR was founded based on the Presidential Decree on the Creation and Management of the PCFIR, promulgated in 2017 [63]. The organisation mainly aims to create national master plans and strategies regarding the fourth industrial revolution [64]. In this context, the PCFIR and central government wanted to use EDC as an experimental project to produce a standard for smart city development. PCFIR promoted a relationship with international partners during the implementation of the EDC project, an essential prerequisite for the successful mobilisation of knowledge and policy. Based on the PCFIR's efforts to create a global standard for smart cities, both the central and local governments intended to commercialise EDC as a Korean smart city model to export to other countries and cities [65] (please see Table 5).

Table 5. Actors in the EDC project.

Actors	Visions for the EDC Project
K-Water	Financial benefit from the project
BMCC/BMC	Revitalisation of the local area through industrial input
MoLIT, PCFIR	Representative case of smart city development
Ministry of Environment (MoE)	Priority of water quality and supply rather than waterfront development

5.2.4. Authority: MoLIT and MoE

For the legally authorised bureaus, their particular aspiration for EDC was simply an implementation of the whole urban development. Under Korea's planning system, MoLIT

was the legal authority granting permission for EDC's development under 'the Special Act on the Utilization of Waterfronts' until 2018. Thus, EDC urban development processes and the pilot smart city area plans were authorised by MoLIT. K-Water, as a primary developer, was controlled by MoLIT throughout the development process.

In May 2018, while the EDC planning process was still ongoing, there was an announcement from the central government that the control by K-Water had been transferred from MoLIT to the Ministry of Environment (MoE), whose main interest was to preserve water-related resources and water quality, rather than development. However, MoLIT retained some influence on the project and operated as one of the governmental actors in the EDC's smart city development. For example, in 2019, after changing the primary jurisdiction bureau, MoLIT announced a competition for 'an activation project for the national pilot city regulation defer system' in connection with the two national pilot smart cities.

6. Precarious Network: Multiple Conceptualisation of Smartness

The EDC's development process was delayed and not implemented as planned initially. From the interviews and document reviews, this paper finds that one of the main reasons for those changes is because BMCC, K-Water, and the external master planner had different definitions of smart cities. The misaligned aspirations made the project network precarious. For BMCC, the idea of the smart city was a developed version of U-City, a concept they had previously pursued. In 2005, the Busan Metropolitan City was introduced by the Financial Times as the first city in the world where the U-City masterplan had been officially established. In the U-City project, BMCC usually focused on creating ICT-centered urban services and governance. From this experience, BMCC believed the idea of the smart city to be equal to the U-City concept that is also found in the definition of 'smart city' in the 'Smart City Act'.

> *'Smart City Act' defines 'smart city' as a sustainable city that provides a variety of city services through urban infrastructure constructed with the convergence of ICT and land development technology to improve the competitiveness of the city and the quality of life* [66].

Although the actual developer of EDC was K-Water, this project was led by the national smart city master planners from the PCFIR. There were two master planners: internal and external. The internal master planner engaged with K-Water, while the external master planner was hired by the PCFIR. Master planners have a unique position (a central point) in the organogram of the EDC project (Figure 4) and thus have authority throughout the implementation of a project. Both the master planners and the main developers are decision-makers. The main developers concentrate on establishing contracts with private firms for constructing the new urban space based on specific technologies, creating the next generation of industrial clusters. Developers build a relationship with domestic and global firms through the master planner's (mainly the external master planner's) recommendation. In this vein, the master planners are another means of 'smart city' mobilisation in the EDC project. Simultaneously, the master planners cooperate and share ideas (solid arrow). Under the smart city guideline publicised by the central government, they communicate with several branches of the national government (for regulations and restrictions), academia and research institutes (for cutting-edge technology and theories) through several consultations (empty arrow). Thus, master planners usually play roles as facilitators who can support the main developers' implementation of a project.

The main developers aimed to concentrate on establishing and maintaining a technical perspective of urban infrastructure rather than managing the city. As a member of the main developer (K-Water), the internal master planner also preferred to find visible outcomes (for instance, new buildings, roads, and visitors).

> *Eco-delta City will be the first smart city which uses highly developed several technologies within the urban area: a city performance evaluation and certification tool. In particular, three main areas—planning (innovation in process), construction (innovation in technol-*

ogy) and management (innovation in public participation)—will be critically examined within the development of Asian KPIs

(Interview with former internal master planner, 2018).

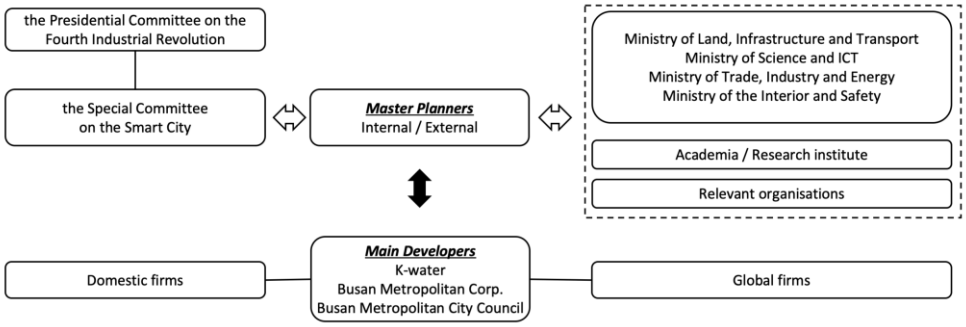

Figure 4. Organogram in the EDC project (source: author's own).

On this background, one of the global programmes and ideas which main developers and the internal master planners attempted to adapt in the Eco-delta City is the Key Performance Indicators (KPIs) for smart cities. Not only the main developers (K-Water and BMC) but also the central government focused on the global standardisation of the smart city model. There were no global guidelines or ultimate indicators that could assess the level of a smart city, even though some organisations developed their individual KPIs. Hence, civil servants in the South Korean government sought to create standards for assessment regarding a smart city. Through the development of KPIs, they also hoped that such a developed Korean standard for smart cities would later become a global standard in the long term. They believed that if the Korean standard for a smart city is able to achieve a global reputation, the Korean smart city model (Eco-delta City) could be exported globally.

The internal master planner particularly paid attention to KPIs for smart cities from European Nations (EU) and the International Telecommunication Union (ITU). Both organisations already developed and suggested KPIs as a measurement of the city's progress towards their smart city goals.

In 2017, the Act on the Promotion of Smart City Development and Industry was partly revised, and it provided significant support for KPIs for a smart city [67]. Under the revised Act, the national pilot smart city had to set up KPIs as well as the aims of its business, and had to announce its performance level to improve the efficiency and effectiveness of the smart city project. The Key Performance Indicators (Figure 5) are divided into core and advanced indicators. There are three basic agendas of measurement: People, Technology, and Nature. Each agenda has a couple of aims such as '5 years longer healthy life' and 'work & life balance' in people; '28,000 jobs' and '124 h saved' in technology; and 'energy plus 20%' and 'recycle 100%' in nature. Under the aims, four or five core indicators are established. For instance, in terms of people, there are five core indicators: natural disaster, social disaster, health, living environment, and workplace environment. Another five core indicators are handled in nature: transportation, renewable energy, construction, water, and waste. In the field of technology, four core indicators were developed: innovative industrial ecosystem, construction, transportation, and life-related services. Advanced indicators provide more in-depth perspectives of smart cities, such as the progress of detailed initiatives [68]. The developers created 35 advanced indicators.

At the initial stage of the development of the national pilot project, the two master planners set a vision of the Eco-delta City as a 'global innovative growing future city in combination with human, nature, and technology'. Based on this vision, three aims were created: a city where work and rest coexist; a city where humans and nature coexist and an innovative city which contributes to the achievement of sustainable development. However, the two master planners (internal and external) showed different detailed views on the project and on the concept of a smart city.

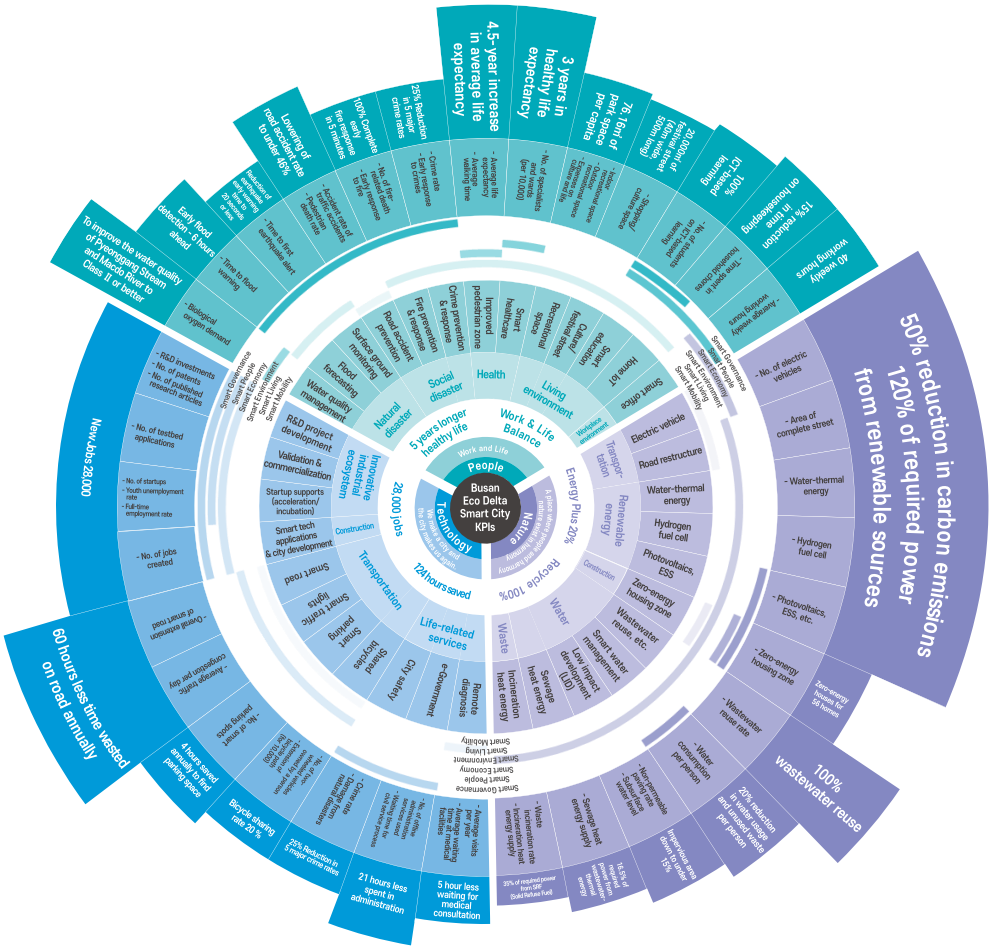

Figure 5. Key Performance Indicators in the EDC project (source: K-Water)).

For instance, the external master planner ran a business incubator firm in London as a British accelerator supporting Fintech and smart city technology companies. He had many years of experience in training start-ups, particularly in Singapore, Hong Kong, and London. Rather than creating several visible outcomes, the external master planner considered smart cities to be tools to prepare the next generation of industries by creating a business-friendly environment. His comment following his resignation as the external master planner describes his thoughts:

> *"There was not a smart city in Busan. There is not a smart city in Busan. Eventually, there will not be a smart city in Busan, even in South Korea as well. They [the main developers] were still focusing on property-led development, which was a very general and popular approach for urban development in the 1990s and 2000s. Yet, it would not work for now. It's almost the 2020s. In my opinion, without the next generation of industry, the city should disappear, and this will impact on South Korea simultaneously. They [the main developers] had no idea how to invite innovative start-ups and how to create a new generation of industry in Busan. South Korea government should also consider this issue urgently".*
>
> *(Interview with the former external master planner, 2019)*

Interestingly, the South Korean government were aware of this different view on the concept of a smart city prior to recruiting him. The committee intended to use his experience and knowledge of smart cities because he was familiar with several of the programmes, policies, and challenges for private firms (start-ups) involved in smart city industries. This means that the South Korean government might believe that learning from

a developed country's ideas and policies regarding smart cities would be useful and could be adopted in South Korea:

> *"I cannot say this is what they [the main developers] thought precisely. This is my opinion. However, I believe that they gave me tacit approval for my approach focusing on the establishment of new industry (not on the short-term and visual outcomes) even though the internal master planner did not have the very same approach".*
>
> *(Interview with the former external master planner, 2019)*

However, different conceptualisations have impacted on the aims and objectives of the EDC project. This has brought about a delay in the delivery of the project and a restructuring of the governance system of the decision-making process within the project. Fundamentally, the main reason for the precariousness and stop–start progression of the network is the different perspectives of the master planners and developers, as well as the loosened relationship and failure to make objectives of the two parts—master planners and the developers—that are aligned as the same, is critical one. As a result, the master planners resigned and initiatives suggested by the master planners were partly implemented with a delay of the project for a certain period of time.

7. The Process of Government-Led Urban Development

In the South Korean context, the bureaucratic procedures complicated the policy mobility process. The main developers asserted that the South Korean government's regulations should have been considered [69]. The unique governance system and the protocol of urban development also affected the adoption of the smart city concept in South Korea.

> *"In the United Kingdom, there is no government agency which prohibits and regulates the private firms' suggestions before creating their outcomes. This type of simple and light governance system encourages private firms to develop their idea and to secure autonomy (and flexibility) during the development process"*
>
> *(Interview with academia in the field of smart city, 2019).*

Conversely, regarding EDC, every programme was managed by either local (BMCC and BMC) or national government (K-Water). In other words, if private firms wished to develop a programme within the EDC platform, they needed to adhere to government restrictions and regulations, which would require additional time and effort.

> *"Developers claimed that they will create a regulatory sandbox, especially for motivating private firms to develop their ideas and programmes without restrictions and regulations. However, it did not work because they didn't know to what extent they eased the restrictions and regulations. Furthermore, a certain number of private firms were chosen as a member who can achieve specific resources (e.g., economic support, technical advice, etc.) by the national government. This means that such firms have to be supervised by the government even though they deliver their project within the regulatory sandbox".*
>
> *(Interview with the former external master planner, 2019)*

Although the external master planner suggested that this type of governance system and process should be modified for the implementation of the EDC project, his suggestion was indirectly denied. Similar to a previous large-scale urban development project—Centum City—the EDC project was implemented and funded by both national and local governments. Thus, civil servants (in the group of developers) argued that they had to manage the whole process. This caused different outcomes for the smart city project, regardless of policy mobility processes, which could be interpreted as a failure of policy mobility.

8. Conclusions

This article has explored the urban development process of EDC in South Korea under the smart city paradigm. This research verifies the value of focusing on actor relations

to understand how the smart city paradigm (universal paradigm) operates and can be applied to local/practical urban development processes. This study did not assess the success or failure of EDC's urban development. The key focus of this discussion was to follow the controversial moment when the broad, global idea of the smart city met a specific society's planning system and the power relations between the actors. It has identified the importance of actor-relations in the development process and how these contribute to planning and design results and elaborate policy mobility.

Discussions of the three research questions which make up the main research question are given below.

- *How Is the Smart City Paradigm Empowered as a Development Concept by Local Political and Economic Actors' Aspirations?*

In the case of EDC, the smart city mobilisation emerged from the actor-relations rather than from the objectively defined consensus of the society. The smart city development was initiated from the interrelations of different and multiple purposes; K-Water, a key player, transferred BMCC to the development project and moved the central government bureaus, MoLIT and PCFIR. K-Water needed financially successful urban development by promoting the smart city concept and BMCC needed a growth engine for the relatively underdeveloped area of its boundary; the central bureaus were searching for a testbed for standardised smart city urban development. All the different aspirations could be aligned, under K-Water's and BMCC's network relations, under the mobilisation of the smart city concept.

- *How Do Different Conceptualisations of the Smart City Affect the Process of Smart City Mobility?*

There is no single case of a successful smartness mobilisation but there are multiple. The multiple ways of mobilisation competed and challenged each other within the local context. The actors involved in the process of development, including the master planners, had different conceptualisations of the smart city. Unlike the different objectives between the actors, the varying conceptions of the smart city hindered the process, damaging the network. After the initial network was changed, the development process could progress slowly. Whatever type of smart city idea is adopted, the critical point that this case study indicates is the importance of a unified idea between actors.

- *How Did South Korea's Government-Led Development Affect the Smart City Adaptation Process?*

South Korea has a long history of government-led urban development, which has a complicated multilevel bureaucratic process. There were two main obstacles in the EDC process caused by this planning system. Firstly, the system has a narrow scope in which to hold the newly introduced technologies that have never been applied in the city. In this hierarchical planning system, the government's permission process also prevents bottom-up and lower-level actors' creative suggestions from being processed. Secondly, multiple bureaus can affect development schemes and can be a burden to the application of new ideas. In the case of EDC, the bureaus involved held different ideas about smart cities, making the whole development network precarious.

In the government-led development system, the bureau's authority and the developer's aspirations must be carefully examined before the project begins. Maintaining an aligned and unified conception of what is being developed is critical. Therefore, there must be a careful investigation into the formal process and into the actors; the mobilisation of the smart city must be presented before the urban development process is established. This paper recognises no archetype of urban smartness, as there exist different and controversial examples of this [7]. There is no single successful 'smart city package' that can be exported to and planted in diverse societies with different urban and economic contexts.

From the analysis, in the case of EDC, the smart city concept is not a ready-made frame that is waiting to be applied in the real world. Rather than this, the case of EDC shows that smartness is a generic and floating entity that is continually changing by the actor-relations throughout the process. As Crivello [11] argues, there is no single case of a successful smart

city to imitate and there are very different and controversial examples. The analysis of this study verifies that the initially brought smartness framed by the government was not accepted intactly but was contested, affiliated, and compounded by the actor relations. In other words, a smart city is made not by a single mind but by the actual local actors' unique means of relations—institutions, individuals, bureaus, and others. In addition, this study also verifies that the assemblage approach is one of the most suitable tools in proceeding and evaluating smart city development which can provide an in-depth understanding of the actual operations of the project's network. However, the detailed means of using the assemblage tool in the smart city project, or any other policy mobilisation case, needs to be further studied in greater depth. Furthermore, future research will compare diverse smart city case studies in South Korea and will investigate whether such cases will be generalised under the answers discussed above.

Author Contributions: Conceptualization, D.H.; methodology, D.H., J.H.K.; formal analysis, D.H., J.H.K.; investigation, D.H.; resources, D.H.; data curation, D.H., J.H.K.; writing—original draft preparation, D.H., J.H.K.; writing—review and editing, J.H.K., D.H.; visualization, D.H.; supervision, J.H.K.; project administration, J.H.K., D.H.; funding acquisition, J.H.K. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by Pusan National University, a 2-Year Research Grant (ref: 202014110002).

Institutional Review Board Statement: The study was approved by UCL Research Ethics Committee (Approval Code: 12281/001 Approval Date: 24 November 2017).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Not Applicable.

Conflicts of Interest: The authors declare no conflict of interest.

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