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Arbeidsnotat nr. 1025/08  
ISSN-nr.: 0804-1873  
Antall sider: 15

Prosjekt nr:  
Prosjekt tittel:  
Oppdragsgiver:

*An Inquiry into the Infrastructural Conditions of  
Early Modern and Late Modern Urban Spaces*

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## FOREWORD

Based on dr.polit dissertation in human geography, University of Oslo (2003): *Constructing Urban Technology – Producing Urban Space. The Case of Geomatics in the Transformation of Water and Road Infrastructures.*

# CONTENTS

- FOREWORD..... 1**
- 1 INTRODUCTION..... 3**
- 2 THE BASIC THESIS..... 4**
- 3 THE RISE AND FALL OF THE MODERN IDEAL OF INTEGRATED INFRASTRUCTURES..... 6**
  - 3.1 The Rise of the Modern Ideal of Integrated Infrastructures..... 6
    - 3.1.1 The Main Thesis of Graham and Marvin ..... 6
    - 3.1.2 The First ‘Pillar’: Ideological Beliefs in Modernity ..... 7
    - 3.1.3 The Second ‘Pillar’: Theory and Practice in Modern Urban Planning..... 8
    - 3.1.4 The Third ‘Pillar’: New Types of Mass Production and Consumption..... 9
    - 3.1.5 The Fourth ‘Pillar’: Governing and Regulating Infrastructures ..... 9
  - 3.2 The Fall of the Modern Ideal of Integrated Infrastructures..... 9
    - 3.2.1 The Main Thesis of Graham and Marvin ..... 9
    - 3.2.2 The First Shift: The ‘Crisis’ of Urban Infrastructures ..... 10
    - 3.2.3 The Second Shift: Changing Political Economies of Infrastructures ..... 11
    - 3.2.4 The Third Shift: Collapsing Ideals in Urban Planning ..... 11
    - 3.2.5 The Fourth Shift: Transformations of the Urban Landscape ..... 12
    - 3.2.6 The Fifth Shift: Challenging Socio-Cultural and Political Changes..... 12
- 4 CONCLUSIONS..... 14**
- REFERENCES..... 15**

# 1 INTRODUCTION

The purpose of this essay is to explore a thesis put forward by David Harvey in his book *The Condition of Postmodernity* (1989). This exploration is conducted in the context of urban infrastructural space. Through history, two parallel and closely interrelated processes have been observed in urbanised environments worldwide. The first and most encompassing set of processes is the wide range of transformations, reconstructions and processes of social production of urban space continually going on around the world. This complex set of processes form the background and the wider context for the phenomena inquired into here. The second set of processes is the parallel transformations of urban technology, or infrastructure networks, taking place within urban spaces around the globe. This constitutes the foreground and the object of interest in the following.

The historical development of infrastructure networks is closely intertwined with the history of urbanisation itself. The built spaces of circulation, flow and mobility - the spaces of electricity, gas, water and sewage, transport and communications - forms the necessary socio-material basis for living in urban areas. The solutions to provision of such services to continuously growing urban populations around the world have manifested themselves in a variety of different infrastructure networks. These solutions have distinctive technological, economic and institutional/organisational features that vary both across time and across space and they constitute conditions for socio-spatial relations and spatial practices.

A very brief historical sketch would start in the latter part of the 19<sup>th</sup> century with the emergence of a range of small networks serving local demands. These networks were gradually integrated into larger networks covering regional and national territories and serving the demands of population in these areas. The last 30 years has seen the gradual disintegration of such encompassing, often publicly owned and monopolistic, networks through a range of different forms of privatisation, liberalisation and deregulation. Graham and Marvin (2001) provide a perceptive account of this history through outlining the rise and fall of what they term 'the modern integrated infrastructural ideal'.

## 2 THE BASIC THESIS

According to David Harvey (1989b: vii), the underlying rules of capitalist accumulation has become manifest as “shifts in surface appearance” within several societal domains, including “the rise of postmodernist cultural forms, the emergence of more flexible modes of capital accumulation, and a new round of ‘time-space compression’ in the organization of capitalism”. Thus, in a political economic interpretation of what is currently taking place within urban built environments in general and urban infrastructural spaces in particular, the observed rise and fall of the modern integrated ideal could be seen - following Harvey’s argument - as a domain-specific parallel to the other noted shifts - based on the same underlying rules of capitalist accumulation and the concomitant “sea-change in political-economic practices” (ibid.).

In coining the core concept of *time-space compression*, Harvey mean to signal “processes that so revolutionize the objective qualities of space and time that we are forced to alter, sometimes in quite radical ways, how we represent the world to ourselves” (ibid.: 240).<sup>1</sup> More specifically, by using the term *compression* Harvey is making a strong case “that the history of capitalism has been characterized by speed-up in the pace of life, while so overcoming spatial barriers that the world sometimes seems to collapse inward upon us” (ibid.). As time and space barriers in many fields of contemporary life seem to shrink, profoundly mediated by technological innovations, “we have to learn how to cope with an overwhelming sense of compression of our spatial and temporal worlds” (ibid.).

The concept of *time-space compression* can be used to capture the experience of emerging new and uneven geographies of infrastructures, most notable in the increasing *liberation of movement* in time and space manifest in a wide variety of empirical instances of *uneven collapse or reduction of time and space barriers*. On this background, it is clear that the new capacities of infrastructure networks - potentially supported by the application of innovative ICT and geomatics technologies - are the type of empirical phenomena that can be described and analysed with the concept of *time-space compression*.<sup>2</sup>

However, the current wave of application of geomatics technologies to infrastructures and built environments must be seen in “its historical context, as part of a history of successive waves of time-space compression generated out of the pressures of capital accumulation with its perpetual search to annihilate space through time and reduce turnover time” (ibid.: 306-7).

Current instances of time-space compression in the infrastructure networks of the built environment are readily experienced throughout daily life in the lived and experienced spaces that Lefebvre (1991) termed *representational spaces*. However, even if increased convenience of many mundane tasks and spatial practices often is the case, ambivalence is also a common attitude among theorists towards the experience of phenomena like time-space compression, the annihilation of space through time, speed-up of social interaction and increased mobility. Thus, the problematic issue of overcoming the ‘friction

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<sup>1</sup> The effects of time-space compression should in some cases be differentiated *within* what, in other instances, are seen as integrated ‘packages’, like the flows of information, money and commodities in a logistical system, because, as Askildsen (2003: 78) argue, “while information flows have been digitalised, the material (commodity) flows are still analogue, and subject to a far slower process of time-space compression than the information flows”.

<sup>2</sup> Curry (1998: 2) claims that geographer’s have been relatively uninterested in the geographical implications of telecommunications and point out their failure to recognise and follow up “on precursors to Harvey’s concept, as in Don Janelle’s (1969) ‘space-time convergence’”.

of distance' remains a focus of technological innovation, for instance within the field of geomatics as shown in Samuelsen (2003).

### 3 THE RISE AND FALL OF THE MODERN IDEAL OF INTEGRATED INFRASTRUCTURES

In the same sense as Harvey gave *The Condition of Postmodernity* the subtitle ‘*An Inquiry Into the Origins of Cultural Change*’ - a change manifest in a transition from modernity to postmodernity underpinned by transitions in the political economy - the thesis explored here can be seen as ‘an inquiry into the origins of infrastructural change’, also underpinned by - *inter alia* - transitions in the political economy.

Several references to the historical development of the infrastructural spaces of modern, industrialised and urban society has already been made above. At this point in the inquiry, therefore, it seems worthwhile to provide a more detailed account of the historical development and change of urban infrastructure systems and networks since the mid-19th century. This account provided by Graham and Marvin (2001) - an account that could truly be termed *The Rise and Fall of Urban Infrastructures* - is one of the most comprehensive available.<sup>3</sup> The main thesis of Graham and Marvin is that the interplay between infrastructures and urban development the last 150 years can be understood in a specific way: as the rise and fall of what they term *the modern integrated infrastructural ideal*. In the history of urbanization, this ideal represented a logic underpinning solutions to urban problems that prevailed for about 100 years. The ideal can be seen as emerging from around the middle of the 1800s until it gradually started to disintegrate from just after the middle of the 1900s. Their account of this thesis seems especially relevant in that first, it covers all types of networked infrastructures; second, it does so within an explicitly urban context; and third, it does so within a conceptual framework that is compatible with my own approach. Based on Graham and Marvin’s arguments, it is the last 150 years of development that must be understood in order to grasp what is happening within urban infrastructural spaces today.

First, I briefly outline the rise of *the modern integrated infrastructural ideal* and its role in the social construction of the infrastructural spaces of the modern networked city. Second, I briefly outline the subsequent fall of this ideal and the crisis of the modern networked city, manifest in ongoing transformations of urban infrastructural spaces.

#### 3.1 The Rise of the Modern Ideal of Integrated Infrastructures

I start this part by presenting the main thesis underlying Graham and Marvin’s idea of the rise of a modern ideal of integrated infrastructures between the 1850s and the 1960s. This thesis is based on four elements that I present thereafter.

##### 3.1.1 The Main Thesis of Graham and Marvin

Graham and Marvin’s (2001) main thesis is that from about 1850 a set of ideals emerged that saw planned, publicly regulated or monopolistic transport, telecom, energy and water networks as crucial to social progress. Such notions became “closely wedded to the modern rationalities of urban planning, the elaboration of modern states, and practices and principles of modern urban consumption” (ibid.: 42). Thus, this served as a *representation of space* jointly constructed by planners, engineers, architects, technocrats and politicians (Lefebvre 1991). The period between about 1850 and 1960, they argue, was characterised by

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<sup>3</sup> Arnulf Grubler’s (1989) book, which is actually titled *The Rise and Fall of Infrastructures*, is, in fact, limited to a quantitative investigation of the diffusion of transport technologies.

“a general movement [...] from the piecemeal and fragmented provision of networked infrastructures to an emphasis on centralised and standardised systems. This occurred through a major expansion in both public and private sector investment in infrastructure networks” (Graham and Marvin 2001: 40).

Other networks like water and sewage systems diffused rapidly throughout cities and transport networks were improved to facilitate circulation. The expansion of such systems was supported by the growth of regulated, public network monopolies.

Thus, in this period much of urban politics was dominated by questions of investment in infrastructures and technological solutions to urban problems that arose as Western cities, in particular, “were in transition from the older compact commercial city to the new industrial metropolis with a strong core and a ring of residential suburbs” (ibid.). As systems and networks were integrated across urban landscapes, production, distribution and consumption could gradually be re-established on mass, industrial scales, based on “standardised, regulated networks designed to deliver predictable, dependable services across (and, increasingly, beyond) the metropolis” (ibid.). As the evidence of progressive urban politics, “the elaboration of standardised networked infrastructures thus allowed all aspects of industrial urban life to be extended and intensified” (ibid.: 41). An important driving force was the building of national networks of interconnected roads, rail, telecom, etc.

In Graham and Marvin’s view, changes in culture and philosophy were also intrinsically bound up with the transitions and the gradual building up of an urban infrastructural space that they describe. Such changes were expressed through the gradual recomposition of notions of “space and time, speed and culture, subjects and objects, technology and society” (ibid.). Moreover, they argue, such ideas, which transformed and modernised urban economic, social, cultural and technological landscapes, “were also closely woven into wider rationalities and ideals of the emerging urban planning movement during this period” (ibid.). A central idea within this planning movement was that of “rational, comprehensive planning, driving ‘progress’ towards unitary, coherent and emancipatory cities” (ibid.). Technological networks were seen as tools to control urban space and time. Urban space, as Graham and Marvin argue, “was seen as an object to be rationally manipulated [through the...] the annihilating effect of space and time-transcending sewer, gas, water, road, railway, telegraphy and telephone networks” (ibid.: 42).

In sum Graham and Marvin (ibid.: 41) construct the following broad picture of the period from 1850-1960:

“From the initial, general, picture of heterogeneous, partial networks, of poorly interconnected ‘islands’ of infrastructure and of extreme uneven development in the infrastructural capacities of different urban spaces emerged, [...] single, integrated and standardised road, water, waste, energy and communications grids covering municipalities, cities, regions and even nations. These were legitimised through notions of ubiquity of access, modernisation and societal progress, all within the rubric of widening state power”.

This thesis of the emergence of urban infrastructural spaces can be further underpinned in terms of four ‘pillars’ upon which the modern integrated infrastructural ideal was constructed, starting with a set of ideological beliefs in modernity. As the modern integrated ideal can be seen as the logic underlying the historical emergence of urban infrastructural spaces, the four ‘pillars’ also constitute central elements in the understanding of this spatial dimension of urban society. This implies that an exploration of these four ‘pillars’ provides insight into the historical constitution of the infrastructural spaces currently undergoing transformation.

### **3.1.2 The First ‘Pillar’: Ideological Beliefs in Modernity**

Graham and Marvin identify the first ‘pillar’ in what they term “a powerful set of ideological beliefs asserting the positive transformative power of modern science and networked technologies” (ibid.: 43). They observe that such beliefs “came to be accepted as the basis of planning, policy, development and management” and that “energy, water, transport, streets and communications grids became [...]

closely associated with modern ideologies, allocating them apparent power to bind and connect cities, transforming them in the process” (ibid.). They emphasise two important elements in this connection. First, the city as “a single, objective entity [...] became a dominant basis of engineering, planning and urban reform debated between 1850 and 1920” (ibid.: 44). This meant that

“the growing corps of urban engineers sought to understand the growing industrial city as a systemic ‘machine’ that needed to be rationally organised as a unitary ‘thing’, using the latest scientific and technological practices available” (ibid.).

Second, networked infrastructures, especially during the period 1880-1940, became “essential supports for the wider application of systems-based engineering techniques to the whole modernisation of metropolitan life” (ibid.). Central here was the increasing electrification of both domestic and industrial spheres (Hughes 1983).

### **3.1.3 The Second ‘Pillar’: Theory and Practice in Modern Urban Planning**

As an important part of the broader project of modernity, Graham and Marvin identify the second ‘pillar’ in theories and practices of modern urban planning.<sup>4</sup> From about 1850 to about 1950, in most Western countries, urban planning with state support was at the core of maintaining what Entrikin term “the integrity of the modernist project” (1989: 34). Supported by ideas of “rationality, science, technology, the celebration of machines, and ideas of ‘modern’ aesthetics, [...] the practices and associated architectural theories of [modern urban planning ushered in] the ‘rationalisation’ of whole urban landscapes” (Graham and Marvin 2001: 49). From the diversity of “practices through which the modern planning ideal of the unitary city was constructed, and how such approaches became predicated on the modern infrastructural ideal”, (ibid.: 52) they highlight a selected set of aspects.

First, they point out how the modern ideal of urban cohesion emerged between 1880 and 1940, not least because social elites “increasingly saw modern urban planning as the mechanism to bring rational, expert-driven practices to the comprehensive reshaping of metropolitan life. Planning was to bring a whole new ‘sociotechnical environment’ to the city” (ibid.: 52). Second, through exploring Haussmann’s plans for the ‘regularisation’ of Paris between 1853 and 1870, they look into the archaeology of the modern notion of comprehensive and integrated street and sewer systems. Here, they identify “the social construction of the very idea that the coordinated infrastructure networks and urban plans might meaningfully connect the dispersed part of the modern industrial city into an ‘organic’ whole, thereby supporting its wider role as a dominant national and international metropolis” (ibid.: 55)

Third, Graham and Marvin explore how urban reformers and social elites, in the period 1880-1940, constructed “the notion that comprehensive underground urban water and sewage systems served to ‘domesticate’ and cleanse the unruly ‘body’ of the modern city” (ibid.: 55). In this period water “became urbanised and commodified as another component in the infrastructural ‘binding’ of the city through standardised infrastructure systems, accessible through single systems” (ibid.: 56). Fourth, they note how “Haussmann’s idea of the ‘regularisation’ of the city through standardised, integrated networked infrastructures linked seamlessly with wider ideals then developing in the fast-emerging urban planning movement of the period” (ibid.: 59). Central here were notions of the comprehensive urban development plan, plans for urban beautification, efforts at technological standardisation and regulation, the emergence of the grid as the norm for organising urban expansion, the use of functional zoning and “an influential range of utopian urban schemes that emerged during the first half of the twentieth century” (ibid.: 62).

Finally, they note how these strands - over the period 1880-1960 - were brought together, taking “the notion of the unitary, networked city to an unassailable, axiomatic position at the hearth of modern urban planning practice” (ibid.: 62). Central to this urban planning practice in the period were “a dominant rhetoric [or discourse] which idealised the notion of the orderly, unitary city, tied together by a visible and non-visible web of standardised infrastructure grids” (ibid.). Much of the thinking

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<sup>4</sup> For a more comprehensive account of modern urban planning see Hall (2002).

rested on the notion of the city as an organism or machine that could be rationally planned and managed by city builders based on scientific knowledge.

### **3.1.4 The Third ‘Pillar’: New Types of Mass Production and Consumption**

Graham and Marvin identify the third ‘pillar’ in the modern networked ideal in what they term “new types of mass production and consumption between 1920 and 1960”. (ibid.: 66). These new types were supported by the ruling ideologies of technology and planning practices and were mediated by standard infrastructure networks. In this period, the so-called *Fordist* systems of mass production, distribution and consumption were elaborated in most Western countries” (ibid.). The requirements of industry in organising their “complex and territorially dispersed production systems [...] were met by massive national and local state investment in standardised and dependable infrastructure services” (ibid.). At the same time these new networks also “underpinned new cultures of domestic mass consumption of a vast range of goods and services over unprecedented distances” (ibid.: 68). Central here was, for instance, the emergence of the modern networked home, a central element in lived spaces (Lefebvre 1991). What is important in this connection is that “all aspects of Fordist social and economic life became predicated on access to the integrated energy, transport, water and communications grids so central to the modern planning ideals of the time” (ibid.: 66).

### **3.1.5 The Fourth ‘Pillar’: Governing and Regulating Infrastructures**

Graham and Marvin identify the fourth ‘pillar’ in the “efforts by governments and states to support the shift to regulated, near universal access to infrastructure networks across cities, regions and nations” (ibid.: 73). They point out that between 1900 and 1960 there was widespread agreement “about the need to roll out rapidly a relatively standardised set of technologies to the city and the wider, urbanising nation. The general view was that infrastructure networks needed to be delivered by social institutions based on private or public monopoly control” (ibid.). In this period, there was a shift from a diversity of local, privately owned to nationally regulated, and often owned, networks. As the modern nation state emerged, infrastructure became an essential focus of its power, legitimacy and territorial definition and there was a high degree of public involvement in its provision. Three features of networks underpinned this: first, they were most effectively managed through ‘*natural monopolies*’; second, they were largely considered to be ‘*public goods*’; and third, they created *negative ‘spillovers’* or ‘*externalities*’ that the public should take responsibility for.

Through this account of the rise of the modern ideal of integrated infrastructures, we can begin to see the significance of the contemporary shifts towards the widespread unravelling of this ideal. I can now address the question of why the modern integrated ideal can be seen as disintegrating. By investigating this question, I can provide insight into the historical emergence of some of the forces contributing to the reconstitution and transformation of urban infrastructural spaces currently taking place virtually all over the urbanised world.

## **3.2 The Fall of the Modern Ideal of Integrated Infrastructures**

I start this part by presenting the main thesis underlying Graham and Marvin’s idea of the fall of the modern integrated infrastructural ideal since the 1960s. This thesis is based on five shifts or forces of change that I present thereafter.

### **3.2.1 The Main Thesis of Graham and Marvin**

Graham and Marvin’s (2001) main thesis is that since the end of the 1960s the assumptions underlying the modern urban infrastructural ideal, and its results in practice, came under a series of powerful critiques. As they argue:

“Most of the central tenets of the ideal - the need for public or private infrastructure monopolies, for singular and standardized technological grids across territories, for the ‘binding’ of cities into supposedly ‘coherent’ entities - became deeply problematic and difficult to defend” (ibid.: 91).

Thirty years later, as the critique has become widespread, a rapidly decreasing number of infrastructure networks are developed and managed along the ‘pure’ lines of the modern integrated ideal. This rapid transformation in the logics underpinning urban infrastructure is supported by a set of wider societal and technical shifts has creating a more volatile context characterised by processes of privatisation, liberalisation, globalisation and the application of new technologies. Graham and Marvin highlight four aspects of this context challenging the integrated ideal.

First, the rise of the modern infrastructural ideal culminated in parallel with the long capitalist boom from the 1950s to the 1970s. In this period, Graham and Marvin argue, the ideal “reached virtually hegemonic dominance in most Western cities” (ibid.). However, significant shifts in economy, politics and culture “have surrounded the emergence of an intensely, but unevenly, interconnected global capitalist economy, society and culture” (ibid.) that has contributed to the gradual disintegration of the integrated ideal.

Second, the application of the modern integrated ideal in Western nations was especially profound within the Keynesian welfare states that now, in its latter stages, everywhere experience serious crises concerning both fiscal matters and legitimacy. What seems to be at stake across the world is that “politically neoliberal critiques of the ‘inefficiencies’ of centralised public control and ownership have fuelled a widespread wave of infrastructural liberalisation and privatisation that is still accelerating” (ibid.). Thus, the integrated ideal seems to clash with neoliberal politics.

Third, drawing on Leonard (1997), Graham and Marvin point out that perhaps the most important factor has been “a dramatic, ‘global assertion of the moral superiority of individual choice compared to the “tyranny” of collective decision making”” (Leonard ibid.: 4, in Graham and Marvin ibid.). New models of infrastructural competition based on liberalised networks and the free play of market forces “are widely attested to deserve hegemonic status as modes of distributing many types of goods and services previously considered to be ‘public’” (ibid.). The influential lobbying of transnational firms is a strong driving force here.

Fourth, powerful social and cultural critiques have joined with the above geopolitical and economic shifts in exposing the inadequacies of the modern infrastructural ideal. Here, Graham and Marvin (ibid.: 92) point out a wide range of views:

“In particular, feminist, anti-racist, postcolonialist and environmentalist critiques have dramatically exposed the social, gender and environmental biases inherent within the various elaborations of the modern infrastructural ideal. Finally, notions of urban planning and the city have also experienced radical overhaul, with the demise of the idea that it is either possible or desirable comprehensively and rigidly to plan ‘order’ and ‘rationality’ into the form, structure and life of cities”.

Graham and Marvin further present these complex and diverse shifts in a sweeping, but selective, exploration of “the interlocking critiques and challenges that [...] have so effectively undermined the modern infrastructural ideal - in the process demolishing the four ‘pillars’ upon which it was constructed” (ibid.). Above, these four ‘pillars’ was seen as central elements in the historical constitution of urban infrastructural spaces. These critical issues are presented in terms of five shifts underlying the disintegration of that basic technocratic representation of space termed ‘the modern integrated infrastructural ideal’ and issuing in the current transformations.

### **3.2.2 The First Shift: The ‘Crisis’ of Urban Infrastructures**

The first shift contributing to the fall of the integrated ideal is identified by Graham and Marvin as “a perceived ‘crisis’ in the infrastructural underpinnings of urban life across the developed, developing and post-communist world, especially since the late 1960s” (ibid.). Debates since this time has evolved around a concern that “the physical deterioration of infrastructure, the lack of spending on new facilities, and a huge backlog in maintenance and rehabilitation, actually threaten to slow and even reverse economic growth in cities” (ibid.: 93).

### 3.2.3 The Second Shift: Changing Political Economies of Infrastructures

The second shift contributing to the fall of the integrated ideal is identified by Graham and Marvin as closely related to “the wholesale political economic shift in processes of urban and infrastructural development that has occurred since the early 1970s” (ibid.: 95). Central here is privatisation of public infrastructures as economic problems have forced all types of nation states “to explore transferring some or all of their infrastructure operations to private operators, in search for the ‘one off’ spoils of privatisation” (ibid.).<sup>5</sup> Moreover, multinational firms play an increasingly important role in reshaping infrastructures. Graham and Marvin highlight three aspects of this wide-ranging transition in the political economy of infrastructure.

The first aspect is “the retreat of state-backed, collectivised forms of urban infrastructure provision” (ibid.: 95-96). What is observed in many economic and urban contexts globally, is that public governments are making it easier for private companies to enter into infrastructure markets that were previously monopolistic. Such privatisation enables “many new, customised infrastructure networks to be overlaid within, through, above and below the monopolistic legacies of modern infrastructural planning and development” (ibid.: 96). Increasingly, nation states are seen to encourage liberalised competition as a strategy in infrastructure provision.

The second aspect is “the rising imperative of ‘competing’ locally through particular configurations of urban infrastructure” (ibid.: 96). This feature is also observed in virtually all economic and urban contexts around the world expressed in ‘entrepreneurially’ based competition between cities and regions through their development agencies involved in building

“networked infrastructures that they think will lure foreign and tourist-related investment, and so position their cities favourably within divisions of labour that are being constructed across international borders with unprecedented precision” (ibid.: 100).

The third aspect is “the widespread retreat of the idea that networked services are ‘public’ services that should be available to all at standard tariffs” (ibid.: 96). A typical manifestation of the changing political economies of cities and infrastructure is a tendency to ‘*decollectivise*’ the provision of energy, water, waste, transport and telecom services. Thus, either “their status as quasi-public goods to be consumed by all, at similar, generalised, tariffs” (ibid.: 102) is effectively reduced or a profound remodelling and recommodification of infrastructure services emerge, enabling their distribution by liberalised, competing providers within de-regulated markets.

### 3.2.4 The Third Shift: Collapsing Ideals in Urban Planning

As the third shift contributing to the fall of the integrated ideal, Graham and Marvin (ibid.: 103) argue that notions of comprehensive and ‘rational’ urban planning has also collapsed:

“The technocratic and comprehensive styles of urban planning most closely allied with the rolling out of the modern infrastructural ideal have also found it difficult to survive the shift to an increasingly globalised political economy driven by liberalised flows of capital, technology and information. It has also lost much of its legitimacy in Western nations as a result of being undermined by powerful ‘postmodern’ social and cultural critiques”.

Several strands constitute this critique of the rationales of modern urban planning that rose to prominence during the period of the urban infrastructural crisis. Only a few can be dealt with here. First, they argue (ibid.: 104),

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<sup>5</sup> This trend, driven by liberal/neo-conservative ideology, is readily observed in Norway. Local, public electricity works and power stations are sold to private interests. In some cases hundreds of millions NOK in revenues has been quickly lost through overly optimistic speculation on the stock exchange. Due to adaptation to the European Union, Norwegian legislation is currently changed in ways that facilitate privatisation of municipal water networks.

“increasingly vociferous economic sectors and firms argued that such plans were inflexible, unwieldy, and failed to deliver infrastructure networks able to meet their increasingly sophisticated locational and technological demands”.

Second, this dissatisfaction with comprehensive urban planning seemed to be increasingly shared by many planners themselves based on discouraging experiences with and increasing social resistance to large-scale infrastructure projects:

“Modern urban planning [...] tended to lose confidence in its core notions of ‘progress’, technical rationality and benefits for all as environmental and social movements lambasted its underlying assumptions” (ibid.).

Through close scrutiny, the practical results of comprehensive urban infrastructure planning were sharply criticised, making one critic characterise modern city planning “a supreme delusion” (King 1996: 1, cited in Graham and Marvin *ibid.*: 108).

### **3.2.5 The Fourth Shift: Transformations of the Urban Landscape**

The fourth shift that Graham and Marvin see as contributing to the fall of the integrated ideal is transformations in the urban landscape, more specifically “the physical spread of cities and the widespread shift from traditional core-dominated cities to polycentric and extended urban regions” (*ibid.*: 114-115). Three aspects are highlighted. First, they maintain that current urban trends, based on advanced network capacities, has eroded the traditional monocentric city and supported the rise of the urban periphery. The forms and landscapes of most contemporary cities are now far from the idealised structures of classical urbanism and urban geography. Second, they point out the role of the automobile in such trends: “the extension and growth of urban peripheries is also intimately bound up with the mass diffusion of the automobile and the increasing dominance of car culture within virtually all contemporary urban contexts” (*ibid.*: 117). Third, they argue that infrastructures have enabled the rise of the limitless city and that their use in connecting urban ‘islands’ of economic, social, ethnic and cultural diversity are becoming more and more critical.

### **3.2.6 The Fifth Shift: Challenging Socio-Cultural and Political Changes**

The fifth and last shift contributing to the fall of the integrated ideal is a diverse set of social and cultural changes rooted in interrelated social and political movements. It is such trends that are seen by social theorists like Harvey (1989b) to be central in the alleged shift from the modern to the postmodern urban condition. However, as Graham and Marvin (2001: 123) argue:

“Such transitions have been complex and varied and their interpretation has been fiercely contested. A key element however, has been the ways in which a wide range of new social movements have brought resistance to bear on the technical and ideological assumptions that underpinned the establishment and propagation of the modern [...] ideal”.

Graham and Marvin highlight four strands among social and political movements.

First, they point out the critique arising from the feminist movement that “urban infrastructure, as developed within the rubric of modern urban planning and design, had provided physical services that were central in structuring social relations between men and women in very particular and biased ways” (*ibid.*: 124). Second, they point out the critique based in postcolonial thinking of the usefulness of theories of modernisation and import substitution as the foundation for infrastructure policy and development in third world cities. Third, they point out the critique from the environmental, energy and intermediate technology movements focusing on the relations between “energy supply, infrastructure networks and the vulnerability of societies dependent on external energy sources” (*ibid.*: 133). Fourth, they connect this critique to wider processes of social and cultural change like differentiation of lifestyles, increased mobility and commodification and consumption of urban spaces.

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Through this outlining of Graham and Marvin's (2001) account of the rise and fall of the modern infrastructural ideal, I have provided relevant background knowledge pertaining to the historical constitution and subsequent disintegration of urban infrastructural spaces. This account is in line with the above arguments based on Harvey. Throughout his explorations of the process of urbanisation under a capitalist mode of production a wealth of evidence is presented that fits well into the representation of an emerging modern integrated infra-structural ideal in terms of four 'pillars'. Here, however, only a few points can be provided.

Concerning ideological beliefs in modernity, Harvey (1989b) has thoroughly analysed how these beliefs emerged through the so-called Enlightenment project, in the form of the rise of objective science, the scientific domination of nature, universal morality and law, pursuit of human emancipation, technological innovation and industrialisation. The built environments produced underpinned a certain vision of the role of infrastructures in modernising society. Concerning theory and practice in modern urban planning, Harvey (1989b) places this firmly on the modernist beliefs and point out that "planning and development should focus on large-scale, metropolitan-wide, technologically rational and efficient urban *plans*, backed by absolutely no-frills architecture" (ibid.: 6). Concerning new types of mass production and consumption, Harvey emphasise the historical importance of development in both physical and social infrastructures that could support and underpin the emergence of the economic mode of development termed Fordism. Concerning the government and regulation of these types of infrastructures, public policy was important in securing quality and access (1989b).

## 4 CONCLUSIONS

According to David Harvey, we have seen “a sea-change in cultural as well as in political-economic practices since around 1972. This sea-change is bound up with the emergence of new dominant ways in which we experience space and time” (Harvey 1989: vii). In these new ways of experiencing space and time, and especially in the efforts *to overcome the problems* related to these experiences, infrastructure networks play a significant role. Harvey have further maintained that there are strong a priori grounds for proposing that “there is some kind of necessary relation between the rise of postmodernist cultural forms, the emergence of more flexible modes of capital accumulation, and a new round of ‘time-space compression’ in the organization of capitalism” (ibid.). As further explored in Samuelsen (2003), urban built environments in general and *urban infrastructural space* in particular is one of the domains where this new round of time-space compression - together with broader changes in social, cultural, spatial and political-economic practices - has become manifest, particularly in the last decade.

However, in line with Harvey, I maintain that the profound changes observed within urban infrastructural spaces across the globe should not be seen “as signs of the emergence of some entirely new postcapitalist or even postindustrial society. [Rather,] when set against the rules of capitalistic accumulation [these changes] appear more as shifts in surface appearance” (ibid.). Thus, compared to the simultaneous rise of postmodernist cultural forms, the observed transformation, reconstruction, deregulation and privatisation taking place within urban built environments and infrastructural spaces seem quite mundane and unfashionable appearances. It is this manifestation that Graham and Marvin (2001) have termed the fall of the ‘modern integrated infrastructural ideal’.

It is important to note that, because of the sociomaterial weightiness and momentum of infrastructure networks, the various modes and ways through which these broader changes in social, cultural, spatial and political-economic practices become manifest in the networks constituting urban infrastructural spaces can have profound influence on what Lefebvre (1991) terms *spaces of representation*. As such spaces are constituted by lived life, this means that the everyday life of literally hundreds of millions of people around the world is affected, for instance through the provision of fresh water and functioning sewer systems.

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