1. Infrastructure and Territoriality

Analysis of the Global Infrastructure System (GIS) and the forces shaping its form and evolution lie at the core of this book. Central to this analysis is the contention that the GIS is based on the interaction between and within state-based territorial infrastructure systems (termed here the National Infrastructure System, NIS). The approach is based on the proposition that states infrastructure as a means of establishing and sustaining territoriality, defined here as the ‘behaviour that uses a bounded space, a territory, as the instrument for securing a particular outcome’ (Taylor, 1995, p. 151). Throughout this book, the state is positioned as the main source of territoriality within the global system and, as a means of securing its objectives, the state will utilise and upgrade existing and establish new physical structures (i.e. infrastructure) across its territory. Infrastructuring is thus viewed as a state strategy designed to enable the control, integration, security and development of a demarcated space. Although such state centric positions have been increasingly questioned (for example, Elden, 2010; Keating, 2013), nevertheless the departure point in this volume is assessing how NIS are shaping and adjusting to the challenge of the globalisation of economic, political and social systems.

This chapter introduces the nature of infrastructure and explores its nexus within the forces of state territoriality. In so doing, the chapter begins to address the main issues shaping the capabilities of infrastructure to operate as an effective tool of state territoriality. This is addressed through the lens of what is termed here as the state’s ‘infrastructural mandate’ (that is, how infrastructure via the NIS enables state territoriality). It is argued that it is this infrastructural mandate that drives state strategy, especially within the context of the GIS, and shapes its evolution.

THE TERRITORIALITY–INFRASTRUCTURE NEXUS

The etymological roots of the word ‘infrastructure’ stem from Latin and refer to ‘the structure beneath’ – that is, the basic physical and organisational structure needed for the operation of a society or enterprise or the supporting structure/base/foundation for a system or organisation. In its
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broadest context, and in the context of this volume, infrastructure refers to the support structure for economy and society. These core facilities support the basic activities needed for a society to function. In modern society this includes all forms of transport, communication, energy, etc. Transport, communications and energy are not of intrinsic value in themselves but rather it is their enabling function that is the source of their utility. For example, the act of being able to transport people or goods from one location to another has no value in itself, but it is what the movement of these people or goods represents in terms of production, security, consumption, etc. that is so important. In short, economic and social development would not have progressed so far without the underpinning support of roads, railways, communication and energy flows.

Over time, the understanding of what constitutes infrastructure has become more complex and ambiguous. Increasingly infrastructure is used as a rather amorphous term which has co-evolved with the development of socio-economic and political systems (for a review, see Howe et al., 2016). When viewed through the lens of territoriality, infrastructure – at its most basic – refers to those physical assets located within a space that enable the territorial authority to assert power over that space (for a fuller examination, see Brenner, 1999a). Contemporary treatments of infrastructure extend beyond a purely physical definition to include the ‘soft’ component of infrastructure systems. Different interpretations of what is meant by the terms ‘hard’ and ‘soft’ infrastructure can cause confusion. Fourie (2006), for example, distinguishes between economic (or hard) infrastructure which promotes economic activity such as transport, telecommunications and energy systems and social (or soft) infrastructure which promotes health, education and cultural dimensions and has an impact on the quality of life such as schools, libraries, universities, hospitals, courts, museums, theatres and recreational facilities. The two categories can and do overlap: education and health provision, for example, are not only important to the quality of life but are also essential for economic activity.

However, although Fourie is not alone in this approach and whilst infrastructure systems can be subdivided in a multitude of ways depending on the context (Neuman, 2006), the definition used within this volume is based on the following (see also Figure 1.1).

**Hard infrastructure**: this refers to the conventional conceptualisation of infrastructures as physical structures that enable and facilitate territoriality. These categories can be subdivided into three categories: communications infrastructures (that is, those that involve the transmission, processing and distribution of human-sourced flows such as transport and information); socio-technical (that is, those structures that enable
the utilisation of – crude or processed – natural endowments to support human activity such as energy and water) and social infrastructures (that is, those physical assets that support social services such as hospitals, schools, etc. and which, according to Fourie constitute soft infrastructure). This volume focuses on those infrastructures that are national systems but which also have to channel extensively transnational flows, namely information, transport and energy infrastructures.

Soft infrastructure: the growing complexity of infrastructure in terms of functional and spatial operations, as well as its increased polycentrism, have increasingly drawn attention to soft infrastructure (Niskanen, 1991). Soft infrastructure constitutes the enabling institutions for the territorial infrastructure system that facilitate both the interworking of the individual and the mutually supporting components through defining the body of rules and regulations that govern their operation and interaction (Portugal-Perez and Wilson, 2012). The regulatory framework is essential to all levels of infrastructure (see later) but it is particularly important to transnational infrastructure, governing as it does issues of eligibility and interoperability in terms of access to particular infrastructure.

Definitions of soft infrastructure are also sometimes extended to include the financing of these systems as well as training programmes, etc. (Brooks and Hummels, 2005). Three main themes (see Figure 1.1) characterise soft infrastructure: institutional design (that is, how these systems are managed and configured to enable the NIS); institutional capability (that is, the human capital within these systems to support territorial needs) and institutional objectives (that is, the objectives of the institutions (in this case the state) and how these affect the configuration of the NIS).

Recognising the increasingly fluid concept of infrastructure (notably with regard to its soft and hard components as well as the interaction between them), Star and Bowker (1995) identify the following core characteristics of infrastructure:

- Infrastructure is embedded within social-economic and technological structures;
- Infrastructure is hidden in many of the tasks it performs and supports;
- Infrastructure has effects beyond a single point in time and space;
- Infrastructure usage has to be learnt as part of a ‘community of practice’;
- Infrastructure co-evolves with the form and nature of its usage (that is, how capacity is shaped by peak flows);
- Infrastructure becomes transparent through standardised interfaces;
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- Infrastructure development reflects path dependencies within the system; and
- Infrastructure becomes visible when it breaks down.

Importantly, these characteristics underline that infrastructures are ‘sunk’ into socio-economic activities and are suggestive of a ‘taken-for-grantedness’ within infrastructure systems based on user expectations that infrastructure will work and that its existence only becomes obvious at the point at which it fails (Howe et al., 2016). This creates a paradox within infrastructure systems whereby infrastructure only tends to be noticed at the point in time or space when its stops operating as infrastructure and needs to be repaired or replaced. For Star and Bowker (1995), infrastructure only becomes infrastructure at the point of usage and that usefulness of infrastructure can vary across different socio-economic groups. This means that in establishing a universal and ubiquitous NIS, the state builds infrastructure that is not used by all, may be under-used or offers limited advantages to limited segments of the population. Star and Bowker (2006) see user groups as central because they generate learning processes which stimulate proper usage and engagement between users. This enabling function involves a more distributed set of activities, comprising an infrastructure system that involves technical, social and institutional factors, which reflects that infrastructure does not emerge from a simple act of being but from the relationships formed between users.

Positioning infrastructure systems as relational systems implies that they operate as enablers of territoriality. This reflects the conclusions of technology historians (for example, Hughes, 1987; Badenoch and Fickers, 2010) who stress how infrastructural relations have been shaped and stretched by the process of modernity. Modernity has generated user reliance on infrastructure systems as political, economic and social relations have become spatially spread (Edwards, 2003). In an era of welfarism, the activist state drove relationship formation as a key component of public policy as identified within the ‘modern infrastructural ideal’ (Graham and Marvin, 2001). Without infrastructure, users could not operate effectively as economic, political or social agents (Edwards, 2003). Within a state-based system of territorial authority, these characteristics define the logic of state infrastructuring as a means of turning space into territory through creating, forming and sustaining the relationships between itself and all non-state agents located and operating within that space (Mann, 1984; Lefebvre, 1991; Brenner, 1999a). It is the provision of these structures (and the relations created and sustained over them) that enables that space to be controlled, secured, integrated and/or economically developed/grown.
State infrastructuring (as a strategy to enable territoriality) seeks not only to facilitate usage to build relations that enable the infrastructural mandate (see later) but also to set terms of usage and limits, controls, and to outlaw or deter those that are contrary to this objective. This increasingly stresses individual responsibility in usage (Rose and Miller, 1992; O’Malley, 1996; Rose, 1996; Cruikshank, 1999; Henman, 2004) with the state exercising power to make agents behave in certain ways within the context of its mandate. This has its most evident expression within the control aspect of the infrastructural mandate (addressed later) which also links with issues of security, integration and development/growth (Jackson et al., 2007). However, using relational systems as a means of attaining territoriality has been made more complex through what Graham and Marvin (2001) term the ‘splintering’ of user demands. This means that not only do infrastructural relations vary between users over space and time (Star and Bowker, 1995) but also within and between communities/user groups as users focus on those infrastructures they need as part of their membership of communities and their immediate or semi-immediate functioning (Frischmann, 2005). This pattern suggests infrastructural relations are dynamic and reflect the learning processes within communities surrounding and utilising these systems as both technologies and user groups change (Star and Bowker, 1995; Star and Ruhleder, 1996).

These narratives underscore the core role of what is termed ‘secondary infrastructure’ in the establishment, development and utilisation of the relational infrastructure systems. These secondary infrastructures are the technologies that directly facilitate access to networked infrastructure. It is through these access technologies that infrastructural relations are created and sustained, subject to issues of congestion, externalities, capacity and
politics (Edwards, 2003). Typically, such technologies include, most obviously, vehicular capacity (maritime, land and air-based) within the transport system, portable and semi-portable information and communication technology (ICT) devices in telecommunications and portable liquefied natural gas (LNG) facilities in energy. These secondary infrastructures exhibit many of the characteristics of infrastructure identified by Star and Ruhleder (1996), not least of which is the ‘taken for grantedness’ based on their embeddedness in everyday activities and conventions and their being easy to use, access and understand. Thus, as the spread of access technologies depends on affordability, skills and their absorption in the system and, as such, these technologies are integral to the infrastructure system (Star and Bowker, 2006). These qualities render them a core focal point for state power because they enable the state to control access, and thus the form and type of usage within a territory.

Theoretically, there is no compulsion for users to build relations with infrastructure but there is a clear sense of value derived from the creation, sustenance and progression of such relations. As harnessed by the features of the aforementioned modernity (for a review, see Howe et al., 2015), user welfare became increasingly reliant upon these systems which legitimised state activism in NIS to drive relation formation and how – in the era of welfarism – the state was pro-active in driving infrastructural relations as a key component of public policy as identified within the ‘modern infrastructural ideal’ (Graham and Marvin, 2001). As modernism has evolved into post-modern systems, the needs of the system have changed from nation state construction and consolidation through to system sustainability and dealing with uncertainty that is ultimately difficult to predict (Edwards, 2003) based on the certainty, adaptability and reliability of connectivity, access, interoperability and quality differentiated systems with variable infrastructural flexibility, adaptability, capacity and connectivity (Johnson and Turner, 2007).

Debates within international political economy on territoriality have focused on whether territoriality is synonymous with the state (as defined by internationally recognised borders). Many argue that such a treatment is too narrow (Agnew, 1994) because it results in a narrow methodological nationalism, assumes the historical fixity of territory and implies that infrastructure will only form around the territorial confines of the state (see, for example, Sack, 1983). Moreover, the state-based treatment of territoriality suggests that infrastructural relations can be confined to the borders of the state where infrastructures are channels through which users (of which the state and its agents are just one set) can possess the capability to interact with – and where necessary influence – other users. However, this purely methodological national approach is challenged,
given that NIS are often built on preceding territorial configurations and that these systems cannot always be operationally confined to within the borders of the state (Sassen, 2013). As Brenner (1999a) argues, territorialisation is historically specific and, as a result, infrastructures – as territorial configurations – are under a constant process of change and are updated and reconfigured as the demands placed upon them alter (Harvey, 1982).

This leads on to the second perspective, namely where territory is defined more by the form and extent of relations than by state borders. This draws explicitly on the globalisation literature in which local processes are integrated into global chains in which actors selectively participate. This reflects the work of Castells (2009) who defines territory as the ‘material support of simultaneity in social practice’ (p. 19) which is increasingly divorced from the demarcated borders of the state, a process driven by advances in technology that render states mere nodes in the ‘global space of flows’. To Castells (2009), it is these flows that are the focus of analysis and the territorial infrastructures merely form the enabling conduits. Painter (2010) argues that territory can be understood as the result of both ‘networked social-technical practices’ and the network of relations, with the result that – according to Sassen (2013) – key elements of the state’s mandate can no longer be conceptualised as purely national because they function in a larger operational space which reflects processes beyond the borders of the state. These processes have been further supported by emergent geopolitical forces that have shaped transnational power relations. Keating (2013) suggests that although such approaches do not render states obsolete (as argued within more extreme de-territorialisation theses), they are not cornerstones of the system (for a review of the issues, see Murphy, 2012).

Keating (2013) comments that the differences between these two perspectives is largely empirical, with each having more in common with the other than first appearances might suggest. The choice of approach is often ontological. By focusing on a global system of national infrastructures, attention is drawn to such hybrid views of territory. This reflects that whilst the border infrastructure system is core to the establishment and evolution of the NIS it nonetheless is shaped by and adapts to global flows and the changing infrastructural relations embedded within such interactions. Thus, although states constructed NIS around existing infrastructures during state formation and these state-based systems continue to evolve with the state, it is argued that the state remains the core territorial building block of the global system and, as such, is the only meaningful actor forming the global infrastructure system. However, it is undeniable that not all infrastructural relations can be captured within the borders of the state (this is explored more fully in Chapter 2) and
therefore states have to adapt the NIS accordingly. Some authors (for example, Bouzarovski et al., 2015) argue that the development of transnational transit systems demonstrates an erosion of state territoriality. However, these systems remain very much a derivative of the state system as it is often the state that finances, drives and legitimises pan-regional systems. Moreover, transnational infrastructural relationships cannot form without state sanction or legitimacy (a theme more fully explored in Chapter 2). This is not to assume spatial fixity of such systems. In examining how and why states infrastructure as a means of understanding the global system, it must be acknowledged that history suggests that new forms of territoriality will subsume existing infrastructure to meet their objectives (Hulten, 1996).

These debates find resonance in multi-scalar treatments of infrastructure systems. The multi-scalar approach distinguishes between six layers within a global infrastructure system, four of which are based on the state (community, urban, regional and national) and two are above the level of the state (transnational and global). In relational systems, users develop interactions with different types of networks to complete different tasks. At the individual level, proximity of and access to local and, to a lesser extent, national networks shape relations. This is different for multinational corporations and, maybe, for some smaller corporates. The important point is that local infrastructure is a key relation for all, whereas higher level relations tend to be more exclusive. Thus, in policy terms there is a greater focus on local networks and less on those above the nation state. In other words, infrastructure relations build from the bottom up with the degree of exclusion growing as infrastructures expand in spatial scope (Smith, 1984). These different levels are set out in Table 1.1 and reflect the conclusions of Brenner (1999a) regarding the redefinition of territoriality by processes at sub-national and international levels.

In focussing on the interface between national and international systems, sub-national systems are treated as a subset of the NIS as they are integral to the attainment of the state’s infrastructural mandate. In the context of the relational NIS, the ‘infrastructured state’ seeks not only to create physical infrastructure channels but also to monitor, stimulate, manage and legitimise the infrastructural flows within and across its borders as part of its mandate to assert territoriality (Agnew, 2005). Implicit in the notion of the ‘infrastructured state’ is that the state has an incentive to control access to and the capabilities of gateway infrastructures (that is, those points of access to the NIS) as a means of asserting territoriality. Such a state-centred view has to contend with shifting relations where the integrity of the system is no longer solely shaped by the conditions within it. Agnew (1994) highlights that as territorial systems, states should not be divorced
from their context and that territoriality through the infrastructure system also has to reflect that the state cannot command sovereignty over all forces operating within or impacting upon it. In other words, what is domestic and international cannot be easily delineated. As Brenner (1999a) suggests, the territorial state is but one layer in a multi-scalar system: it is part of an institutional mosaic comprising multiple overlapping levels that

<table>
<thead>
<tr>
<th>Type</th>
<th>Scale</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Community infrastructures</td>
<td>Sub-national</td>
<td>Infrastructures of either a limited spatial or user reach: these can be dedicated to a limited community of practice, be it a particular social group or corporate entity, and could include a private network in a building or road networks in a single site. This infrastructure tends to be highly localised.</td>
</tr>
<tr>
<td>Urban infrastructures</td>
<td>Sub-national</td>
<td>Spatially fixed infrastructures that cover an expansive area with a high density of users in an urban agglomeration.</td>
</tr>
<tr>
<td>Regional infrastructures</td>
<td>Sub-national</td>
<td>These infrastructures may or may not include single or multiple urban, sub-urban or rural areas within an expanded territory, usually within the borders of a single state.</td>
</tr>
<tr>
<td>National infrastructures:</td>
<td>National</td>
<td>These are the totality of all network infrastructures located within a territorial state. These are independent systems and reinforce state territoriality.</td>
</tr>
<tr>
<td>Transnational infrastructures</td>
<td>International</td>
<td>In areas of evolving inter-state integration (both formal and informal), these infrastructures support the creation of a virtual transnational system through the interaction between national systems. Systems remain territorial but are open, interoperable and interconnected to ensure the seamlessness of the system at the point of intersection (that is, borders).</td>
</tr>
<tr>
<td>Global infrastructures</td>
<td>International</td>
<td>These are territorial and non-territorial infrastructures whose interaction and interdependencies enable seamless global flows. These include the global commons but also the desire of states to limit institutional barriers to global flows.</td>
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</table>
are neither congruent, contiguous nor co-extensive with each other to the extent that infrastructural relations can never be fully internalised.

THE NATIONAL INFRASTRUCTURE SYSTEM AND THE INFRASTRUCTURE MANDATE

The NIS (a term increasingly deployed by policymakers) represents the totality of networked infrastructure (that is, stand-alone and interacting communication, socio-technical, soft and social infrastructure systems) located within the borders of a state. Within the literature on territoriality, the salience of the NIS is based on the state’s ‘infrastructural mandate’ – that is, a necessity by a state to infrastructure if it is to demonstrate territoriality. It is through the NIS that the state is able to establish and sustain the relationships between it and civil society and business that enable it to assert sovereignty over a demarcated space (Mann, 1984; Lefebvre, 1991; Brenner, 1999b). This implies a need for the state not only to build, maintain and sustain physical, interconnected links but also to enable flows across and between these physical components. The infrastructural mandate reflects the intimacy between the capability of the state to fulfil its major social, political and economic functions and the existence of a supporting infrastructure through which these capabilities are to be realised (Samli, 2010). These four state functions (territorial integration, control, security and economic growth/development – see later) reflect an amalgam of perceived roles from diverse, multi-disciplinary literature (for example, Hartshorne, 1950; Mann, 1984, 2008; Taylor, 1995). These are inherent to what is termed here the ‘infrastructured state’ – that is, the capability of the state to exert territoriality through a mature, spatially complex NIS.

As a state strategy, the complexity of the infrastructure creates a number of challenges for the sustained operation of the NIS as a support to state territoriality:

1) Obsolescence: this emerges when the NIS is no longer relevant to the needs of the state as the infrastructure becomes divorced from its shifting context (that is, economic growth and development, productivity, climate change and environment, population and demography and technology).

2) Senescence: this emerges as the NIS structure and capabilities erode through degradation generated by the ageing process and the slowness of the system to change, with the result that the infrastructure begins to fail more often and with greater disruptive effects.
3) Complexity catastrophe (Kauffman, 1996): this occurs when infrastructure and its interlinkages grow so complex that it can fail in a multitude of ways, many of which are not readily evident. This can often stem from the fact that systems can change too fast, creating new interconnections without full comprehension of the risks created by such complexity. This is more fully explored with reference to the spatial complexity generated by globalisation in Chapter 2.

4) Failing soft infrastructure: this reflects the inability of the supporting institutional systems to stimulate NIS adaptation. Examples of such failure include limits to modular-driven innovation and systemic liberalization; the absence of appropriate enforcement and failure to build user groups, etc.

5) Failing nodes (McKelvey, 2002): this is based on connectivity failure where human failure generates a loss of capability and inadequate coverage to sustain the system. This can be created by the absence, failure and/or obsolescence of social infrastructure which is central to creating institutional capability.

In addition to these legacies from the complex operation of infrastructure, state infrastructuring also faces other practical issues. First, the infrastructure mandate is increasingly realised through polycentric infrastructure systems (Scholte, 2005) in which the state is but one source of power. Moreover, the state is increasingly becoming more of a client/user of infrastructure over which it seeks to exert influence or attempts to develop in a manner that suits its objectives and not those of the asset owner (Willke, 1986). In a market-led NIS, the state retains a role largely through addressing issues of market failure. Second, as identified by Graham and Marvin (2001), there is increased splintering away from the ‘infrastructural ideal’ because value from and quality of the system offered can vary widely across space, time and socio-economic clusters. Thus the infrastructural mandate (which relies upon ubiquity and uniformity) can be compromised. Third, the infrastructure mandate depends upon learning processes as a means of generating inclusiveness (Star and Bowker, 1995) which can also vary widely over space, time and socio-economic groups. Fourth, as mentioned earlier, user focus on those segments of the NIS that are needed as part of their membership of communities limits systemic perspectives at the point of usage (Star and Ruhleder, 1996). In combination, these characteristics of the NIS create pressures upon the state in the attainment of its infrastructural mandate because the complex structures, through which the process is attained, are not always responsive to state pressure.
THE FOUR DIMENSIONS OF THE INFRASTRUCTURE MANDATE

Based on a multi-disciplinary approach, the relationship between the state and the NIS can be synthesised into the four inter-related processes of the infrastructural mandate: control, security, integration and growth/development. The identification of the infrastructural mandate offers a neo-Weberian perspective on the state, namely that the state is a social body/social organisation that pursues specific goals (Palan et al., 1996). This is also reflected in Auster and Silver (2012) who argue that the state functions to sustain itself through the provision of structures that enable security, protection, control and economic welfare gains. This work reflects themes embedded within the logic of the competition state and of a zero sum mentality in state strategy as each state seeks to maximise the welfare of their respective populations (Jackson and James, 1993). These structures are examined in more depth next.

Control

Infrastructure operates as an intermediate platform for power relations between the state and all agents located and operating within a territorially (both horizontal and vertical) (Elden, 2013) demarcated space (Mann, 1984; Brenner, 1999a). Under this treatment, infrastructures are channels through which users (of which the state and its agents are just one set) possess the capability to influence the actions of other users. Mann (1984) refers to the occurrence of infrastructural power, stressing how these structures are key to enabling the state to penetrate civil society and to exert power over territories. Such power is not necessarily malign and may also reflect security or integration concerns. Political control depends upon the ability of the state to move the resources of control around a territory. In his categorisation of social power, Mann (2008) states that ideological, economic, military and political power are all reliant upon infrastructures to be effective. Infrastructure represents the channels through which information and commands are transmitted. These themes have been rather perversely reflected within the state failure literature (Brenner and Elden, 2009; Eriksen, 2011; Sundsoleriksen, 2011; Wolff, 2011) which notes that the state – where it is at risk of loss of control over a territory – has an incentive to under-develop, destroy or control access to infrastructure.

Power comes from relations becoming reliant and – in a Foucauldian sense – control is embedded throughout the system, not merely through formal methods but through social, cultural and personal norms all shaping the form and intensity of the infrastructural relationship (Rose
and Miller, 1992; O’Malley, 1996; Rose, 1996; Cruikshank, 1999; Henman, 2004). These are frequently not the high politics shaping the infrastructural mandate, but lower level everyday interactions within the system that shape its functioning but can impact upon attaining the objectives within the infrastructural mandate. The state seeks to facilitate usage to build infrastructural relations that enable the infrastructural mandate, but also to set the terms of usage and limits, controls and outlaws those actions that are contrary to this objective. This increasingly stresses individual responsibility in usage (O’Malley, 1996; Rose 1996) with the state exercising power to seek to make agents behave in certain ways within the context of its mandate. Integral to this are rules over access to, control of and usage of infrastructure that become a key element of control within the economic system. This involves the social goods from learning about what is beneficial usage and what runs contrary to this.

Control also extends to the nature of the Anthropocene where infrastructure is used to control natural environmental processes and events to enable human activity to be sustained both within and across territories. Consequently, long-term environmental processes have implications for infrastructure because they place pressure upon the state to adapt the NIS to actual and anticipated environmental change. For the state, such adaptations are driven by the challenge to the sustenance of territorial control implied by these processes where territorial integration is threatened/undermined and growth/development impacted. The underlying logic is that failure to control (or at least militate against) these territorial changes arising from long-term environmental change can – via its infrastructural impacts – have a widespread impact on state territoriality.

The final element of control relating to the NIS concerns the sustaining influence over an NIS where it is but one player among several. The polycentric NIS (where established) has to be compliant with the state’s infrastructural mandate. Consequently, as users establish relations with or are transferred to non-state components of the NIS, the government will seek to steer users towards specific aims that support its territorial objectives (Braithwaite and Drahos, 2000; Moran, 2003). This is achieved through a mix of methods including business model legitimisation (Kostova and Zaheer, 1999), universal service obligations and firm/industry specific regulation.

Integration

For the state, the integrative aspect of the NIS is reflected in how the spatial and temporal compression promotes economic, social and political cohesion within a territory (Munnell, 1992; Rietveld, 1995; Edwards, 2003).
Hartshorne (1950) argued that the role of the state is to bind together assorted social and territorial segments into an effective whole (see also Martin and Rogers, 1995). This is a vertical process for social groups and a horizontal process for territorial groups. The integrative aspect of the infrastructural mandate reflects the operation of the NIS at the confluence of a range of policies, notably social and regional policies. It also reflects a need on the part of the state to establish the NIS as a scalable system that enables flows at sub-national levels to integrate with the broader national system and to ensure that flows within the borders of the state have the capability to penetrate both territorially and across all socio-economic groups. This is seen as beneficial for both the state and the targeted regions/groups (Mann, 1984). As argued in Chapter 2, the trend towards globalism is extending this integration to enable all parts of a state's territory to access the main global infrastructure channels as a stimulant to welfare enhancement (for a review, see Puga, 2002) through a focus on those segments of the NIS that facilitate the proactive competition state (notably key gateways and hinterland systems).

Integration is reflected in Lefebvre's notion of abstract space: that is, space that has the explicit goal of homogeneity through the enabling of social, political and economic relations (Brenner, 1999a) where only the state – so Lefebvre (1991) argues – has the capability to organise space on such a grand scale. Conventionally, these themes were embedded within a welfarist approach (Gramlich, 1994) to NIS development encapsulated within the aforementioned 'modern infrastructural ideal' (Graham and Marvin, 2001). The shift to neo-liberalism within NIS has shifted priorities towards an NIS that enhances welfare through enabling growth (Rose and Miller, 1992; Estache and Fay, 2010; Majone, 1996). This refocus has seen some splintering of the system as infrastructure varies according to user requirements rather than a simple universal system (Graham and Marvin, 2001), resulting in access to and quality of infrastructure varying markedly across socio-economic strata (Offner, 1999) and potential power asymmetries across a territory (Massey, 2005), with a resultant inhibition of territoriality (Poulantzas, 1978; Mann, 1984).

Security

Security is defined here as the external threats to the military, political, societal, environmental and economic security of the state (Agnew, 1994; Williams, 2003) that can be mobilised through the interaction between and within NIS. Economic, technological and environmental changes have – both singularly and in combination – exposed infrastructure systems to both man-made and naturally occurring events and processes that can
disrupt the relational system to the extent that users are unable to function and their mandate is compromised (Rinaldi et al., 2001). In contrast to notions of control, security within the infrastructural mandate is borne of the interaction of the NIS with other systems (Held et al., 1999; Scholte, 2005). Consequently, debates within critical infrastructure strategies (see later) reflect anticipation that the threats to security across NIS increase as the intensity of flows increases. This occurs when complexity and global change have created uncertainty over the stability and sustenance of relational infrastructure systems (Moteff, 2012). The efficacy of systems is not only impaired by harmful external flows but also by events beyond the borders of the state that hinder the capabilities of the NIS. These challenges can be sourced from the global commons (Murphy, 2010), such as choke points (see chapters 3 and 5), from cyberspace (see Chapter 4) or from other NIS, either through transit or direct links.

In view of these security concerns, the core challenge is that interdependent networks are largely, as mentioned, under private control but are central to the state’s strategic interests. This suggests that there is the need for a strong legitimisation process to ensure that those who control such strategic assets do not operate counter to the long-term interests of the state. There is a clear mandate within the process that state involvement and interaction can be legitimised within the domain of critical infrastructure (see later) where the state potentially seizes either control or ownership of such assets to ensure its objectives are met. In prioritising infrastructure, this process recognises that not all infrastructures within a particular system have the same salience. Evidently, the core assets within the infrastructure system are those that offer the greatest knock-on effect and spill over into other infrastructures.

**Growth/Development**

Conventional approaches to the nexus of prosperity and the NIS are formed around the consensus – as part of the process of territorial economic integration – on enabling intra-state exchange as economic relations become stretched (Gritsch, 2005). Infrastructure plays a core role in organising and rationalising resources within a state by fostering communication and exchange and by shaping the economic geography of the state (Aschauer, 1989; Easterly and Rebelo, 1993; Canning et al., 1994; Sanchez-Robles, 1998; Canning and Pedroni, 2004). The infrastructure narrative within international economics reflects a desire to mitigate against the impact of the absence of and/or deterioration of infrastructure upon transactions costs. The logic is that investing in infrastructure decreases the cost of undertaking trade, thereby increasing the potential
for trade. In reflecting a Foucauldian discourse on the role of the state, the economic growth/development narrative implies that the NIS has a function – especially within the context provided by the logic of the competition state – as a key component of the state’s export system. The NIS is the means by which commodities and fully and part-finished products are moved through the state’s gateways. These gateways are shaped by the economic need to interact with the global system, and the NIS is seen as a catalyst and sustainer of these value creating relationships.

The logic of the competition state is embedded within policy discourses in which the NIS is positioned as a platform for the global positioning of the state (Romp and de Hann, 2007; Röller and Waverman, 2001). This reflects a broad consensus on the impact of the state of the NIS on growth (as reflected within Porter, 1990). As markets integrate, NIS are focused on making markets work more efficiently by facilitating and stimulating flows (both within and external to the state) that enhance strategic positioning (Palan et al., 1996). This is based on the state pushing users towards those infrastructures and types of uses that have positive feedback on performance, reflecting that growth is a function of usage rather than absolute levels of provision. The erosion of the welfarism of the positive state has given way to the growth focus of the competition state (Fougner, 2006). This reflects a Foucauldian perspective that the core welfare focus of the state is to generate economic growth. Glykou and Pitelis (2011) suggest that the most effective industrial strategy in the context of global markets is to reduce the production and transaction costs faced by firms as a means of generating productive efficiency. Infrastructure represents one of the main channels through which such efficiencies can be attained by improving internal and external facing logistical systems.

THE INFRASTRUCTURE MANDATE THROUGH THE AGES

The four main dimensions of the infrastructure mandate – control, security, integration and growth/development – are not new and have played a significant role in infrastructure development for centuries. As is the case today, the predominance of each dimension has varied, depending on the prevailing political, economic and social context. However, it has been commonplace for more than one dimension simultaneously to play a significant role in infrastructure strategy and policy. A long-term perspective on infrastructure development reveals that major changes have occurred on the back of technological change and that new dominant powers have emerged through military or economic means or a mixture of both, and
have frequently exploited infrastructure in a pioneering way which has yielded advantages over competing powers.

Until the nineteenth century, transport infrastructure was the only significant form of infrastructure; energy, telecommunications and related infrastructure only came to prominence as a result of industrialisation. In pre-industrial days, both road and water-borne transportation played an important role in the economic and political evolution of the most successful civilisations and seemingly drew on the four dimensions of the infrastructure mandate. The Roman Empire provides an early example of this phenomenon. Roman roads, which reportedly incorporated over 86,000 kilometres of paved roads in addition to many more minor roads, were originally built to facilitate rapid movements of troops and supplies, and provided key communication links between Rome and its imperial offshoots (Chevallier, 1976). They were thus important in the consolidation, or integration, of the Empire and helped its rulers control and secure its territory as well as facilitating trade with far-flung parts of the Empire.

Not only did the roadmap of the Roman Empire delineate the extent of Roman influence politically and economically, but it also influenced the reach of arts and religion, thereby further integrating the imperial territory. The spread of Christianity was linked to the pattern of Roman roads, some of which served as major pilgrimage routes in medieval times. As well as acting as a conduit for the military and trade, Roman roads thus helped bind the different races and regions of the Empire together, a phenomenon which continued to exercise an influence on the evolution of modern Europe long after the demise of the Roman Empire.

Although its roots can be traced back several centuries prior to the emergence of the Roman Empire, the Silk Road, a network of overland trade routes linking Europe with China, began to develop in earnest during the first century of the Han dynasty (206BC–220AD) and reached its heyday during the Mongol Empire in the thirteenth century. During its long existence, the Silk Road saw and helped foster the rise of several civilisations, acting as a conduit for conquering, trade and the transmission of cultural and religious values. Frankopan (2015) attributes the spread of Zoroastrianism, Judaism, Christianity, Buddhism and Islam, in part, to links made possible by the Silk Road. Frankopan (2015) also repeats the theory that it was the Silk Road trade routes that played a key role in spreading the Black Death during the fourteenth century.

The first Silk Roads were essentially overland routes and were more suitable for low volume, high value goods such as silk (which prompted great interest in Rome) and spices. However, maritime transport provided opportunities to trade a greater array of goods over longer distances and potentially supported the control and security dimensions of infrastructure.
In addition to roads, the Romans also used coastal sea routes to support their empire and opened shipping routes between Europe and India. From the ninth century onwards, Arab traders started to develop their own sea trading routes down the coast of Africa and to the east, gradually diminishing the importance of the Silk Roads.

Waterborne transport was at the heart of logistical developments in the medieval period. Rivers and coastal waters facilitated trade in both northern Europe and the Mediterranean. The Hanseatic League, a federation of merchant guilds and towns, had its origins in the German city of Lübeck. By the peak of its influence in the late fourteenth century, it involved towns spanning northern Europe from England to Russia and dominated trade throughout the Baltic and northern Europe. Its influence also extended beyond the commercial sphere into a military and diplomatic dimension to defend its trade routes. Its rules and regulations are also an early example of the role and power of soft infrastructure.

The Hanseatic League was essentially concerned with short sea transport, but from the fifteenth century onwards European powers increasingly sought alternative long distance maritime trade routes to the traditional overland east–west routes, prompted in part by the fall of Constantinople in 1453. Portugal and Spain were among the first to find success. The former quickly established domination of trade and of a greater part of the world than any other power for a short period. By the mid-sixteenth century, Portuguese influence stretched along the east and west coasts of Africa and through the Persian Gulf and Indian Oceans, resulting in Portuguese control of the Ceylonese and Indonesian spice trade, which also enabled Portugal to establish a presence in China and Japan. Spain turned its ambitions towards transatlantic trade, hoping to find an alternative route to Asia. Consequently, it established trade and colonial territories throughout South America, in the Caribbean, notably Cuba and Hispaniola (the modern day Haiti and Dominican Republic), Mexico and into southern and western parts of what became the US.

Other European powers were not far behind. The Netherlands, largely through the offices of the Dutch East India Company, established powerful trading bases in Asia, notably in modern day Sri Lanka and Indonesia, whereas France gained influence in the Caribbean and West Africa. England, latterly Britain, developed the most extensive overseas trading networks accompanied by political and diplomatic supremacy in several parts of the world. This maritime and political supremacy reached its peak in the second half of the nineteenth century when it was increasingly challenged by the US and Germany in particular.

Major economic breakthroughs have been accompanied throughout history by improvements in technology, production, communications...
and logistics. That is not to say that communications improvements cause economic transformation but they have often been necessary to it. Given their superior organisation, the Romans travelled faster than medieval man. Indeed, during medieval times, the transport system deteriorated (Leighton, 1972) and, significantly, there were no major changes in the organisation of economic life. The domestic inland transport systems of the post-medieval European empires were initially less advanced than their long-distance maritime transport, but during the eighteenth century the supply and quality of inland transport in England improved; for example, in the 40 years from 1780, according to Girard (1965), the duration of the road journey from London to Manchester fell from five days to 36 hours. Along with the development of canals, and later railways, these changes provided conditions for the industrial age to commence earlier in England than elsewhere. Transport innovations extended the market for goods, thereby facilitating the introduction of mass production and the creation of factories. Manufacturers were also guaranteed more reliable and continuous supply and delivery of raw materials and goods.

It was no accident, therefore, that the first canals, and later the first railways, were built to service the coal mines which were essential to the steam age which began in the early nineteenth century. As the century progressed, steam transformed maritime transport and enabled the spread of railways which, according to Wolmar (2009, p.26), ‘between the first and last quarter of the nineteenth century, . . . transformed the world from one where most people barely travelled beyond their village or nearest market town, to one where it became possible to cross continents in days rather than months.’ Consequently, production and consumption no longer needed to be located in close proximity to each other, opening up the possibility of large-scale production, specialisation and the development of new industries, along with attendant social changes in terms of urban development and working practices. The railway revolution began in Britain but quickly spread to the rest of Europe and to the US where it helped open up vast swathes of territory for settlement. Railways were also used by the British to consolidate their imperial power in terms of commerce (the prosperity dimension) and security and control in Africa and India (see later).

Rick Szostak (1991) has argued that it was the absence of an effective transport system which inhibited industrial modernisation in France during the eighteenth century. However, by the mid-nineteenth century, Britain’s continental rivals were beginning to catch up economically. The Second Empire’s (1852–1870) rail policy under Napoleon III demonstrates how politicians and financiers were becoming increasingly aware of the potential political and economic power derivable from railways (Blanchard, 1969). In 1852 only 3,000 kilometres of track were in use – lines were
discontinuous and split between companies. By the time of the Empire’s demise in 1870, almost 20,000 kilometres of rail track were in operation and were organised in a few coherent units. Blanchard (1969) maintains that this transformation was only possible as a result of deliberate policy by a strong government and far-sighted financiers who conceived the rail system as a distinct network rather than as an accumulation of individual lines and which settled the pattern of French industrialisation.

Napoleon III also encouraged the restoration of French influence and prestige in neighbouring countries and was prepared to use economic means, including control over railways, to achieve this. A prime example, albeit not the only one, of this policy (Blanchard, 1969) occurred in 1868–9 when the French Compagnie de l’Est bought several short and unprofitable lines serving Belgium and Luxembourg with a view to integrate them seamlessly into its own network and to develop a direct link with Dutch lines, especially those providing access to Rotterdam. This development posed threats to the prosperity of the port of Antwerp and gave rise to Belgian fears that French iron interests, which exercised control over Compagnie de l’Est, would interfere with the export of iron ore from Lorraine to Belgium’s iron and steel industry. Detecting a French plot to dominate Belgium economically, and perhaps even to occupy it, the Belgian government alerted Britain and Prussia to what was happening and the project failed to materialise.

The French example demonstrates the potential use of railways to increase political and economic influence in neighbouring countries, whereas the development of the German rail system highlights rail’s potential to foster political unification and integration (Henderson, 1975). Early German rail development occurred on an ad hoc basis with a mixture of state and private provision and frequent bitter rivalry between states and between towns and cities in the same state. However, even during the early days of the German rail system in the 1830s, figures like Friedrich List warned that short-sighted rivalries between states should not be allowed to inhibit the development of a German rail network and that co-operation in communications, especially in relation to rail building, would substantially enhance the advantages accruing from the Zollverein (the customs union), which was established on 1 January 1834.

List’s warnings were ignored. However, the railways mushroomed and stimulated economic growth: new firms of contractors and engineers were established; jobs were created; iron foundries flourished on the backs of the railways and markets for agricultural and industrial products were extended. Once the railways reached the ports, particularly Hamburg and Antwerp, goods previously only consumed within small local regions were exported. In the longer run, claims Henderson (1975), railways helped
unite Germany and broke down long-standing local rivalries and isolationism. The railways, together with the Zollverein, sowed the seeds for German unification in 1871 and, it can be argued, were a prime example of the integration dimension of the infrastructure mandate.

In Russia towards the end of the nineteenth century railroads, which had been a force for modernisation and economic dynamism elsewhere, were used to maintain Russia’s autocratic system of government. Following the assassination of the liberal Tsar Alexander II in 1881, Alexander III reverted to a more conservative style of government which involved asserting his absolute dominance over all aspects of life. The construction of the Trans-Siberian Railroad (Marks, 1991) was a case in point. Poor communications were a weak link in Russia’s control of its eastern territories and rendered the country vulnerable to foreign aggression in the Pacific region. Central to Russia’s internal policy during this period were attempts to overcome internal political division and to promote a unified Russian state through government intervention, centralisation and Russification. The railroad was intended to bring Siberia into contact with the rest of Russia, thereby destroying its uniqueness and individuality which provided ammunition for Siberian regionalists and separatists Marks (1991, p.45) concluded that ‘Russification and the extension of political control to the region were to be gained through the construction of a railroad and economic development.’

In this sense, infrastructure was being used as a political tool to facilitate further political integration and to exercise control over the territory. In relation to external policy, various writers (Marks, 1991; Wolmar, 2013) argue that the result of building a railroad which could transport troops to the Pacific and bring about the de facto annexation of northern Manchuria was an important contributor to the outbreak of the 1904/5 Russo–Japanese War, failure of which helped provoke the 1905 uprising in Russia.

Although it had been the tsar’s decision to build the railway based purely on ‘his personal motivations and his assessment of its military and political value’ (Wolmar, 2013, p.76), Russia’s Finance Minister (later Prime Minister) Sergei Witte had prior experience in the development of Russia’s railways and recognised the economic potential of rail for Russia and, according to Wolmar (2013), regarded railways, and the Trans-Siberian Railway in particular, as a key driver in Russia’s modernisation and industrialisation. It was this economic push which he anticipated, wrongly, would help maintain the tsarist regime.

As the example of the Trans-Siberian Railroad demonstrates, railways were one way of extending a nation’s influence and territory. During the nineteenth century, European powers used railroads to consolidate their
power and influence in their colonial territories and to prevent incursion in these territories by competing powers. Rail investment also served to tie many of these territories into the international economy as producers of primary commodities. Many of the railroads were built with private capital but were harnessed by European governments to serve bigger imperial strategies.

By the late nineteenth century, the so-called ‘Scramble for Africa’ was in full swing with railroads playing a key part. The moving force behind this for the British was Cecil Rhodes whose main aim, in popular mythology at least, was to link all the British colonies of Africa through construction of the ‘Cape to Cairo’ railway. Reality was more complex than this: the activities of Rhodes in the late-nineteenth century reflected a complex mixture of factors in which the drive to extend British influence throughout Africa was co-mingled with entrepreneurial objectives. The major impact of the railroads in Africa was at a sub-imperial level. The Rhodesian railway through Northern Rhodesia (in which Rhodes's British South Africa Company was a driving force) and Lord Salisbury’s Uganda line, built in part to frustrate a possible French threat to British control over the Suez route to the East, were examples of this. These routes acted as bricks for nation building, opened up new land for settlement and enabled the colonial territories to be integrated into the economic systems of the imperial power as providers of primary commodities. In India, British rail policy also served both as a tool of commercial policy and as a way of exerting political control over the princely states of India (Sethia, 1991).

During the twentieth century, transport infrastructure continued to play a role in the life of nations beyond simple involvement in ensuring movements of goods and people. In Nazi Germany, for example, the construction of the autobahns, commonly known as ‘Hitler’s highways’, became an important symbol of the new regime. Shand (1984, p.48) argues ‘the propagandistic exaltation of the Reichsautobahnen melded together three fundamental strands of Nazi ideology; national unity, national greatness, and party leadership in a strong state’. Hitler himself certainly attributed great importance to the development of the autobahns: within two weeks of becoming Reich Chancellor in 1933, the need to improve the condition of German roads and to construct new highways was discussed in Cabinet and Fritz Todt was given the task of pushing this forward (Seidler, 1988). Hitler was also interested in rail and, according to Albert Speer (2009) aspired to build a transcontinental rail network to link together economically all parts of his anticipated future empire.

Although many of these examples of the promotion of infrastructure for broad political and economic motives may be adjudged to have failed to fulfil their ambitious objectives, the concept of infrastructure as a
powerful political and economic tool has nevertheless exercised a powerful influence over policy makers and over the interpretation of historical trends. This influence remains strong to this day. In Europe, for example, the Trans-European Network (TEN) Initiative has attempted, with patchy success, to promote cross-border infrastructure across the EU with a view to stimulate economic growth and greater integration (Johnson and Turner, 1997) in line with two of the four dimensions of the infrastructure mandate.

However, the ‘One Belt, One Road’ (OBOR) project announced by the Chinese government in 2013 represents the most ambitious and far-reaching cross-border initiative of modern times and has the potential to serve all four dimensions of the infrastructure mandate. The OBOR is a two-pronged plan to improve connectivity within and between Eurasia, East Africa and Oceania through construction of new and the improvement of existing infrastructure, namely ports, airports, roads, railways, pipelines, fibre-optic networks and logistics hubs. The first component is the Silk Road Economic Belt, which comprises several land corridors to link China, Central Asia, West Asia, the Middle East and Europe, involving countries along the original Silk Road and also links between China and South and South-East Asia. The second component is the Maritime Silk Road intended to foster collaboration and investment through the South China Sea, the southern Pacific and the Indian Ocean, thereby spreading the reach of OBOR to East Africa.

Given the relative newness of the OBOR concept, opinions vary regarding its implications and the relative salience of each of the four dimensions of the infrastructure mandate. The economic aspirations, albeit diverse, are the clearest. For China, the OBOR is intended to increase prosperity by increasing investment and trade. Reflecting the multi-scalar, multi-actor scope of the project, the increased economic activity will benefit the less developed provinces of western and central China in particular and China’s large state-owned enterprises and construction companies as a result of the massive engineering projects involved (estimated at US$4 trillion plus over the coming decades). Once the projects are in place, trade should become faster and easier. The OBOR will also help China source much needed raw materials and supplies for its own growth and, through the stimulation of trade, bolster markets for its own goods. Moreover, the OBOR is anticipated to enhance China’s security by reducing reliance on the bottleneck formed by the Malacca Strait. It is the political implications of the OBOR which are less clear cut in terms of the perceived ambiguity of China’s objectives and of the uncertainty over whether China will be able to overcome the many economic and political challenges involved in implementing the OBOR. Such uncertainties include the role of major
international players such as the US and India (Blanchard, 2016; Luft, 2016) who have their own concerns about what the OBOR might mean for the global and regional balance of power. Other challenges include the sheer scale of the funding required and the ability/willingness of countries along the various transport corridors to participate and contribute.

CRITICAL INFRASTRUCTURE AND THE INFRASTRUCTURE MANDATE

The value of the infrastructural mandate as a conduit for territoriality is increasingly expressed through themes of critical infrastructure. Although there are assorted definitions on what constitutes ‘critical’ infrastructure (Organisation for Economic Co-operation and Development, OECD, 2008) it can be broadly defined as those segments of the NIS whose failure would directly compromise state territoriality as expressed in the infrastructure mandate. Across states, assets and activities such as banking, food supply, medical facilities and the military can be and are often included in the definition of critical infrastructures. However, as stated earlier, this volume concentrates on economic infrastructures.

Debates upon critical infrastructure have been shaped by a number of themes. The first is the aforementioned shift towards polycentric NIS, especially within the many developed economies in which the state has replaced the direct ownership and control of infrastructure with a more ‘regulatory approach’ (Majone, 1996; Moran, 2003). This regulatory approach does not downplay the importance of infrastructure but implies that attaining the objectives as expressed within the infrastructural mandate does not always necessitate direct state ownership. As such, as Braithwaite and Drahos (2000) argue, the state begins to steer the system towards its objectives via regulatory controls and other incentives and/or controls (for review of the UK system as an exemplar of this process, see Stern, 2014). Second, the impact of globality (see Chapter 2) combined with increased security concerns has highlighted a need by the state to ensure that these points within the system are secure and can effectively filter out and monitor threats to the state. Third, technological change has introduced new vulnerabilities that have further exposed these systems to disruption. This is highlighted by the increased pervasiveness of ICTs across all infrastructures.

These adaptive tensions within NIS as a result of these and other changes highlight their increased functional and spatial complexity. The spatial complexity of NIS (where the impact of externally sourced or destined flows can impact on the efficacy of the NIS) is discussed in the
following chapter. However, there is a need to consider (largely due to its links to globalising forces) functional complexity within NIS insofar as it impacts on state territoriality. The burgeoning literature on ‘criticality’ has stemmed from a number of disciplines but common to all of them is the idea of NIS as complex adaptive systems in which no single piece of infrastructure is divorced from any other because they mutually interact and depend upon each other for their functionality. Rinaldi et al. (2001) identify the following interdependencies: cyber interdependency where the success of infrastructure depends on information transmitted through information infrastructure; geographic interdependency where a local event can generate change in all connected (both direct and indirect) systems and logical interdependency where the state of each piece of infrastructure depends upon the state of others.

For states, such complexities matter because they create uncertainty over the attainment and retention of territoriality. It is possible with functional complexity that the erosion and failure and/or disruption to a single piece of infrastructure can have cascade effects (see Chapter 2) throughout the NIS which challenge a number of components of the infrastructural mandate. The danger for states from such complexity is the lack of knowledge as to how exactly infrastructures can fail, which, in turn, generates limited understanding of how such events/processes will impact upon territoriality. Moreover, this also places an emphasis on soft infrastructure systems to fully create an awareness of the risk and to militate against perceived and/or actual ignorance of system complexity and its legacy. This underscores the importance of the aforementioned challenges to the system and that the state not only needs to infrastructure but also to continually re-infrastructure as a means of securing territoriality.

CONCLUSION

This chapter has focused on identifying the form and nature of infrastructure systems and their intimate link with the territorial state. Infrastructure systems are relational systems; they are the physical channels through which interactions occur between users. This renders them central to the operation of the territorial state through the establishment and evolution of the NIS. The NIS is shaped by what is termed here the ‘infrastructure mandate’. This mandate underlines the notion that the core functions of the state (i.e. improving the welfare of citizens and ultimately preserving state territoriality and retaining its sovereign position over this space) are dependent upon the provision of a spatially extensive infrastructure within the borders of the state. However, key to
the successful support of the state’s functions by the NIS is its ability to adapt to its shifting context. At the core of adaptive tensions within territorial systems is the global stretching of relations that are altering the nature of territoriality.

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Infrastructure and Territoriality


