# 6. Intermediate and interminable: a railway regeneration drama in two acts

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When urban infrastructures fail, the public discourse is largely the same everywhere. Something went wrong; a 'D-word' occurred. Frequent delays of provision make the degradation of infrastructural service visible (Graham and Thrift, 2007). Infrastructural disorder leading to disruption and disastrous accidents (Graham 2010). Long neglect, synonymous with decay and conducive to infrastructural disaggregation, division, and dispersion (Denis and Pontille, 2015). Then comes a call to react and respond. Symmetrical 'R-words' (e)merge. Restoration, removal, replacement and, most often, repair are frequently mentioned (Henke and Sims, 2020; Denis and Florentin, this volume). Some infrastructures are refurbished, retrofitted (Howe et al., 2016) or rehabilitated (Barnes, 2017), sometimes remade or renewed (Strebel, 2011), and finally regenerated. This last word comes from urban and housing planning (a building or a district is being regenerated) but is less used in the case of transport infrastructures (Clegg, 2012; Schurig and Turan, 2022). In all cases, the transition 'from D to R' is seen as a critical sequence that entails a combination of multifaceted processes (cognitive, social, economic and political). In this chapter, we argue that: (1) the term 'regeneration' refers to a specific technical kind of repair; (2) it represents an attempt to reorient the governance of repair practices; (3) it is a challenge, maybe doomed to failure, if the technical actions and their expected promises shock either against other realities and inertias of the infrastructural regime, or against the rhythms of evolution of the rest of the infrastructural system.

The sociological concept of trial (Martucelli, 2015) offers a way to delve into the making of always temporary agreements over the state of the railway and what regeneration can contribute to it, notwithstanding the obduracies (Hommels, 2020) that any semantic candidate for a 'D to R' process creates. The first section of this chapter focuses on definitions of trial in the context of railway infrastructure seen as a socio-techno-political regime and on the framing of a regeneration planning model. The case study is a dilapidated and congested Paris suburban line that has suffered a series of incidents and accidents and is now undergoing intense regeneration, though without much apparent success. As in other contexts (Ureta, 2014), nobody knows exactly when normality will return. Worse, the more it is regenerated, the more prone it seems to breaking down, despite (or perhaps because of) the exceptional financial and human resources invested in it. Each of the decisions and practices we analyse show that managing time and narratives proves to be of paramount importance in the conduct of a regeneration process. In the first facet of the trial (the second section of this chapter), we explain why agreement over a version of railway disruption does not prevent from catastrophic events that only then – and too late – trigger repair measures. The third section interprets the frictions produced by recovery practices in the day-to-day life of the infrastructure that form the second facet of the trial. The conclusion discusses to what extent the meaning of infrastructural regeneration, which paradoxically calls for infrastructural rebirth, can be lived as an interminable intermediacy.

## FRAMING RAILWAY REGENERATION AS …

### … A Socio-Techno-Political Regime

Repair activities are embedded in and produced by the multifaceted and interconnected lives of socio-technical systems (Denis and Pontille, 2015). So, it is no surprise that repair activities depend upon a long chain of decisions and visions produced by a range of entities that enrol technologies and infrastructures to achieve political aims. Gopakumar's (2020) vision of a techno-political regime (borrowing the notion from Hecht, 2009) reveals the prescriptive dimension concealed in the evidence-based rhetoric disseminated by institutions and 'superbureaucrats'. He describes how a 'congestion regime' is framed in the booming city of Bangalore through a specific vision of streets (as car corridors), policy tools (urban megaprojects) and end goals (the making of a world-class metropolis). His notion of regime focuses on two main ideas: the density of interconnections linking infrastructures, institutions, people and ideas into 'constellations', and the drive to produce a stable dominance order in which private and public stakeholders produce and share value, income and power.

Drawing on this perspective, we frame rail regeneration as a techno-political regime, and analyse the articulation of a technical dimension (a descriptive infrastructure knowledge) and a policy dimension (an attempt to reform the way rail infrastructure is managed and governed). We consider that regeneration links together a constellation of discourses and practices, information flows, regulations and policies. We add the word 'socio' to the techno-political. This addendum makes the relation between an infrastructure and an ensemble of individuals and groups more explicit. It keeps us alert to the tough daily experience of users, the asymmetries of knowledge and power within the transport system, and it more clearly integrates railway regeneration into the perspective of critical infrastructures studies (Steele and Legacy, 2017).

### … A Fragile Agreement

We highlight in this chapter that rail regeneration is purported to provide the right method to diagnose and the proper way to fix a series of physical faults, managerial errors and past political failures in French rail planning. It is thus presented as the product of rational discourse. The capacity to express views on a certain state of an infrastructure, to grant legitimacy to some judgements and to acknowledge some truth, are all elements associated with the sociological notion of trial. A trial on this account is a process through which disputes concerning an ongoing evaluation are resolved through the production of a shared judgement concerning a certain reality. The concept helps unpack the mechanisms a society employs to navigate controversies and find a compromise.

We especially mobilise Martucelli's (2015) twofold problematisation of trials (*épreuves*). One approach consists in understanding how a demonstration is framed in the form and in the continuity of modern science thinking but with a direct connection with action. This trial (*épreuve-sanction*) uses a kind of reasoning that is carefully constructed so as to appear irrefutable, yet in a pragmatist vein, the result can never be considered as definitive truth; rather, it appears as a provisional sharing of public beliefs. Another way is to see a trial as a challenge (*épreuve-défi*), and to observe the way it is shaped and transformed within a dynamic arena of power. These perspectives will be investigated successively, because the railway as a problem and regeneration as the solution are posited, in our case study, firstly in the form of a scientific

trial, then as a policy challenge. Yet we also want to demonstrate that both parts of this dichotomy are inextricably interlinked: every agreement remains temporary, uncertainties constantly threaten compromise or even transform the purported solution into a scapegoat. As Bovens and 'T Hart (2016) explain it, a trial remains fragile as the success or failure of a solution are always circumstantial. Here, our aim is precisely to demonstrate how variable and contingent evaluation processes shape temporary agreements, and how the notion of regeneration, even when consolidated among experts, is constantly undermined and (re)framed by institutions and society in their perpetual quest for a stable agreement.

Drawing on the case of Indian rail, Bear (2020) proposes a more precise problematisation of the notion of agreement. For her, a 'nodal agreement' over the exact and real state of a rail network is the goal the socio-techno-political regime is trying to attain and maintain. She notes that such a quest may be precipitated when disruption produces a 'truth event' in rail activity. The purpose of attempting to reach a nodal agreement is to eliminate uncertainties, not only about the state of the infrastructure, but also about the associated business model and the boundaries and consistency of the regime. Bear also introduces a broader spatio-temporal dimension into her analysis of the valuation processes embedded in rail (re)investment cycles. She shows connections between institutions, policies and power networks at international, national and metropolitan scale. And, in keeping with her assertion that 'Issues around the provisioning of rail networks and their repair … have recurred in historically emergent forms since the mid-nineteenth century' (Bear, 2020, p. 49), we think that rail regeneration should not be only perceived as a new problem that is shaping a new era of railway care. The rail problem resurfaces cyclically and plays a key role in the political economy of urban infrastructures.

### … A two-Step Temporal Process, Plus a Promise

A trial confronts discourses that articulate infrastructural representations and imaginations in various temporalities. Valuing the possibilities of regenerating a railway infrastructure includes, implicitly or explicitly, an assessment of the past of the railway, some aspirations for future robustness and, in between, the reasons for the need to repair. These broad temporalities are reworked during the moment of the trial, which begins with the production of a question and closes with the establishment of a compromise. In accordance with the 'D to R' perspective, the resilience planning literature formulates a pertinent two-step model of 'definition' and 'implementation'. The dynamic follows a trajectory that is the product of a relation between time (horizontal axis) and a metric representing the degree of functionality of the infrastructure (vertical axis) (Figure 6.1).

After a period of relatively smooth and/or relatively acceptable operation, a disruption occurs. In step 1, the poor condition of the infrastructure is acknowledged, mutual agreement is reached, a decision is taken, resources are marshalled. Then, in step 2, functionality is supposed to improve step by step. Restorative practices reinject robustness into the infrastructure by correcting deficiencies one after another. After step 2, resilience is supposedly attained. Resilience has a temporal meaning. It closes a period of functional instability. It is also an indicator that functional recovery has been fully achieved. Such a model is open to multiple critiques, the most obvious being the constant blurring between the objective and subjective assessments of what good infrastructure functioning is – an inherent quality of the infrastructure or a matter of judgement? Nonetheless, it allows us to shape the idea of infrastructural regeneration in the form of a two-act drama, in which we explore the two facets of a trial that

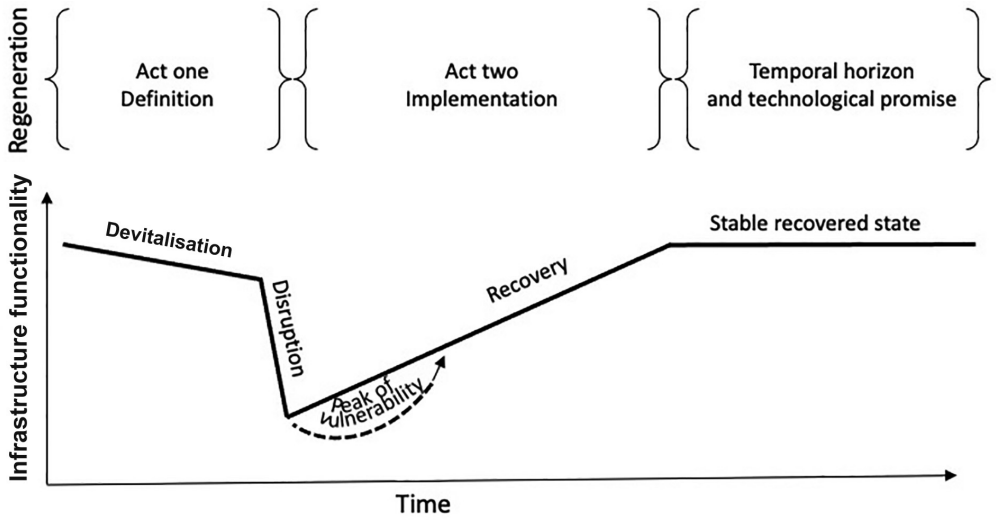


*Figure 6.1 Infrastructure functional resilience model*

are apparently distinct but, as will now be seen, are in fact closely interconnected. In the next two sections, in way of illustration, we apply this approach to the study of the regeneration of a suburban line of the Paris regional train system.

## ACT ONE: DOES AN INFRASTRUCTURAL TRIAL NEED A CATASTROPHIC BREAKDOWN TO OVERCOME DISAGREEMENT?

### Methods: Gathering Materials and Testimonies

The survey methodology entails a classic mix of literature compilation and interviews. The written sources fall into three categories. Railway history books (1860–1960) reconstruct the creation and transformation of Paris metropolitan rail network, noteworthy accidents and the debates associated with them. Post-war rail planning literature describes the making of the Parisian mass transit system. The grey literature reflects its alleged decay. In addition, 30 in-depth interviews (for an average duration of 90 minutes each) were conducted with bottom-to-top rail experts and operators to contextualise infrastructure vulnerability and map the arguments around the regeneration project. The panel encompassed train drivers, regulators, technicians and planners as well as commuter organisations and authorities. Around half the interviewees have direct connections with the rail and share the expert or insider's views of the question. Another half consider themselves non-experts and claim to represent the views and interests of other parties critical of regeneration.

**The Definitional Trial of Infrastructure Regeneration**

The survey shows that an overwhelming majority of experts and non-experts are severe in their diagnosis of the state of the rail infrastructure and equally harsh in their assessment of past and current rail policies. Broadly, the judgements converge on the following explanation. All in all, France's conventional railway network is in a bad state because for too long maintenance has been inadequate, for two reasons. One, since the 1980s, the fetish of high-speed has channelled public spending, thereby diminishing the capacity to look after the conventional rail network. Second, the current technical and financial flows dedicated to rail repair are inadequately managed and geographically scattered. This is because France's railway network is too large. It is impossible – as national and regional governments still try to do – at the same time to maintain services on old rural lines used by relatively few passengers (but in danger of closure due to their poor condition) and to reinforce city and intercity lines where traffic is increasing and where repair efforts consequently need to be proportional to the intensity of wear and tear (Spinetta, 2018). A bold national political choice is urgently needed. From this perspective, the connection between the descriptive and prescriptive dimensions is obvious. Rail problems occur in the context of a rail regime with its technologies (high-speed vs. conventional train systems), its planning complexities (historical rail monopoly, national and regional governments sharing knowledges and powers), its geo-historical policy trends (the recent focus on mass transit problems versus the problem of obsolescence on rural networks).

This narrative adopts the structure of the scientific trial and follows the abovementioned binary framework. Two 'D-words' are the pillars of the causal demonstration. The root of the problem is rail devitalisation, which sooner or later leads to infrastructural disruption. Devitalisation can be encapsulated in a single criterion, the mean age of the components of the rail system (catenaries, electrical devices, tracks and ballast, switches and other items). Statistical models can produce such an aggregated indicator at any level. The national mean age of French rail is above 30 years. An international comparison shows that this figure exceeds all European neighbours (and rail competitors). In other words, the infrastructure is too old, consequently obsolete (an interpretation of factual age of the infrastructure) and prone to devitalisation (a threatening trend). The situation needs to be reversed to safeguard the long-term performance and even the existence of the nation's infrastructural heritage. Devitalisation and regeneration are transparent metaphors which conceive the railway as a living organism. They are framed as the product of the balance between a negative flow (a loss of substance, result of an intense utilisation or, conversely, of the quasi-abandonment of some parts of the network) and a positive flow (the reinjection of specific repair practices).

The result of the demonstration is a new official classification of railway management. A first group in this classification is still maintenance, which includes routine *surveillance practices* (regular in-situ inspections and visual verification of the presence and condition of technical components) and c*orrective maintenance* including the fixing of defects. But both measures are of no use on devitalised lines. The second group covers repair, which consists of *renovation* measures (i.e. replacing the components of a rail system with identical components) and *modernisation* (e.g. the replacement of a rail signalling system with a more recent technology with enhanced functionalities). Finally, *regeneration* suggests a coherent, large-scale and integral *recovery* programme in which all system components are renewed at the same moment on one large section of rail, so as to achieve maximum efficiency, speed and economy of effort and cost. Solé-Pomies (this volume) provides a road-oriented vocabulary of

repair with a gradation of terms that echoes our own and suggests that transport operators are currently very busy with this definitional activity. But a scientific trial's moment ends when the reasoning is socially agreed upon, hence when it fits with other parts of the society visions and perspectives of real-world railway issues.

**An Ambiguous Testbed for Rail Regeneration**

Next, our dialogue with experts and non-experts turns toward the infrastructural problems facing the RER C line. Paris's C line would seem to be not only an example, but one of the testbeds of regeneration. Why? The Paris region's mass transit system is one of the world's densest and busiest metropolitan networks (Laurent et al., 2018). It ranks just behind the Greater Tokyo network, which has been regarded as facing similar issues (Fisch, 2019). Paris mass transit, which carries every year more than 3 billion passengers on 14 urban metro lines and 13 metropolitan lines (Janssoone, 2019) has five express lines comprising a sub-network called the RER (regional express network). The C line belongs to this RER sub-system but its tracks also support intercity, high-speed and freight traffic. With 84 stations, the C line extends over 187 km and moves daily more than half a million commuters in the trains labelled RER C alone. Its eight branches (Figure 6.2) go first through blue-collar suburbs where rapid gentrification is underway, then extend into residential white-collar outer suburbs north, south and west of Paris. In the last 25 years, it has experienced two derailments, two terrorist attacks, several catastrophic Seine floods that have stopped operation for weeks or months, plus innumerable power outages and train cancellations. Traffic delays are the norm: on some days, two thirds of the trains run late. If a regenerative approach can tackle such tricky conditions for rail repair, it may solve many more problems and consolidate the agreement around this trial.
The trial is quite easy to frame within its temporal brackets. It begins when the line's fragility becomes visible (in the late 1990s), it ends in 2013 (with the derailment of an intercity train that used the same tracks as the C line: the Brétigny accident killed eight people) or in 2014 (a fire in the C line's electrical system halted operation for several months and led to this section of the metropolitan network being declared a maximum priority). It is less easy to characterise with the former justifications of age, obsolescence and devitalisation. In fact, what is the exact age of RER C's components? The C line was commissioned in 1979, yet it was not a brand new line but the product of a series of interconnections between existing track sections. The section that serves the Vallée de l'Orge (a southeastern residential area where a third of the line's users live) served Orleans in the late nineteenth century. The section running through Paris was built at the time of the Universal Exhibition of 1900. Other line subsections date from the 1870s and were reopened after decades of closures.

At first glance, the demonstration of regeneration fits very well. Some of the C line's catenaries have been in place and in operation for more than a century. The C line's age and technical heterogeneity (different sections were built by distinct private companies) therefore creates obvious complexities and fragilities for service in term of interoperability, rolling stock adaptation, power supply specifications… At second glance, however, the direct link between age, obsolescence and devitalisation is not so easy to demonstrate. Mass transit lines evidently receive much more maintenance than the rest of the French rail system. The normal mode of existence of the C line since its 1979 opening has been characterised by a constant stream of monitoring, maintenance and repair. An alternative explanation for its deterioration may lie in a more silent disruptive point attained by the entire rail regime: the disequilibrium between

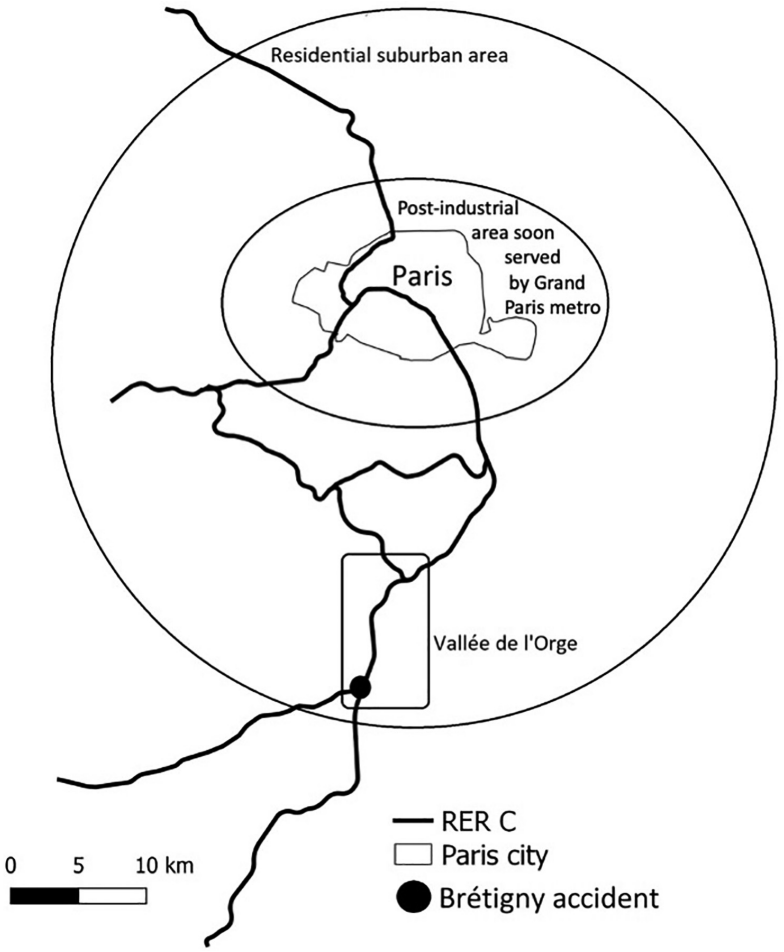


*Figure 6.2 Paris suburban line C map*

traffic flows (caused by the socio-spatial transformation of the Greater Paris and its rocketing residential sprawl from the 1960s) and technical flows (the constant maintenance routines that cannot reverse a dangerous wear-and-tear mode of infrastructure management attached to specific governance model). This point of disruption is attained in the turn of the millennium (as retrospectively assessed by experts), but this cause went against the regulation system and could hardly be integrated by the regime until the truth event of a rail tragedy.

**First Act in the Trial of Regeneration: Reordering Achieved at the Cost of Fatal Disruption**

Returning to the notion of trial, a question raised by its local application concerns the identity of the speakers and the interests they are defending in such a proposal. How are they situated in the regime? What resources do they want to protect in reaching a compromise over the regeneration of the C line?

A clue puts us on the way to answering this question. Let us go back to the official birth of the modern line. Zembri (2003, 2006) argues that the C line is structurally dysfunctional because it was a low-cost project due to the 1970s oil crisis, the subsequent austerity period, and, importantly, a context of rivalry between transport institutions. The rail company SNCF created and ran the C line to challenge the growing market dominance of the Paris metro authority RATP, which was already running Lines A and B. This strategic reading of the conditions under which the post-war mass transit network was built illuminates the interconnected dynamics sustaining the rail regime. In the case of India's metropolitan transport, Gopakumar (2020) argues that 'the tight interlinkages between material, institutional and political actors' create an entity that exists in a self-perpetuating cycle of enormous stability that 'is surprisingly resistant to unravelings' (p. 360). Is the idea of regeneration consistent with the obduracies (Hommels 2005) of this regime and to what extent may regeneration be a tool to protect the interests of the 'regenerator'?

The invention of regeneration as a category makes sense if it is seen as an attempt to reorder the mass transit regulation that threatens to marginalise SNCF Réseau, the owner of the rail infrastructure and champion of this kind of repair. As Figure 6.3 shows, *Île-de-France Mobilités*, the metropolitan transport authority that funds the metropolitan transport system, is mainly focused on service performance criteria. The system does not leave much room for the protection of the long-term interests of the infrastructure itself. The introduction of the term regeneration can thus be read as an argument for and an illustration of the importance of preserving SNCF Réseau's sole asset. It is in the interests of this institution to challenge the centrality of service performance (Gaudry, Lapeyre and Quinet 2011). Regeneration may be interpreted as an instrument of SNCF Réseau to take back power in the game after the big bang of the late 1990s rail reform, which split the former monopoly rail company into two entities with divergent goals (customer satisfaction made ever difficult when traffic is rising for SNCF Transilien, the service provider; asset integrity for SNCF Réseau).

Unfortunately, a scientific trial can fail. The pace of infrastructural deterioration and the time lapse before various groups have a rethink and come to a compromise are not necessarily synchronised. Here, the drama seems to turn into a serious game or a tragic race. The term regeneration originates in a report issued in 2005 by a Swiss university department (Rivier and Putallaz, 2005), and therefore considered doubly 'neutral' vis-à-vis the French state and SNCF Réseau. It was developed and updated in 2012 (Putallaz and Tzieropoulos, 2012), and it is an illustration that research is going on, but also that SNCF Réseau needs further proofs to convince two partners: Ile de France Mobilités (placed under the pressure of a metropolitan public opinion obsessed with the need to add trains to respond to fast-growing passenger numbers) and Transilien (under the pressure of contractual rules and service quality indicators, and worried that renovation work might disrupt the traffic). After the 2013 derailment and the 2014 fire, everybody agreed on the necessity to urgently regenerate the line. The first act (the agreement over a shared scientific truth) was superated, but the complete C line story was not over.

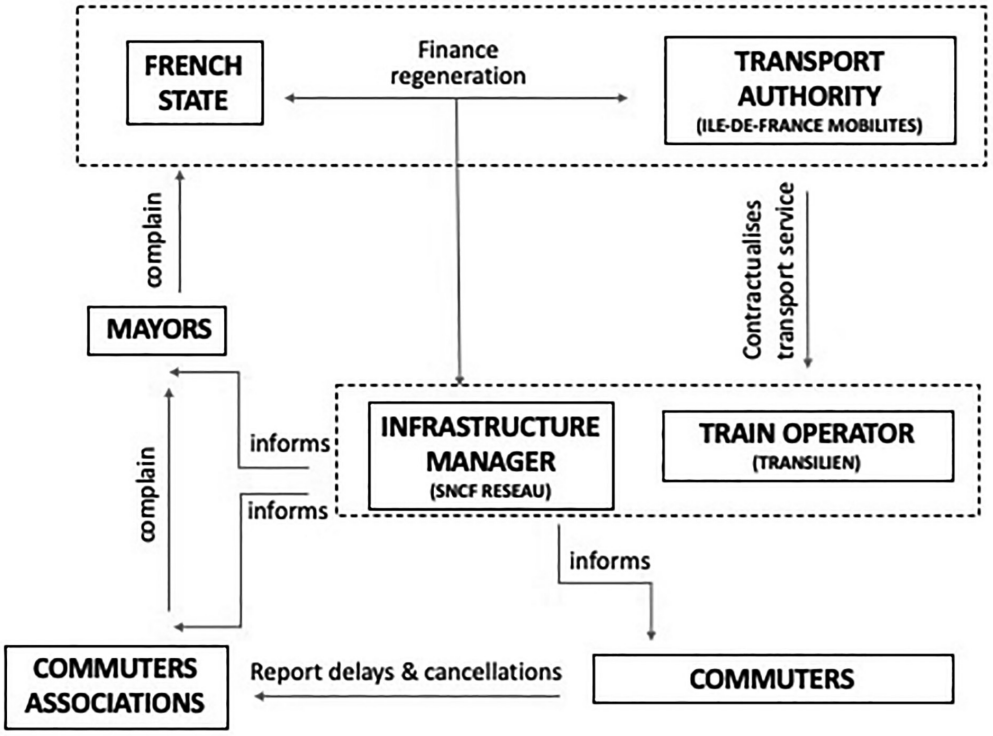


*Figure 6.3 Paris mass transit regulation and regeneration funding system*

## ACT TWO: RECOVERY CAPTURES THE INFRASTRUCTURE AND ITS REGIME IN A PERPETUAL PRESENT

### The Tricky Launching of a Regeneration Roadmap

The act of repairing line C can only be implemented in the middle of its users. A multiscalar perspective of the 'geography of repair' (Persaud et al., 2019, p. 13) is made visible. This perspective is illustrated in our case study by the localisation process for recovery practices and the way Vallée de l'Orge crystallises the frictions between recovery practices and other interests and actions, and how this tiny part of the rail regime definitely weakened the consensus that regeneration could be a solution.

Scheduling engineering works is traditionally a crucial dimension of rail repair planning and management. As they are conceptualised within an ambitious and industrialised approach to railway repair, regenerative practices powerfully alter the material and organisational landscape in which they take place: the habits of train drivers, the routines of commuters, even the nature of the regime's managerial and political practices. The wave of disruption triggered by regeneration is centrifugal in terms of its direction (it affects internal rail bureaucracies, then other institutions, operational staff and users) and its rate of acceleration is logarithmic rather than arithmetic. Within SNCF Réseau itself, the regeneration programme gradually destabilised working habits. It took roughly three years to recruit and train specialised technicians,

to rent the huge machine that simultaneously replaces ballast and tracks, to arrange timeslots with the authority for works on a line in operation. In the aftermath of the train tragedy, all these tedious and relatively discreet preparations led to accusations of bureaucratic inertia that quickly began to erode agreement.

Then, abruptly, recovery became too fast and too strong. Its practical instantiation involved line closures and limits on train speeds. Vallée de l'Orge commuters (entirely dependent on the C line to access their jobs in Paris) rebelled against the regeneration scheme. On some working days in 2021, half the trains were cancelled, albeit on part of the line, and others ran at substantially reduced speeds. This increased commuting times by an hour or more (for people who experienced already long trips, about one hour in each direction each working day). Moreover, the slower the trains travelled, the fewer trains could be scheduled on the same track. Because of this, the recovery phase was experienced as a time of overcrowded trains with not enough seats.

**Recovery-Induced Over-Fragility: Nasty Surprise or Well-Kept Secret?**

Recovery leads to an exceptional commuting order that clearly creates friction with the social components of the regime. It can be justified as a temporary situation, promising a better future in compensation for short-term inconvenience. Yet, during the initial phase of works, recovery seemed to lead to a mysterious and dangerous acceleration in the deterioration of the line. Rail resilience experts had at this time a response. McCallum (2019) thus notes that the functionality of an infrastructure temporarily worsens because adding brand new components in some sections exacerbates heterogeneity, which temporarily weakens the whole system until the gradual introduction of new materials reduces total heterogeneity and increases the robustness of the system. We have already noted how the C line is the result of heterogeneous technical standards and struggles with interoperability problems. Hence another disruptive point is attained when recovery starts and new uncertainties flourish in and out expert circles. How long might this intermediate period last? How deep can the weakening caused by recovery actions go? Such questions not only affect the second act of the trial (acceptance of the recovery programme) but also the first, about the very state of the rail (and its coping capacity). What is at stake is the factual and temporal guarantee offered by the concept of regeneration and the social capacity to trust SNCF Réseau (and more globally the institutional regime of the Paris mass transit system). As in Gómez-Urrego (2019), expectations and temporalities of infrastructuring are materially and symbolically interlinked. Past and future trajectories perceptions of the C line, of metropolitan lines and of national lines are revisited and confronted. Gradually, the resilience horizon is acknowledged to be more a target in an abstract model than a reality attainable after a predictable and determined amount of works.

The introduction of suspicion in a small part of the spatial and social system makes the underlying contradictions of the regulation regime questioned. If a predetermined proportion of trains do not run, the regulatory authority may impose financial penalties. As a result, theoretically, the more repairs the network operator carries out on the C line, the less money the train operator earns. Worse, the train operator may lose the next transit tender if it fails to meet its contractual obligations. This governance framework triggers an accumulation of divergent evaluation processes and socio-political and institutional tensions that threaten the whole regime.

**Regeneration Tamed by Regime Obduracies**

'Our goal is to transport people. Commuters need the train to get to work. We have the absolute obligation to deliver service and, taking this into account, we try to let [recovery] works happen, we are not here to prevent them, but not at any cost' (transport authority director, 24 November 2020). Such a firm response by one of the top managers in the transport authority to questions about the C line recovery programme can be explained by the fear of the uncontrolled extension of failure discourses that these engineering works have triggered. The hard landing of regeneration is followed by a multifaceted set of narratives that underpin a heated political controversy in which three major discursive strands can be identified.

The first, highly publicised narrative targets the traditional culprit for public rail problems: too much money was (or still is) dedicated to high-speed rail. A second storyline based on the word *galère* (roughly equivalent to the English 'hellish' when describing the experience of public transport) which is partaken with rail union and users' communities (see, e.g., www.stopgalere.fr) also pops up. *Galère* not only conveys a mix of incomprehension, impotence, distress, weariness, anger and fatalism, it is also a metonym for the suburban lifestyle as a whole. Finally, as the recovery period lengthens, a third narrative emerges among local authorities of the Vallée de l'Orge (Durovray et al., 2021) and characterises the politicisation of the trial challenge and the criticality of the C line. Failure is no longer the result of infrastructural policies but a tale of two urban worlds, a story of victims and victors. The victors inhabit either the suburbs that are now served by light rail systems or will shortly be linked to the Grand Paris Express metro. The victims are the suburbanites who live along the RER train lines built in the 1960s and the 1970s. They no longer even enjoy the service quality they had in the post-war era, as public money now goes to megaprojects, in particular the Grand Paris Express, seen as a flagship of Paris's 2024 Olympic Games (Enright, 2016).

This last narrative contains a subversive dimension and is closely connected with the recent protests by socially declining peri-urban white-collar workers, the so-called Yellow Vests movement in 2019. It shows that a trial (as any challenge) may be constantly reopened and displaced toward new evaluation criteria, in this case a perspective of socio-spatial discrimination and mobility justice. At this point, other kinds of disruptions and truth events can be acknowledged, and a triple strategy is elaborated to contain the controversy and maintain the regime.

The first part of the response offered by the authority, the rail manager and service operator is to qualify the problem as a mere communicational and procedural one, as if coordination could resolve the difficulty of finding a consensual window to conduct engineering works on saturated networks or to better stand the inconvenience (Rye et al., 2018). This attempt can be interpreted as a first instantiation of Hommel's concept of obduracy. Thanks to dedicated apps for train users and special information procedures for elected representatives and community organisations, at least commuters can have sufficient advance notice of engineering works and are given tools to help them adjust their trip. This illustrates a reflex of containment of the problem within a technical toolbox at hand's reach.

The second part of the institutional backlash is also a good example of the strategy institutions develop in order to avoid the construction of a negative 'labelling process' (Bovens & 'T Hart, 2016). The counterattack of rail institutions consists in foregrounding the greater Paris politicians' own responsibility for rapid rail devitalisation. This line of justification is that the infrastructural deterioration is the direct consequence of an urban planning model and not the result of a dysfunctional transport system. Indeed, it is true that major socio-spatial

transformations in the region's settlement over the last four decades required and still call for significant changes in train services, and the rail authority does not want to politically assume these unpopular[1] changes.

The third illustration of the defensive strategy of the entity in charge of regeneration can be found in the arrangement of power and authority hidden in the apparently neutral technology of repair and maintenance reporting and budgeting:

> aintenance and regeneration works are part of the initial (C line) project. They are author- Financially speaking, this means they are budgeted for without any need to reassess the roject. SNCF Réseau takes the decision alone. We have one billion for rail regeneration in Île-de-France which is allocated by us to regeneration works here and there, so that no budget line goes over 23 million euros. Another category is rail modernisation, which requires a socio-economic assessment – as stipulated in the law – hence a public debate, hence the al organisation of participatory sessions with users and politicians. (manager, SNCF au, 8 August 2021).

This remark by SNCF Réseau's manager explains that another kind of techno-politics (here a certain agency in repair categories) ensures the C line's recovery programme can go on regardless of complaints and despite additional breakdowns. Consequently, both parts of the trial (scientific truth and implementation challenge) are strongly connected to the renewed categorisation of repair practices that derived from the initial rail problem diagnosis. Regeneration is not a repair practice, but a tool to protect the flexibility and autonomy of the corresponding institutions and to exclude rail management from institutional and democratic control.

## CONCLUSION

In this chapter, our aim was to enrich the empirical and theoretical analysis of infrastructural repair practices and policies by exploring the conceptual invention and the physical implementation of *regeneration*. We were interested in the ways in which railway scientists and experts forged a distinct concept and envisioned a means to reframe technical standards and to reorient infrastructural policies by re-situating them strategically within a complex and dynamic socio-techno-political regime. We framed regeneration as a temporal process which sought to bridge the gap between the 'D-problem' and the so-called 'R-"solution"'. We described disruption and recovery times as moments that appear to be successive phases but are in fact strongly interrelated cognitive-oriented definitional trials and regulatory order-challenging trials. As an object in which the local and national scales of rail problematics intersected, the metropolitan C line epitomised the tensions, ambiguities and contradictions created by diverging evaluation processes and embodied the obduracies of the techno-political regime.

We can now answer the question: is regeneration a success or a failure? Certainly, it has succeeded in the way it has shaped the dominant narrative of the rail question as a shock of obsolescence. Yet, it has not prevented from the continuing deterioration of the network or from serious accidents, nor has it limited popular discontent. Its most visible impact lies in the

[1] For example, it takes longer for Vallée de l'Orge residents to travel to their Paris jobs than it did in the 1980s because the train must now stop in interstitial cities, in which ongoing gentrification and integration in the Paris job market leads to more demand for public transport at peak hours.

way it has reordered and redirected the debates over the path France has followed in adopting European rail regulation. Could the balance between infrastructure protection and service performance be integrated into the market-oriented principles resulting from EU directives that underly the current governance and political economy of mass transit? This question was partly reconfigured by the trial we explored, but not fully answered. A visible failure can be perceived in the frictions arising from the confrontation between regeneration and the social, territorial and political constituents of the regime. The failed technological promise associated with the concept cast doubt on the legitimacy of the infrastructure manager, but the window of opportunity for a real reset of the socio-technical system was avoided. We can conclude that the difficulties of the recovery's works were considered publicly as a 'semi-failure' and comforted a public opinion that considers the railway and the transit problem quite insuperable, but that the nodal agreements at the bottom of the regime were not so much exposed or re-negotiated.

Some questions deserve further exploration. One falls within the purview of railway engineers but is of paramount interest to urban planners, who are afraid of importing further fragility into an already deficient infrastructure. This avenue of research seeks to clarify the dynamics of infrastructural recoverability, e.g. how to control 'the speed at which an entity or system recovers from a severe shock to achieve a desired state' (Rose, 2007, p. 387). Linked with this is the question of orchestrating the temporality of the cognitive, financial and institutional flows of regeneration with other socio-spatial dynamics of metropolitan regions. For this, we call for a more in-depth exploration of the links between an infrastructural present (with its intrinsically intermediate nature as a process that is 'always in the making' (Silva-Novoa Sanchez et al., 2019)), thick moments of evaluations and the long-term structural characteristics (professional and epistemic cultures, policy frameworks, geographies of decay and repair) that forge the whole timescape of an urban infrastructure.

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