

Railroad Luxemburg: Rosa Luxemburg's Theory of Infrastructure and its Consequences for a Public Service Internet

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Abstract: Infrastructures of circulation, transportation, and communication play a central role in Luxemburg's work in political economy as well as revolutionary strategy. This paper seeks to reconstruct and develop a theory of capitalist infrastructural expansion drawing from a variety of Luxemburg's writings. In *Accumulation of Capital*, infrastructural expansion – namely of railroads – plays a central role at all stages of capitalist accumulation. Railroads act as a site of military and state investment for introducing the commodity economy to non-capitalist sectors and eventually for the “capitalist emancipation of the hinterland.” At the same time Luxemburg rejects the progressive character of these infrastructural endeavours, and she argues that they will not be a genuine “stamp of progress in an historical sense” until capitalism has been destroyed. It is no coincidence then that her political writings prominently feature figures such as railway and postal workers, who are strategically positioned to strike at the infrastructures of imperialism. A Luxemburgist theory of infrastructure has important relevance for contemporary debates around the expansion and ownership of Internet infrastructures. The past decade has been marked by various calls for new models of Internet ownership. These include The Public Service Internet Manifesto, the Democratic Socialists of America's Internet for All Campaign, Tarnoff's *Internet for the People*, Téwodros Workneh's “Case for Telecommunications Commons in Ethiopia,” and netCommons Project's vision for community networks. Such calls for a publicly owned and funded Internet risk reproducing some of the dynamics Luxemburg describes in her account of the history of railroads, canals, telegraphs etc. Namely, such calls parallel the state subsidising of an infrastructure that seeks out new sites of accumulation and extraction. This is not to say that such endeavours should be wholly abandoned, but must fit into a broader anti-capitalist political program, otherwise such infrastructural expansion can be seen as continuing the expansion of capitalist accumulation. Luxemburg deters us from looking for a technical fix. For this reason, Luxemburg's political writings and her critique of the non-progressive nature of capitalism are also useful as she indicates how the destruction of capitalism can alter and redeem such large infrastructural projects.

Keywords: Rosa Luxemburg, infrastructure, Internet, railroads, circulation, forces of production

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1. Introduction

Over the past decade, there has been a proliferation of calls for rethinking and challenging the private ownership of the Internet's infrastructure. They include *The Public Service Internet Manifesto*, the New York City Democratic Socialists of America's “Internet for All” campaign, Ben Tarnoff's *Internet for the People*, Téwodros Workneh's “Case for telecommunications commons in Ethiopia,” Cory Doctorow's *The Internet Con: How to Seize the Means of Computation*, and netCommons Project's vision for community networks. These are important and welcome initiatives for thinking about

the power held by private corporations over critical means of communication and for charting futures where essential infrastructures do not serve the interests of capital.

Often what is not addressed centrally in these various calls for a publicly owned Internet is a reckoning with the deep imbrication of these infrastructures in colonial and imperialist projects. And while there is the implicit hope that an Internet in the hands of the public will move the Internet away from serving the project of empire, it is necessary to more explicitly parse out an understanding of the interrelationship between infrastructures of communication and imperialism, as state investment and public ownership of networked infrastructure have historically served the interests of capitalist expansion.

To address these questions there is no better thinker to turn to than Rosa Luxemburg. Throughout her most influential works – *The Accumulation of Capital*, *Junius Pamphlet*, and *The Mass Strike* – Luxemburg reckons with the role of networked infrastructures in imperialist expansion as well as in anticapitalist revolt. While her primary focus is on railroads (and occasionally canals, postal networks, etc.), I argue that we can generalise an infrastructural theory from Luxemburg which helps us think about contemporary debates about digital capitalism and ownership of Internet infrastructure.

In the chapter “Introduction: Breaking the Spell of Technicism” in *Outlines of a Critique of Technology*, Monika Reinfelder introduces Luxemburg as one of the earliest Marxists to “extricate themselves from technicism” (1980, 24). Reinfelder argues that Luxemburg rejected Lenin’s “hymn to factory discipline as evidence of his mechanistic” thinking and dismissed “the idea of a technocentric continuum in the transition to socialism” (25). Along with her astute analysis of imperialism, Luxemburg’s non-dogmatic approach to the question of technology and the forces of production make her thinking so relevant to the present.

To clarify a Luxemburgist theory of infrastructure, I turn to three critical interventions made across her corpus. First, in *The Accumulation of Capital*, Luxemburg points to the proliferation of railway construction in the 19th and 20th centuries as central to the historical conditions of accumulation. Looking at her discussion of the history of railways in the US and the Ottoman Empire helps us to better understand the roles of networked infrastructure in capitalism’s ongoing expansion into non-capitalist zones. Second, in her *Junius Pamphlet*, Luxemburg makes an important intervention in thinking about the contradictory nature of the forces of production under capitalism. She argues, on the one hand, that technological development under imperialism had lost its claim to progress, while at the same time, these technologies could be brought into the service of humanity only in the context of a socialist revolution. Finally, in *Mass Strike*, Luxemburg’s attention to the railway, telegraph, and postal workers’ militancy in the 1905 Russian Revolution clarifies her thinking about the role of networked infrastructures and the workers that power them during times of revolutionary upheaval.

Once I have reconstructed Luxemburg’s theory of infrastructure, the conclusion will return to contemporary questions about Internet infrastructure to show how Luxemburg’s thought sheds important light on questions of digital capitalism. Luxemburg’s writing about railroads can be broadened into a larger theory of networked infrastructure and can help us to understand infrastructure’s relationship to capitalist accumulation and imperialism. This is useful for thinking about the expansion and ownership of the Internet among other communication networks and is also interesting in light of recent calls in the US for nationalising the railways (Lydersen 2023).

Before continuing, it is necessary to provide a brief note on terminology. Infrastructure is not a term that Luxemburg employed in her work. Instead, she often refers specifically to the technologies that today we think of as infrastructure, such as railways,

telegraph, and postal networks without referring to them with an umbrella term such as “infrastructure” or “technology.” She will at times refer to “means” of transportation or communication. Within this paper, in order to draw out the relevance for twenty-first-century interests in questions of infrastructure, I use “infrastructure” – a term that Luxemburg herself didn’t use – as an umbrella for means of transport and communication. I broadly conceive of “communication” as the flow of information, goods, people, etc. Further, by “infrastructure,” I do not mean to invoke the use of the term as a stand-in for the term “base” in Marxist discussions of the relationship between the base and the superstructure. For instance, Louis Althusser in *Ideology and Ideological State Apparatuses* argues “that Marx conceived the structure of every society as constituted by ‘levels’ or ‘instances’ articulated by a specific determination: the *infrastructure*, or economic base (the ‘unity’ of the productive forces and the relations of production) and the *superstructure*, which itself contains two ‘levels’ or ‘instances’: the politico-legal (law and the State) and ideology (the different ideologies, religious, ethical, legal, political, etc.)” (Althusser 1971, 134). Christian Fuchs has analysed the problems of the Althusserian approach noting that “[t]he political and the cultural are economic and non-economic at the same time. But not only are culture and politics economic, the economic is also cultural and political. Althusser underestimates the operation of the non-economic in the economic realm” (Fuchs 2019, 7). While Luxemburg does tend to the conflict between forces of production and relations of production in her work, she also insists on the persistence of non-economic forms of coercion and violence by means of militarism, the state, and the law in imperialist expansion, which leads her to a significantly less rigid separation between the base and superstructure. As I argue below, for Luxemburg, large infrastructural projects, such as railways, are sites where not only forces and relations of production come into conflict but also are a site of state violence, where claims of cultural progress and other ideological battles are key.

Finally, what we understand today as infrastructure can be understood as a central component of what Marx called “the general conditions of production.” Soren Mau notes: “Such projects require large investments of sunk capital and are usually too risky or unprofitable to be attractive for individual capitals. Infrastructure forms a part of what Marx called the general conditions of production, in contrast to the conditions of particular capitals or fractions of capital. Capital has to shift such burdens ‘on to the shoulders of the state,’ since the latter is the only institution that possesses ‘the privilege and will to force the totality’” (Mau 2023, 276).

2. Infrastructure in Luxemburg’s Theory of Accumulation

In *The Accumulation of Capital*, Luxemburg complicates Marx’s account of expanded reproduction in *Capital Volume II*. Luxemburg argues that even in the abstract, capitalism cannot expand and reproduce itself in a world where only capitalists and workers exist. Capitalism always requires an outside, non-capitalist environment. For Luxemburg, “[a]ccumulation is more than an internal relationship between the branches of capitalist economy; it is primarily a relationship between capital and a non-capitalist environment” (Luxemburg 2003 [1913], 398).

So-called primitive accumulation, the securing of new regions for exploitation and the expropriation of lands and goods produced by non-waged workers is ongoing throughout capitalism for Luxemburg, not an isolated incident that simply served as a historical precondition of capitalism’s emergence.¹ For Luxemburg extra-economic coercion and accumulation by expropriation persist alongside capitalist exploitation, and

¹ See for instance Roberts 2020, Harvey 2004, and Nichols 2021.

capitalism falls into crisis when it loses an outside from which to continue this plunder. As Luxemburg saw it, imperialism was a stage of capitalism where European capitalists had nearly exhausted their own internal non-capitalist areas and set out into the rest of the world to seek out new non-capitalist environments.

Railroads historically allowed capital to reach capitalism's outside, finding capitalists new non-capitalist spheres to tap into in order to find new workers, consumers, land, and goods to expropriate. Luxemburg asserts that:

“The forward-thrusts of capital are approximately reflected in the development of the railway network [...] Public loans for railroad building and armaments accompany all stages of the accumulation of capital: the introduction of commodity economy, industrialisation of countries, capitalist revolutionization of agriculture as well as the emancipation of young capitalist states” (Luxemburg 2003 [1913], 400).

Railroads, both as a means of circulation and movement, but also as a large-scale infrastructure that served as a vessel for massive loans and investment, were a pivotal part of the historical conditions for capitalist accumulation. This is not a technological determinist argument, but rather based on Luxemburg's historical analysis of the nineteenth century where railroads “grew most quickly in Europe during the forties, in America in the fifties, in Asia in the sixties, in Australia during the seventies and eighties, and during the nineties in Africa” (Luxemburg 2003 [1913], 400).

To illustrate her point, Luxemburg examines three historical examples of imperialist railroad development under capitalism: the role of the railroad in North American westward expansion, British loans for railway constructions throughout the Americas, and lastly German loans to the Ottoman Empire. The example of the US and Canada serves to elucidate the role of railways in the struggle against the peasant economy and the separation of “industry from agriculture, to eradicate rural industries altogether from peasant economy” (375). Whereas the example of loans to the Ottoman Empire for railway construction demonstrates how the promise of modernization through large-scale infrastructure projects unevenly incorporated countries like the Ottoman Empire, Russia, China, and Egypt into the capitalist world system as debtor nations. Railways were for Luxemburg not simply tentacles of empire in the sense that they connected various parts of the earth – although this point is important. They also served as important sites of state and private capital investment, helping capital in the imperial core attract states eager to indebt themselves and purchase the materials for modernising their transportation and communication systems.

2.1. Railroads and the American Frontier

“In the wake of the railways, financed by European and in particular British capital, the American farmer crossed the Union from East to West and in his progress over vast areas killed off the Red Indians with fire-arms and bloodhounds, liquor and venereal disease, pushing the survivors to the West, in order to appropriate the land they had ‘vacated’, to clear it and bring it under the plough” (Luxemburg 2003 [1913], 376).

Luxemburg points to nineteenth century railroads along the American frontier which lured European settlers with the promise of escaping the capitalist drudgery of British factories or factories setting up on the east coast of the US Railroad companies – equipped with large land concessions and subsidies from the state – advertised vibrant

farmlands along the railways for settlers to move out and become farmers. But once settlers moved out and became farmers, they were quickly outpaced by monopolist farm companies – that were often owned by the same people who owned the railways. This then forced the farmers to abandon an idyllic, self-sustaining farm life and begin again, working for a wage. Along the American frontier, what accompanied the violent dispossession of Indigenous people and land was a constant process of recreating the dynamics of enclosure, encouraging settlers to engage in simple commodity production which was quickly extinguished by industrial capital. The promise of escape from capitalist drudgery was necessary for capitalism’s continual existence and expansion, capital needed farmers who were not quite wage labourers to then re-incorporate into the wage system. Capital was in a constant process of re-creation and re-discovery of an outside. As Luxemburg puts it: “capital cannot accumulate without the aid of non-capitalist organisations, nor, on the other hand, can it tolerate their continued existence side by side with itself. Only the continuous and progressive disintegration of non-capitalist organisations makes accumulation of capital possible” (397).

Drawing from the insights of Luxemburg as well as John Hobson and Vladimir Lenin’s writings on imperialism, Manu Karuka develops the concept of “railroad colonialism” in his book *Empire’s Tracks*. His account is much more attentive to the impact of imperialist expansion on Indigenous people in North America than Luxemburg’s account, which is much more focused on the settler perspective. On the concept of “railroad colonialism” Karuka writes:

“Infrastructure, in other words, played a police function, materialising not through liberal universalism, but proliferating distinctions and comparison along the lines of community, nation, race, gender, caste, and respectability. Railways enabled the circulation of colonial commodities throughout the imperial core, and even more importantly, they made the large-scale export of financial and industrial capital to the colonies a central feature of global capitalism” (Karuka 2019, 40).

Karuka’s concept of the war-finance nexus is additionally useful for understanding the interrelationship between the state (both as a lawmaker and military enforcer) and the boom of financial capitalism that funded railroad expansion. In this nexus, it is hard, if not impossible to separate the work done by the state and by private companies. They give each other legitimacy, and this is especially clear in the case of railroad companies leading the way in colonial expansion with the state’s authorization. In his discussion of railroad companies, he writes “Corporations transformed, from extensions of state power for establishing sovereignty, into sanctuaries from state power for the accumulation of capital” (164). For Karuka, “[r]ailroad colonialism was central to the co-constitutions of the modern imperial state and finance capitalism, in the latter half of the nineteenth century” (xiv).

2.2. Ottoman Railways & Debt Colonialism

Another example Luxemburg gives of the role of railroads in imperialist expansion is how German loans underwrote the Ottoman Empire’s construction of major railways from the 1880s onwards. These German loans were used to buy German locomotives, railcars, and other technology along with German steel for the construction of the Ottoman railway. Luxemburg writes that in the 1890s and 1900s, “German capital was used to a considerable extent to pay for German goods, the Germans forgoing, to use Sismondi’s term, only the pleasure of using their own products” (Luxemburg 2003

[1913], 407). For contemporary economists, this process seemed plainly absurd and counter to the economic interests of German capitalists as German money was being used to buy German goods.

Luxemburg argues that this appearance of absurdity actually made economic sense for German capital, which, facing a saturated domestic market, sought out the Ottoman Empire as a new market to expand into. What mattered was not domestic consumption but rather finding new sites to “beget and realise surplus value, so that accumulation can proceed” (408). Luxemburg details how, through an elaborate chain of Ottoman tax administrators, this major industrial project was ultimately funded by the direct expropriation of Ottoman peasants whose goods were seized by the Ottoman state and sold to pay debts to Western Europe. Here, so-called capitalist emancipation and modernization were paid for by the non-capitalist peasants rather than for by wage labourers; “large regions of natural economy are open to conversion into commodity economy, or existing commodity economy can be ousted by capital” (408). Through a “complicated metamorphoses” grain produced by peasant farmers was expropriated and passed through the hands of various tax collectors ultimately ending up in the hands of the Administration de la Dette Publique Ottomane, an entity owned and operated by Germany and other European countries that served the purpose of collecting debt payments (424). Luxemburg characterises this relationship bluntly as

“a coarse and straightforward metabolism between European capital and Asiatic peasant economy, with the Turkish state reduced to its real role, that of a political machinery for exploiting peasant economy for capitalist purposes, – the real function..of all Oriental states in the period of capitalist imperialism [...] Germans allowing the shrewd Turks merely the ‘use’ of their great works of civilisation – it is at bottom an exchange between German capital and Asiatic peasant economy, an exchange performed under state compulsion. On the one hand it makes for progressive accumulation and expanding ‘spheres of interest’ as a pretext for further political and economic expansion of German capital in Turkey. Railroad building and commodity exchange, on the other hand, are fostered by the state on the basis of a rapid disintegration, ruin and exploitation of Asiatic peasant economy in the course of which the Turkish state becomes more and more dependent on European capital, politically as well as financially” (424).

Luxemburg argues that this supposed “capitalist emancipation” of the Ottoman Empire, a capitalist hinterland, further entrenched a relationship of subordination to European capitalists (399). The creditor-debtor relationship between Germany and the Ottoman Empire served as the grounds for “further political and economic expansion of German capital in Turkey” as the disintegration of the Turkish peasant economy and the building of railroads created a dynamic where the “Turkish state becomes more and more dependent on European capital, politically as well as financially” (424). Luxemburg clarifies this contradictory dynamic of capitalism’s imperialist phase wherein, on the one hand, the development of railways and other infrastructural projects create greater competition between Western European powers and on the other hand, these foreign loans are also the means by “which the old capitalist states maintain their influence, exercise financial control and exert pressure on the customs, foreign and commercial policy of the young capitalist states” (401).

2.2.1. The Promise of Infrastructure

In Luxemburg's discussion of the Ottoman Empire, she is criticising the ruse of capitalist emancipation. While the construction of high-tech railways was seen as a way to modernise the Ottoman Empire, and bring it into competition with capitalist Western Europe, its incorporation through loans and foreign imports further entrenched its subordinate position in the capitalist world system. We can see in Luxemburg a critique of "capitalism's teleology of perpetual expansion" (Menozzi 2018, 7).

Additionally, we can read Luxemburg as an early thinker of what in critical infrastructure studies is referred to as the "promise of infrastructure". Hannah Appel, Nikhil Anand, and Akhil Gupta in the introduction to *The Promise of Infrastructure* describe how infrastructures "including roads and water pipes, electricity lines and ports, oil pipelines and sewage systems [...] have long promised modernity, development, progress, and freedom to people all over the world;" yet with this promise of connectivity, circulation, distribution, and modernity, infrastructures are also "critical locations" of "accumulation and dispossession" (Appel 2018, 3). Infrastructures hold a certain purchase on our imagination about bringing forth a better future, yet Anand, et. Al. remind us that often this promise also involves the "poisoned promise of economic growth" (27). In Luxemburg's account, railways put forward a certain promise to the agrarian settlers on the western frontier and to the Ottoman Emperor of political and economic emancipation, progress, and modernization. Yet her critical analysis shows the ruse of such a promise, a ruse that is still operational today when thinking about networked infrastructures. Additionally, in situating infrastructure in the historical progression of capitalist expansion, Luxemburg provides a strong rejoinder to those in STS who might be seduced by arguments about the agency of non-human actors, reminding us that non-human objects such as railways are sites of struggle between human actors and social forces.

3. *Junius Pamphlet* & Capitalist Technology's Stamp of Progress

In her discussion of railroads and other infrastructure, Luxemburg explicitly deals with the often-discussed contradiction between the forces of production and the relations of production. In the preface to *Contribution to the Critique of Political Economy*, Marx described this contradiction as a direct conflict between the two, whereby "at a certain stage of development, the material productive forces of society come into conflict with the existing relations of production" (Marx 1859, 263). This conflict arises when relations of production turn into the "fetters" of the "development of the productive forces" which are also the source of the material conditions for the "solution" of this antagonism (263). Capitalism's revolutionising of the technologies and techniques of production outpace the social relations of the capitalist mode of production and creates the conditions for revolution and a solution to this contradiction.

Luxemburg complicates this understanding of the role of the forces of production in resolving this antagonism. She argues that in capitalism's imperialist phase, the forces of production themselves – and not just the relations of production, i.e., the private ownership of the means of production – at a certain point cease to be progressive. She sees within the development of these progressive technologies the simultaneous development of tools of mass misery and what she would call the barbarism of imperialism. Throughout her writing, one encounters what seem like contradictory assessments of the development of technologies under capitalism. What these contradictory statements capture is the existing contradiction within capitalism, whose resolution is

a deadly serious matter, hence her famous formula: socialism or barbarism. This allows Luxemburg sometimes to assert that “[c]apitalism, by mightily furthering the development of the productive forces, and in virtue of its inherent contradictions. . . provide(s) an excellent soil for the historical progress of society towards new economic and social forms” while elsewhere asserting that “[n]o medicinal herbs can grow in the dirt of capitalist society which can help cure capitalist anarchy” (Geras 1973 quoting Luxemburg, 17)².

As it relates to a discussion of railroads, Luxemburg’s analysis of the layered contradictions between forces and relations of production during capitalism’s imperialist phase is most clear in her *Junius Pamphlet*. In the *Junius Pamphlet*, Luxemburg is primarily critiquing much of the left’s response to WWI. What is particularly interesting in this pamphlet is the way that she breaks with some strains of Marxists who seem to be boundlessly optimistic about capitalism’s ability to produce technological progress and revolutionise the forces of production. Luxemburg agrees with other Marxists who point to the contradiction between capitalist technology and forces of production as progressive and capitalist relations of production (bourgeois ownership of means of production) as oppressive, but argues that this progressive tendency of technology eventually loses steam.

Luxemburg argues that the brutality of capitalism’s imperialist phase which was necessary to bring these technologies to the non-European world undercut any progressive claim on these technologies. She argues against capitalist economists who would point to the expansion of “railroads, matches, sewerage systems and warehouses” as emblematic of the spread of “progress and culture” (Luxemburg 1915, 338). She instead insists that these infrastructural projects are “neither culture nor progress, for they are too dearly paid for with the sudden economic and cultural ruin of the peoples who must drink down the bitter cup of misery and horror of two social orders, of traditional agricultural landlordism, of super-modern, super-refined capitalist exploitation, at one and the same time” (339). She goes further arguing that WWI is a turning inward or boomeranging of imperialist brutality onto Europe itself. WWI for Luxemburg marked “a turning point in the course of imperialism. For the first time the destructive beasts that have been loosed by capitalist Europe over all other parts of the world have sprung with one awful leap, into the midst of the European nations” (339).

Luxemburg writes that under imperialism, capitalism’s triumphant technological and infrastructural advancements cease to “bear the stamp of progress in an historical sense” (Luxemburg 1915, 339). But nevertheless, she maintains that communications technologies have a revolutionary potential in their capacities for international connectivity and the building of a truly internationalist socialist future. She asserts that “historic development moves in contradictions,” and that the destructive forces of imperialism brought about its opposite, the possibility of “overthrow by the proletarian international” (338). Likewise, the use of modern infrastructures towards devastating destructive ends has brought about the opposite potential for the reconfiguration of the world and its infrastructures towards the cause of human emancipation. Luxemburg polemicized that the brutal imperialist phase with its expansion of infrastructures “has created the premises for its own final overthrow” (338). The “only cultural and progressive aspect of the great so-called works of culture” is their potential redemption as “the material conditions for the destruction of capitalism and the abolition of class society” (338). By further interconnecting the world, capitalism and its networked infrastructure created the conditions for thinking revolution on the world scale. Only under these conditions

² The thinking in this paragraph is indebted to Geras’ 1973 *NLR* article.

will the enormous infrastructural projects “bear the stamp of progress in an historical sense” (339).

Under imperialism, capitalism has lost its progressive character, it has revealed itself for its inhumanity both within and beyond Europe. Technological advances revealed themselves to be crucial equipment for imperialism’s inhumanity. Here Luxemburg resists any technological determinism that would see the forces of production as always having a progressive character in the face of the relations of production. The inhumane relations of production of capitalism in its imperialist phase undermine capitalist technology which ends up serving the ends of destruction. In the *Junius Pamphlet*, Luxemburg complicates a forces of production determinism without precluding the possibility of recuperating these technologies.

4. Railway, Telegraph, and Postal Workers in the 1905 Russian Revolution

In *The Mass Strike, the Political Party and the Trade Unions*, Luxemburg argues that political parties or union bureaucracy are unable to call a revolution into action; she argues there is a degree of worker self-activation that cannot be calculated or dictated from above or without. To make this argument she looks at the 1905 Russian Revolution, and argues that while there were small labour mobilizations that sparked the revolution, these mobilizations gave way to more generalised mass strikes and political revolution. The narrow economic demands of the labour union then fuelled a larger political horizon.

Luxemburg describes the specific labour struggles such as “the conflict of the railwaymen with the management over the pension fund” as “a partial conflict” and “subordinate and apparently accidental things” which subsequently gave way to the “general rising of the industrial proletariat” (1906, 189). What is interesting for the present essay is the specificity of these subordinate and accidental mobilizations. As incidental as she makes them out to be, most of these labour strikes were done by railway, telegraph, and postal workers. Russia had recently rapidly industrialised and grown its railways through Western European loans in a similar fashion to the Ottoman Empire case discussed above. Tsar Nicholas II, under the guidance of his finance minister Sergei Witte, undertook dramatic projects of national industrialization which “involved heavy government expenditures for railroad building and operation; subsidies and supporting services for private industrialists; high protective tariffs for Russian industries [...]; increased exports; stable currency; and encouragement of foreign investments. Government expenditures to spur industrialization were paid for with stepped-up regressive indirect taxes on articles of mass consumption, and by foreign loans” (Skocpol 1979, 91). This “state-guided capitalist development” led to dramatic industrialization with railroad mileage growing by 40 percent between 1892 and 1902 (91). Foreign loans from Western Europe played an important role in securing the materials necessary for this industrialization and to pay for these loans the government doubled its tax income and “agricultural ‘surpluses’ were squeezed from the peasants and marketed abroad to finance purchases of foreign technology and to maintain the balance of payment” (91). Like the other cases that Luxemburg studied, the building out of railroads in Russia was ultimately paid for not by the surplus value of wage labourers, but by direct expropriation from peasants. All of this exacerbated social tensions and rapidly created a displaced and oppressed peasantry as well as a new rapidly formed industrial proletariat concentrated in cities like St Petersburg and Moscow. This quickly created an urban proletariat of railway workers as well as an indignant peasantry who had their goods expropriated from them by the state to pay for the loans from Western

Europe. Railways were then not incidental but very much emblematic of the existing economic and political issues that were upsetting Russians.

The “subordinate and apparently accidental” labour mobilizations were significant insofar as they were microcosms of the broader political and social context against which Russians were revolting (Luxemburg 1906, 189). Luxemburg asserts that it is impossible to separate political and economic dimensions. Mass strike flows from the narrow economic struggle of workers, often railroad or telegraph workers, and then is generalised into a political strike which then becomes massified and economic again. The workplace struggles of the railway, postal, and telegraph workers for Luxemburg were a “small scale” version of the “entire history of Russian mass strike” (194). These narrow struggles are ones “out of which political conflicts on a large scale unexpectedly explode” (195). Here again we see Luxemburg resisting an all too easy technological determinism. While the Russian Empire’s infrastructural undertakings were a clear site of social disruption and a prime target for a revolutionary offensive, Luxemburg refused the possibility of predicting the unfolding of history.

Russia’s recent expansion of its railway networks and the subsequent social disruption and reconstitution shaped the terrain of struggle placing railway workers in prime positions to strike at networked infrastructures of capital and the state. Furthermore, the centrality of networks in the 1905 Russian Revolution made it into the very language used by Luxemburg in her analysis. In theorising the relationship between economic and political struggles, Luxemburg uses the spatial language of networked feedback. She writes:

“In a word, the economic struggle is the *transmitter* from one political centre to another; the political struggle is the periodic fertilisation of the soil for the economic struggle. Cause and effect here continually change places; and thus the economic and the political factor [...] form the two interlacing sides of the proletarian class struggle in Russia. And their unity is precisely the mass strike” (Luxemburg 1906, 195, emphasis added).

Here Luxemburg is theorising the relationship between economic struggles – the narrow demands of the striking railway workers for things like a better pension – and the broader political struggle for revolution. Her use of the concept of transmission from one centre to another to describe strikes and sabotaging by rail and telegraph workers evokes the images of the networks themselves that were being disrupted.

In the 1905 Russian revolution, networked infrastructures like railways which had so radically disrupted Russian society in the preceding decades by means of the “brutal triumphant procession of capitalism through the world” became the site of intense political and economic struggle, and provided a glimpse of these same technologies functioning in the service of human emancipation (Luxemburg 1915, 338).

5. Luxemburg’s Theory of Infrastructure and its Implications for Contemporary Movements for Public Ownership of the Internet

To summarise, for Luxemburg networked infrastructures like railways open up and help capital expand into new non-capitalist sectors. While promising escape or access into capitalism’s outside –escape from the drudgery of wage labour, or, access to non-capitalist regions and new areas of investment, enclosure, and privatisation –Luxemburg teaches us that capitalism always requires a non-capitalist outside to expand into and plunder. Railways and other networked infrastructure are thus crucial for capitalism’s maintenance and resolution of crises. On the one hand, there is the promise of

escape into the outside, while also serving as a prime mechanism for the capture, integration, and subsumption of new sites of extraction. Additionally in Luxemburg we see an insistence on the brutality and non-progressive nature of these infrastructures in capitalism's imperialist phase, but also a vision of these technologies as an important site of political struggle that can be put to the service of human emancipation in a post-capitalist future. That is to say a rejection of a technicism or technological determination, and close attention to the relationship between the relations of production and technology.

Given Luxemburg's understanding of accumulation as not happening strictly internally to capitalism, but as a dynamic process both within and without, it is no surprise that railway workers would be such an important and appealing political figure for her to turn to. Railways as discussed throughout this paper were central for linking capitalism's inside and outside in the processes of production, consumption, distribution, and exchange. Railway workers sit on a pivotal infrastructure that can both shut down capitalist accumulation and potentially transform these networks in the name of human emancipation.

In Luxemburg's theory of infrastructural expansion, we can see an early, decidedly materialist elaboration of what infrastructure studies scholars call the "promise of infrastructure." In Luxemburg's description of railroads in *The Accumulation of Capital*, there is always some sort of promise of escape or of moving out of one's current situation. This was the case for the European settlers in the Americas, who saw the west-bound railways as a way to escape enclosure and proletarianization in the UK and on the east coast of the US. It was also the case for countries like Turkey, Egypt, and Russia who saw the building of railways as a means to escape subordinate positions in global politics and economy and enter into inter-imperialist competition with Western Europe. In all of these instances, massive infrastructure projects provided hope and promise of moving outside or beyond a certain realm of capitalist domination. These communications networks also provided a site for the investment of surplus credit. However, Luxemburg's theory of accumulation teaches us that this outside itself is central to the maintenance of capitalism. Railways and other infrastructural projects act as networks that open onto new sites of circulation, extraction, and accumulation. These lessons are ever important today as alternatives to privately owned Internet infrastructure are being put forward around the world.

Many scholars have accounted for how the expansion of Internet infrastructure serves imperialist tendencies of capital to seek out new, untapped sites of extraction and accumulation.³ Already in 2004, Y.Z. Ya'u asserted in *The Review of African Political Economy* that "current international attempts at bridging the digital divide are part of wider efforts to not only secure the virgin markets of developing countries, but also to configure the world in the interest of the new imperial powers" (11). Here Ya'u is speaking specifically of the context of neoliberal breakup of state telecommunications monopolies and the takeover of African Internet infrastructure by multinational corporations. But the securing of virgin markets and seeking out new sites of accumulation by the expansion of Internet infrastructure can hold true even in the case of a publicly owned infrastructure, so long as capitalism is left intact. Luxemburg's corpus provides us with plenty of examples where state-funded infrastructure projects proceed in lock-step with the interests of capital.

³ See for instance Duarte 2017, Greene 2022, and Aouragh and Chakravartty 2016.

In *Internet for the People*, Ben Tarnoff gives us a terrific history of the Internet's journey from a publicly funded endeavour to a privatised, enclosed commercial infrastructure. He makes a compelling argument for the de-commodification of the Internet and the transformation of it into a public utility run, returning it to the hands of the state and the public. What Tarnoff does not tend to closely enough throughout his articulation of a politics of returning the Internet to its status as a public utility is what, exactly, this return entails. The book begins with a clear-eyed discussion of the military origins of the networking protocols that would become the Internet. Tarnoff is clear in outlining how the Department of Defense spent so much public money on developing Internet-working with its eyes on defeating communist, anti-imperialist struggles in Vietnam. While Tarnoff does not shy away from this history of the Internet which married public ownership with capitalist imperialism, he perhaps falls into the trap of technological optimism when it comes to thinking about the tension between the destructive and progressive dimensions of technological development under capitalism. For Tarnoff, the Internet was a machinery of warfare, but it was also a machinery with a promise of state-led public communication and participation. And the *Internet for the People* charts out a compelling path for how to return the Internet to a state of public ownership. However, in light of Luxemburg's infrastructural thinking, it falls short in tending to the ways that the capitalist state can and has played a vital role in expanding the infrastructures of empire.

Returning to Luxemburg's writing on railroads in *Accumulation of Capital* and the *Junius Pamphlet* here is instructive. In observing the ways that the promise of development is doled out to the "noncapitalist" sectors of the world, taking her instance of Egypt or the Ottoman Empire, she demystifies some of the progressive character of capitalist development that other Marxists are enchanted by. The building of canals in Egypt, and the construction of railways in the Ottoman Empire, were actually not creating conditions for expansion of capitalism in the sense of bringing in new people into a proletarian, wage-labour class. Instead, these technologies disrupted the production of the crops they claimed to be helping, sunk these countries into massive debt to European creditor countries, and ultimately the surplus value that was extracted through these ventures came from peasant classes whose land and goods were expropriated. In these moments of infrastructural expansion, accumulation proceeded by means of dispossession rather than by means of exploitation and state-funded infrastructure projects were a central component. So long as capitalism continues to expand and cannibalise the non-capitalist sectors, these technologies do not even fulfil the promise of bringing about a bourgeois revolution, i.e. of subsuming more of the world into wage relations. Thinking with Luxemburg, we can see how the railroads do not represent an expanding international proletariat but instead represent the continued plundering of peasants throughout the Global South who become the collateral for the loan that funded the infrastructural build-out. So, when we are tempted to look to the past for a golden period when the Internet was funded by the state and not for profit-seeking, we need to be cautious. The Internet was always an instrument of accumulation even when it was mostly owned and managed by the state.

Authors such as Nick Couldry and Ulises Mejias (2019) have put forward an argument that a critique of colonialism must be central to our contemporary understandings of digital capitalism. They argue in *The Costs of Connection* that while "historical colonialism annexed territories, their resources, and the bodies that worked on them, data colonialism's power grab is both simpler and deeper: the capture and control of human life itself through appropriating the data that can be extracted from it for profit" (Couldry and Mejias 2019, xi). While correctly identifying the datafication of human life as a new

site of dispossession, what the legacy of Luxemburg adds to this analysis is that the same infrastructures that permit “data colonialism” also continue many of the dynamics of “historical colonialism,” which is not historical but an ongoing project; or in the famous formulation of Patrick Wolfe, it is “a structure rather than an event, its history does not stop” (Wolfe 2006, 402).

Luxemburg, when read as a theorist of technology and infrastructure, can be understood as a sort of predecessor of critical positions in the philosophy of technology taken up by thinkers like Bernard Stiegler and Herbert Marcuse who reveal technology as a site of political struggle. These thinkers, like Luxemburg, teach us that you cannot simply take control of technology built in the service of human domination without first understanding and confronting these harmful logics. Marcuse in developing the concept of technological rationality provided us with the insight that technologies of industrial capitalism have shaped rationality even at the individual level, turning it against the interests of human emancipation. In critiquing technological rationality and the substitution of logics of efficiency for rational behaviour, Marcuse argues that the very idea of “protest and liberation appear not only as hopeless but utterly irrational” (Marcuse 1941, 145). Modern technology for Marcuse ushered in an era where the “prevailing type of individual is no longer capable of seizing the fateful moment which constitutes his freedom” and has moved away from a capacity for “resistance and autonomy” (152). Rediscovering the capacity for such autonomy and emancipation then are central to a socialist political project in the face of modern technologies. First written in 1941, Marcuse’s (1941) “Some Social Implications of Modern Technology” can be seen as an update of Luxemburg’s *Junius Pamphlet* in light of the Third Reich’s mobilisation of industrial technologies towards genocidal ends. Bernard Stiegler and the Internation Collective in the introduction to *Bifurcate* take aim at the twenty-first century “developmental model” characterised by “accountancy directives in the age of algorithms” and “technology of calculability” (Stiegler 2021, 16). They assert that “this developmental model is in reality a model of destruction – and this destruction, long regarded as ‘creative’, has been accomplished over the past two decades through the global civil war now being waged with the computational weapons of mass destruction that arise with reticular and disruptive innovation” (Stiegler 2021, 14). Here we can see Stiegler and the Internation Collective providing an update to Luxemburg’s critique of capitalist technological progress, arguing that what such progress and development represent is their opposite: barbarism and destruction.

While Luxemburg struggled during her lifetime for a future where infrastructures of empire could be repurposed in the service of world socialist revolution, she provided little by way of prescription of what a socialist use of infrastructure ought to look like. The tripleC issue on “Communicative Socialism/Digital Socialism” (Fuchs 2020) provides glimpses of what an emancipated use of technology could look like. We might also look to past efforts such as Eden Medina’s chronicling of Salvador Allende’s socialist government’s Project Cybersyn. The hazards of the politics of networked infrastructure can be seen in the counterrevolutionary government of Augusto Pinochet which subsequently employed computer technology provided by Washington “as part of its larger campaign to ‘modernize’ and ‘professionalize’” intelligence agencies of US-backed right-wing dictatorships in Latin America (Grandin 2014).

Railroads, like Internet cables and other communication networks, ensure a persistence of an outside even in times when it seems like most of the world’s geography has been incorporated into capitalism. These networks in some ways add an additional layer to the map of territorial expansion. This can be seen for instance in the discussions of the politics of the allocation of radio spectrum and satellite orbit slots. Both the

electromagnetic spectrum and outer space are twentieth century discoveries that in turn became sites of commercial and state expansion and means of communication. In the past twenty years or so, there has been a criticism of the “enclosure” of the electromagnetic spectrum commons, and similarly a critique of the privatisation of space. The gradual employment of metaphors of land and property to the intangible electromagnetic spectrum and the rise of ownership regimes and auctions of radio frequencies can be understood as the creation and subsumption of the sort of non-capitalist outside that Luxemburg is so attentive to in *Accumulation of Capital*⁴. Similarly, the ongoing political and legal debate about outer space as a “global commons” and the increasing use of orbital space for private ends, such as by the Starlink company present another frontier of the ongoing enclosure (Pic et al. 2023).

Luxemburg’s contribution to our thinking of networked infrastructure along with her important assertion of the persistence of dynamics of primitive accumulation, expropriation, and extra-economic violence speak to contemporary debates over the question of “digital feudalism” taken up by people like McKenzie Wark, Evgeny Morozov, and others. In *Capital is Dead*, Wark makes the case for updating our analysis of class relations, arguing that “maybe now there’s another kind of ruling class” in addition to the landlord and capitalist class that “owns neither [land nor factory][...]but instead owns the vector along which information is gathered and used” (Wark 2019, 4). Wark’s vectorialist class wields power by controlling information and the infrastructure for this information’s circulation. Morozov takes aim at recent trends in Marxism that argue that transformations in the means and relations of production in light of the ascent of networked information technology have brought us to something different than capitalism. He lumps in Wark with thinkers like Cedric Durand and Yanis Varoufakis who argue that rather than the capitalist mode of production dominating, we now see the primacy of techno-feudalism. Morozov invokes Luxemburg in his critique of this position, pointing to Luxemburg’s argument that under capitalism, “exploitation and expropriation have been – and still are – mutually constitutive” (Morozov 2022, 102). This understanding pushes back against those who argue that we are moving in “the direction of the feudal logic of rent and dispossession, rather than the capitalist logic of profit and exploitation” (Morozov 2022, 107). By understanding Luxemburg’s writing on the dynamics of the networked infrastructure of her time as functioning similarly to those of digital Infrastructure, we can read into Luxemburg an anticipatory critique of the techno-feudalism argument. While Wark is not the primary target of Morozov, his argument might not apply to her position. Despite the provocative title of her book, Wark is emphatic that “modes of production are multiple and overlapping” (Wark 2019, 14) and that her investigation into the vectorialist class asks “if an additional [class] is emerging, not whether it describes the totality” (7). Understood as such, we might see Luxemburg’s theory of infrastructure as complementary to both Morozov and Wark’s position as all three recognise that the success of the capitalist class is contingent on domination by other classes. Furthermore, Luxemburg’s focus on struggles over means of communication and transport in her political writing suggests that she, like Wark, saw networked infrastructure as a new site of imperialist power that was just as important to investigate as the factory.

6. Conclusion

So long as we live under capitalism, infrastructure serves the purpose of rooting out new sites of accumulation. We can see this in the Internet as bringing new people

⁴ See for instance Streeter 1996 and O’Dwyer 2013.

online intensifies demands for energy and rare minerals for ICTs and other electronics, which are attained by means of child and slave labour and are also leading to the opening of new sites of extraction along what Julie Klinger calls the “the rare earth frontier”. One can see Norway’s recent announcements of plans to commence deep sea mining in the Greenland Sea, the Norwegian Sea and the Barents Sea as a confirmation of Luxemburg’s insistence on capital’s persistent need for an outside, a non-capitalist space to exploit (Bryan and Milne 2023). Whether the Internet is run privately or by the state makes no difference. If we think of the earlier optimism of the Internet as a digital commons with the promise of free-flowing communication, entertainment, and education we can see today how that enthusiasm and participation has served as a new site of extraction for various corporations.

This is not to say that such endeavours should be abandoned, but a broader political program is necessary otherwise such infrastructural expansion will continue the expansion of capitalist accumulation, whether ISPs are in private or state hands will not necessarily change that. In Luxemburg’s works, we do not see a Luddism in the pejorative use of the word as a blanket rejection of technologies. Instead, we should understand her as, like Marx, seeing that “the struggles against machines were the struggles against the society that utilized them” (Mueller 2021, 24) and embracing “a more liberatory politics of work and technology” (29).

Luxemburg reminds us that so long as capitalism is intact you cannot take the progressive technologies available and make them serve the purpose of human emancipation.

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