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**Article**

# Contradiction, intervention and urban low carbon transitions

## Abstract

This paper presents an analysis of contradictions in urban low carbon transitions as engines of change. Following Kojéve's reading of contradiction in Hegel's oeuvre, I argue that contradiction is a constitutive feature of low carbon interventions. This is an alternative to conventional readings of contradiction as a provisional encounter of opposites in which one will eventually cancel the other. I unpack the concept of contradiction in three ways: first, by displaying a Hegelian-inspired understanding of contradiction in relationship with change, time and desire; second, by explaining how inherent contradictions can be read in relation to the excesses that characterise the deployment of methods of calculation in low carbon interventions; and third, by situating these contradictions within the overall dynamics of carbon governance and purposive attempts to bring about a low carbon transition. The paper explores the practical implications of this analysis in a case of low carbon interventions in social housing in Ljubljana, Slovenia. The case study shows that contradictions are at the heart of low carbon interventions. In this context, contradiction analysis may provide a direction towards broader reconfigurations of social and technological practices and generate a desire to change.

## Key words

Low carbon transitions, carbon governance, carbon calculus, contradiction, excess

**Introduction**

In January 2014 a leaked climate change report written by the Intergovernmental Panel of Climate Change, the IPCC, made news by stating that failing to address climate change in the next 15 years would make the problem impossible to solve (APNY, 2014). Indeed, every release of IPCC reports is accompanied by a renovated sense of urgency. The need to 'take action' is a central component of climate change narratives, such as those put forward, for example, by former United Nations secretary Kofi Annan (2014). These calls are directed both towards influencing international climate change negotiations at the United Nations annual Conference of Parties and towards generating practical actions that address climate change in specific local settings. For example, the United Nations' programme Momentum for Change, launched in 2011, recognises small projects that in their view, open pathways towards "*the transformational societal shift underway to address climate change*" (Rigg, 2013; p. 5). The implication is that everyone must be involved in such transformation.

Empirically, there is a growing body of evidence demonstrating that different actors, from individual citizens to private firms and governments, are taking action to address climate change in the wake of the disenchantment with international negotiations and the perceived lack of action at the national level (Hoffmann, 2011). These are separated interventions that attempt to bring about a global transformation to avoid detrimental climate change through local action, whether this is by demonstrating the functioning of technologies, changing lifestyles or developing policy and social innovations. Such interventions are often associated with a call for a low carbon transition that emphasizes the need for rapid structural change (Smith et al., 2005). Low carbon interventions include heterogeneous initiatives from individual incentive programmes to the development of new systems of energy and transport provision (see e.g.UN-Habitat, 2011).

These climate change governance trends are most visible in cities, where local authorities alongside other public and private actors find governance arenas that render themselves open to intervention (Bulkeley, 2010). Looking at cities as laboratories to test the practical aspects of climate governance, climate change interventions are deployed in a highly experimental manner, open to uncertain results and with unintended consequences(Bulkeley and Castán Broto, 2013; Evans, 2011). Ideas of replicability and scalability inspire most interventions (e.g. Corfee-Morlot et al., 2009). They represent attempts to bridge their inherent contingence with the perceived need to intervene at a planetary level. In doing so, intervention increasingly draws from a calculative rhetoric for organizing and ordering intervention work (Bulkeley et al., 2014).
Contradictions are pervasive in low carbon interventions. Take for example the creation of new markets for green growth as an strategy to tackle climate change, which is often perceived as reproducing the very means that led to the climate crisis (e.g. Bäckstrand and Lövbrand, 2006; Prudham, 2009). The construction of the citizen as a passive consumer of green products (Slocum, 2004) directly contradicts the emphasis on transformation through the re-examination of individual consumer practices. Attempts to change mundane practices through multifarious interventions that promote, for example, individual control of carbon emissions (from Personal Carbon Allowances to offsetting), "*operate through a communicative logic of obsession with connection to and judgment by peers, through the sense of needing to be validated through one's public presence and approbation, and of course, through constant innovation in the creation of new commodities*" (Paterson and Stripple, 2010; p. 341). These are vivid examples of contradictions in climate governance. However, contradiction is not just a by-product of capitalism.

Contradictions also emerge from the encounter between utopian attempts to transform the world and the need to implement such attempts in practice. In energy studies, for example, the 'rebound effect' recognises that efficiency improvements are hardly translated into parallel reductions of energy consumption (Greening et al., 2000). Popular social movements, such as Transition Towns, gain momentum from the simultaneous deployment of opposite arguments for communal living and psychological re-examination of individual values (Smith, 2010). Attempts to replicate grassroots innovations limit their transformative potential (Seyfang, 2010). These are just a few examples of common contradictions that emerge in low carbon

interventions in relation to the lived contradictions of capitalism. In the accounts above, contradictions are seen as a provisional encounter of opposites that will eventually be resolved, whether this is by gaining more knowledge, re-examining individual values in relation to wider collectivities or through the upheaval of the capitalist economy. Whatever the explanation, the diagnostic mechanism is always the same: contradiction points towards an impossibility that needs to be resolved through the annihilation of one of the terms of the contradiction. This approach however, overlooks the generative potential of contradiction.

Instead, I propose an alternative notion of contradiction in relation to the deployment of calculative practices in carbon governance. This alternative notion, that emerges from a critical engagement with  Kojève's reading of Hegelian dialectics as situated in time, emphasises contradictions as having generative power within the dialectical movement of history. Kojève argued that contradictions in human history generated a desire for change that mediated utopian aspirations and concrete action. Contradiction is thus a generative force inherent to the struggle to make utopian aspirations operative. If carbon governance is understood as an assemblage of efforts to overcome the climate change crisis, contradictions are not the by-product of governance interventions, but rather, contradictions generate interventions in carbon governance. From this perspective, contradiction analysis may be construed as providing a direction towards broader reconfigurations of social and technological practices.

Carbon governance processes are characterised by the deployment of a carbon calculus (While, 2013). This calculus follows the imperative to measure and characterise low carbon interventions.  Excess emerges when such carbon calculus is deployed in practice from the encounter between idealised representations of the problem and the actual realities of intervention. Yusoff (2009; p. 1025)  describes excess in climate governance, following Battaille's definition, as a "*dissipation of energy that cannot be accumulated in … a restrictive economy*". Yusoff, in particular, is concerned with how the globalizing excess of climate calculations limits society's intuitions of climate change catastrophes. When understood within the context of carbon governance interventions in specific settings, such excess is experienced as a contradiction. From this perspective, contradictions are neither inherent defects of low carbon interventions, nor are they the logical consequence of capitalism. Emerging from the encounter between aspiration and experience, contradictions are better understood as engines of change.

Following this, I seek to explain contradictions as a constitutive part of low carbon interventions. The following section situates the notion of contradiction in relation to a Hegelian understanding of time and change. After that, the notion of contradiction is tied first to a desire to change, and then, to the production of excess in carbon governance. This theoretical perspective is then used to examine a case study of an international recognised initiative to retrofit low carbon technologies in social housing in Ljubljana, Slovenia. The example demonstrates not just that contradictions inspire change, but also, that such changes do not resolve contradictions but rather, embed them in wider totalities.


**Understanding contradiction through an unorthodox reading of Hegel**

Whether he is presented as a statesman or a spy, a dogmatic civil servant or a polemic philosopher, Alexandre Kojève is always remembered as a teacher and idiosyncratic interpreter of Hegel's philosophy. In a series of lectures on Hegel, Kojève (1969) elaborated a  perspective on contradiction, defining it as the inherent opposition within existing realms in which contradicting forces do not cancel each other but rather, define each other's existence. In this way, Kojève regards contradiction as inherent to human existence and embedded in its history. Contradiction awareness is thus the engine of social [and technological] change. In particular, "*to become aware of a contradiction is necessarily to want to remove it. Now, one can in fact overcome contradiction of a given existence only by modifying the given existence, by transforming it through actions*" (Kojève, 1969; pp. 54-55). Contradictions highlight the importance of structure within the contingent situation of opposites and thus, overcoming contradictions requires explaining the conditions that produce the contradiction rather than

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attempting to establish the primacy of either opposite. Kojève's contradiction emerges within his interpretation of Hegelian dialectics and his exhortation "*to take the notion of the concrete seriously and to remember that philosophy must describe the concrete real instead of forming more or less arbitrary abstractions*" (Kojève, 1969; p. 210). Thus, rather than attempting to find immutable ideas, as the philosopher in Plato's allegory of the cave does, Kojève is interested in concrete realities, that is, whatever happens 'inside the cave'. Historicism thus becomes possible through apprehending human experience as a method to understand broader truths and their temporal significance, because "*for Kojève's Hegel the attention to history did not lead to relativism, but to a knowing which understood the connection of knowledge to time*" (Roth, 1991; p. 401).

Kojève's thought illuminates the notion of contradiction in relation to revealed concrete experiences of history and the resulting negativities that together enable the recognition of the dialectical movement. Such notion of contradiction differs from neo-Marxist interpretations that characterize it as an inherent manifestation of capitalism. In particular, the notion of the second contradiction of capitalism (O'Connor, 1988, 1991, 1996) extends the Marxian theory of the internal contradiction of capitalism. Marx argued that capitalism's insatiable thirst for growth led to overproduction and capital accumulation, further impoverishing workers and thus, seeding the sows of discontent that eventually would generate a revolutionary momentum towards capitalism's own end. O'Connor observed a second contradiction of capitalism in the continuous depletion of raw materials and the production of waste, costs that capitalist firms and States continuously externalize. As resources and waste sinks become scarce, capitalism drives towards an underproduction crisis. In its planetary guise, climate change is presented as the final port of call for capitalism. Political economy analyses of climate change, for example, have mobilized O'Connor's theory to understand planetary destruction as the logical consequence of capitalist development and to argue against promethean positions that see human technology as mediating sustainable futures (Clark and York, 2005; O'Hara, 1996). These accounts do not address, however, the extent to which climate change actually opens opportunities for capitalism's growth. Johnson (2010; p. 829), for example, has described how the increasingly fragile conditions created by climate change have released hydrocarbon reserves, such as those in the Arctic, that remained 'locked away' from commodification, in a geophysical process that is "*altering the natural properties of the territory, thus raising new opportunities for rent-seeking and production strategies that sharpen and deflect the general ecological contradiction process* [of] *'accumulation by degradation'*". The second contradiction of capitalism focuses on the dynamics of capitalism reproduction rather than on the constitution of carbon governance arenas.

Kojève's contradiction, instead, shifts attention to the concrete realities that shape human action at a particular moment of history. Kojève's notion of contradiction differs from the neo-Marxist reading explained above in three fundamental ways: first, Kojève's contradiction is revealed in instances of concrete reality, within specific histories, rather than as a general abstract notion of history's purpose and thus, contradictions emerge within multifarious concrete instances; second, for Kojève, negativity is generative rather than destructive and "is the key to radical freedom" (Nichols, 2007; p. 29). He argues that "*if action is independent of the given real because it negates it, it creates in realizing itself something essentially new in relation to this given*" (Kojève, 1969; p. 209). Finally, Kojève's locates contradiction at the centre of human action and experience, not necessarily ascribed to the spheres of production and consumption but rather imbricated in the production of knowledge and the desire for recognition, a politico-historical force always linked to conflict (Shepherdson, 1999; Sims, 2012). From this perspective, contradiction is not the end point, the explanatory factor that O'Connor proposes, but rather, it is a perspective that enables a diagnosis of instances of concrete reality.

The notion of contradiction points towards a meta-level of analysis revealing the connections between opposites, that is, their 'strict mutual implication' (Jarczyk and Labarrière, 1996). Overcoming the contradiction is not akin to eliminating it but to establish the multiple connections that underlie it (Collins, 2000). This can be seen, for example, in relation to the evolution of the car through the 20th century in the US, as described by Gartman (2004): first, it emerged as a status symbol; then, it became an object of mass production for indistinguishable

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masses; then it acquired multiple meanings through the diversification and individualization of the car as a consumer commodity. Gartman's analysis suggests that while in each stage contradictions motivated change, each stage of development in automobile culture incorporated, rather than solving, the contradictions of previous stages.

Hahn (2007) argues against reducing contradiction to a principle of negation, summarised as the incompatibility between p and not-p. She argues, instead, for a "*non-bivalent logic that allows one to see p as identical to not-p in a way that is internally related to not-p, yet not reducible to not-p*" (Hahn, 2007; p. 25). Contradiction, thus, captures the mutual interdependence of opposites rather than the mutual incompatibility of such opposition. To resolve such opposition, identities themselves have to be questioned. For example, the dialectic Master/Slave is not solved by the predominance of disappearance of neither of them, but by the transformation of the identities of individuals as either Master or Slave in the recognition of human freedom.

Contradictions can be overcome "*only to the extent that they are played onto the historical plane of active social life*" (Kojève, 2000; p. 168). Contradiction is thus a social condition distinct from individual experiences of antagonism that "*is experienced in the experience of society*" (following Adorno, 1993; p. 78).

Grant (2010; pp. 236-237) has argued that contradictions reveal "*the double life of experience, as a site of profound conservatism and the potential source of an explosion*". Contradictions are not embedded within a single, predetermined and unmovable history, but rather, within discrete forms of teleology that explain historical developments beyond isolated, contingent, moments. This helps to relate the notion of contradiction to wider concerns about the politics of intervention not by denying the contingency of socio-ecological relations but by contextualizing them within a historical moment and within a certain envisaged trajectory. If contradiction is generative only within instances of concrete reality, its transformative potential should be contextualised in relation to history and time and the desire for change it generates.


**Contradiction and the desire for change**

The above analysis suggests that contradiction emerges always in relation to a given trajectory of social change. There is, however, a tendency to characterise contradiction as a homogenizing global occurrence. Haughton and McManus (2012), for example, have examined contradictions within neoliberal policy regimes as manifested in neoliberal experiments subject to constant modification and adjustment, which have their maximum expression in the deployment of discourses of environmental quality of life alongside neoliberal storylines of private sector efficiency and innovation. Within an urban context, these analyses also resonate with an understanding of the nexus between carbon governance and urbanization as mediated by narratives of capitalist globalization and competitive advantage (e.g.Whitehead, 2013). The implication is that the lived contradictions of capitalism influence every aspect of human experience. Guthman and DuPuis (2006), for example, regard the contradictions of capitalism as literally embodied' in their analysis of the contradictory impulses that lead to eating patterns which simultaneously emphasize self-control and eating out of control. Their analysis resonates with the construction of the consumer-citizen in low carbon discourses (e.g. Slocum, 2004) and the simultaneous emphasis on promoting and preventing consumption, because only through new forms of consumption green outcomes can be achieved.

Instead, I approach carbon governance in relation to concrete experiences of societies and ecologies. In bridging global aspirations and localised actions, low carbon interventions open up transformation possibilities within a discrete teleology. Muttersbaugh (2004), for example, has explained how capitalist contradictions reflected local-transnational tensions in the case of organic coffee producers in Oaxaca, Mexico. Contradictions emerged within the working practices of both certification inspectors and local producers because of the interactions between actors with different spheres of understanding and influence as they drawn from available knowledge and material resources.

My understanding follows Kojève's insistence in the notion of Hegelian time to understand human capacity for historical change. History is linked to a distinctively human desire "to be recognized as an autonomous value or as having intrinsic dignity" (Nichols, 2007; p. 24). In this reading, history and the political emerge within relations of hierarchy and domination (Geroulanos, 2011). Questioning authority is a step towards social change (Kojève, 2004). Desire and negativity are experienced in opposition to accepted truths and forms of authority (Kojève, 1969). For such negative force to emerge, there is first a need to establish the truth that is being challenged, the 'p' that generates a 'non-p' within a contradiction. Such truth reveals itself within the need to apprehend totality at a given point of history, but becomes challenged through time. Truth and error are dependent on the passing of time (Kojève, 1969; Roth, 1991). Accepted truths at a given moment only realize themselves in the dialectical movement through the constitution of negativities and the overcoming of both the given truth and its opposition.

Kojève thought that contradictions tended towards overcoming (Kojève, 1982), and thus, he argued, overcoming the fundamental contradiction in the Hegelian Master/Slave dialectic would fulfil the fundamental human desire for recognition thus bringing about 'the End of History' (for critiques see: Cooper, 1984; Stoekl, 1997). The end of history can also be read as the end of desire, because the realization of desire means its disappearance (Groys, 2012). In relation to climate change, the end of history could also be written as the paralysis embedded in catastrophist accounts of climate change or as the displacement of responsibility that follows the misreading of scientific evidence in, for example, the narratives of climate change sceptics (for examples see: Chivers, 2012).

Contradiction here is a dynamic method for the analysis of intervention and change which generates a desire to change. It emerges as a congealed moment in the dialectical movement of history and generates the desire to bring about broader reconfigurations of social and ecological systems. In the context of experimentation that characterises climate change governance (Bulkeley and Castán Broto, 2013), contradiction provides direction, even if this direction is provisional and unstable. Contradiction generates tension towards truths (concrete realities) when truth is understood as a project to be realized, and therefore proved, by action (Kojève, 1946). At a given historical moment our desires are intrinsically linked to our capacity to respond, in this case, to what is recognised as a climate change crisis. In fostering this desire for change contradictions contain the promise of follow-up action (Kojève, 2000).

This reflection suggests a three step diagnosis of contradictions in low carbon transitions: first, contradiction needs to be approached from a non-bivalent perspective that looks beyond the opposition of contraries and explains, instead, how contraries are mutually constituted. For example, Holden and Linnerud (2011) found an inherent contradiction in the application of sustainable transport policies. For example, they found that policies like compact cities guidance, the promotion of pro-environmental attitudes and the use of information and communication technologies (ICT) to manage traffic, reduced the use of private vehicles in everyday life while also stimulated leisure travel. These contradictory impacts of transport policies do not simply negate each other but rather, point at the complex relationship between work and leisure mobility.

Second, contradictions need to be approached from within their capacity to generate a desire for change. For example, Rutherford (2011) has tied contradiction with materiality in his relational analysis of infrastructure and networks revealing inherent tensions- contradictions- in urban material flows. He argues that the inertias in these flows are themselves conducive to action. In relation to low carbon cities, for example, he explains that there is a contradiction between the aspiration to dematerialize the economy through advances in ICT and the critiques which see these advances as relying on a disproportionate consumption of energy. This contradiction appears to have spurred multiple attempts to redefine the terms of operation of the ICT industry. Rutherford's analysis points at the desire for change embedded in such contradictions.

Third, transcending contradictions requires the redefinition of the binary oppositions that generate them. In debates about low carbon cities, for example, reducing density is a central priority embedded in mainstream paradigms for low carbon planning. Increasing density is mostly regarded as an operation associated to vertical growth. While such correlation stands in some heavily planned cities such as NY, empirical observation suggests that density is not always associated with vertical growth. For example, higher densities are observed in unequal cities where a high proportion of the population lives in informal- and clearly not vertical-settlements (Hassan, 2010). In this context, the notion of contradiction moves thinking away from notions of vertical and horizontal urban growth, as they do not explain well urban density. Here, contradiction contains a challenge to urban blueprints which divide the city bluntly between vertical and horizontal patterns of growth.

These examples show how contradiction unfolds in low carbon transitions associated with the dynamics of purposeful change, but also embedded in heterogeneous assemblages of narratives and resources that make interventions possible. Contradiction is not an explanatory but an analytical tool that, rather than providing a masterplan for the management of low carbon transitions, demonstrates the limitations of carbon calculations and highlights excess in carbon governance.


**Carbon governance, calculation and excess**

Since its inception, the construction of climate change as a problem has been largely dominated by its conceptualization as a largely technical or scientific problem (Demeritt, 2001). In cities, the emphasis on carbon control has generated a 'carbon calculus' (While, 2013). Carbon governance is underpinned by a 'system of national territorial accounting', that is, "*measurement systems that can render explicit the emissions of citizens, firms and, most crucially, territories*" (While, 2013; p. 84). Although the carbon calculus has progressive potential to challenge accepted principles of neoliberal economic organization, "*there is no a priory reason why carbon control should be based around progressive goals in social and environmental terms*" (While et al., 2010; p. 86). In carbon governance, carbon accounting is intimately linked to the production of carbon subjects: the application of governing instruments is associated not only with the forms of rationality that underpin them, but also, with the presupposition of certain identities and modes of action (Paterson and Stripple, 2010). This requires tools for quantifying the amounts of carbon which are emitted. It also requires methods for calculating the impact of the actions of a broad set of actors seen to hold responsibility for carbon reduction, including individuals, state institutions, private firms and any form of civil association.

In this context, climate change experimentation is tied to a need to develop new forms of calculation, to render climate change technical and to open up the possibility of intervention (Bulkeley et al, 2014 following Li, 2007). This can be read as a response to attempts to govern climate change through international negotiations and the creation of universalizing forms of global citizenship (Hoffmann, 2011). However, in relation to the carbon calculus, experimentation is tied both to the generation of low carbon innovation within a given setting and to the need to improvise and adapt to the constraints of applying such innovations in contexts of great uncertainty. Alongside the deployment of new forms of carbon calculation, experimentation entails dealing with the encounter of a carbon calculus with concrete realities of intervention, an encounter which is characterised by excess.

Yussof applies the notion of excess in her analysis of general circulation models (GCMs), the mathematical models which attempt to map out climate change as a global phenomenon (Yusoff, 2009). As the production of knowledge in this way obscures other areas of human and ecological experience, Yusoff (2009) argues, unknowing becomes an inherent part of the impossible project of data accumulation predicated in GCMs. In her view, GCMs promote overtly rationalistic, machinic visions of climate change in which anything that does not fit such visions is thought of as non-knowledge, as an excess. Yusoff builds her analysis on Bataille's notion of excess. For Bataille, any attempts to deploy an ideal to control and contain the

material world encounter a base matter that cannot be easily reduced to the ideal (Bataille, 1985). This encounter between the ideal and base matter generates 'an excess', that 'energy' that cannot be accumulated (Ibid). Excess, particularly, emerges within restrictive economies that attempt to organise and domesticate the general exchange economy of social life (Bataille, 1991).

Yusoff focuses on the realm of digital production, but equally, this excess emerges in local interventions of carbon governance and in the generation of a carbon calculus. Excess is not restricted to a particular area of social life, but it becomes particularly visible in carbon governance interventions because of the need to bridge global visions and local action in a context of high uncertainty. Given the variety of public, private and civil society actors intervening in carbon governance, and their interaction through enabling practices and partnerships (e.g. Castán Broto and Bulkeley, 2013) an array of rationales for intervention are displayed in low carbon interventions. At the same time, attempts to harmonise such rationales encounter limitations to translate calculation methods across contexts. For example, one key step for local authorities developing plans for carbon governance is to establish an inventory of carbon emissions (e.g. ICLEI, 2010). This requires assigning GHG molecules to a city's jurisdiction "*by spatially referencing them to transportation, energy production and consumption, and other GHG-producing activities that occur within the city*" (Rice, 2010: 938). However, the basis for delimiting such jurisdiction is highly contested, specially because administrative boundaries are thought of being inadequate to explain the circulation of GHG molecules in the atmosphere and how they relate to multiple realms of human activity (Dodman, 2009). Carbon accounting is a powerful tool that legitimises and enables intervention and yet, fails to capture the concrete realities of carbon circulation.

This excess is characteristic of low carbon experiments. For example, T-Zed (Towards Zero Carbon Development) is a gated compound built by private developer (BCIL Ltd) in Bangalore. In T-Zed, BCIL attempted a radical change in housing for a raising middle class of professionals (Bulkeley and Castán Broto, 2012). Banking on the purchasing power of its customers and their concerns with addressing climate change through consumer practices, the developers packed every low carbon innovation they could think of in their housing design 'to bring sense' to consumer decisions. Excesses emerged as new forms of calculation were deployed through its implementation. Radical innovations such as a zero-energy cooling system never worked, despite investments in consultant expertise and technology development. The installation of low carbon lighting systems was only possible after several failed attempts to integrate LED technologies. An improvised water provision system became the highest selling point of T-Zed as it led to the rumour that T-Zed had the best quality of water in the city. The private developer engineered the constitution of a community of eco-minded residents but the community contested any prescriptions and redefined what it meant to be green in T-Zed. Poorer residents who were excluded from the gated compound found that the fence was more permeable than originally intended, gaining access to its supply of water through informal arrangements with wards and other workers. These stories, as told by different actors, were framed as unexpected successes or failures, as events that transcended original visions and narratives that conferred meaning to the actions leading to the construction and habitation of the development (Castán Broto and Bulkeley, 2014). These are examples of what can be read as excess, as that which goes beyond attempts to constrain the general economy by corseting it into rational depictions of what the world is or ought to be (Bataille, 1991). Excess emerged in relation to attempts to control the different economies that operate in T-Zed, not just as a clash of visions but rather, as a clash between rational modes of argumentation and the actual concrete experiences of experimentation. When actions emerged directed at particular areas of urban intervention in housing, service provision, transport or urban greening this excess ties onto the material disruptions that such actions provoke. Such excesses are expressed in forms of uncanny materiality that reveals "*the individual, the social, and the natural, as a socio-natural continuum that disrupts the boundaries between the above socially constructed categories*" (Kaika, 2006; p. 75). The management of excess requires multiple adjustments in neighbourhoods and cities, such as adjustments to material spaces, resources and networks but also adjustments to broader social and political expectations.

Kojève regarded with contempt attempts at establishing total truths that, he argued, were predicated on the manipulation of observed realities (Kojève, 1969). Instead, he proposed to develop methods for direct engagement with the analysis of concrete realities. In his view, attempts to establish truths that transcended the specific moment in time in which they are generated are hampered by a direct encounter with the actual realities of dialectical time.

Is excess, thus, generated by the inherent difficulty to establish truth beyond the concrete space of intervention at a given moment? Does excess relate to the actual clash between the generation of intervention narratives and their actual enactment in concrete acts? If so, what is then the relationship between excess and contradiction? Bataille himself recognised that Kojève's lectures on Hegel had a definitive influence on his thinking (Belay, 1997; Hollier, 1997).Within existing frameworks of rational thinking and utilitarianism, Bataille characterised excess as cataclysm, as disorder, as human depravation. But he also posited it in relation to passion, creativity and motion. This is an argument against understanding the end of struggle as the end of desire. By engaging with excess, Bataille is extending the notion of desire to incorporate all that which is not acknowledged but goes beyond the struggle for recognition that Kojève theorised: the necessity of a human negativity 'without use' (Agamben, 2004).

There is thus a circular movement between the perception of a contradiction and the generation of desire to overcome such contradiction. Excess refers to the experiential aspect of such contradiction, that which is not reducible to rational explanation. Excess emerges in relation to contradiction because contradiction is not the actual dialectical movement, but just a snapshot of a given moment in history, a moment in which the wholeness of human experiences encounters the limitations of rationalism. A photograph of a holiday is not the holiday itself. The photograph cannot quite capture the memory of the whole trip but it brings up memories and fosters a desire to continue (or to stop) travelling. Equally, contradictions are not the dialectical movement. Rather, contradictions place humans within a given moment of history and enable further movement. Contradictions activate a desire for intervention, a desire that emerges from within the experience of excess.

Take for example the multiple contradictions perceived in low carbon governance: from the need to act across scales to the mismatch between perceived reasons for intervention and results; from the call for simultaneous individual and collective action to the primacy of state, private sector or activists in bringing about climate change action (e.g. Betsill and Bulkeley, 2006; Jasanoff and Martello, 2004; Richards, 2003). All these are related to a desire for something else (bridging separate scales, match rhetoric and action, develop a collective consciousness, redefine the role of the state). They also follow on from the perception that action to date, no matter how many and by whom, is not quite enough. This perceived negativity actually generates a desire to change and fosters further intervention.

Both the generation of a carbon calculus and the need to maintain the continuity of intervention limit carbon governance and produce excess. These excesses are experienced as contradictions by the actors that lead action within an intervention. In the case of T-Zed, managers themselves described a contradiction between their portrait of ideal residents and resident's actual practices, while residents pointed at a contradiction in the ideal representation of the technologies and the service that they actually provided (Castán Broto and Bulkeley, 2014). Sometimes manifestations of excess are attributed to inherent political contradictions in climate policy, particularly to the divergence between the progressive orientation of carbon governance ideas and their fixation in practices which support rather than challenge the workings of a purported neoliberal state (e.g. While et al., 2010). This rationalises contradiction as a grand narrative which not only does not accurately reflect the lived experiences of excess but also leads to paralysis.

Experimentation, in all its ambiguity, constitutes an antidote to paralysis. Read within the fatalistic reading of climate change which highlights human failure to take meaningful action in response to it, Last (2013) has argued for forms of bodily and personal experimentation that help overcoming the cosmic terror that climate change provokes, thus opening up spaces of possibility. Experimentation also means avoiding an a priori prescription of what constitutes

good carbon governance. Human encounters with and responses to excess are characterised by drawing on the discursive and material resources at hand, including neoliberal accounts and capitalist exchange. Hence, a sweeping dismissal of such interventions because they are seen as following the dictum of neoliberal logics overlooks their potential to appropriate and create spaces of possibility. The role of experimentation in overcoming paralysis is undeniable.

Contradiction, in relation to the excess that follows low carbon interventions, moves from corroborating the mismatch between aspiration and reality in carbon governance to pointing at generative desires that provide impetus and direction to low carbon interventions. Regarded as a constitutive, rather than as a diagnostic element, contradiction highlights the potential to redirect trajectories of change. Paraphrasing While et al (2010), there is no a priori reason why looking at contradiction should be more progressive than existing carbon governance models already are. Nevertheless, contradiction analysis is a powerful means to transcend the binaries of simple opposition that permeate scholarly and practitioner debates on carbon governance. In the following section, I explore the implications of this theoretical reflection in practice, through an engagement with a case study of energy efficiency retrofits in social housing in Ljubljana.

**Contradictions in practice:  energy efficiency retrofits in social housing**

The Public Housing Fund in Ljubljana (the Fund) has implemented low carbon retrofits in social housing since the mid 2000s. Their work has been widely recognised for their impact both in reducing carbon emissions and addressing social issues (Author's reference). The Fund provides housing at low rents for families in low incomes, but the demand greatly surpasses supply. Not being able to meet the demand with new housing, the municipality needs to maintain post-war blocks built with cheap and low quality materials, which the government inherited from the former socialist system. Steletova Ulica 8 is one such social housing block owned by the Fund since 1990, with 60 rental flats for low-income families.  The block was refurbished in 2007 and has now become a flagship project for the Fund. Refurbishment followed an interest in reducing the costs of housing provision. The Fund, has problems with "*tenants who simply do not pay rents and other maintenance costs, which is a cause of disputes, often going on for years, between tenants and managers of low cost apartment buildings*" (Grgic, 2009). Moreover, unpaid bills have to be met by the Fund, thus, reducing their overall budget for housing provision. Energy efficiency measures such as ceilings, insulation and ventilation systems can reduce the costs of electricity so that "*residents can pay the bills*" (Fund representative interview, Ljubljana, February 2011). Further aligning the Fund immediate needs to influence energy consumption with the City's environmental strategy, the strategy of refurbishing social housing blocks meets simultaneously institutional demands, environmental policy and progressive concerns for affordable social housing.

The refurbishment of the block Steletova Ulica 8, costing 615,228 EUR, included interventions such as thermal insulation (exterior walls (+10 cm), basement (+8 cm) and attic ceiling (+20 cm)), replacement of windows and façade doors with energy efficient products and the improvement of the ventilation system reintroducing external thermal shutters and a mechanical ventilation system with 75% heat recovery (Grgic, 2009). The Fund consulted experts not just to inform their choice of technologies, but also to monitor the results. They, collectively, established success in terms of reducing energy consumption. According to municipal records the refurbishment was successful because energy consumption fell by 30%-40% approximately (down to 54 kWh/m2 year).

However there is a sense of disappointment about its results. The academics who evaluated the refurbishment argued that "*the results of the project were only partly satisfactory*" because although "i*n terms of its technical and logistics outcomes the project was definitely very successful... the final aim in terms of reduced energy use was far from the project's initial goals*" (Cirman et al., 2012; p. 204). Failure is diagnosed by comparing the projected reduction in energy consumption of 70 per cent with the 40 per cent that was actually achieved. They argue that this was due to 'human reasons' because "*the tenants were technically equipped to individually take control of their energy consumption, yet they had not used the newly installed features properly*" (Cirman et al., 2012; p. 205). Success required thus both installing

appropriate technologies and ensuring residents' good behaviour. Fund representatives, following the opinion of experts and academics who they consulted, established an ideal pattern of behaviour inside the home that residents had to conform to.

Following this, the Fund's main priority became, in their own words, "*to educate people to live in the flat*" because "*you have to educate people to live in the flat, especially flats with a new technology. You have to know how to change the thermal shutters, that during summer time you have to put shelter down not to let the sun to heat your flat, to take care about it... because this takes a lot of time and money*" (Fund representative interview, Ljubljana, February 2011). What we see here is an excess manifest in the behaviour of residents which does not conform to the ideal prescribed by the Fund. This excess leads to unpredictable patterns of energy consumption, challenging directly the assumptions underlying intervention. Residents are thought of as being careless, and they are approached through educational programs and a system for monitoring energy consumption with thermal imagery to "*ensure users behave properly and break out of their old 'habits' of having radiators on in the highest positions and with the windows opened*" (Cirman et al., 2012; p. 205).

Rather than moulding residents' behaviour, the Fund's approach has antagonised them. Informal interviews with residents at the entrance of the block (Ljubljana, February 2011) showed that, despite their evident pride in the refurbishment of the block, particularly in comparison with the decrepit blocks that lie next to it, residents were wary of the Fund's intention and questioned the extent to which their life quality had improved. They found the mechanical ventilation system uncomfortable. Some thought it was noisy. Other tenants complained that the ventilation system provokes a current of 'cold wind', which they find distressing rather than refreshing. Moreover, some of them associated bad smells ('like stinking pipes') with the system. A tenant explained that many of her neighbours did not use it because it needed an electricity generator which they thought consumed too much electricity and increased their bills – just the opposite from the Fund's objectives in installing this technology. And they were upset about being told not to open their windows.

Both the Fund and the experts deployed a model of resident for whom energy consumption is a priority (above, for example, feeling the fresh air from the window). Moreover, residents were portrayed as being able to take direct action, without compromising their life practices. There is an excess emerging from the mismatch between the representation of the ideal tenant and the living practices of the actual tenants, which also relates to the different ways in which technological innovation is experienced. In consequence both residents' and municipality's views are constructed as being in opposition and conflict emerges. But neither view can be understood without reference to each other.

Attempts to impose either view do not succeed in surpassing this contradiction. For example, the municipality's campaigns and surveys to explain the functionality of the refurbishment features, if anything, raise more apprehension among residents. While residents may implement life practices in their home, such practices are nevertheless embedded in a system of conventions and need to be justified. Complaints against the municipality go hand in hand with arguments to legitimise life practices which are seen as inappropriate, event though they may have solidified over several decades of inhabiting this particular block of flats. Municipal attempts to control users' behavior are as fruitless as residents' contestation performances.

In new construction, the Fund has implemented measures that do not depend on the behaviour of residents. For example, the Fund completed in 2011 a project of 183 social housing apartments called Polje II, in the suburbs of Ljubljana. According to municipal officials, in Polje II, they experimented both with technologies and with models of building communities. For example, the new buildings used systems of ventilation and solar collectors as a means to increase energy efficiency without necessarily questionings living practices inside the houses. A Fund representative emphasised that they tried to build a sense of collective responsibility through the combination of private and community spaces in one single development and using the surrounding landscape as an inspiration for the design. The Pipanova project inaugurated in 2012 had 22 self-contained small living units to provide temporary accommodation for

disadvantaged people. The idea of temporary occupation relates also to the design of the accommodation, and thus, there was an emphasis on measures to lower energy bills through designs that promoted the use of natural light, ventilation and solar generators. These projects signify attempts to reimagine the material relationships around low income housing. In doing so, these projects offer an alternative model of housing away from the private housing market and re-inscribe the relationship between the Fund and residents as one of mutual support, rather than as one of patronage and rule compliance.

However, given that most of the housing stock in Ljubljana are old blocks of flats built between the 1950s and the 1980s, and that the Fund has limited resources for new projects, refurbishment is a priority. As the case of Steletova Ulica 8 shows, refurbishment focuses on energy-efficiency measures that depend on an ideal type of resident as consumer and which largely ignore the experiences of people living there. Municipal initiatives to educate residents negate their life practices while residents also negate municipal efforts to improve the living conditions in their homes. This is a contradiction that points towards the need to redefine the institutional relationship between the Fund and residents to move beyond a tenancy model that reproduces the spatial separation between the public responsibility for refurbishing the building and the private responsibility for the protection of the individual home as a consumer space.


**Discussion**

Why does it matter to look at contradiction as a constitutive part of urban carbon interventions and as an engine to change? Contradiction is inscribed in knowledge systems dominated by ideal representations of concrete reality, and their relationship with base matter. Thus, the binary opposition which marks the contradiction emerges in relation to wider discursive dychotomies, for example, associated with the cultural representation of social agents (good/bad consumer) or materialities (fresh air/foul air). As a constitutive element, contradiction points at the movements that attempt to transcend such binary oppositions, whether this requires a redefinition of the material and spatial relationships in relation to energy or the social relations that produce them. When contradiction emerges within forms of representation, such as it happens in the Ljubljana case, the consequent intervention is directed towards attempts to counter opposite representations. Yet, transcending the contradiction may entail turning attention to the material and institutional aspects of the socio-technical system, in this case, the spatial distribution of energy networks, the conditions of house tenure and the limitations of energy efficiency models to explain life practices.

A focus on contradiction moves the debate away from the stalemate produced by stubborn opposition and shifts attention to new avenues where productive change can be brought upon. This is not to say that looking at contradiction can lead to ready-made solutions. Rather than pointing towards a meta-level of analysis (as argued in dialectical analysis, for example, by Collins (2000)) contradiction, most likely, enables engagement with alternative spheres of intervention. As argued before (e.g. Gartman, 2004) moving from a contradiction does not 'solve it'- it merely creates new ones. Any contradictions associated with radical reconfigurations of socio-technical systems (whether this is by establishing new relationships with homes, energy or waste systems) will not be evident until they are deployed, as excess is precisely related to the compromise with the unknown that emerges from the gap between established ways of knowing and actuality.

An utilitarian view on contradiction, thus, will hardly satisfy the questions raised in this paper. Progressive social change that confines and prescribes the form of such change compromises both the possibility of change and its progressive aspirations. Yet, contradiction can be espoused as a means to move beyond paralysis, whether this is provoked by human engagement with cosmic terror and the futility of human action (cf. Last, 2013) or with the obsession with cancelling opposite positions. In this sense, the perspective I have developed in this paper moves beyond Kojeve's contradiction in two ways: first, because it identifies contradiction as an analytical tool, the root of a method that enables engaging with the historical dialectical movement that preoccupied him; and second, because the multiple desires that

emerge in relation to contradiction question his attempt to reduce them all to a desire for recognition.

The question that follows- and it is not a new one- is what can make a difference in achieving transitions. Those who see it as a process of transformation towards an end, putatively sustainable, state (e.g. Hodson and Marvin, 2010) engage with figuring out what such state is and how to recognize it. Such view presupposes that contradictions in low carbon interventions can be fully overcomed. However, looking into the constitutive character of contradiction invites to recognize it as an intrinsic component of intervention that bridges its possibilities and aspirations. In this latter view the key concern is not overcoming contradictions but using them to foster constant movement away from what is thought of as unjust. In the context of climate change experimentation, contradictions do not point towards a prescribed pathway but towards an overall direction. This also speaks to the changing character of carbon governance and the need to open up to the possibility of being wrong just because, as Kojève argues, time will tirelessly change the state of affairs. Contradiction, as a generative but unmanageable force in low carbon transitions, is a key concept to understand not only the configuration of concrete socio technical configurations but also how to bring about new ones.

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