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Protesting against neoliberal and illiberal governmentalities: A comparative analysis of waste governance in the UK and China

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ABSTRACT

The central states of the United Kingdom and China are committed to finding effective ways to govern normative sustainability programmes. A more sustainable waste policy solution than landfill is energy-from-waste (EfW). The governmentality perspective suggests that, to achieve such policy ends, compliance is required from a range of actors who operate at a distance from central states. This paper is the first to draw together theoretical comparisons of Western neoliberal and Chinese governmentality in the context of waste governance. We find that long-standing liberal approaches to power and policy-making witnessed in the UK have parallels with a hybrid mix of socialist governance and Chinese governmentality. Beijing seeks to govern not via neoliberal tactics of 'freedom and liberty', but rather through a distinct planning and administrative rationality. Our comparative case study approach allows us to illustrate the dual facilitative and authoritarian dimensions to 'top-down' compliance given 'bottom-up' counter claims of expertise by citizen scientists and other activists in local communities. This analysis in turn reveals how power plays out between state actors, corporations and local communities in these two different political and planning systems. We suggest that the progressive development of lay expertise in environmental health risks is a dynamic marker of the limits to the top-down imposition of waste policy in both countries. Our approach to comparative analysis draws attention to the need to revisit approaches to neoliberal Western governmentality and to extend empirical investigations using illiberal Chinese governmentality.

Introduction

The UK and Chinese central states are committed to finding effective ways to govern normative shifts towards greater sustainability. However, both countries face serious difficulties with their national waste management strategies. In the face of dwindling options for landfill, each country has committed itself to large construction programmes of energy-from-waste (EfW) plants. Both states support technological claims made by developers and engineers that newer EfW facilities are more sustainable than the previous generation of incinerators. EfW plants reclaim energy from burning unrecoverable municipal solid waste (MSW). Delivery of this new waste infrastructure, however, is well behind schedule in both countries. Corporate claims for EfW sustainability are heavily contested by environmental non-governmental organisations (NGOs) and members of dissenting affected communities.

In this article, we use a mixture of our own research, a review of secondary sources and a comparative analytical framework to show how the planning systems of both England and Wales and China act as governmental technologies of central control. In this context, we suggest that power plays out very similarly between state actors, developers and local communities in both countries and that there are dynamic limits are to the top-down imposition of centralised waste policies. This comparative analytical approach extends descriptive models of governmentality into waste governance in both countries showing that key critical dimensions such as public participation are similarly rarely meaningful in either country. We examine local events in four case studies, two from each country. Events are assessed longitudinally in timelines in the supplementary material. This material reveals that, even when the state achieves its policy ends (i.e. constructing an EfW plant), political challenges to these new facts on the ground remain. Such dissent arises due to perceived negative social, economic and

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environmental outcomes as evidenced in each timeline.

Our social constructivist analytical framework examines the competing logics of actors involved in contesting the siting and technology of EfW plants. We offer insights into neoliberal governmentality, Chinese illiberal governmentality and 'rhizomatic' resistance, a concept from Deleuze and Guattari (1987). The terms rhizome and rhizomatic are part of a powerful notion borrowed from biology - a metaphor for the unlimited horizontal growth of root systems. When applied to analysis of past events, the rhizomatic approach is characterized by "ceaselessly established connections between semiotic chains, organisations of power, and circumstances relative to the arts, sciences, and social struggles." (Deleuze & Guattari, 1987, 7). As Semetsky (2003, 18) indicates, a rhizome, or network of dissenting actors: "[multiplies] its own lines and establishing the plurality of unpredictable connections in the open-ended … smooth, space of its growth." Smooth or 'fluid space' is irregular, open and heterogeneous. This is contrasted to striated space which has rigid schemata and fixed points ordered by hierarchical power (Allen, 2016; Deleuze & Guattari, 1987; Murdoch, 2006; Semetsky, 2003).

In our analysis, we suggest parallels between the reactions to the top-down imposition of governmental policy at a distance - via 'technologies' of measurement – in these neoliberal and illiberal states. Both countries wish to govern through influencing the choices, aspirations and capacities of individuals (cf. Dean, 1999; Foucault, 1991; Jeffreys & Sigley, 2009; MacKinnon, 2000). Hindess (1996, 77), for example, suggests that the similarities are: "more significant than the obvious doctrinal points on which they differ." We conclude that our empirical evidence and insights demonstrate the value of extending descriptive models of governmentality and rhizomatic resistance into waste governance analyses in both countries (cf. Bulkeley, Watson, Hudson, & Weaver, 2005; Jeffreys & Sigley, 2014).

With waste policy governance, we propose a typology (Fig. 1). There are three types of networks of actors in both countries – developers, regulators and dissenters. The agency of the first two is constrained by striated space. Dissenters occupy fluid space. In both countries, we document social struggles involving dissent by communities and non-governmental organisations (NGOs) against powerful, hierarchical actors embedded in institutional structures of governance. We characterise such dissent in terms of rhizomatic resistance. This approach suggests how, where, when and why the limits to the top-down governmental 'imposition' of waste policy are contested (Hacking & Flynn, 2017). Opposing framings of risk of different actors are characterized in terms of: 1) asymmetric power relations in national planning systems (Murdoch, 2006), 2) the influence of network linkage to traditional and social media which amplify risk perceptions (Kasperson et al., 1988), 3) specific geographies of resistance (Keith & Pile, 2013) and, 4) the development of alternative expertise based on citizen science (Wynne, 1996). Alternative expertise is interesting because expertise and legitimacy are so heavily fought over by opposing actors, particularly regarding environmental health risk perceptions (Whatmore, 2009).

We argue that the progressive development of lay expertise regarding environmental health risks (and its diffusion via social media) acts as a dynamic indicator of the limits to the top-down governance of waste policy. We suggest governmentality studies should pay more attention to understanding the dynamic nature of rhizomatic dissenter responses (cf. Deleuze & Guattari, 1987). Our research also offers insights into how and why power plays out similarly between actors given analogous waste planning and administrative rationalities in two very different political systems. Our approach to neoliberal and illiberal governmentalities, summarised in diagrammatic form (Fig. 1), enables insights into: 1) the asymmetric nature of power relations between state actors,

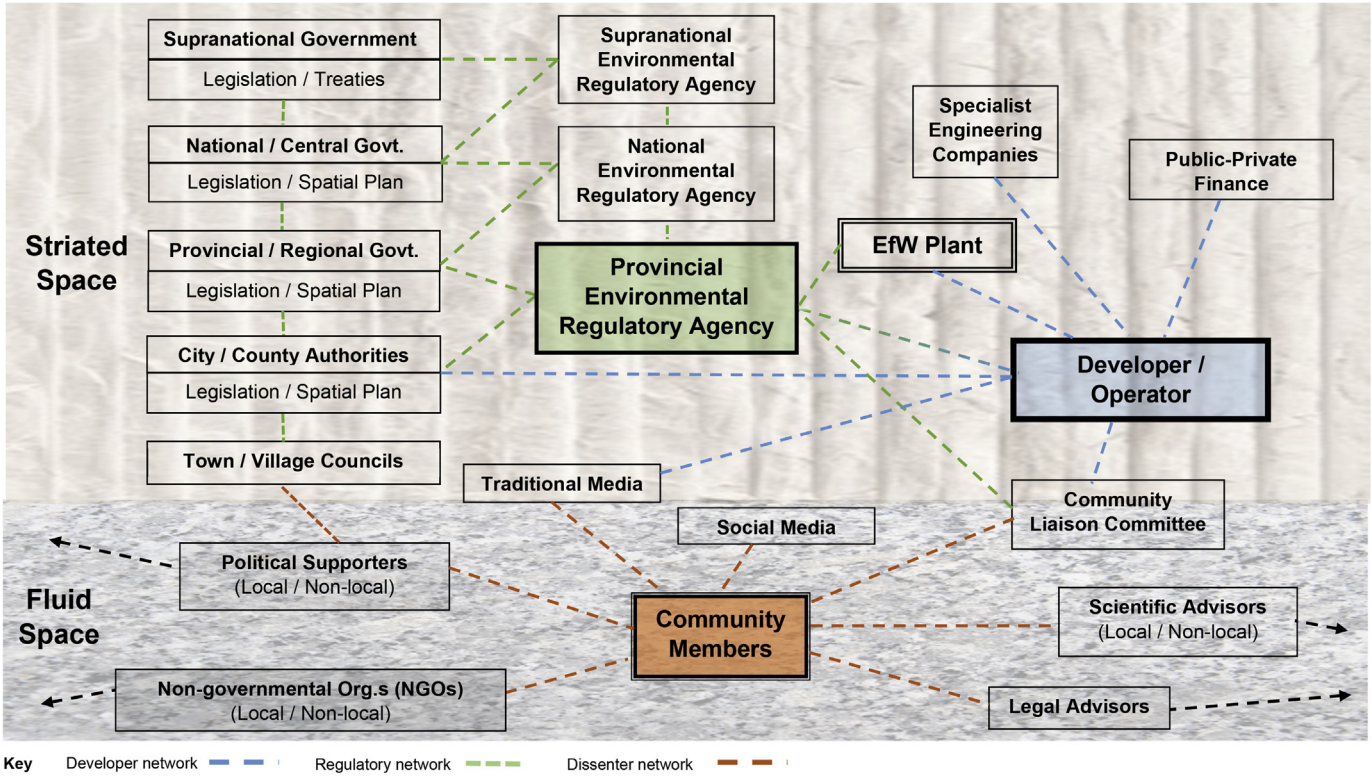

Fig. 1. Three networks operating in striated and fluid space.

developers, NGOs and communities, 2) how and why protestors reshape these asymmetric power relations through developing their technical expertise as citizen scientists, 3) how and why protesting communities enrol other actors (at a distance) with alternative scientific expertise to bolster their campaigning and, 4) how and why waste management technology is framed as a sustainable solution. Ultimately, our comparative analytical approach demonstrates the value of our interpretation of governmentality in terms of the nature of protest and its longevity and how and why the state's policy aims, even when fulfilled, remain contested.

In terms of the structure of this paper, our reviews of waste management governance in the UK and China involve characterising: 1) the comparative nature of neoliberal and illiberal approaches to environmental governance, 2) the national land use planning system and how its use as a technology of measurement for the delivery of waste policy, and 3) examples of top-down national and regional instruments and guidance. We then review and compare four EfW case studies, two each from England and Wales and China. The case studies illustrate the dual facilitative and authoritarian dimensions to top-down compliance with centralised waste management policies via comparisons between the state's top-down claims for legitimacy and bottom-up counter claims of expertise by citizen scientists and activists in local communities.

Comparative waste governance

In this section, we undertake a comparative review of different understandings of governmentality in the context of the UK and China. This is then applied to each country's respective land use planning system to characterise their institutional approaches to waste governance. With EfW waste policies, we argue that the central states in China and the UK are dealing with very similar social, economic and technical dynamics on the ground (despite their very different political systems). This comparative picture covers upstream framings of waste as a policy problem and downstream consequences of that framing in terms of technology choices and site selection (Wynne, 1992). In both countries, the top-down imperative with waste governance policies is determined by the urgent need to overcome the landfill capacity problem. In the next section, we characterise Western neoliberal and Chinese illiberal approaches to governmentality.

Neoliberal and illiberal governmentalities

Discursive forms of governmentality provide "an alternative basis from which to conceptualise the nature of governing" (Bulkeley, Watson, & Hudson, 2007, 2736). They explain the demands and social dynamics of governing a modern state, how power relations are exercised relationally, and the potential for geographies of resistance (Pile & Keith, 1997; Dean, 1999; McKee, 2009). Faced with policy problems with divisive outcomes (cf. Alty & Darke, 1987; Davoudi & Atkinson, 1999), responses by actors to displays of power in the planning arena result in adaptation (MacKinnon, 2000) or resistance (Raco, 2003). With concepts of both liberal and illiberal forms of governmentality – what Foucault termed the study of the "conduct of conduct" (Defert & Ewald, 1994, 237) - power relations are seen as all-pervasive and expressed relationally between actors (Dean, 1999; Foucault, Burchell, Gordon, & Miller, 1991; Miller & Rose, 1990). Power can be exercised oppressively instead of achieving liberal freedoms (Foucault, 1975, 1980). As Bevir (1999, 69) summarises: "[L]iberal freedom [is] … impossible … modern reason excludes … the way modern power dominates the individual." Foucault's work also underpins an illiberal version - Chinese governmentality - as we discuss below. What is important to both is the state's need to successfully project power at a distance and so retain a measure of control over its territory. Governmentality suggests the 'power to' achieve things at a distance (i.e. agency) is expressed relationally via relatively rigid networks held together by 'immutable mobiles' or activity which strengthens a network's relational links (Latour, 1987). Such activity is therefore underpinned by 'technologies' of measurement - e.g. accounting systems, spatial plans, and development plans, in the case of a planning system - which shapes human conduct at a distance from the centres of calculation (Barry, 1996). Immutable mobiles help align governed actors particularly in geographically remote areas (MacKinnon, 2000; Murdoch, 2004).

> "[I]f we want to do an analysis of power … we must speak of powers and try to *localize them in their historical and geographical specificity*" (Foucault, 1976, cited in Crampton & Elden, 2007, 156, our italics).

In the case of EfW, neoliberal states use top-down networks providing immutable mobiles, their planning system and a state regulator to measure the financial and physical inputs and outputs at sites at a distance from centres of calculation, such as Brussels, London or Cardiff, to determine the attainment of policy objectives (Bulkeley et al., 2005, 2007). State power creates new knowledge, including geographical data, to further 'steer' actors and individuals in more distant territorial spaces (Ó Tuathail, 1996; Rose-Redwood, 2006). However, dissenting actor networks enter into 'trials of strength' (Latour, 1987, 78) with state-backed actor networks to undermine the political and technological claims of pro-EfW actors. Who 'wins' a trial of strength depends on the strongest network of actors and resources (Murdoch, 2006).

There are a wide range of indirect ways in which power structures the behaviour of individuals and organisations (Allen, 2004). Stakeholders behave responsibly because they understand what acceptable behaviour is and what they imagine to be the reality of their own circumstances (Griffin, 2012). With waste management, protestors can be acutely aware of their operational context in terms of individual/collective behaviour (see case studies below). Allen (2004, 23) therefore suggests that for "embedded institutional practices", governmentality is a plausible explanation for constrained agency. For instance, regulatory 'intrusions' into *local* spaces shapes the distinct responses that communities are 'permitted' to pursue. However, the top-down imposition of an EfW policy by a central state, its regulators, local government and developers in our case studies typically fails to recognise deep-rooted local historical specificities of communities.

In a succinct critique of neoliberal governmentality, Griffin (2012) makes two pertinent points. Firstly, regulatory and state/developer networks draw upon much greater resources than dissenters in exercising their power. Secondly, the governmentality perspective underplays individual agency by suggesting that actors' activities are steered via dominant discourses, such as neoliberal environmental governance used for the regulation of polluting industries. As we shall see both points matter in our case studies.

There are, of course, limits to what can be achieved by liberal states deploying top-down imposition of policies. In theoretical terms, Deleuze and Guattari were concerned with how "capitalism and the state function as apparatuses of capture" (Purcell, 2013, 30). They suggest unfettered capitalism creates instability and upheaval while the state tries to manage economic production. The state must impose its will on institutions and individuals via a "whole apparatus of regulation" to govern economic relations (Deleuze, Guattari, & Massumi, 1977, 252). Normative approaches to public participation are therefore challenged via "revolutionary connections" (Deleuze & Guattari, 1987, 473). Concerned with transition

and 'becoming' rather than 'being', Deleuze and Guattari (1987, 474) advocate freeing individuals from state-controlled "striated space" (Fig. 1). Such dissent may occur in cross-cutting, bottom-up fora in "free space". This space is non-metric, relational and acentred (Deleuze & Guattari, 1987, 17). Rhizomes are a "non-hierarchical, non-signifying system without a General and without an organising memory or central automaton, defined solely by a circulation of states" (Deleuze & Guattari, 1987, 21). Rhizomes self-organize, challenging the state's top-down projection of power. Coyne (2008, 558) says they are "parasitic on established structures [growing] from within to subvert the edifice." Rhizomes are "entities in which each member has the potential to communicate horizontally with any other" (Purcell, 2013, 27). However, not all forms of dissent automatically equated with 'rhizomatic' resistance.

The land use planning system in England and Wales

The planning system matters because new EfW plant requires land use decisions. The planning system in England and Wales involves a top-down administrative hierarchy centred on London. Its structure, shown in Fig. 2, involves policies and plans made by four influential departmental bodies of the UK's central state:

- HM Treasury - responsible for national economic planning. Social and economic spending plans - 'Budgets' - tend not to extend beyond the five-year lifetime of each elected Parliament.
- The Department for Communities and Local Government (DCLG) - includes guidance for Local Government on how to achieve national planning policy. This guidance's stated aims include greater public participation.
- The Department for Business, Energy and Industrial Strategy (BEIS) - created in the summer of 2016 has responsibility for businesses, science, innovation, energy and climate change.
- The Department for Environment, Food and Rural Affairs (DEFRA) - formulates and promotes national standards of environmental protection, manages, monitors and enforces environmental protection along with the Environment Agency (EA) in England (and the EA's equivalent bodies in Northern Ireland, Scotland and Wales).

These departmental policies and plans are communicated in turn to sub-national government (Ayres & Pearce, 2013). There are devolved planning powers available to the nations in Northern Ireland, Scotland and Wales and these powers include waste governance. A major barrier to the operation of the planning system, however, is interdepartmental rivalry within the central state in London.

The leading central state institutions have the greatest influence on development planning and act as centres of calculation. These key departments therefore use various means of measuring the activity of other less powerful actors (e.g. budgets, targets, performance indicators). These are the relationally linked immutable mobiles which help stabilise the policy-led network from within the formal planning system but at a (geographical) distance in the provinces/nations/regions and cities. Land-use activities are made visible through the immutable mobiles involving statistical and spatial data for analysis, problematisation and new policy formulation at centres of calculation.

Institutional approaches to waste governance in England and Wales

In England and Wales, the European Union leads reform of waste governance. This is chiefly via the Waste Framework Directive (75/44/EC) and the Landfill Directive (99/31/EC) (see *Supplementary Material — England and Wales's waste-related policies*). When the Waste Management Licensing Regulations (1994) were put on the UK's statute books, energy recovery was

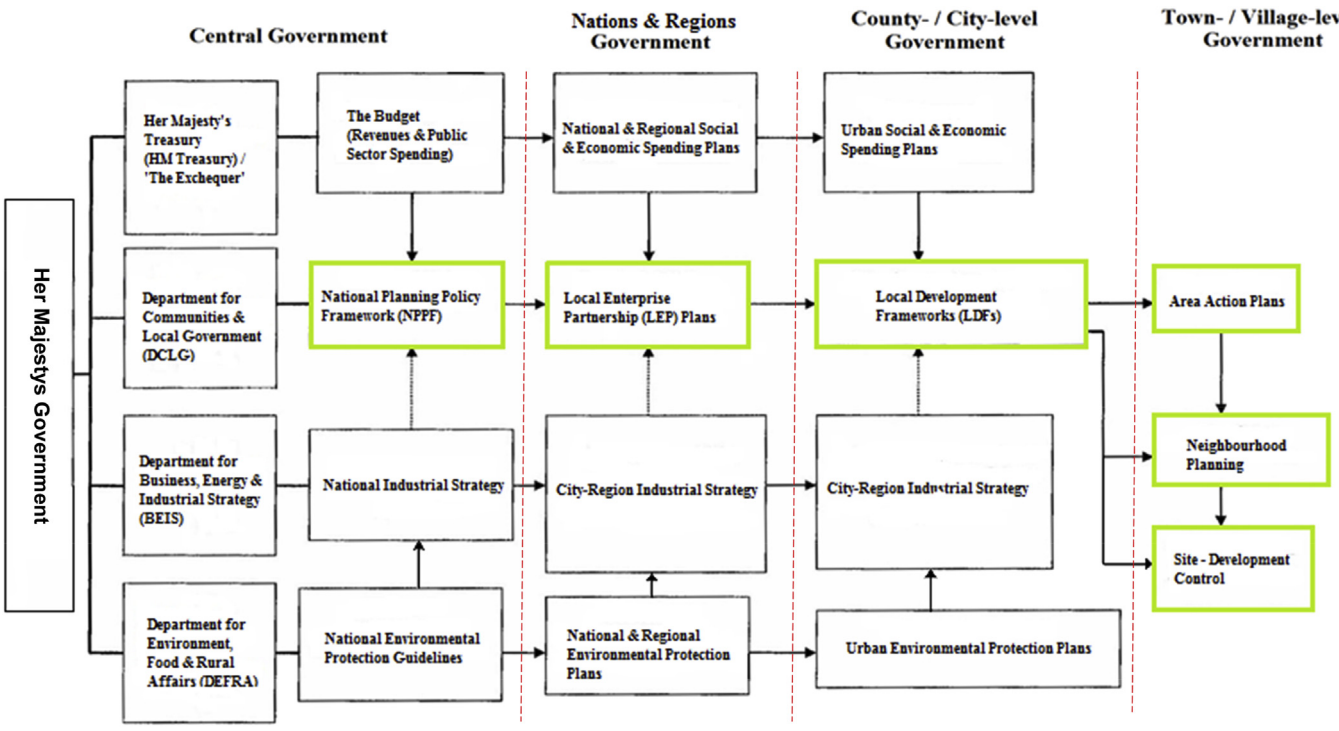

Fig. 2. England and Wales' hierarchical planning system.
Based on: various UK government online resources.

controversially placed at the same level as recycling and composting in the waste hierarchy. The waste policy agenda thus became more sympathetic to the possibility of EfW. The industry expanded to meet rising policy-led demand. In Wales, where two of our case studies come from, this picture is further complicated by political devolution. From the early 2000s, the National Assembly for Wales (now the Welsh Government) has produced its own waste management strategies (see *Supplementary Material – England and Wales's waste-related policies*). In 2002, recycling targets in Wales were more ambitious than in England and markedly less sympathetic to EfW, but the position on EfW has since become more favourable.

Waste incineration dissenter activity in the UK accelerated from the 1980s. It should be seen as a response to this increased promotion of EfW as a waste management solution by central government and its associated agencies. In particular, reframing incineration as a waste solution via the energy recovery is seen by some dissenters as a state 'tactic' to improve the incineration's legitimacy and so gain acceptance by communities earmarked for a development (other 'tactics' identified by UK dissenters include promises of significant numbers of local jobs and apprenticeships and district heating systems to combat localised fuel poverty).

The governmentality perspective suggests one of the key observations about communities in England and Wales faced with EfW proposals is the localised development of an 'alternative' expertise on incineration based on 'citizen science' and the precautionary principle (Irwin & Wynne, 1996; Wynne, 1996). Knowledge and expertise about incinerator and EfW technology, the environmental impacts and the alternatives are shared via networks within and between dissenting communities. This knowledge exchange includes input from some non-governmental organisations and academic researchers (see the case studies). Communities, therefore, have access to knowledge, alternative expertise and support that they might not normally have expected when challenging the dominant framing of a public policy problem. Such bottom-up, countervailing responses to the UK's top-down implementation of its evolving waste policy present central government with a tangible sense of the limits to compliance with its neoliberal policy edicts. Some dissenting communities in England and Wales have acquired more power and influence in their inevitably asymmetric contestations with the state over EfW plants by presenting their alternative expertise as an increasingly legitimised form of knowledge (Hacking & Flynn, 2017). Whether successful or not in individual localities, governmentality suggests that the wholesale rejection of the state's expertise on EfW means that, for central and local government, EfW strategy is increasingly problematic to deliver.

Chinese illiberal governmentality

Extending Foucault's Western theoretical concept of governmentality to a non-Western context might appear 'Eurocentric'. However, there is a long-standing literature on Chinese governmentality (e.g. Anagnost, 2006; Bray, 2006; Dutton, 1992; Greenhalgh & Winckler, 2005; Hindess, 1996; Hoffman, 2006; Jeffreys & Sigley, 2009, 2014; Kipnis, 2007; Sigley, 2006). Once China liberalised economically in the 1980s, a characterisation of the socialist arts of government based on Foucauldian antecedents, or 'Chinese governmentality' followed (Bray & Jeffreys, 2016). However, while some of the elements of neoliberal reasoning are visible today, the "prevailing discourse on government in China continues to approach the task of government in a distinctly Chinese … and … 'socialist' manner." (Sigley, 2006, 495). The neoliberal roll back of the central state is *not* being pursued in China as in the West. Instead, the state is intervening in different ways, combining both neoliberal and socialist, facilitative and authoritarian strategies (Bray, 2006; Jeffreys & Sigley, 2009). Thus, the simultaneously different neoliberal governmental contexts between China and the UK are familiar and demand a highly nuanced comparative analysis as outlined below.

Hindess (1996) suggests that, in China, there is neither a distinctly socialist nor liberal 'technology' of government. Instead, both political traditions suggest the central state should aim to realize a community of individuals who can largely regulate their own activities. The country's political transition from socialist plan to market socialism has involved reconfiguring its governance along the lines of: "scientific social engineering and socialist planning combined with neo-liberal strategies of governing from a distance." (Jeffreys & Sigley, 2009, 1). Beijing has also further incorporated a range of expertise into its ambitious plans for social engineering from the 1980s. Foucault (1991) argues that the increasing institutionalisation of professional expertise is a key part of the process of governing modern central states. In China's case, Beijing's plans have involved economic rationalization and marketization programmes in employment, education, sustainability, and health, amongst others. (Bray, 2005; Dutton, 1992, 2008; Greenhalgh & Winckler, 2005).

The development of the socialist market economy in 1990s in China has thus encouraged a new form of authoritarianism for the market, one that has many similarities with the notion of 'good governance' within advanced liberal societies and global institutions. The establishment of a socialist market economy, however, has not signalled a retreat of the state. Rather, a socialist market economy requires a powerful government that continues to intervene but often in different, more subtle ways. Crucially, the Communist Party of China remains important and necessary as the ruling party in this one-party state (cf. Dean, 2010).

In summary, Chinese governmentality suggests that state actors do not govern through Western neoliberal notions of 'freedom' and 'liberty'. Instead, the conduct of conduct of Chinese state actors is evidenced via their distinct economic planning and administrative rationalities. As in the West, approaches to governance rely on a body of technical expertise whose growth has been sponsored by the state. Nevertheless, we argue that the limits to the top-down Chinese system of waste governance have become apparent as citizens have developed their own health risk expertise. Increasingly, citizens demanded to be involved in decision-making via the planning system. This is linked to the recent emergence of open government initiatives including public participation in policy making. The governmentality approach suggests such evidence from the Chinese national planning system permits new insights into the nature of Chinese governmentality in terms of relational 'topologies of power', i.e. how, when, where and why technologies of measurement and control are deployed (cf. Allen, 2016; Collier, 2009).

To further appreciate how the Chinese planning system can be considered a governmental technology of central control, the next section offers an institutional overview of the Chinese land use planning system.

The land use planning system in China

The planning system in China involves a top-down administrative hierarchy centred on Beijing. The hierarchical structure shown in Fig. 3 shows how the plans of four key institutions of central government are communicated to provincial-level, county- and city-level, and town- and village-level government. Allocation of land-use resources is centrally controlled via a planning system formed prior to the market reforms of the 1980s. The competing plans of the four key institutions produces "great uncertainties and

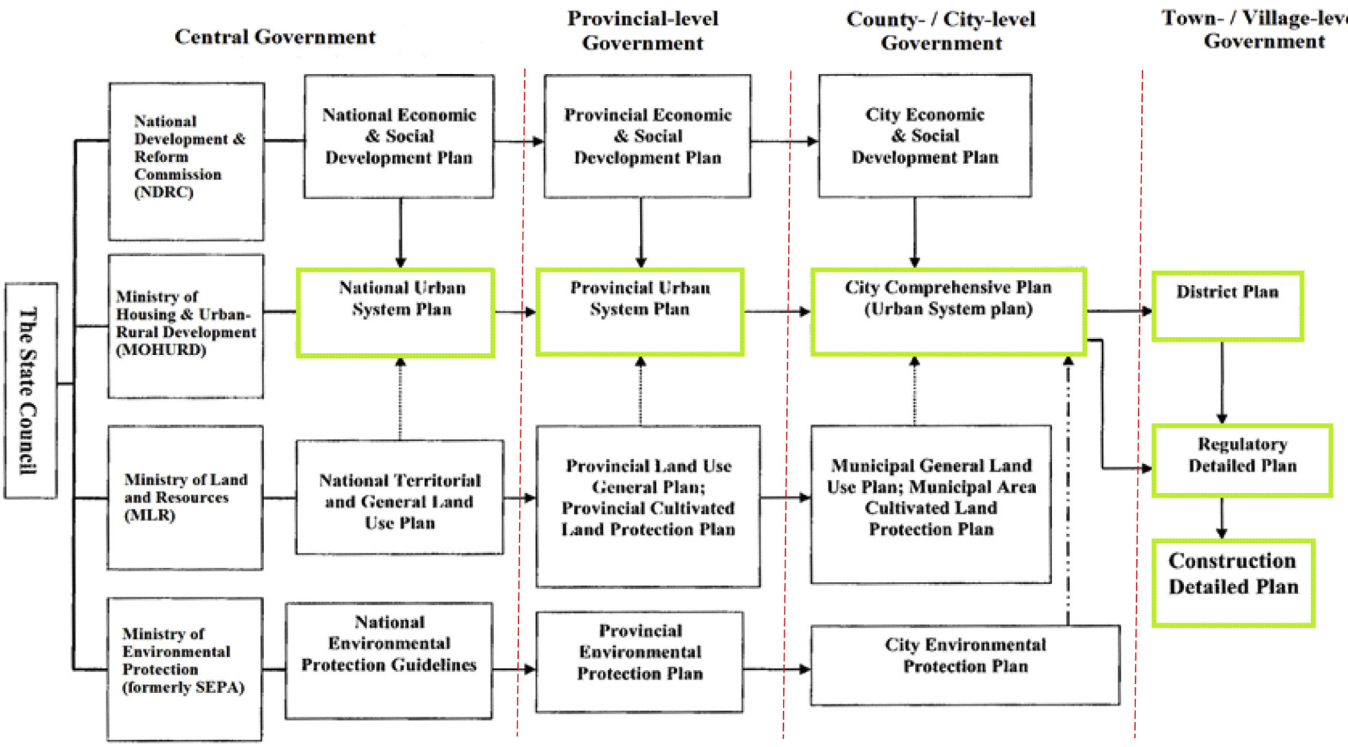

Fig. 3. China's hierarchical planning system.
Based on: Yu (2014).

inefficiencies in policy-making and delivery" because of different departmental interests (Yu, 2014, 97, cf.; Shi & Cai, 2006;; Cai, 2008;; 2010). These departments and their impact on waste governance are outlined below:

- The National Development and Reform Commission (NDRC) - responsible for 5-year national economic plans (inc. assessment and approval of local large infrastructure development projects applied for by local governments). The NDRC has also initiated a type of regional plan known as development functioning zones.
- The Ministry of Housing and Urban-Rural Development (MoHURD) - includes national guidance on sanitation and approval of city comprehensive plans. MoHURD works on allocating housing subsidies with the NDRC and the Ministry of Finance (Yu, 2014).
- The Ministry of Land Use and Resources (MLR) - makes land allocations for defined urban developments. The MLR designs policies to protect cultivated land but conflicts typically arise over local government land leasing.
- the Ministry of Environmental Protection (MEP) (formerly SEPA) - formulates and promotes national and professional norms and standards of environmental protection.

It manages and monitors environmental protection in major development areas and plays an active role as a coordinator in inter-regional environmental disputes.

At the next level down in Fig. 3 are the links that make immutable mobiles: the key provincial departments of local government including bureaux of urban planning, construction, environmental protection and transport. These bodies are directly responsible to the leading departments of the central government which in turn use provincial bureaux to work with local city CPC chiefs and mayors and administrators at the next two levels down in Fig. 3 (county-city and town-village) (Yu, 2014).

Institutional approaches to waste governance in China

In China, rapid urbanization, population growth and industrialization continue to produce unprecedented increases in waste generation. By the end of 2013, China was producing more waste than any other country, more than seven billion tonnes of untreated municipal solid waste (MSW), covering over three billion square metres of land (Zhang, Huang, Xu, & Gong, 2015). Waste surrounds two thirds of the nearly 680 cities in China and many cities' waste is transported to rural areas to be disposed of with Chinese cities referred to as being under a 'garbage siege' or 'waste siege' (Li, Zhao, Li, & Li, 2015; Xin-Gang, Gui-Wu, Ang, & Yun, 2016).

EfW plants are framed by the central state in Beijing as a way of breaking this siege and overcoming waste management problems. Thanks to rapidly evolving legislation (see *Supplementary Material - Chinese waste-related policies*), there has been a rise in the number of EfW proposals, sites under construction and in operation. A national plan within the 12th Five-Year Plan (2011–2015) which appeared on April 19th, 2012, focused on the safe treatment of waste in urban areas (Geng, 2012).

Contrary to Beijing's expectations, disquiet has grown in local communities in the populous east as EfW plants have been encouraged there. Concerns centre on the potential environmental impacts and the lack of opportunities for citizens to influence decisions (Johnson, 2014; Lang & Xu, 2013). The top-down imposition of this waste policy encourages dissenter reactions in communities which can involve direct action and the challenging of state-supported scientific expertise including site and technology selection (Johnson, 2013a). Potentially negative environmental health outcomes, including the cumulative contribution to localised air pollution and climate change, are becoming more widely recognized. Nevertheless, the ways that this rhizomatic resistance is made manifest on the ground is also distinctive due to institutional approaches to power and place-specific dissent.

For example, 'persistent persuaders' appeared in Beijing and Guangzhou (Lang & Xu, 2013). They avoid the perception of overtly challenging the authority of the state for fear of reprisals. These typically well-organized activists use social media to covertly inform and mobilize community members and express their discontent with urban authorities (Sullivan & Xie, 2009; Zhang & Nyíri, 2014). EfW dissenters in China have learned of and from the experiences of others and so developed their own alternative expertise as environmental activists able to undertake citizen science and/or mobilize protests.

However, community members are also prepared to pursue mass (direct) mobilisation particularly when public participation in upstream and downstream policy decision making is tokenistic or non-existent. The hybrid mix of socialist governance and Chinese governmentality deployed to achieve the state's waste plans still do not include the institutional and legal channels for the Chinese public to participate *meaningfully* in the decision-making stages of the planning system. Decisions on the siting of incinerators in China have been changed as a result of such direct action which can involve many thousands of protestors taking to the streets. Major concessions from local government can be won, it is argued, because Beijing prioritises political stability and typically punishes provincial officials for letting a localised contestation become a mass protest (BBC, 2015).

Methods

In this paper, we draw out the dynamic nature of power relations from four case studies using a mixed-method approach and a longitudinal analytical framework (Tashakkori & Teddlie, 2010; Yin, 2003). Our framework shows how events are contested, constructed and reconstructed by capturing:

- the nature of individuals' opposing constructions of knowledge over time, and
- how asymmetric power relations between opposing networks play out in space and time.

As well as a new approach to waste governance in China, our analysis is an opportunity to reappraise the evidence for the neoliberal governmentality approach to waste governance in the West (Bulkeley et al., 2005, 2007). By studying actor activity pre and post the regulator's licensing decision in both countries in a genealogical fashion, we characterise the evolving nature of each particular contestation over long time frames and note the similarities and differences in social processes.

Our research design draws on qualitative interviews with key stakeholders for our Welsh case studies and analysis of quantitative and qualitative data from secondary sources for case studies in both countries. We note the difficulties of undertaking research in China (Lang & Xu, 2013) and this inevitably produces an asymmetric approach to primary source material weighted in favour of contributions from South Wales. Nevertheless, as part of our process of data collection, one of the authors visited a newly built EfW plant in Eastern China. During the visit, discussions occurred with the management about the materials to be burnt and the planned operating efficiency of the plant. Discussions also covered the siting of the plant, the approval process and relations with the local community. Discussions between the plant operator and the local environmental protection body (the municipal MEP office) were also covered in the meeting.

For each case study, internet searches were undertaken via a range of secondary sources from academic, media and grey literature. We also examined technical papers and reports from specialists in waste management in both countries. These sources have helped us to understand how EfW activity is framed, its proponents' dominant perceptions of communities and participation, and its favoured solutions. From this analysis, four timelines were created with reference to all actors. The timelines are divided into three broad sections: the planning phase, the construction phase and the operational phase. Using secondary sources of data in this way is a well-established method of analysing relationships and policies between tiers of government (Li & Wu, 2012). Chinese-based researchers are interested in community attitudes to EfW, the rising use of social media in constructing lay expertise and dissent, and the central and local state's responses (Cai, 2008, 2010; Johnson, 2010, 2013a, 2014). We therefore sought out such evidence in secondary sources and emphasized the impact of knowledge networks in our timelines. The result of these methodological approaches is a well-rounded perspective on how EfW has come to be a favoured waste policy solution in both countries, how it is delivered and the nature of opposition. Our analysis is divided into four analytical themes that are outlined in the next section.

Analytical themes

We pursue four analytic themes in each case study. These themes emerged from the coding of primary source interview material and the collation of secondary material into timelines:

- democratic openness – opportunities for public participation and transparency,
- expertise – dominant versus alternative framings of risk and sustainability,
- role of space and place – the impact of socio-spatial processes on actor interactions,
- role of regulation – how top-down governance is imposed.

These themes help us to illustrate which factors are determining the limits to the top-down imposition of waste policy in each case study.

Evidence and analysis

In this section, we highlight our results and analysis from each case study making reference to their summary characteristics in Supplementary Material. This includes *Supplementary Material – EfW Case Study Summary,* site situations in *Supplementary Material - EfW Case Study Sites* plus individual timelines and policy summaries. The data shows how neoliberal approaches to power, policymaking and governance witnessed in the UK have many parallels with the hybrid mix of socialist governance and Chinese governmentality in the PRC.

The evidence summarised in the timelines suggests that the top-down imposition of centralised waste policies at a distance helps shape the nature and extent of dissent in that striated space. All timelines were of a long duration, each with many events. The planning institutions and procedures in both countries are very similar with events moving through three phases - i) planning, ii) construction and iii) operation – and involving impact assessments. Cumulative impacts from all pollution sources are similarly not assessed in either country. Two of these EfW facilities – Crymlyn Burrows and Cardiff – were sited in already highly disadvantaged areas. The general health of these two local populations was already poor especially for vulnerable individuals. Dissenter activity at all four sites was enabled by access to social media (cf. Sullivan & Xie, 2009; Zhang & Nyíri, 2014). The similarities continue with dissenter networks in each country overtly and/or covertly challenging decision-making.

Case study 1: Crymlyn Burrows, South Wales, UK

Local waste authorities in England and Wales began looking at ways of radically reducing the amount of waste sent to landfill from the mid- to late-1990s in anticipation of the EC's Landfill Directive (EC, 1999) (see *Supplementary Material – England and Wales waste-related policies*). Failure to comply would result in fines both at the local and national levels.

In *Supplementary Material – Crymlyn Burrows*, there is a timeline outlining details of the £32 m public-private waste partnership between the Portuguese developer, HLC, and Neath-Port Talbot County Borough Council (NPTCBC). Begun in 1998, this Private Finance Initiative deal was for a Materials and Recovery Energy Centre (MREC), an EfW plant located in Crymlyn Burrows near Swansea's East Side, a populous and disadvantaged district where health indicators were low (Hacking & Flynn, 2014). As the timeline shows, the local area has a long history of environmental degradation involving coal, oil and other hydrocarbon emissions, carbon black manufacture, and hazardous chemical spillages. This place-specific context is key to understanding much of the subsequent resistance to the MREC: by 1998, when the facility was first approved by NPTCBC, various local communities were already highly distrustful of local and national authorities' environmental health enforcement abilities.

NPTCBC occupied striated space. Its approach to sustainable waste management was framed in the centres of calculation and institutional rule-making in Brussels, London and Cardiff (see *Supplementary Material – England and Wales waste-related policies*). The council therefore found its agency limited by being part of centrally-led networks aligned with relatively rigidly via immutable mobiles. The council's waste planners knew that this top-down imposition of centralised power would provoke significant localised resistance (Co-developer D1, 2009). NPTCBC took expert advice recommending Crymlyn Burrows from seven potential sites and, according to the dissenters, opted for the least perceived political risk: "It's on the border between two authorities … If [residents] kicked up a fuss, well, they could be ignored." (NGO member B1, 2009). NPTCBC also took closed-doors' expert engineering advice on the selection of a range of more sustainable waste technologies than those built in the 1970s and 1980s. In taking such upstream decisions, the developers, their engineers and the regulator all considered themselves to be 'rational' in the way they framed incineration technocratically as a low-risk process. As the regulator argued:

> *"[The community] don't seem to understand* that if they burn something in their garden they are probably producing more [dioxins] … [Also] going to the social club once a year would give people a bigger dose of PM10 [particulate matter up to 10 microns in diameter] and plenty of other pollutants than they'll ever get from a year's worth of living within one mile of this incinerator" (Regulator, E1, 2009, our emphasis).

In terms of rhizomatic resistance in the freer space of the communities, dissenters undertook direct action and some acted as citizens scientists. Like the developers and the regulator, the dissenters regarded themselves as rational with their concerns about the scientific uncertainty. Pertinently, these individuals were asking how dioxins, furans, NO2 and ultra-fine particulates impact upon human health, either alone or in combination:

> "[O]nce you've got kids you worry about every single thing … [M]y neighbours, some of whom have never smoked in their lives, who do not drink, [who] like fish, who cook proper food, are getting very, very ill" (Citizen Scientist A1, 2012).

Ultimately, local compliance with the waste policies of the UK central state was facilitated by immutable mobiles in striated space via networked links between the local council (NPTCBC), and the regulator Environment Agency Wales (EAW) acting as vehicles for producing and reproducing the domination of central government's ideological system (see Fig. 1) (cf. Deleuze & Guattari, 1987; Latour, 1987). However, this top-down imposition of the UK government's centralised policies on waste management at a distance from Whitehall had provoked (and continued to provoke) strong rhizomatic resistance from residents, politicians and NGOs in neighbouring communities via rhizomatic network linkage in smooth space – using direct action, media and/or citizen science activity (see *Supplementary Material – Crymlyn Burrows*). For example, the technical expertise that dissenters built up challenge findings in two key planning system documents, the Environmental Impact Assessment and a Health Impact Assessment (HIA). Because of the asymmetries of power between opposing networks, the citizen scientists did not trust the dominant risk framings of the documents' authors.

In summary, the limits to the top-down imposition of EfW waste policy were approached in Crymlyn Burrows. The co-developer, D1, suggested that the project was very nearly derailed both during the planning and operational phases (Interview with MREC co-developer D1, HLC, 2009).

Case study 2: Splott, Cardiff, South Wales, UK

The second case study from the UK covers events linked to the Trident Park Energy Recovery Facility (ERF) near central Cardiff. Located beside several large, very disadvantaged communities, including Splott, the ERF's timeline of key events (*Supplementary Material – Cardiff*) reveals a history of localised concern about pollution and repeated lost opportunities for participation.

As with NPTCBC, Cardiff City Council's (CCC) waste planners operate in striated space held in place by immutable mobiles, i.e. there is linkage to actors and documents held by the EC, the central state in London, the Welsh Assembly and the Environment Agency Wales (EAW) (as per Fig. 1). After the EU Landfill Directive (1999) and the publication of *Wise About Waste: The National Waste Strategy for Wales* (2002) (*Supplementary Material – England and Wales waste-related policies*), CCC waste planners calculated that Lamby Way, the city's main landfill site, would reach capacity around 2008. Much greater fines for landfilling then be imposed. In 2008, CCC approached neighbouring authorities to establish a regional EfW management facility, later known as 'Prosiect Gwyrdd' (Project Green). Collectively managing waste was preferred as there were no suitable sites for waste disposal in Cardiff. Also, CCC, like NPTCBC, wanted to avoid localised rhizomatic resistance.

Splott residents have higher levels of ill-health and greater exposure to major risk factors affecting health (which are statistically significantly). Community members are twice as likely to be physically inactive, one and a half times more likely to smoke and more likely to suffer from obesity when compared to those living in the least deprived wards in Wales. Residents' health risk perceptions reflected this (Chadderton, Elliott, Hacking, Shepherd, & Williams, 2013; Greenup, Powell, & Hacking, 2010). In 2016, a community member describes ongoing concerns about the environmental risks associated with the ERF and a neighbouring steel works:

> "[It's] having a big impact on people's health … with asthma … [C]ancer in this area is rife … I've tried to grow vegetables and … there's white dust all over them … dust all over your cars …

> metal fragments … and that's what our children are breathing in … The community is just being shafted basically … [P]eople don't speak up, they just plod along … and think it's the norm." (Community Member CCOM1, 2016)

In 2010, prior to licensing, activists from a local environmental NGO became involved in a trial of strength with ERF's promoters and the regulator. They complained that initial efforts to inform the community were opaque and anti-democratic: the choice of incineration as a technology had been made behind closed doors. "Prosiect Gwyrdd was used to override local councils. Just chief officers and others [were] making decisions." (Cardiff NGO, CNGO1, 2017).

The EAW granted an operating licence later in 2010 and the facility opened in 2015. By this time, owner-operator Viridor had secured a major public-private partnership from CCC and partners with Prosiect Gwyrdd. The ERF has since gone on to process municipal solid waste from nine local councils in South Wales. A high volume of waste input is needed for this large facility to operate efficiently. However, local NGOs have queried how the ERF can perform efficiently and sustainability in future if domestic recycling rates in South Wales continue to improve.

In summary, like Crymlyn Burrows, a local environmental NGO attempted to enrol citizen scientists and tackle the ERF's scientific and engineering legitimacy. For support, the NGO linked to a range of local and outside supporters in its pursuit of a precautionary approach towards waste governance with the ERF's incinerator. The wider community in Splott was initially very concerned. However, more organized dissent soon waned after the licensing decision and there was relatively weak rhizomatic resistance in Splott compared to Swansea. This appears to be due to the greater fragmentation of local political networks in Splott (Interview with CNGO1, 2017). The local NGO continues with a much-reduced trial of strength post the licensing decision based on citizen science and legal challenges but the Trident Park ERF now represents new 'facts on the ground'. NGO members continue to attend Liaison Group meetings with the developer and regulator. They have asked for greater transparency with emissions monitoring data (Interview with CNGO1, 2017). The Splott community therefore continues to be shut out of decision-making about the plant's operation and some indicate an ongoing inability to successfully pursue their human health concerns (Community Member CCOM1, 2016).

Case study 3: Gaoantun, Beijing, China

As outlined above, EfW with incineration was being advocated by the central state in Beijing from the mid-1990s because of the rapidly growing waste problems (Wang, Jiang, Wu, & Liang, 2000) (see *Supplementary Material – Chinese waste-related policies*). This top-down governance began with the Law on Prevention and Control of Environmental Pollution Caused by Solid Waste (SCENPC, 1995) which also established a monitoring, inspection and enforcement regime for solid waste disposal. Fines of up to 500,000 yuan (£58 K in 1996 prices) could be imposed. In this context, the first case study we examine in China is the Gaoantun EfW plant in Beijing (see *Supplementary Material – Beijing*). The timeline in the supplementary material shows that, after a delay, this facility received its approval from Beijing's Environment Protection Bureau in 2004 (Johnson, 2013a). This occurred after the publication of the Chinese central state's 2003 White Book on waste disposal which encouraged the technological selection of the newer generation of incinerators which Western multinational engineering firms had been marketing in Europe and North America.

The supplementary material on the Gaoantun EfW plant also shows that there were distinct historical sensitivities to an environmental hazard in the area – a landfill - prior to planning approval for the EfW plant in 2004. In terms of localised rhizomatic resistance to Beijing's waste policy, residents were mainly middle-class, not particularly united or persistent and were relatively less well connected to more experienced activists (Johnson, 2013b). They began complaining to local government about smells from a landfill which had opened in Gaoantun in 2002. Trust in the local authorities to improve matters was lost when nothing changed. With the EfW plant's announcement in 2004, the environmental health risk perceptions of the by-now-mistrustful local residents shifted to focus on the imposition of the risks of incineration on their local area. This included concerns about the potential toxic impacts of dioxins, furans, and heavy metals, amongst other pollutants (Johnson, 2013a, 2013b).

Public participation in the decision-making on incineration technology and the siting of the Gaoantun EfW plant was extremely limited because the national Chinese planning and environmental regulatory systems did not entertain *meaningful* opportunities for engagement. Trust in the national agency, SEPA, was lost in 2007 when campaigners learned that they had not been consulted in 2004 for the plant's EIA (which was undertaken in secret). Instead, the views of fifty nearby rural residents who were unlikely to oppose the incinerator, had been taken into account (satisfying the 2003 EIA regulations, see *Supplementary Material – Chinese waste-related policy*). This institutional context and the central Chinese state's top-down approach to incineration policy provoked rhizomatic resistance amongst the local community in Gaoantun Community. These dissenters were most concerned about the objectivity of scientific approach in SEPA's EIA undertaken in 2004 (and which was not released). These dissenters opted to challenge the city authorities via persistent persuasion and citizen science based on their own counter-expertise over perceived environmental health risks:

> "[They] demonstrated a good understanding of technical and legal issues related to waste incineration … [and] claimed that public participation was lacking and that SEPA [now MEP] had 'not only harmed our environmental rights and interests, but had also violated national laws'" (Zhou, Chen, Han, Wang, & Liu, 2007, cited in Johnson, 2013b, 115).

Gaoantun residents failed to prevent the incinerator from operating, however, because their network was weaker than the state's network. In the end, they were unable to obtain sufficient actor and resource support. Opportunities for public participation after the licensing decision remained poor. The community dissenters found they were much less able to fight the project once it had been constructed.

Overall, the trial of strength in Gaoantun in Beijing has been similar to that in both Crymlyn Burrows and Cardiff. While its residents are middle class, not predominantly working class, Gaoantun's residents were poorly connected and politically disunited (Johnson, 2013b). Like CATI, Gaoantun residents demonstrated a good understanding of technical and legal issues related to waste incineration. Just as in South Wales, they claimed that public participation was lacking and that this was the responsibility of the environmental regulator, SEPA (later MEP). Community dissenters in Gaoantun failed to prevent the EfW plant from operating because their network was weaker than the state's network. They were unable to obtain sufficient actor and resource support in the trial of strength. Similar to the experiences in Cardiff and Crymlyn Burrows, community dissenters in Gaoantun were far less able to fight the project once it had been constructed. Opportunities for public

participation after the licensing decision remained poor.

Case study 4: Panyu, Guangzhou, China

The second case study from China is about an incinerator intended for Panyu, a district of Guangzhou, a major city to the north-west of Hong Kong. Here, the collective agency of dissenter actor networks managed to overcome the initial governmental imposition of an EfW plant via strong rhizomatic network linkage (see the events' timeline in *Supplementary Material – Gangzhou*). After the promotion of incineration began in the mid-1990s (see *Supplementary Material – Chinese waste-related policy*), the siting of this plant, originally chosen in 2004, was ultimately relocated to a new industrial location in nearby Dagang in 2013 (see *Supplementary Material – EfW case study sites*).

The timeline shows that in the 2000s, the rise in privately-owned apartments and homes in China's cities meant that, in the southern district of Panyu, some of the first large real estate developments were occupied by middle class Chinese residents. Many were working in Guangzhou, located 120 km from Hong Kong, in the most competitive and vibrant media environment in China where journalists are encouraged to push the boundaries of acceptability. At this time, one of two small landfill sites operating nearby in Huijiang Village closed putting pressure on waste disposal options. The EfW plant proposal received its approval in 2004 and a re-approval by the Guangzhou Planning Bureau in 2006 with a site nomination (as in Gaoantun, this siting process followed on from the publication of the central state's 2003 White Book legislation). However, precisely because public participation in the planning phase was minimal, major protests as well as persistent persuasion were pursued by members of local communities near Panyu. Individuals working in the media were able to amplify the news of the protests locally and nationally. Panyu's dissenters also live in close proximity to a number of NGOs based in Hong Kong and, via social media, learned of a successful anti-incineration campaign that had previously been undertaken at Liulitun in Beijing. Environmental risk perceptions centred on air pollution from dioxins linked to incineration. A number of the dissenters' protest tactics showed that they had adopted more high-profile and visually-striking approaches of environmentalist organisations in Hong Kong and the West. As Lang and Xu (2013, 838–9) comment on one demonstration:

> "Some wore surgical masks or gas masks to emphasise fears about air pollution, while others dressed in T-shirts emblazoned with slogans such as 'Dioxins, our new neighbors' … and shouted slogans such as 'In governing people, respect public opinion'"

Lang and Xu (2013) suggest that the Panyu protestors were not classic not-in-my-backyarders (NIMBYs). They studied documents produced by the Liulitun protesters, including research on overseas cancellations of incinerator projects, and challenged the scientific legitimacy of using incinerators to deal with municipal solid waste suggesting incineration should be banned throughout China. One Panyu protester said in a social media post:

> "'We are not simply asking the government to move the project out of Panyu. Wherever it is located, burning garbage harms people's health and the environment, and we will protest'" (Wang, Li, & Qiu, 2009, cited in; Lang & Xu, 2013).

Site approval was initially delayed and then cancelled in late 2009 by the Panyu municipal authorities to placate the rhizomatic resistance faced from local communities. This stage of the contestation at this site therefore revealed the limits of the central state's top-down approach to waste policy. In 2011, a new site was suggested by the authorities. It was therefore through network building and social media that the Panyu dissenters were able to gather their own expertise from another group of protesters. They then built their own case against the incinerator based on an alternative scientific expertise and the specifics of local situation precisely as the dissenters at Crymlyn Burrows and Cardiff did.

The trial of strength in Panyu played out differently to the other three case studies. This, we suggest is because of Panyu's place-specific characteristics. While the area had middle-class professionals like Gaoantun, community members were employed in the media. While members of the media are important network members in all of the case studies, these individuals managed to amplify news of the protests both locally *and* nationally causing embarrassment to local and central institution (cf. Kasperson et al., 1988). Panyu's dissenters were also in close proximity to NGOs in Hong Kong. Via social media, they copied high-profile and visually-striking anti-incineration tactics. Direct action in Panyu proved to be so politically embarrassing to the local municipal authorities – networked to Beijing via various immutable mobiles centred on the delivery of waste policy – that local officials agreed to relocate the EfW site from Panyu to an industrial site in nearby Dagang. In Panyu's trial of strength, the limits to the top-down governmental imposition of policy from Beijing were not only revealed but acted on by Beijing. A significantly more powerful fluid space of dissent opened up (Murdoch, 2006). Based on a dissenter network with alternative expertise, networked actors marshalled specific localised resources (Latour, 1987).

Conclusions

In the four case studies, the imposition of the policies of a centralised state at a distance produced fluid spaces where individuals and institutions attempted to increase their 'power to' change things, or their agency, via dissent. The spatio-temporal edges of the relatively ordered, or striated, hierarchical space become constrained or expanded over time as the central state and its immutable mobiles – including via its local government bureaux - struggle to deliver central policies on the ground. Localised rhizomatic resistance to the imposition of top-down waste policies – chiefly direct action, passive protest and/or citizen science - provoke crackdowns to dissent. Enforcement is by immutable mobiles particularly in places where protest space is not structured in the dissenters' favour. Nevertheless, case study timeline evidence suggests that dissent regarding EfW policy reappears elsewhere in a rhizomatic fashion when conditions become more favourable.

Overall, we pursued four analytical themes of democratic openness, expertise, the role of space and place and the role of regulation. The four timelines reveal that the operation of neither planning system delivers meaningful participation (at least from the perspective of concerned community members and NGOs). Affected communities were largely unaware of plans for these four EfW developments until late in the planning phase or even into the construction phase. By this time, the key siting and technological decisions had already been made. In each case study, actors inhabiting striated space associated with technical expertise on EfW regard incineration as a low-risk activity. The central state's tokenistic approach to public participation in planning in *both* countries, whether pre- or post- the licensing decision, was central to the rejection of the state's expertise by community members, chiefly its framing of risk (Hacking & Flynn, 2017). This rejection of expertise underpins the dissenters' trials of strength or rhizomatic

resistance. Their collective agency in fluid space supports campaigns of persistent persuasion, media attention, citizen science and/or direct action. Such events then trigger further attempts by the central state and its immutable mobiles to stifle dissent (whilst further justifying the top-down approach to waste policy delivery).

The empirical evidence suggests that a governmentality analysis of waste governance in both countries is a complex policy subject where expertise and technical knowledge is prioritised. Our comparative analytical approach demonstrates the value of extending descriptive models of governmentality in combination with the concept of rhizomatic resistance into waste governance in both countries. From this, we have shown that key critical dimensions such as public participation are rarely meaningful in either country. A technocratic approach to waste governance marginalises local communities unless they too hold similar expertise (Whatmore, 2009; Wynne, 1996). Community members were shown to learn quickly, share and generate knowledge; create opportunities for spaces for dialogue via hybrid forums (Callon, Lascoumes, & Barthe, 2009). Yet, in reality power relations between communities and the state remain distinctly unequal. Social media and the internet can help to overcome such barriers (but not necessarily reduce them). In terms of rhizomatic resistance, our analysis shows that there needs to be a redefining of the limits to top-down, governmental approaches to waste policy delivery which makes the process of governing more challenging.

Finally, in terms of a future research agenda, we suggest further empirical testing of the ways the concept of rhizomatic resistance compliments governmentality. Such work should be undertaken in terms of producing better understandings of how different types of relational space relate to power relations, knowledge and expertise. We feel that more time and attention needs to be paid to the potential for where and when public participation can better be incorporated into the waste infrastructure development process. Potential sustainability gains could, for example, be made with hybrid fora further upstream from licensing decisions. Such dialogue must be tempered with realism about the political nature of such contestations between actors. At a minimum, greater respect is needed for the genuinely different perspectives of individuals with alternative expertise in very specific localities.

Conflict of interest

None.

Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.polgeo.2017.12.004.

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