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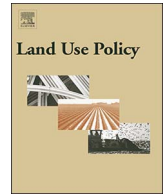
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Towards a peri-urban political ecology of water quality decline

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A B S T R A C T

Recent years have witnessed an expanding body of peri-urban and urban scholarship. However, recent scholarship has yet to adequately address the central role of politics and power shaping water quality decline. The article focuses on the trans-Hindon region which is part of Ghaziabad city, close to India's capital, Delhi. We draw upon urban political ecology and peri-urban scholarship to explain the role of politics and power shaping water quality decline. We argue in favour of creating stronger synergy between peri-urban and UPE debates as part of conceptualizing water quality decline. The article shows that as a complex socio-political challenge, water quality decline is centrally shaped by the intensifying linkages between urban and peri-urban forms of development and as a result deserves central attention as part of both these debates.

1. Introduction

Neoliberal urban restructuring has intensified connections between the world's largest cities, or 'global cities' (Sassen, 2000: 80), in terms of flows of raw materials, goods, information and capital (Smith, 1982). This has come at a high environmental cost for the peri-urban (Thong, 1995; Arabindoo, 2006). Typologies of spatial development and planning still often assume that the peri-urban boundaries are spatially as well as temporally fixed. However, the peri-urban is a term that can be more aptly understood as an analytical construct to understand the changes which are shaping territories in between rural and urban (Alexander Wandl et al., 2014). The peri-urban is further characterized by substantial poverty, inequality and social fragmentation associated with changes in land and natural resource rights and access along with exclusionary service provision (Marshall et al., 2009; Mehta and Karpouzoglou, 2015; Narain and Vij, 2016).

Less recognized are the water quality decline (henceforth, WQD) implications associated with the changing relationships between the urban and peri-urban. The aspiration of urban planners and developers to re-design "world-class" cities with key roles in the circulation of global capital (Shatkin, 2007), has meant that the urban cores of metropolitan regions are rapidly extending their reach in order to secure sufficient supply of potable water, as well as land for the disposal of waste, industrial and real-estate expansion (Friedmann, 2016).

Wastewater treatment facilities are often non-existent while traditional irrigation methods based on wastewater reuse are undermined by urbanization and the increasing burden of unregulated wastewater entering the river and groundwater (Birley and Lock, 1998; Marshall et al., 2005; Singh et al., 2010; Hofmann, 2013).

Societal responses to WQD have a long history that is tied to the prestige and authority of scientific expertise in Europe's early modernity. In many towns and cities such as London and Paris, the emergence of the 'bacteriological city'¹; in 19th century Europe was set in motion by scientists, and this brought about a set of drastic state reforms for centralized public water and sanitation (Gandy, 2006). This was a period of profound transformation in people's attitudes to and perceptions of the very notions of water and waste. The rapidly growing popularity of the newly established disciplines of microbiology and sanitary engineering meant that novel hygiene standards were quickly adopted by urban citizens and established traditional customs associated with water were soon forgotten (Goubert, 1989). People who had previously relied on their sensory perceptions (such as taste, colour and appearance) of water and its quality were becoming familiar with the technical logic of 'pollution standards', 'monitoring', 'distribution', and 'drainage' based on the newly acquired scientific knowledge (ibid: 32).

This early history of WQD is reproduced in debates surrounding WQD today that tend to focus more on the expert science of WQD (Karpouzoglou, 2012; Karpouzoglou and Zimmer, 2012). Scientific

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¹ The term has been employed in order to suggest an organic conception of the modern metropolis that viewed human faeces not only as a matter of unpleasantness but also as a source of danger to public health (cf. Gandy, 2006).

experts have further extended their power and authority beyond the traditional boundaries of urban and sanitary reform, and as a result WQD has become a subject with new meanings and interpretations. Importantly, while early modernity water quality concerns were focused principally around the potability of water in cities and towns, attention has now shifted towards environmental protection, river conservation and pollution control concerns (Alley, 2002). We contend in this article that in order to fully capture the underlying causes of WQD more careful conceptualization of the societal aspects of WQD is required, particularly those which relate to power and politics. This is a line of enquiry that has been considered by urban political ecology (UPE) theorists. Scholars interested in UPE attempt to overcome the nature/society divide, emphasising that they are “fused together in a way that renders them inseparable” (Swyngedouw, 1999:461). Insights from this body of work have already started to inform theoretical ideas about the peri-urban, particularly in terms of understanding the politics of fragmented water supply, wastewater disposal and inequalities in terms of access to basic services (Mehta and Karpouzoglou, 2015; Karpouzoglou and Vij, 2017; Wright-Contreras et al., 2017). However, we still find a unique opportunity for creating stronger synergy between peri-urban and UPE scholarship as part of addressing the underlying politics of WQD which continue to remain insufficiently addressed.

Focusing on a case study of the trans-Hindon region which forms part of Ghaziabad city, near the eastern border of Delhi, we have selected a study site that is peri-urban of Delhi and where WQD has intensified in recent years due partly to the paradigm of industrial development which has shaped the region (Sharan et al., 2010; Karpouzoglou, 2012; Randhawa and Marshall, 2014). Understanding the politics of how industries operate in Ghaziabad is therefore critical for understanding the role of power and politics associated with WQD in the peri-urban. Ghaziabad city is currently formally recognized as a critically polluted zone and there is significant concern over the impacts of industry on water quality (CPCB, 2009; Suthar et al., 2010). Despite this, regulatory arrangements continue to remain very poor and characterized by weak levels of compliance. Ghaziabad city therefore becomes an interesting region to explore why in such a context, WQD persists and particularly to trace the politics of WQD associated with the unregulated disposal of industrial waste water.

The article structure is as follows. We first explore the relevant literature and highlight the UPE scholarship that helps us conceptualize WQD as a socio-political issue followed by a section which draws insights from peri-urban scholarship on WQD. Next, the methodology and research approach adopted for this paper to analyze our case study are described. This is followed by a short introduction of the study area, tracing the start of industrial development as a precursor to WQD. Our case study insights are then described in three main sections: first, exploring the politics of re-locating industries to the peri-urban, secondly, tracing the impacts of WQD on the peri-urban, and thirdly, showing how they relate to citizens' uneven exposure to risks from WQD. Finally, in our conclusions we summarize the main contributions of this study to UPE and peri-urban debates.

2. Theoretical framework: towards a peri-urban political ecology of water quality decline

Two strands of debate inform the analysis and conceptualization of WQD. The first is the debate on UPE (section 2.2.) and the second on water quality in the peri-urban (section 2.3). These two debates have thus far proceeded in parallel but the exchange of ideas between these two debates has been fairly limited. There is however significant value in fostering stronger synergy between these two debates as they bring different strengths in theorizing WQD. In the UPE debate, which we turn to first, we draw on a long history of research on urban environments and from this debate we can distill ideas that can help capture the role of power and politics shaping WQD. To engage our research more fully with the power asymmetries that shape exposure to WQD

and the way risks from WQD are negotiated between social actors. The peri-urban debate, provides important insights to help understand the peri-urban as a distinctive spatial-temporal phenomenon characterized by the shifting nature of rural activities and urban activities. It is through creating this conceptual synergy between these two debates we can arrive at a more comprehensive understanding of WQD as a socio-political issue.

2.1. Water quality decline and UPE

Scholarly work pertaining to UPE has advanced the understanding of nature and society relations in cities (Robbins, 2012). UPE challenges neutrality in the representation of urban nature and aims towards re-constituting cities as essentially “politicized environments” (Bryant and Bailey, 1997). Urban environments are shaped by social relations of power, and there are winners and losers associated with the urbanization of nature (Swyngedouw, 2004; Veron, 2006; Lawhon et al., 2014). The ontological positioning of UPE therefore captures well questions that relate to access and distribution of natural resources.

UPE scholarship has engaged systematically with the understanding of urban water (Swyngedouw, 1999; Bakker, 2003; Baviskar, 2007; Gandy, 2008; McFarlane, 2008; Bouleau, 2013). The interesting features for this study are those which relate to UPE more focused attention on the intertwined dialectics of the material and non-material, shaping access and distribution to natural resources such as water, thereby encapsulating “multiple tales of socio-nature” (Swyngedouw, 1999:446). UPE further stresses that urban environments are in fact highly politicized spaces enmeshed with contradictions, vested interests, conflicts, and power relationships that create and maintain social inequalities (Loftus, 2007; Kooy, 2014; Cornea et al., 2016; Karpouzoglou and Vij, 2017).

However, very little attention has been given to the topic of WQD within UPE debates. This, indeed remains a caveat in UPE in terms of capturing a fuller understanding of the socio-material and cultural production of water. Crucially, as political ecology scholars conceive of water to be a contested resource, similarly WQD can be contested. Despite this, WQD tends to be represented as culturally neutral and directly solvable by a combination of objective science and implementation of water pollution prevention policies (Alley, 2002; Karpouzoglou, 2012). This is linked to a dominant expert discourse on the causes of WQD which normally revolves around placing limits to population growth and the development of pollution standards to curb domestic sources (Karpouzoglou, 2012; Karpouzoglou and Zimmer, 2016). Historically, granting exclusivity to expert science has contributed to social segregation and also changing by force of traditional practices, behaviours and cultural relationships with water (Prashad, 2001; Sharan, 2002; Broich, 2007).

The exclusivity of expert science in addressing WQD can ultimately lead to underestimating and eventually rendering invisible the role of power and politics. We argue that using UPE as a conceptual perspective can help challenge expert science as the only credible model for responding to WQD and help bring the role of power and politics back into policy, civil society and academic debate. It is by following this reasoning, that we argue that there is an opportunity space created within UPE to place a stronger emphasis on WQD alongside its traditional concern with issues of water access. In particular, UPE can help to put better emphasis to the multiple, and often adversarial framings surrounding WQD. Who are to blame for the persistence of WQD, and who are the victims? And more importantly, where does one draw the line between the objective science of WQD and the politics of knowledge of the underlying causes?

Some emerging work is attempting to address such questions. Truelove, drawing insights from UPE and feminist political ecology marks the importance of socio-spatial subjectivities and how these reinforce water inequalities (Truelove, 2011). The work of Farhana Sultana (2011) on arsenic water contamination in Bangladesh further

highlights that human suffering as a result of poor water quality is intertwined with “gendered subjectivities”, given that it is women who encounter most directly the “pain” of being able to provide sufficient and good quality water to their families. It is highlighted that an understanding of the “everyday” can cast light on the socio-spatial relations of water inequality, particularly in terms of revealing how mundane water practices shape social differences and how these social differences become fixed in particular urban spaces (such as households, streets and places of work). Research in low income settlements of Delhi, shows that wastewater exposure is socially differentiated while the interaction of local level politics with larger class divides deepens the marginalisation of the urban poor (Karpouzoglou and Zimmer, 2012, 2016; Zimmer and Saktapolrak, 2012). This article contributes to this growing literature.

2.2. Water quality decline and the peri-urban

Situating water quality in UPE requires an understanding of how the peri-urban is re-defined as a result of neoliberal urban development. The so called world-class city in the global South has generated ‘new geographies of governmentality’ whereby urban development is concentrated around specific forms of infrastructure and socio-economic groups (Appadurai, 2001: 24). Urban spaces that facilitate financial flows which are relevant to the world-class city (IT parks, gated communities, new urban infrastructures such as airports and commercial hubs) are prioritized, while ‘the hazy world of urban informality’ is rendered obsolete (Sassen, 2000; Björkman, 2014: 39). A distinctive feature of this process has been the “desire to establish orderly places” with a “clear purpose of what is to be done there and by whom” (Qviström, 2007:270). Neoliberalism encourages the state to re-organize space, displacing older, lower-value and historical land uses to make way for newer capital-intensive developments that can attract capital and fix it in physical infrastructure and land (Smith, 1982).

This form of urbanism is heavily impacting the peri-urban (Marshall et al., 2009; Mehta et al., 2013). The state has encouraged the development of so-called ‘new towns’ in the periphery so that development pressure can be removed from highly congested urban cores of megacities (Schindler and Kishore, 2015: 33). At the same time, the peri-urban continues to serve state and corporate interests which relate to the unregulated dumping of industrial activities and materials extraction (Narain and Vij, 2016; Sharma-Wallace, 2016; Narain, 2017). Rather than a smooth transition to a “bourgeois utopia”, peri-urban development has in reality intensified social and income inequalities while the state has become an important mediator not only of land transactions but also of the distribution of environmental risks (Ranganathan and Balazs, 2015; Shatkin, 2016:147). In the context of Delhi, curbing water pollution is often framed by water experts and engineers as being primarily a city problem that does not concern directly the periphery even if that means effectively delegitimizing

particular environments and social groups (Sharan, 2002; Karpouzoglou, 2012). In part therefore, the politics of WQD are located in water pollution prevention plans (such as those which relate to river water quality restoration) that are drawn up on the basis of an emerging convergence of expert knowledge and a middle-class aesthetic of what constitutes a ‘clean’ environment, whilst neglecting the consequences of this vision for the towns and regions that surround it (Karpouzoglou, 2012; Follmann, 2014; Mehta and Karpouzoglou, 2015; Narain and Singh, 2017).

As a consequence, the peri-urban has become deeply embedded in precarious flows of waste from the city to the periphery. Vij and Narain (2016): 65) argue that it is the implicit biases in the urban planning process about “who modern cities are meant for” that are permitting peri-urban land and water resources to become “engulfed” to meet growing demands of the city while in the peri-urban, waste accumulates and depletes the commons. For example, heavy metals are commonly found in wastewater used for peri-urban farm irrigation that remain in the soil and water for long time periods, posing a risk not only to the farmers of food crops but also to consumers, through contaminated food crops purchased in urban food markets (Marshall et al., 2005; Singh et al., 2010). Wastewater irrigation is a practice that has become increasingly widespread in recent years even though the immediate and long term risks of such pollutants on human health are still not widely known (Shahalam et al., 1998; Amerasinghe et al., 2013).

This is an important aspect in terms of creating new modalities of exposure to WQD. One point that is clearly emerging from ongoing research is that the peri-urban poor are increasingly more vulnerable from poor water quality (Sharan et al., 2010; Randhawa and Marshall, 2014). Their physical exposure to contaminated water is often increased by the fact that they are forced to reside in marginal or ecologically vulnerable areas (Allen, 2003; Hofmann, 2013). As a result the health impacts of exposure to and consumption of WQD across these populations can often be dramatic: it is often associated with common diarrheal diseases (such as cholera and typhoid) as well as longer-term impacts from heavy metals with carcinogenic potential, which have been found in groundwater extracted for drinking purposes and wastewater used for irrigation (Marshall, 2003; Singh and Kumar, 2006). Placing attention to peoples’ cultural preferences and how these are influenced by perceptions of water quality therefore reveal a high level of complexity in terms of exposure and distribution of WQD risks in the peri-urban context (Wright-Contreras et al., 2017).

3. Methods and research approach

3.1. Data collection

The insights developed in this article are based on fieldwork conducted in the trans-Hindon region of Ghaziabad district in the state of Uttar Pradesh (U.P.), near the eastern border of Delhi between

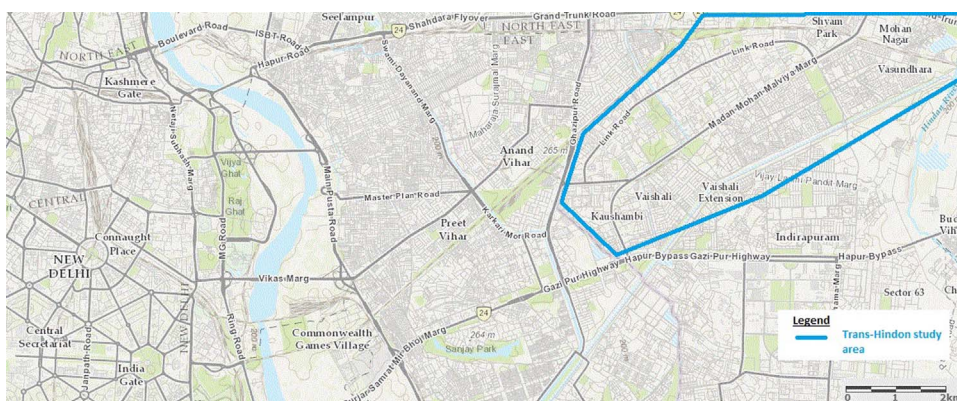


Fig. 1. Location of the Trans-Hindon region study area in relation to the capital of India, Delhi. Map sources: MapmyIndia, Esri, HERE, Garmin, USGS, Meti/NASA.

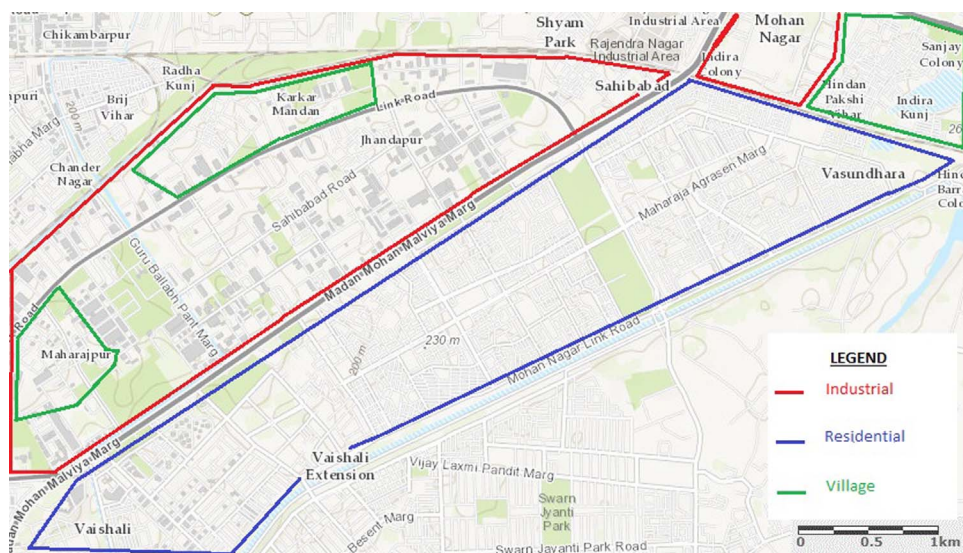


Fig. 2. Main areas within the study site consulted as part of the data collection. Map sources: MapmyIndia, Esri, HERE, Garmin, USGS, Meti/NASA.

November 2009 and April 2010 (about 30 kilometers from Delhi) (see also Fig. 1).

Data was elicited through qualitative methodologies such as participant observation, semi-structured interviews as well as consulting grey literature to understand a case study in its real-life context (Yin, 1994). Qualitative data was collected primarily in the form of interviews which were completed after visits to bureaucracies, peri-urban villages, newly developed residential areas and industrial areas (hosting a diverse range of small and large scale factories) (see also Fig. 2). We positioned our enquiries in public and private spaces where informal conversations and 30 interviews with residents (such as local women and men) in the study area took place. This included interviews with farmers and local activists in households, in typical Indian tea stands (in Hindi, *chai wallahs*), local restaurants, the district hospital and small shops. Our queries were guided by open-ended questions. We asked peri-urban residents to describe specific elements or instances of WQD, and to reflect on how problems have shifted over time. In addition, we compared residents' accounts with those of district officials as well as pollution scientists and water engineers. The point was to collect data on WQD not strictly adhering to the scientific notion of 'water quality' but to infer the less visible representations of WQD that were of direct interest to the research participants. By way of an 'outward layering' of data sets, a process of learning was achieved that allowed the research to reveal the political dimensions of WQD.

The main additional sources of grey literature included official documents accessed via the Right to Information Act (GoI, 2011), government audit reports dealing with environmental regulatory institutions and civil society reports. These forms of grey literature helped construct a better understanding of the locations within Ghaziabad where water samples are collected, factories operating in the district which failed to comply with environmental norms, and the frequency with which pollution enforcement inspectors visited villages, residential colonies and other departments within the district. This information also helped develop a better picture of the numbers of industrial units operating illegally in the study area. In the entire duration of the fieldwork, we took into account important ethical considerations such as ensuring informed consent of participants in the research, maintaining confidentiality, and preventing disclosure of identities where it could harm those participating in the research.

3.2. Data analysis

Information drawn from interviews and the grey literature was analysed using discourse analysis (Apthorpe and Gasper, 1996; Hall,

2001). Data in the form of quotations are used to illustrate how different discourses surrounding water quality are emphasized by different groups of actors. Interview quotes analysed as discourses further help understand how involved actors portray institutional relationships, reveal power differences between actors and show how formal responsibility is shared between officials involved in the enactment of formal policies and interventions (see also Karpouzoglou, 2012). Data was analysed with a view to understand the nature of different water quality risks, and how these are presented to diverse social groups residing in the study site. Specifically in this case study, the fieldwork attempted to bridge two foci. The first is a focus on the water resources: to develop an understanding of what happens to the river and the groundwater that at present seem to be only the recipients of wastewater. And following on from this, to understand how this failure might be perceived by residents, government officials, and scientists operating in the district with different roles (such as health, water and pollution control specialists). The intention of the data analysis was to understand how WQD as an environmental concern is negotiated between diverse stakeholders and to unpack the perceived notions of exposure to risk from WQD.

3.3. Methodological limitations

Illustrating how problems of water quality are defined from different perspectives means moving across different worlds, cultural as well as geographical. In the process, dilemmas arise, puzzles confound and social relations are formed that can challenge the research process.

Early on in the fieldwork we used a pre-designed questionnaire as the primary method for data collection. This questionnaire was designed on the basis of certain expectations, particularly regarding the level of access to information we could gain from the respondents working in organisations related to pollution enforcement. However, researching water pollution issues in the peri-urban became much more challenging than we had initially anticipated. For instance, when interacting with some officials in Ghaziabad, we would frequently receive fragmented stories and partial 'yes' or 'no' answers to questions that challenged our own learning process. Equally, it was very difficult to interview workers on industrial sites as often they were unwilling to disclose information about their operations in order not to compromise their own relationship with their employers (the industry owners).

These issues at times made us question the usefulness of questionnaire methodologies in a politically charged peri-urban context. We therefore invested time in the study area developing genuine 'partnerships' with a small number of actors who are pro-active and willing to

support the research during its different phases. Such partnerships were built with scientists working in the area, NGOs and environmental activists. To develop these partnerships it was often important to deviate considerably from the questionnaire approach. Investing considerable time in getting to know the research partners; meeting with them regularly, taking time to interact with them at a social level.

4. Main findings: the case of peri-urban Ghaziabad, Uttar Pradesh

4.1. The study area

The trans-Hindon study area falls within the administrative boundaries of Ghaziabad district, which was initially part of the larger region of Meerut, founded in 1976. Ghaziabad city, located within the district of Ghaziabad, acquired Class 1 status in 1971, marking Ghaziabad's status as a new large city. Ghaziabad city is also the second largest city in the state of Uttar Pradesh (after Kanpur) with approximately 13,000 industrial units registered with government records.² The trans-Hindon is therefore part of Ghaziabad city and is called this way because of the city's two major divisions separated by the Hindon River: trans-Hindon on the west and the *cis*-Hindon on the east side. The growth of Ghaziabad city has accelerated particularly after the 1990s with the onset of India's neoliberal economic reforms and the emergence of India's middle class. Ghaziabad city is reflective of the main characteristics of the peri-urban since it includes a diversity of human settlements, with people variously accommodated in villages, unauthorized colonies, slums, and middle-class colonies. This area has been enormously affected by its direct proximity to India's capital, Delhi (see also Fig. 1). Resulting in the loss of farmland to urban development and the relocation of polluting industries from Delhi to Ghaziabad city (Mehta and Karpouzoglou, 2015; Waldman et al., 2017).

The industrialisation of Ghaziabad started in the 1960s with the acquisition of land under the direction of the U.P. administration and has continued in consecutive years through numerous government notifications for the acquisition of agricultural land from the villages. To date, nearly 1500 acres of agricultural land have been acquired from roughly 50 villages for the industrial development of the region.³ This land is now under the auspices of the Uttar Pradesh Industrial Development Corporation (UPSIDC) and includes large industrial estates such as Sahibabad, Loni and Meerut Road. The legal basis for the acquisition of this land rests with the Land Acquisition Act of 1894, the reason given at the time of the acquisition being that the land was required for 'public purpose'.⁴ But what the legal discourse often conceals is that the haste with which the land acquisition took place has brought major transformations to the villages, and has created widespread dissatisfaction amongst farmers, many of whom are still taking legal action to claim the financial compensation promised by the U.P. government for the land that was acquired.

Delhi's urban restructuring in the climate of neoliberalization has further fuelled Ghaziabad's growth. The Ghaziabad Master Plan 2021 (GDA, 2006) bears many resemblances to the Delhi Master Plan for 2021 (MoUD, 2007), both in terms of its overall vision as well as the type of uses defined under the plan for further development. For example, the Ghaziabad Master Plan 2021 is highly focused on 'regional integration' and the development of commercial centres, multiplexes, and 'planned' residential localities similar to those found in the capital. Increases in land prices in Delhi have also meant that many of the elite of Delhi's workforce prefer to live in Ghaziabad. Middle and senior level

government employees, journalists, private sector employees and owners of small/medium enterprises maintain a more 'middle class' lifestyle, and have their own private transport. These social groups are representative of an emerging middle class that have migrated to the peri-urban.

Urbanizing villages located in the study area such as Arthala, Maharjpur and KarKar Model represent conglomerations of small localities housing primarily poor people who work in the informal sector in occupations such as home-based artisans, street hawkers and vendors, casual labourers, security guards, carpenters, petty shop owners, and other 'blue-collar jobs'. Major industrial estates such as Sahibabad are either surrounding the villages or located in close proximity to them (see also Fig. 2). Many of the residents are representative of a 'labour-class' who work for the industries and reside near their work places. Some residents of these localities claim to be the earlier settlers in this area, comprising mainly old castes such as Rajputs (upper caste land owners), Jats (farmers), Gujjars and Tyagis. It is these social groups that saw their farmlands forcefully acquired by the state of U.P., a process which has clearly led to the progressive disempowerment of villagers in terms of their right to land in the district.

Rural migrants have come to Ghaziabad to secure more affordable accommodation while commuting to Delhi to work as low-wage labourers or to work for the industries. The migrant populations generally receive little or no recognition from the state and are often looked down upon by other village residents as well (Mehta and Karpouzoglou, 2015). This more recent wave of migrants has now come to occupy resettlement colonies⁵ and squatter settlements (*Bastee*) such as Rajiv Colony, Ambedkar Nagar, Chitrakoot, Ramnagar and Balaji Vihar.

4.2. The politics of re-locating industries to the peri-urban

Ghaziabad has hosted polluting industries as far back as the 1960s, which is when the U.P. Government initiated the land acquisition process for industrial development in the region. In Sahibabad industrial area situated within the trans-Hindon, the largest industrial estate in the district, there are over 300 industrial units presently registered. These include industries that have been "evicted" from Delhi and have relocated there, such as dye and dyeing factories, electroplating as well as chemical factories. They have been established primarily through channels of informal negotiation with the state industrial corporation, the Uttar Pradesh State Industrial Development Corporation (UPSIDC), the government authority responsible for the lease of land for industrial purposes. Given the relatively large plots of land at the disposal of the UPSIDC it has been entirely possible for illegal businesses to settle, either in vacant plots or by 'sub-contracting' land on a temporary basis from the owners of units already there.

The establishment of illegal industries in Sahibabad industrial area constitutes an important public health concern, particularly for the village residents who, since their land was acquired by the UPSIDC, have been forced to reside in very close proximity to these factories. At the same time, the lack of a robust mechanism for implementing regulatory norms has encouraged an informal system of regulatory preference that allows many of the industrial units to operate with impunity (Sharan et al., 2010, Karpouzoglou, 2012). Difficulties in introducing pollution abatement measures means that pollution inspectors prefer to remove polluting industries entirely from their routine monitoring practices, on the basis that, ultimately, such industries can never conform to environmental standards. As explained in a meeting with a pollution official:

There was a case 17–18 years back when a 1 mm drop of a red colour chemical seeped in the ground water. The chemical was potent enough to

² Information provided by the Uttar Pradesh Pollution Control Board, under the RTI Act, 2005 (GoI, 2011).

³ Information provided by Government of Uttar Pradesh (U.P.), under the RTI Act, 2005 (GoI, 2011).

⁴ Information provided by Government of Uttar Pradesh (U.P.), under RTI Act, 2005 (GoI, 2011).

⁵ Most of the public interventions directed towards squatter settlements in Delhi consisted of the eviction and resettlement of colonies in the peri-urban areas of the city (Maria, 2008).

turn a large volume of the ground water into a red colour; if industry owners are not aware enough of these risks, how could we possibly trust them [with pollution abatement]?’

Reasons for the perceived weak influence of the regional authority, the Uttar Pradesh Pollution Control Board, have a strong political underpinning. Industrial estates were initially planned to operate as ‘designated’ zones where industrial development was less restricted; this also meant that regulatory bodies have less influence in these areas. Formally, the regional authority is obliged to monitor which industries are conforming to the pollution control norms by means of issuing a ‘No Objection Certificate’ (NOC). This is essentially a written consent provided by the regulatory authority to the industry and proves compliance with environmental norms. The NOCs need to be reviewed by the regional office on an annual basis to check that industries are continuing to maintain their pollution levels below permissible limits. Industries that are running illegally or do not hold a NOC are assumed not to be complying with environmental norms.

In reality this procedure is flawed and highly contested by peri-urban citizens. At the time of the study, the regional authority recognized only 15 units operating without environmental clearance, although the actual number for that industrial area was closer to 140 units.⁶ There is a widely endorsed belief by affected peri-urban citizens that even though a formal mechanism for pollution control is in place, in reality this makes little difference for water polluters. This was eloquently described in an interview with a human rights law advocate who resides close to one of the industrial estates:

‘The same bureaucrats and engineers whom we suspect of giving sanction to the industries that pollute our water are in the so-called “expert committees”. It is like giving the key to the thief!’

What we have observed, is that the way that impunity has become granted to industries has become normalized in the way pollution officials narrate their experiences often forcing pollution abatement norms.

‘We are completely dependent on the administration. Those who drafted the industrial development plans did not want the engineers to have the authority to go and close factories. At that point, pollution was not the main priority. It was the social benefits being derived from industry.’

The majority of the industries found in the trans-Hindon are situated within ‘notified’ industrial estates. In these areas the UPSIDC is responsible for granting consents of operation to industrial operators. Nonetheless, industrial development has, in recent years, become so deeply haphazard and unplanned, and as a result easily taken over by the vested interests of industrial elites. For an industry then to be ‘notified’ is more of a testament of an industry’s legitimacy to pollute rather than a mark that it is actually conforming to environmental norms. The nodal agencies that monitor and regulate water quality, the Central Pollution Control Board and State Pollution Control Boards, appear well organized on paper. However, in practice, they often have little power to take action against polluters. This is partly a result of the fact that in the context of India’s neoliberalization, enhancement of the international competitiveness of its industrial sector is still perceived by many of India’s top policy makers as a higher priority than investing in pollution abatement (Stuligross, 1999; Williams and Mawdsley, 2006). There is therefore a coherent interest at the highest levels of government in keeping business booming no matter the environmental costs, an interest that is further confounded by ‘pro-development’ values of pollution inspectors on the ground.

It is worth noting that policies formulated at the national level in recent years have also played a role to exacerbate this phenomenon. This is why environmental shortfalls in the peri-urban context have to be situated within a much larger politics of ‘exclusion’ that has come to shape neoliberal urban development processes (Fernandes, 2006). For

instance, a curious legislative inscription in the Environmental Impact Assessment (EIA) guidelines notes that hazardous waste businesses can be established without either a public hearing or consultation with the affected communities (Menon and Kohli, 2008). This legislative inscription of the EIA has further coincided with the pursuit of Special Economic Zones (SEZs), as yet another government-led project established to foster capital accumulation near or within growing cities while loosening restrictions to development, such as those tied to strict enforcement of environmental regulations (Harvey, 1978). This results in very poor levels of industrial compliance with water pollution norms. In 1991 more than 4000 pollution cases were pending around the country. Since then this figure has been constantly on the rise, while the rate of conviction has remained rather low irrespective of the growing number of legal cases currently being filed in court (CSE, 2009).

4.3. Impacts of water quality decline on the peri-urban

An increasing number of ‘hazardous waste disposal’ industries operate illegally, which means that industrial waste is dumped directly into the river Hindon and the groundwater. As a result, an extremely high pollution load finds its way into the water.⁷ The unregulated discharge of industrial wastes is also seen to pose significant risks to the food system (Marshall et al., 2017). Not all villages have abandoned agricultural practices, but the scarcity of freshwater has led many farmers towards the irrigation of food crops such as cereals and vegetables with wastewater that can contain industrial pollutants (Marshall et al., 2005). It is common knowledge amongst villagers for instance that a large number of dye and dyeing factories pump polluted water directly into the ground via pipes, a practice used to conceal from pollution control authorities the true scale of waste produced from industrial processes. The main contaminants identified within the effluents of these industries include high levels of organic pollutants as well as high concentrations of heavy metals. The levels of these contaminants in the river and groundwater are consistently above permissible limits and as a result the water is considered unfit for recreational activity and the sustenance of aquatic organisms (Rizvi et al., 2015). High values of heavy metals are frequently documented in the peri-urban (Singh et al., 2010) and can be extremely toxic to aquatic organisms as well as to humans, where long-term ingestion of water polluted with heavy metals can be devastating, leading to the development of a number of cancers, neurological disorders, and even death. In Arthala colony, lead has been found in the groundwater in concentrations more than three times the permissible limits of the WHO (Lewis, 2007). Although a more detailed assessment of heavy metal contamination of the water source in village areas of the trans-Hindon was not available at the time of this research, adverse health impacts of WQD were regularly picked out by community respondents, environmental activists and the local media. For instance, there were regular stories in the local news reporting the death of animals such as cows or goats that have consumed chemically-polluted water, but also stories reporting incidents where people’s health has been adversely affected by exposure to impaired water quality.⁸

4.4. Peri-urban citizens’ uneven exposure to risks from WQD

Despite various arrangements to ensure the protection of water quality the state fails to take an integrated view that can address the risks in an equitable manner. Politically less powerful groups are systematically more severely affected by water pollution, while middle-class citizens residing in newly built gated communities such as

⁷ See also recent news article by The Hindustan Times, <http://www.hindustantimes.com/india-news/once-the-lifeline-of-western-up-hindon-is-just-a-toxic-drain-now/article1-1368953.aspx>

⁸ Source, selected stories from local newspapers on pollution in Ghaziabad district that have been translated from Hindi to English

⁶ Information provided by the regional office, U.P. Pollution Control Board, under the RTI Act, 2005 (GoI, 2011).

Vasundhara and Vaishali, have in a fairly short space of time acquired the status of ‘deserving’, and are therefore far better insulated from the risks of WQD.

Vashundhara is an elite residential colony constructed as part of land monetisation strategies (Shatkin, 2016). Real estate developers, in a hurry to sell the apartments strive to provide ‘assurances’ for basic services (such as wastewater treatment facilities) using temporary ‘showrooms’. These showrooms are situated adjacent to the plots in an effort to reap apartment sales revenues even before the construction is complete. Use of names such as ‘River Heights’ or ‘Oasis Flora Heights’ to label apartment complexes ‘in the making’ is meant to add to the perceived attractiveness of the vacant plots and to ensure harmony with the neoliberal urban aesthetic. WQD is understood by residents to be increasing because of the heavy industrialisation taking place in the district, but in reality citizens of these colonies have achieved a certain degree of distance from WQD. The introduction of modern water filtration technologies, such as Reverse Osmosis, is central to creating this distance. Through modern technologies that restore water quality to levels that are safe for human consumption, middle class households have turned a problem of ‘public’ action into a problem of ‘private’ consumption (Mehta et al., 2013). Land monetisation is therefore deepening WQD inequalities given that the value of land in the more affluent colonies is creating momentum for a higher degree of investment in critical infrastructures for water treatment.

In comparison to Vasundhara colony, urbanizing villages located in the trans-Hindon area, such as Arthala, Maharajpur and KarKar Model, experience problems in a different way. This is partly linked to their social status in the district and because many industries are operating both adjacent to, but also increasingly inside the villages. Here, the risks are amplified due to the fact that slum residents (mainly migrant populations) have little disposable income. For example, to purchase medicines needed to treat WQD related illnesses. That means that these citizens are continuously exposed to easily treatable illnesses, such as general rashes on the skin, stomach disorders and skin lesions or even more severe illnesses, such as respiratory, reproductive disorders and cancer. The death of a family member from a pollution related illness is often perceived as a normal re-occurring event in these settlements.

In Maharajpur village, WQD is seen as part of a much more general trend of exclusion from civic amenities: *‘We are bound to live in filth and bad odour while our water is poisonous; in Vasundhara, the rich have clean houses and get treated water from the Ganga’*. In Arthala village, situated close to Arthala Industrial Area,⁹ industrial wastewater flooded the catchment area, leaving the groundwater completely exposed to toxic chemicals that have entered the shallow underground aquifer contaminating the village’s only water source. The colour of the water coming from the hand pumps was frequently described as yellow while large cesspools of excess wastewater were formed around the housing colony. Ironically, some of the cesspits have been ‘developed’ by the municipal corporation and the Ghaziabad development authority, to build ‘lakes’ for recreation. However, a rather paradoxical situation has emerged where ‘picnic spots’ and ‘boat ride’ activities are available in the same areas that wastewater is being disposed of.

The fact that WQD is perceived and internalized differently by peri-urban residents, can be traced to the gentrification of the peri-urban space under a state led planning framework which is designed to prioritize elite and middle class interests. The statement made by the Municipal Commissioner of Ghaziabad, encapsulates quite vividly the type of development vision shared by state officials in the district, *‘we are planning and trying to implement the best of the schemes possible, and available within existing the resources...the results however will be better in the future and one needs to have patience’*, hoping to convey that in time ‘even the poor’ will be able to benefit from the recent development of

Ghaziabad.

This type of discourse alludes to a much larger reality about the peri-urban that is rarely made explicit despite its underpinning significance. Citizens of middle-class housing colonies have achieved in a relatively short time interval far greater political representation than citizens residing in urbanizing villages and re-settlement colonies. They are in a better position than the poorer social groups to mobilize the state so that it takes that ‘extra care’ which is needed for their well-being and protection from WQD. Middle class colonies are often in a position to liaise directly with the municipality through their own Resident Welfare Association (RWA) regarding any complaints related water quality concerns. In the case of the poorer colonies, government agents tend to respond to specific outbreaks of communicable disease such as cholera or typhoid by implementing control measures, and only after there had been extensive media reporting of incidents of water contamination taking place (Saravanan, 2013). Grievances are regularly expressed by poorer peri-urban citizens residing within or close to peri-urban industrial zones. However, these grievances are rarely taken seriously by state authorities or translated into action against polluters.

5. Conclusion

This article contributes to ongoing UPE and peri-urban debates through examining the role of politics and power shaping WQD. In the case of the trans-Hindon, our observations suggest that industries are an important reason for WQD and the causes for this are centrally related to politics and power. Industries despite their importance for income related activities, pollute local water bodies indiscriminately because the peri-urban has been drastically re-configured by powerful actors. The purpose of this re-configuration is to provide land, water and raw materials for housing, industrial production and other so called “best uses” written into the lexicon of urban planners while ignoring the social and environmental impacts upon poorer residents and the vital natural resources that they rely upon (Qviström, 2007:269).

In such a context, WQD is far from apolitical; rather it is constantly sustained through politicized negotiations of urban and peri-urban elite interests. WQD risks become unevenly distributed through a form of “micropolitics of control” forged between different classes of citizens, state and industrial actors (Truelove, 2011:145). This also affects perceptions around problems of WQD in the region that tend to vary significantly between different actor groups, and depending on whether a particular group resides in an elite residential colony, a migrant settlement, or an urbanizing village. Large contradictions exist between expert-led framings (and official policy expectations) of WQD (namely those produced by pollution control authorities) and how WQD is experienced by diverse actors in peri-urban contexts. The dominant expert discourse on WQD revolves around population growth and domestic sources, but as we have observed in the discourse of villagers and slum dwellers it is a much more personal, deeply contextual and contested problem.

In light of these complex realities which affect the peri-urban on a daily basis, the purpose of this article has also been to show the new possibilities for theoretical and empirical work which can be created by fostering greater synergy between peri-urban and UPE scholarship. Currently, we still find that there are few studies that attempt to develop such synergy and to work across these two conceptual and empirical scientific fields. However, as we have also shown, this is becoming urgently needed with urbanization and peri-urbanization intensifying and where issues affecting both become increasingly interconnected. The next step, is to develop a concrete research agenda for action that identifies specific research areas that would benefit mostly from engagement across peri-urban and UPE scholarship. Social inequalities arising from land-use change, inequalities in terms of access to safe and clean water, and the management of industrial waste are only some of the pressing issues that will continue to rise in

⁹ This is a more recent industrial estate than Sahibabad in the Trans-Hindon study area which is under the control of the UPSIDC.

importance and will require a joint endeavour of thinking across UPE and peri-urban scholarship.

Finally, WQD in the peri-urban deserves to be a much more visible policy and planning priority, and to design appropriate institutional and regulatory mechanisms through which citizen concerns could take a central role in shaping water quality management policies and monitoring plans examined. For example, ongoing work focussing on peri-urban Ghaziabad is examining the emergent potential for local environmental activism, and new alliances between civil society initiatives, to underpin new forms of ecological democracy (Priya et al., 2017). However, these alliances need to be much better recognized and connected with state plans and interventions in the peri-urban. There is also a need to confront larger processes of exclusion and neoliberal growth imperatives which strengthen a narrative of services modernization but ignore the heterogeneity of the peri-urban and the fact that not all social groups have achieved the same kind of political representation. This study therefore underpins an urgency to understand how WQD is shaped by conditions of exclusion in the peri-urban and what sustains them. It also creates a need to direct more focused attention to how resource inequalities and the distribution of WQD related risks in peri-urban areas are linked to gender, class and other social power struggles.

Conflict of interest

The authors are not aware of any conflict of interest in the publication of this article.

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