Land Use Policy 74 (2018) 187–194

Contents lists available at ScienceDirect

Land Use Policy

journal homepage: www.elsevier.com/locate/landusepol

The de-industrialization, re-suburbanization and health risks of brownfield land reuse: Case study of a toxic soil event in Changzhou, China

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ARTICLE INFO

Keywords:
De-industrialization
Environmental health risk
Brownfield land
Redevelopment
Changzhou
China

ABSTRACT

After over three decades of rapid urbanization and economic boom, China has inevitably entered a phase of economic restructuring of its cities. A process of land re-urbanization has also emerged in the process of inner city regeneration and the consequent reuse of industrialized land in suburb areas. However, as chemical and heavy manufacturing have been the primary industries in most industrialized cities of China, the population has become increasingly subject to the threat of a toxic environment and health risks when suburbanization involves the creation of new residential zones or university towns in old industrial suburbs. In this paper, we investigate a toxic soil event in Changzhou, Jiangsu province and study the re-urbanization of manufacturing suburbs to reveal the extent of the environmental and health risks involved. From this, it is concluded that relevant land use policies, environmental management regulations and improved public health perceptions are needed for ensuring sustainable suburbanization in future in China and other similar newly industrialized counties.

1. Introduction

After over 30 years of rapid development, the 2008 global economic recession brought the export-driven economy of China to a vertex. The emerging depression of the export sector pushed both national and local governments to accelerate both their restructuring strategy and local initiatives (Yang, 2012: 19). Local governments have taken the opportunity to realize an industrial transformation shift in the economic structure from high input, high energy consumption, high pollution but low production and efficiency (termed the "three-high and one-low" traditional development mode) to one that is more sustainable and environmentally-friendly. For instance, since 2007, as the bellwether of Yangtze Delta area on economic restructuring and de-industrialization, Shanghai's city government has adopted aggressive measures to bolster consumption, adjust and upgrade its industrial structure by shutting down over 6700 high-energy consumption and high pollution facilities (Shanghai Government, 2014). As a result, for the first time in many Chinese city (e.g., Changzhou), the plate glass, ferroalloy, electrolytic aluminum and leather tanning industries have been completely withdrawn from Shanghai. Therefore, as one of the previous leading center of heavy industry center in Yangtze Delta area, Changzhou copied the strategy of economic restructuring and mimicked the practice of Shanghai to replace manufacture-chemical industry sector with commercial and real estate industry in the wave of re-suburbanization consequentially. In this way, cities are beginning to replace their "three-high and one low" industries with high-technological industries and sell the remaining land for housing development (Ding, 2007).

However, the process of de-industrialization and industrial transformation relies on the reuse of brownfield land, which is causing a legacy of major environmental and social problems. Although no longer used by high pollution industries, brownfield land continues to contain a high level of pollutants. According to statistics issued by the Ministry of Land and Resources, 34.9% of China's industrial wasteland is polluted to some degree, including heavy metal pollution (MEP, 2014). The lack of regulation and high cost of land remediation has resulted in much "poisonous" land entering the land market without any cleaning processes (Ren et al., 2014; Ren et al., 2015). This has caused serious public health repercussions in many developed cities in industrialized eastern China and even in western less developed cities (Lora-Wainwright, 2013; Wu et al., 2015a,b,c). News of people having to

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http://dx.doi.org/10.1016/j.landusepol.2017.07.039
Received 18 February 2017; Received in revised form 14 July 2017; Accepted 22 July 2017

contend with physical ailments due to living, working or studying in new buildings in former areas occupied by heavy and chemical industries has been a frequent feature in the media over the past few years (Ren et al., 2015). The threat from soil pollution is particularly problematic, with contaminated land often being reused for agriculture prompting concerns over the transmission of pollution through the food chain. Thus, China and other New Industrialized Countries (NICs) are being threatened by high environmental health risks in the wave of economic restructuring that has occurred through the reuse of industrialized land, as these countries or entities, such as Taiwan, Singapore, South Korean, and Indonesia, also relied very much on the heavy manufacturing and chemical industries in their industrialization-based urbanization (Agyeman, 2003).

It is therefore time to question land use behavior and policy from both national and local practices when approaching urbanization in terms of sustainable development. In doing this, the remainder of this paper first discusses the urgent need to increase the recycling of brownfield land and soil restoration. This is discussed from the perspective of policy formulation and execution, and from technological as well as economic cost. We argue that local government faces a dilemma between upgrading industry and economic restructuring though brownfield land redevelopment. A multi-beneficiary perspective between local government, enterprises and other parties is then presented in a case study of Changzhou, China.

2. Brownfield land redevelopment under the backdrop of the post-industrialization era: challenges, risk and achievements

The pace and context of urbanization has shifted significantly with the waves of de-industrialization and suburbanization in the global north and south since the 1970s-world recession (Harvey, 2007). The economic restructuring led by the energy supply crisis following the Arab-Israeli War of 1973 trigged the first wave of de-industrialization in the global north. The manufacturing capital moved from the high-labor cost western cities to cheaper-labor supply cities in such emerging market countries (EMCs) as Singapore, Indonesia, South Korean and China − causing large-scale industrialization-led urbanization and then suburbanization since the 1990s. However, the world financial crisis in 2008 symbolized a new wave of de-industrialization in the EMCs equivalent to that experienced earlier by the global north. The “global manufacturing center” of China” has been gradually fading from China cities (Sung, 2007), a large number of factories have closed and numerous of brownfield sites are being redeveloped as housing and commercial centers in previous manufacturing suburb; this has created a new wave of property-led suburbanization in the process of social-economic restructuring (Long et al., 2012).

It is clear that the mixed processes of de-industrialization and suburbanization in the post-industrialization era in developed countries since the 1970s and new-market countries since the 1990s have resulted in a considerable amount of brownfield land being generated in inner cities and industrial suburbs (De Sousa, 2002; McCarthy, 2002; Liu et al., 2016; Peng et al., 2016). Brownfield land not only results in a decreasing quality of urban life, especially for disadvantaged people and communities, but also cause serious environmental problems and health risks (Wang et al., 2016). Thus, brownfield land redevelopment has been treated by policy makers and planners as a part of inner city recovery, community revitalization or sustainable development in developed countries (Dixon, 2007). As a result, a large amount of scientific literature has emerged concerning brownfield land redevelopment, mainly focusing on technological aspects and factors influencing their success in a democratic environmental governance setting (Lowham, 2016), with political-economic causality in non-elective democracy settings yet to be considered (Wu et al., 2015a,b, 2016).

With current technologies, soil remediation in brownfield land redevelopment is a time-consuming, energy-consuming and costly process (Lee et al., 2009; Zhao et al., 2012). It is more than a technical process, as soil remediation and environmental protection not only depends on technological issues, but also relies on the complicated governance of multi-actor participation. Thus, in addition to examining the technical aspects of the problem, considerable research has also been conducted to establish an efficient collaboration mechanism to mobilize each participant (De Sousa, 2001; Adams et al., 2010; Hula, 2003; McCarthy, 2002; De Sousa, 2000; Lange and McNeil, 2004; Alberini et al., 2005; Dixon, 2007). This involves combining market-led redevelopment and soil remediation, policy-push based compensation, remediation standards and legislation, and multi-actor participation-based employment promotion, community involvement and cooperation (Dixon, 2007).

Brownfield policy development has also responded to this trend, for it is clear that governments simply imposing stringent environmental regulations is insufficient to encourage the private sector and real estate developers to become involved (Alberini et al., 2005; Day and Johnson, 2004; Li, 2011). Thus, Western governments including North America and Europe tend to offer market-based fiscal incentives and provide more flexible liability regulations (Li, 2011). As Lowham (2016: 22) concludes, in the US, “*current state and federal brownfield policies stress collaboration, not command*”.

When we turn to the global south, the rapid de-industrialization and associated health threats from brownfield land reuse has obliged the development of policy and practices on a large scale to handle the burgeoning environmental risk involved. Since the 2008 global recession, China has encountered unprecedented restructuring issues in cities and consequent adjustments to its export-driven strategy (Yang, 2012). Thus, the agenda of land re-urbanization has emerged in inner city regeneration projects and the necessary reuse of suburban industrialized land because of the limited supply of available land in China (Ding, 2007; Wang et al., 2012a, 2012b; Zhao et al., 2012). Certainly, the effects of this de-industrialization process in terms of the economy and spatial re-urbanization are combined into the complexity of social-spatial restructuring, which differs from the previous rapid-expansion-based suburbanization geographical dimension. However, the chemical and heavy manufacturing industries have for a long time been the primary industries in most of the country’s industrialized cities, thus the new wave of re-suburbanization-based transformation of previous manufacturing suburbs into new residential zones or university towns has created toxic soil and environmental health risks.

It is acknowledged that the 2008 global recession accelerated the pace of industrial restructuring in China. Given its large increase of labor costs and international competition from cheap-labor developing countries such as Vietnam, Cambodia, China has had to gradually abandon its traditional mode of export-oriented industrialization driven by foreign investment (Yang, 2012). Thus, both strategies of incentivizing domestic consumption and industry restructuring, such as upgrading local industries and relocating local “*three-high and one low*” industries to less-developed interior regions have been adopted (Bräutigam and Tang, 2014). For example, cement plants have been transferred to Central Asia and Africa in the “New Silk Road” strategy of China (Collins, 2014; Hansen, 2012).

Industrial restructuring at national or regional scale is seen as inevitable (Peet and Thrift, 2014). Because of China’s limited land resources, a strategy of making room for high technological sector and service sectors is necessary (Lin and Ho, 2003; Long, 2014; Wang et al., 2012a,b). This has involved lower profit, high fossil-consumption and pollution industries being transferred from the high labor cost east coast to western inner land areas (Yang, 2012). Nevertheless, the requirements for national restructuring have caused a new wave of local de-industrialization. In reality, the rapid development of the coastal areas emerged in the 1980s initiated a wave of industrialization-based urbanization incentivized by foreign direct investment. This is now approaching the end, however, and industry restructuring has been required since the 2008 global recession. These cities have also tried to attract hi-technological industry, real estate investment and the education sector to regenerate these manufacturing and chemical industry