

*Reflections, Issue 8*

## **ECO-CITIES IN THE MAKING? THE TRANSFORMATION OF INDUSTRIAL PARKS IN CHINA**

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**Abstract:** This essay summarises the findings of research into the development of ‘Eco-Industrial Parks’ in China, many of which have taken on increasingly urban characteristics as workers have settled nearby. It argues that policies in future need not only to be adjusted to ensure better environmental performance within the parks themselves, but also to encompass their relationship with the wider urban setting that they often generate. While China’s industrial parks have traditionally been associated with high levels of pollution, policy adjustments in future may realise their potential for playing a key catalytic role in the furtherment of sustainable urban development.

**Keywords:** sustainable city, eco-city development, China, eco-industrial parks.

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While policies and plans for urban sustainability often envisage a future in which high-tech or green-tech companies provide local employment, heavy industry is typically not so well catered for. In many countries in the world, however, heavy industry remains a significant part of urban life, and continues to be a shaping force in ongoing urban expansion. Especially in China, urbanization is often driven by industrialization. This process brings out the challenges of industrial activities, environmental pressure and urban development. This research project explored the relationship between China’s ‘eco-industrial parks’ (EIPs) and their urban context over time, seeking to understand how related policies might be improved in future to further broader goals of urban sustainability.

During the last three decades, China has achieved impressive economic growth. However, this has come at the price of dramatic pollution and resource depletion. Severe environmental issues such

as ecosystem degradation, groundwater contamination and smog have become visible crises. In China, industrial parks were initiated in the 1980s, aiming to attract foreign investment and to increase export. Most of these were manufacturing bases which lacked environmental planning or management. In these early stages, these parks were mainly dominated by companies processing materials into products with low added-value. Local authorities sought sheer GDP growth without considering energy efficiency or environmental costs. While these industrial parks have immensely contributed to China's GDP, the scale and intensity of their industrial activities have jeopardized the ecological security and health of local communities. To solve the environmental issues in industrial parks, a national EIP programme was introduced in 2001 in China. EIP aims to promote 'closed-loop' material and energy systems, cascading through resource service sharing, by-product exchange and environmental management. Other similar systems internationally have been inspired by the idea of 'industrial symbiosis' pioneered in Kalundborg, Denmark (see Figure 1).

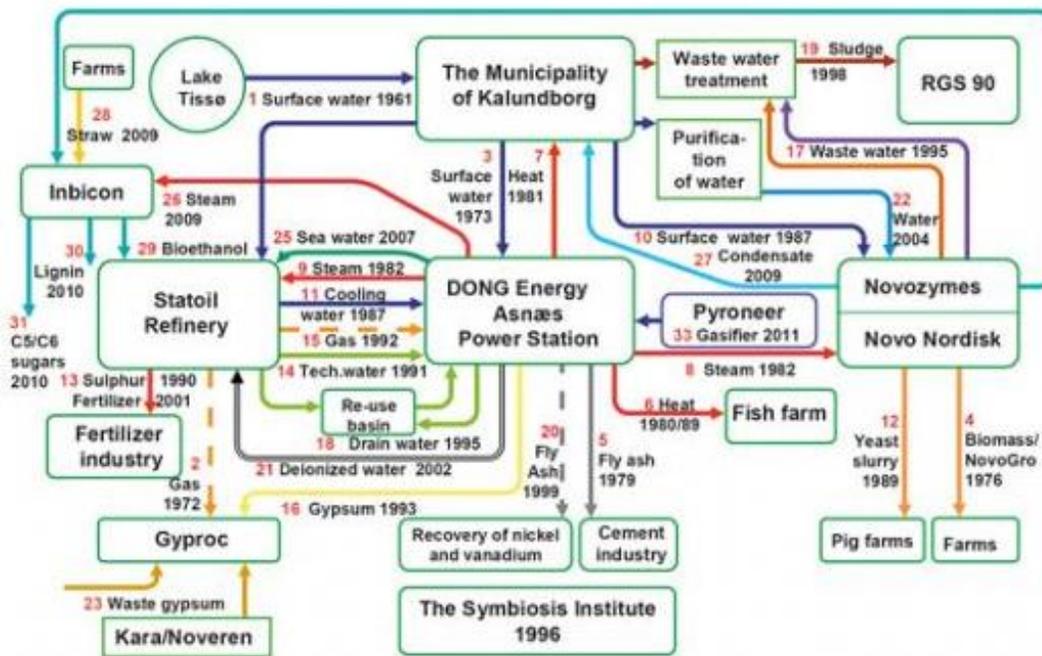


Figure 1: Symbiosis network of Kalundborg (source: [www.symbiosis.dk/en/system](http://www.symbiosis.dk/en/system))

Over time, many industrial parks in China have also become industrialized towns or urban districts. More and more employees with their families have settled near the industrial areas. Local authorities have responded to this process, but also driven it by attempting to improve urban services (e.g. houses, medical care, education and commercial centers) so as to attract talented workers. The emergence of tertiary sectors and residential areas in or adjacent to industrial parks have meant that such places have taken on increasingly urban economic and social characteristics. Such transitions in turn entail higher requirements for environmental performance. It follows that policies for eco-transformation of industrial parks also need to

consider the features of the urban development which so often results. At this stage in China's history, it seems that eco-transformation of industrial parks provides opportunities for city-scale sustainable development to occur.

The national EIP programme has been in force in China for over a decade. The participating industrial parks have adopted various measures to implement EIP projects, though the effectiveness of the policy instruments differs. A number of problems have been exposed during policy implementation. Although most of the national EIP programs in China are driven by government, more specialized plans are formulated at local level to improve the environmental performance in the existing industrial parks. In this model, local authorities produce EIP plans which provide detailed guidance on how to match the flows around anchor tenants and build or retrofit public utilities, aiming to reduce pollution and resource consumption. However, in such planned EIPs there is a significant risk that companies are not actually engaged, even though they are located nearby. Moreover, relying on command-and-control and mandatory environmental standards can only solve specific pollution problems; there seems to be little guarantee that it will improve companies' broader attitudes towards environmental responsibility.

While many pilot EIPs have made progress to improve environmental performance and energy efficiency, others have ended up abandoning the programme of eco-transformation. In some industrial parks, the policy instruments for EIP projects led to conflicts with other policies due to inefficient coordination by local authorities. In some cases, the necessary financial support was missing, which constrained the key projects and influenced company participation. In addition, some pilot EIPs overemphasise new technologies for pollution treatment. However, the technologies are bought but not appropriately used, which causes inefficient investments and disappointing environmental performance. Indeed, eco-transformation of an industrial park is more complicated than matching and optimizing flows precisely because of the wider socio-technical context. As an economic and industrial site, an EIP is a system that involves various actors and interactions influenced by a set of rules. Even the same environmental policy instruments may get different results.

My doctoral research project Eco-transformation of industrial parks in China aimed to understand the underlying factors that determine EIP's development, to allow effective, tailored policy interventions. The theoretical research explored the evolution of this research field, and led to the construction of an analytical framework rooted in the body of knowledge of EIP and institutional analysis, and adopting a socio-technical perspective. In-depth empirical research was then conducted in three Chinese industrial parks: Tianjin Economic-technological Development Area (Figure 2), Dalian Development Area (Figure 3) and Suzhou Industrial Park (Figure 4).



Figure 2: Tianjin Economic-Technological Development Area (source: [www.china.org.cn](http://www.china.org.cn))



Figure 3: Dalian Development Area (source: [www.mlr.gov.cn](http://www.mlr.gov.cn))



Figure 4: Suzhou Industrial Park (source: [www.sipac.gov.cn](http://www.sipac.gov.cn))

These three industrial parks are all national development zones with mixed industrial sectors. They were the earliest pilot industrial parks in the National Demonstration EIP Program. Their experience of EIP development in the last decade provides various empirical materials, which have yielded a series of useful lessons about how related policies might be better implemented in future.

The key conclusions are briefly summarised below:

- The primary issue is that strict thresholds for environmental performance need to be set. Environmental requirements must be substantially improved and enforced when industrial parks recruit new companies and evaluate existing companies.
- Second, the planned EIP model is useful to initiate the EIP program in the starting stage. This planned model is demonstrably effective in reducing pollution through end-of-pipe treatment. Many existing industrial parks do not have physical or institutional conditions to spontaneously evolve towards an EIP, due to the environmental principles being absent in the original planning. Thus, the eco-transformation needs to build up enabling features, such as retrofitting environmental infrastructures and institutional innovation. This needs political and financial support from local authorities as well as knowledge input from research expertise.
- Third, as the EIP development continues, the strategies of policy intervention need to be adjusted to encourage local institutions to engage company participation. At this stage, the portfolio of economic, regulatory and voluntary instruments should be better integrated to stimulate company participation. Coordinatory bodies (whether local authorities or business associations) have a key role to play in facilitating networking among companies and in building consensus around eco-development.
- Last but not least, we need to be aware that new urban features may emerge as industrialization and urbanization proceed. Industrial activities may change the distribution and structure of population, which lets urban functions emerge. Currently, China is promoting sustainable urbanization. My research findings show that many mature EIPs in China have developed urban characteristics – and this potentially paves the way towards whole eco-cities emerging. Therefore, policy objectives and instruments of an EIP need to be adjusted to realise the agglomerative effects of industries, talents and innovation, embracing and enhancing the comprehensive development of economy, environment and social welfare in a more holistic fashion.

*This research project was supported by Next Generation Infrastructures Foundation. It was supervised by Prof. Margot Weijnen (Delft University of Technology, The Netherlands), Prof. Gerard Dijkema (University of Groningen, The Netherlands) and Prof. Martin de Jong (Delft University of Technology, The Netherlands & Fudan University, China).*

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The paper should be referenced as follows:

Yu, C. (2014). 'Eco-cities in the making? The transformation of industrial parks in China', in Joss, S. (ed.), *International Eco-Cities Initiative Reflections Series*, Issue 8. University of Westminster. Online: <https://www.westminster.ac.uk/eco-cities/reflections>

**Publication details:**

Yu, C. (2014). Eco-transformation of industrial parks in China. NGINFRA PhD Series on Infrastructure no 71. Delft: Next Generation Infrastructures Foundation. ISBN 978-90-79787-60-9.

**The second, fourth and fifth chapters of the thesis have already been published as:**

Yu, C., Davis, C. & Dijkema, G.P.J. (2014). Understanding the Evolution of Industrial Symbiosis Research: A Bibliometric and Network Analysis (1997–2012). *Journal of Industrial Ecology*, 18 (2): 280-293. DOI: 10.1111/jiec.12073.

Yu, C., de Jong, M. & Dijkema, G.P.J. (2014). Process analysis of eco-industrial park development – the case of Tianjin, China. *Journal of Cleaner Production*, 64: 464-477. DOI: 10.1016/j.jclepro.2013.09.002.

Yu, C., Dijkema, G.P.J. & de Jong, M. (2014). What makes eco-transformation of industrial parks take off in China? *Journal of Industrial Ecology*. Early online version. DOI: 10.1111/jiec.12185.