



# A comprehensive analysis of cleaner production policies in China



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## ARTICLE INFO

### Article history:

Received 24 May 2015

Received in revised form

6 June 2016

Accepted 29 June 2016

Available online 1 July 2016

### Keywords:

Cleaner production

Policies

Content analysis

China

## ABSTRACT

Studies of cleaner production have often focused on two domains: the applications and the effects. An ever-increasing importance of cleaner production is pushing researchers to pay more attention to the formulation and principles of cleaner production policies. However, there is nearly none of the previous research that systematically and comprehensively analyses the development processes of cleaner production policies and exploring their characteristics deeply. The missing study is important in not only contributing to the perfection of cleaner production policies but also influencing the strategic planning of firms. This paper bridges this gap by first presenting a comprehensive study of the development process of cleaner production policies and then exploring their characteristics. We choose China, the biggest developing country and one of the most challenging countries to implement cleaner production, as the main research target and in addition a number of other developed and developing countries for comparisons. To investigate deeper into the characteristics of cleaner production in China, all the major policies and regulations issued by central ministries from 1997 to 2013 have been studied, ensuring the accuracy and reliability of the research. By employing T-LAB software with linguistic and statistical content analysis method, this paper derives following conclusions. (1) “audit”, “implementation” and “environmental” have the highest correlation coefficients with cleaner production; (2) cleaner production policies focus on four themes: “pilot”, “indicator”, “people” and “list”; (3) the formulation and implementation of cleaner production policies are endowed with typical characteristics of collaboration; (4) the characteristics of cleaner production policies are typically constraining types that evidently guide and regulate the behaviours of firms. This paper contributes as a general important reference of cleaner production policies for governments and firms especially in developing countries.

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## 1. Introduction

The positive influence brought by cleaner production (CP) on the enterprises, countries and the society has been widely acknowledged by theoretical and practical circles. For example, [Khuriyati and Wagiman \(2015\)](#) suggested that CP can bring economic, technical and environmental benefits for small-scale cracker industry; [Silvestre and Silva Neto \(2014\)](#) put forward that

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although in developing and emerging countries CP cannot build sustainable mining regions, it is definitively a step in the right direction; [Rahim and Raman \(2015\)](#) proposed that CP is a feasible strategy for the production plant to reduce CO<sub>2</sub> emission; [Zhang et al. \(2013\)](#) found that after CP was implemented in the sewage treatment system, the environmental performance and the resource efficiency are all improved to a certain degree. Regarded as one of the most efficient methods to reduce industrial contamination ([Kong and White, 2010](#)), CP not only contributes to environmental protection, but also contributes to firms' sustainable development. It can help firms to decrease production cost ([Zhang and Wen, 2008](#); [Hicks and Dietmar, 2007](#)) and increase production flexibility and dynamic capacity, thus enhancing firms' competitive advantages ([Zhang and Wen, 2008](#); [Liu, 2013](#); [Liu and Liang, 2015](#)).

Moreover, by efficiently and economically utilizing natural resources, CP can minimize the risks and dangers to human safety and health (Tseng et al., 2009). It has already been demonstrated that CP contributes to the sustainability (Bonilla et al., 2010; Glavic and Lukman, 2007), but the implementation of CP is confronted with serious obstacles of consciousness, supervision, finance, technology and organization (Wang, 1999; Dong et al., 2010; Khalili et al., 2014), which urgently need the support of government's guiding and supporting policies and this phenomenon has already attracted the wide attention of theoretical and practical circles.

Energy and environmental pollution problems are very serious in developing countries, and in order to solve these problems, various and effective policies should be implemented by the governments (Xie and Sidney, 2000). In recent years, a growing number of developing countries start to realize the importance of CP in minimizing the generation of waste and the consumption of energy, water, and raw materials in the process of industrialization (Dong et al., 2010), and therefore, various kind of CP policies have been formulated and implemented by them. However, in spite of all the efforts to promote CP, limited results have been achieved. For example, the majority of Chinese CP policies, characterized by non-compulsory, encouraging enterprise to carry out CP voluntarily. As a result, many Chinese firms cannot feel the urgency to promote CP. Meanwhile, CP cannot bring direct economic benefits in a short period, so firms do not have the motivation and passion to promote CP. In summary, the internal and external impetus for CP is not forceful (Chang et al., 2015). Moreover, the Chinese government neglected the advertisement of CP. Under such circumstance, the management in some enterprises cannot understand the essence of CP. They misunderstood that the key object is to protect the environment rather than improving the resource use efficiency and upgrading enterprises' equipment and key technology (Bai et al., 2015). Furthermore, the process of promoting CP is capital consuming, and some enterprises are confronted with the problems of capital shortage. Therefore, the Chinese government should allocate certain funds or subsidies for those firms that promote CP, construct the information service platform of CP and enhance their cooperation with the foreign environment protection departments (Zhang et al., 2016).

Based on these reasons, it is highly important to explore deeper into the reasons and give the corresponding advices for governments in the developing countries to optimize their CP policies. China, the largest developing country in the world, also the most challenging country to implement CP, has endeavoured greatly in promoting CP. In 1990s, the Chinese government has started to introduce CP (Ortolano et al., 1999). Since then a large number of laws and regulations about CP have been formulated and implemented (Ortolano et al., 1999; Wang, 1999). In China, CP has been involved in national strategies (Ortolano et al., 1999). National CP centres have been built, a large number of CP experts have been cultivated, and the tradition of a roundtable conference about CP has been formed, etc. (Wang, 1999). In addition, after years of practices on CP, it has achieved remarkable improvements in social, economic and environmental aspects (Guo et al., 2006), making it one of the most important and successful developing countries in promoting CP around the world. As a result, its CP policies have attracted increasingly more attention from the academic world. Based on the analysis above, this study selects China as the primary research subject.

The CP policies in China have been studied by many researchers, but the vast majority of their research was confined to certain regions, certain industries or to a certain period of time. For example, Geng et al. (2010) studied CP policies in Liaoning, China and put

forward that the implementation of CP may still suffer from the ineffective enforcement of relevant regulations; Zhang et al. (2013) conducted an empirical study in Changshu, China, and the research results helped policy-makers to better understand the drivers of firms' willingness to promote CP; Ren (1998) studied the influence of CP project in pulp and paper industry in China, and emphasized the importance of internal and external mechanisms promoting CP. Bai et al. (2015) analysed Chinese CP policies from the perspective of mandatory audit system. Meanwhile, they analysed the regulating policies of CP, and put forward that the mandatory CP audit system can enhance enterprises' conciseness and ability of CP. Luken et al. (2016) illustrated the influence of certain CP policies on CP. For example, they explained the influence that the Laws for Promoting CP of People's Republic of China brought for CP, and they divided these policies into four parts, namely, mandatory policies, audit policies, motivation policies, and punishment policies. The development of China's CP policies system has experienced four stages, namely, the initial stage, the legislation stage, the institutional stage, and the perfecting stage (Chang et al., 2015). It is very important for policy makers and practitioners to continually looking back to evaluate and review the progresses they have achieved in CP, which is essential for the future development of CP (Brown and Stone, 2007). However, none of the researchers mentioned above carry a longitudinal and comprehensive study on CP policies in China, and it is very challenging to comprehensively and systematically analyse them. This paper focuses on all the major CP policies in China and therefore it is comparatively the most comprehensive and systematic analysis for CP policies in China to date. Although countries differ in CP implemental scope, political reality and environmental awareness (Thorpe, 2011), there are also many things in common. Therefore, the contribution of this paper provides an important reference and guidance for the government and firms in not only China but also other developing countries.

The rest of this paper is structured as follows. Section 2 briefly illustrates the theoretical backgrounds. Section 3 explains the research methodology. Section 4 presents the qualitative research findings of the content analysis, including the findings of word associations and the findings of thematic analysis of elementary contexts. Section 5 discusses the findings in details. Section 6 concludes the contributions, research limitation and sheds lights on priorities for future studies.

## 2. Theoretical backgrounds

CP, originated from waste minimization in the USA, was very popular in Europe in the nineties (Schramm, 1997). Generally, the policies related to CP can be divided into three categories: regulating policies, incentive policies and guiding policies. These policies serve different functions, i.e., regulating policies are adjusting enterprises' production behaviours with mandatory measures; incentive policies are engaging enterprises in CP actively; guiding policies are guiding the modes, methods, and directions of CP.

### 2.1. Regulating policies

As the Pollutant Release and Transfer Register (PRTR) systems provide the basic data and information about emissions of pollutants, policymakers can continuously track the generation and release of contaminants (Lerche et al., 2004). It is regarded as one of the most commonly used environmental policy tool to regulate facilities' pollutant emissions in the Organization for Economic Co-operation and Development (OECD) countries (Kolominskas and Sullivan, 2004). For example, in Australia, industrial and other fa-

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