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Prevention and control of major accidents (MAs) and particularly serious accidents (PSAs) in the industrial domain in China: Current status, recent efforts and future prospects

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ABSTRACT

China has been experiencing dynamic industrialization because of rapid economic growth. Even with steady industrial safety improvements in recent years in China, the death rate per accident is increasing, and major accidents (MAs) as well as particularly serious accidents (PSAs) are still occurring every year. Evidently, the risk of industrial accidents, especially of MAs and PSAs is still high. Moreover, China has entered a bottleneck period for the prevention and control of MAs and PSAs. In a word, MAs and PSAs have become a significant challenge for China's industrial, social, and economic development. In recent years, especially since 2016, great attention of the Chinese government has been given to the prevention and control of MAs and PSAs. China launched its nationwide safety campaigns for firmly curbing MAs and PSAs. Some potentially effective measures and strategies in a series of safety policy documents (e.g., the 'Guidelines for Comprehensively and Resolutely Curbing MAs and PSAs' and the 'Thirteenth-Five-Year Plan for Work Safety') were also proposed, to reduce MAs and PSAs. Firstly, this paper makes a statistical analysis of China's MAs and PSAs between the year of 2002 and 2016 to figure out the current status of MAs and PSAs in China. Then this article reviews some latest major events of the prevention and control of MAs and PSAs in China to introduce the recent efforts in the prevention and control of MAs and PSAs in China. Finally, according to a series of safety policy documents in China, and the scientific research literature from other countries, this study gives a brief introduction to the future prospects of the prevention and control of MAs and PSAs in China. Obviously, this study can provide useful evidence and suggestions for the future prevention and control of MAs and PSAs both within China and in other countries.

Contents

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1. Introduction

Large-scale accidents (especially road traffic accidents and industrial accidents) have pervaded many parts of the world, especially developing countries such as China (Yu et al., 2012; Shin, 2013; Ma et al., 2015; Jiang, 2017; Markowski and Siuta, 2017; Wang et al., 2018a; Wang et al., 2018b). In this paper, we restrict our study on industrial accidents, or more specifically major accidents (MAs) and particularly serious accidents (PSAs) (see Table 1) defined by the 'Byelaw Governing Reporting, Investigation and Handling of Accidents' (State Council of PRC, 2007) in the industrial domain. Actually, China has always been suffering from the high frequency of occurrence of industrial accidents. According to the World Health Statistics Annual 1993 (World Health Organization, 1994), the industrial accident has become one of the major cause of deaths of Chinese citizens. The study of Chan and Griffiths (2010) showed that five of the world's most fatal industrial accidents in the past decade (2001–2010) occurred in China. Wang et al. (2018a) pointed out that China's death toll of industrial accidents ranks the first in the world in 2013 and 2014. At present, industrial accidents, especially MAs and PSAs are still a terrible monster in China that threatens industrial, economic and social development (SAWS, 2016a; General Office of the State Council of PRC, 2017). For example, according to the data from the Accident Query System of the State Administration of Work Safety (SAWS), in 2016, the total number of MAs and PSAs was 18, and the total number of deaths was 366, resulting a death rate per accident of 22.33. In a word, MA and PSA risks have raised major social concerns in today's China.

Many recent studies and statistical investigations (e.g., General Office of the State Council of PRC, 2017; SAWS, 2017a; Wang et al., 2018a) reveal that, with the efforts of the Chinese government and the massive developments in accident prevention and control strategies, the number of industrial accidents and fatalities in China has decreased significantly since the promulgation and implementation of 'Production Safety Law of the People's Republic of China (PRC)' (SCNPC, 2002) in 2002. However, industrial accidents claiming high numbers of casualties and causing substantial economic loss are still occurring every year in China. According to the data from the SAWS, there were 17 industrial accidents each resulting in at least 60 deaths in China between 2005 and 2016, with a total number of fatalities of 2101. Meanwhile, Wang et al. (2018a) calculated an index of death rate per accident (the total number of deaths/the total number of accidents) for the years 2001–2015, concluding that there has been an ongoing increase in the death rate per accident in 2001–2015 apart from a temporary and slow decrease in 2008–2012. This shows that the frequency of MAs and PSAs is increasing in China. Moreover, because of the increasing size and complexity of industrial systems (plants), the emerging and widely applied new materials and new technologies, and the more and more dynamic and competitive business environment, the risk of MAs and PSAs over the world is continuously growing (Fabiano, 2014; De Rademaeker et al., 2014; Planas et al., 2014; Wang et al., 2017; SAWS, 2016b; SAWS, 2017a; Xinhua News, 2016a). Therefore, the prevention and control of MAs and PSAs in China still faces many challenges (SAWS, 2016b; SAWS, 2017; Wang et al., 2018a).

'Safe development' officially proposed by the Chinese government in 2005 is a basic and key concept and rule of China's development (Wang and Wu, 2017). Obviously, the frequent occurrence of MAs and PSAs has badly affected China's safe development. Furthermore, because China's economic strength and the people's need for safety have both experienced a sharp increase with the rapid social and economic development over the past decades, the MAs and PSAs are becoming more and more unacceptable for China, which is an immediate concern that has provided the original momentum for the prevention and control of MAs and PSAs. Hence, in recent years, the Chinese government has paid great attention to the prevention and control of MAs and PSAs (Jiang, 2017; Wang et al., 2018a). The year of 2016 and 2017 were two crucial years for the future directions of the prevention and control of MAs and PSAs for China, not only because of the start of the nationwide safety campaigns for firmly curbing MAs and PSAs, but also because of the implementation of some potentially effective measures and strategies to reduce MAs and PSAs (Xinhua News, 2016a; Work Safety Committee of the State Council of PRC, 2016a; Work Safety Committee of the State Council of PRC, 2016b; General Office of the State Council of PRC, 2017; Work Safety Committee of the State Council of PRC, 2017a; Central People's Government of PRC, 2017a). China's recent efforts to prevent and control MAs and PSAs, which are little known to the left of the world, are introduced in Section 3. China has unfortunately a large number of the cases of MAs and PSAs, which however can provide excellent supports for an analysis of MAs and PSAs, to provide useful evidence and suggestions for the future prevention and control of MAs and PSAs. Therefore, this paper intends to analyze the current situation of MAs and PSAs (including the main characteristics and tendencies of MAs and PSAs) in China, and to introduce some recent efforts and future outlook of the prevention and control of MAs and PSAs in China.

The present paper may help to advance the cooperation and communication on the prevention and control of MAs and PSAs between China and other countries, to reduce MAs and PSAs in China as well as in the rest of the world (Wang et al., 2017). Meanwhile, this article could form an opening article on this topic (for example, it leaves many interesting questions to investigate and study in the future, see Section 2 and Section 4), which can widen and deepen the current discussion and study on MAs and PSAs. Specifically, this study can provide a foundation for researchers, professionals and policy makers interested in the prevention and control of MAs and PSAs to conduct a series of further studies or discussions, such as: (i) exploring the underlying causes for China's MAs and PSAs, and the characteristics and tendencies of MAs and PSAs in China; (ii) doing some comparative studies on the pre-