

# The Role of SMEs in China's Circular Economy Transition

### A CIRCULAR ECONOMY VISION

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### **01. Introduction**

The definition of Chinese SMEs (small and medium-sized enterprises) derives from China's SME Promotion Law 2003. It distinguishes between industries and considers three aspects including the number of employees, total assets and business revenue. From table 1 and table 2, it can be detected that the size of Chinese SMEs tends to be larger than that of European ones. According to data from OECD [1]. the number of Chinese SMEs in 2020 reached over 140 million. These SMEs contribute to more than 60% of GDP. 50% of tax income. 70% of technological innovation as well as 79% of job positions. A Chinese from а research report organization estimates that the distribution of SMEs will still climb even if at a limited speed [2], as presented in Figure 1. However, SMEs also cause significant environmental issues. According to the national environment ministry [3], Chinese firms accused of environmental regulations violations were fined a total of 15.28 billion yuan (\$2130 million) in 2018, most of the penalty being incurred by SMEs. At the same time, tens of thousands of SMEs were closed because they underperform the environmental standards.

Instead of making up for their negative impact on the environment, SMEs could contribute better by actively participating in the Circular Economy (CE) transition. For instance, the textile industry in China, consisting of over 90% SMEs, was the third largest source of wastewater in 2015 in terms of the data from the Ministry of Environmental Protection [4]. The potential of the CE business model in improving the situation is already emphasized by China's environmental policies, which have put textiles on the list of industries required to commit to CE development. In addition, the vital technology innovation in Chinese SMEs can strongly support CE transitions like green energy. In fact, even European SMEs detect multiple business opportunities as well, suggesting that hightech solutions are needed for China's energy transition and many investment areas remain untouched by State-Owned Enterprise (SOE) [5].





Figure 1: Number of Chinese enterprises and SMEs 2016-2025 (adapted from [2])

| Company<br>category | Industries   | Staff<br>headcount | Total assets        | Business revenue |
|---------------------|--------------|--------------------|---------------------|------------------|
|                     | Industry     | < 300              | $<$ 40 $\ddagger$ m | < 30 ¥ m         |
|                     | Construction | < 600              | < 40 ¥ m            | < 30 ¥ m         |
|                     | Wholesale    | < 100              |                     | < 30 ¥ m         |
|                     | Retail       | < 100              |                     | < 10 ¥ m         |
| Small               | Transport    | < 500              |                     | < 30 ¥ m         |
|                     | Post         | < 400              |                     | < 30 ¥ m         |
|                     | Hotel        | < 400              |                     | < 30 ¥ m         |
|                     | Restaurant   | < 400              |                     | < 30 ¥ m         |
|                     | Industry     | 300 - 2000         | 40 - 400 ¥ m        | 30 - 300 ¥ m     |
|                     | Construction | 600-3000           | 40 - 400 ¥ m        | 30 - 300 ¥ m     |
|                     | Wholesale    | 100-200            |                     | 30 - 300 ¥ m     |
|                     | Retail       | 100-500            |                     | 10 - 150 ¥ m     |
| Medium              | Transport    | 500-3000           |                     | 30 - 300 ¥ m     |
|                     | Post         | 400-1000           |                     | 30 - 300 ¥ m     |
|                     | Hotel        | 400-800            |                     | 30 - 300 ¥ m     |
|                     | Restaurant   | 400-800            |                     | 30 - 300 ¥ m     |

Table 1: The definition of SMEs in China's SME Promotion Law 2003 Note: Small enterprises meet at least one condition, medium enterprises meet all the conditions listed in the table.

| Company category | Staff headcount | Turnover | Balance sheet total |
|------------------|-----------------|----------|---------------------|
| Small            | < 50            | ≤€ 10 m  | ≤€ 10 m             |
| Medium-sized     | < 250           | ≤€ 50 m  | ≤€ 43 m             |

Table 2: The definition of SMEs in EU recommendation 2003/361s

### **02. Problem Statement**



When it comes to the CE transition in China. limited attention is paid to fundamental development and the involvement of businesses, NGOs and individuals, whose power could be better utilized to synergise the implementation at policy and micro levels. Notably, Chinese SMEs are featured with constrained financial resources but enormous vitality in technology innovation. They have more advantages than larger companies and SOEs in terms of being flexible and open to CE practices. To clarify the role of Chinese SMEs in the CE transition. several research questions are put forward here:

What are the development characteristics of Chinese SMEs?

How can Chinese SMEs contribute better to China's CE transition?

What is the implication for SME-related policies and management?

### **03. The Development Characteristics of Chinese SMEs**

Currently, the majority of Chinese SMEs are self-employed and entrepreneurial, starting from a very small size and short-term vision at early stages. A simple liability system tends to be adopted in the companies [6]. referring to a small group of shareholders (less than 10 persons). Compared with larger firms, decision-making is more concentrated and involves individuals in the SMEs. Such a simple management structure is prone to make mistakes but can effectively cut down the administration processes, leading to more agility faced with various market conditions and information. In addition, these features of SMEs also impose an impact on their routes of financing and technology innovation.

### **3.1 Difficult Financing**

The definition of financing used here is adapted from the literature [6]: In order to maintain operation status and implement future operation and development strategy, the company raises the required funds through certain channels and methods. According to the World Bank [7], having access to finance is the second most cited constraint to SME development in developing countries. International Finance states that there is unsatisfied financing of \$5.2 trillion every year in SMEs from developing countries. Compared with larger firms, SMEs have more difficulties in financing themselves with bank loans, so many of them need financial support from family members and friends to launch the business.

SMEs in China also show high dependence on external funding, especially from commercial banks [8].The reason behind the phenomenon is that the majority of them are unqualified for financing from the stock market. Although bank loans are the main finance channel for Chinese SMEs, due to the small scale at the initial stage. SMEs tend to be faced with financing difficulties from bank loans. This situation is related to the deficiency in the current credit system, in which the credit application and evaluation process can be highly bureaucratic. In other words, the information asymmetry between banks and SMEs is hindering loaning and finance processing. Hence, many SMEs turn to private funding and capital, from which they can gain more flexibility when most SMEs require frequent loans in a small batch. However, the lack of laws and regulations in private funding leads to many disputes between borrowers and lenders.

#### 3.2 Dynamic Technology Innovation

As emphasized by OECD, innovation is critical to developing new patterns of manufacture and consumption [9]. It helps broaden market opportunities and allows new ways to cope with environmental risks and also keep transformation costs down. As shown in Figure 2, China's innovation capability has been increasing dramatically over the years. According to OECD, there has been an increase of 1040% and 611.5% in environmental technology patents and all patent applications, respectively, from 2000 to 2011. Behind the growth, SMEs are more likely to be the most dynamic entity, once they contribute over 65% of patents, 75% of technological innovation and 80% of product development to the Chinese Market [10].



# Figure 2: Environmental technology percentage change 2000-2011 (from OECD data [9])

# 04. China's Circular Economy Transition and SMEs

As mentioned in the introduction, SMEs play an important role in China's national economy and bring enormous benefits, but also cause severe environmental issues. The implementation of an environmental pollution penalty helps improve SMEs' awareness but does not address the problem directly and specifically. CE, as a widely adopted concept nowadays, devotes to balancing economic and environmental requirements by adjusting production and consumption patterns from a lifecycle perspective. In terms of the number of SMEs in the Chinese market, the adoption of CE by SMEs is nearly equivalent to the successful transition of CE in China. Therefore, efforts could be more valuable if they were put into assisting these SMEs in paving a CE road.

# **4.1 The barriers of SMEs toward a circular economy transition**

First of all, a good understanding of common barriers for Chinese SMEs in the process of a CE transition is required. In over 90% of manufacturing 2010. enterprises were composed of SMEs [11]. At that time, similar environmental issues were shared among the printing and dyeing, food processing, and chemical industries in the sense that they polluted the surrounding environment and severely affected residents' health. The main reasons behind this poor performance are the use of obsolete machines and technologies and the employment of unqualified workers. This can be explained by insufficient limited financial resources and environmental management.

From the previous section, it can be

concluded that one of the main issues is the insufficient financing of SMEs. The lack of money to support the initial cost of a CE transition is the core barrier to most SMEs. although various barriers are discussed including the lack of government support, the lack of information, the lack of technology, and the lack of support from networks, among others [11]. For example, the lack of advanced technology has been commonly complained about. However, this might seem contradictory to the existing dynamic technology innovation shown in the aforementioned OECD database. In fact, a further investigation of the innovation indicator might explain a lot.

Looking closely at Figure 3, compared with other countries, a distinguished gap between producing patents and applying the corresponding technologies can be found in China's market. It can be understood that the costs of inventing something on paper are more affordable than promoting a technology on a larger economical scale. Therefore, the lack of technology in SMEs can be partly resolved by obtaining more financing, leading the issue back to the core problem: limited financial resources. However, other reasons behind the poor connection between theories and practices in the industry still remain unknown. This could represent a valuable direction to research by exploring what the financial resources are proportional to the new technoloav application in SMEs.

|                                    | % of world's green innovation |       |       |         |
|------------------------------------|-------------------------------|-------|-------|---------|
| Patent Office                      | pate                          | ented | de    | veloped |
| Europe (European<br>Patent Office) | 15.4%                         |       | 28.0% |         |
| United States                      | 25.1%                         |       | 21.1% |         |
| Korea                              | 18.4%                         |       | 21.0% |         |
| Japan                              | 32.4%                         |       | 15.5% |         |
| Germany                            | 9.9%                          |       | 12.6% |         |
| China                              | 37.7%                         |       | 3.9%  | •       |
| France                             | 2.6%                          |       | 3.8%  | •       |
| Chinese Taipei                     | 3.5%                          | •     | 3.2%  | •       |
| United Kingdom                     | 1.9%                          | •     | 2.4%  | •       |
| Russia                             | 2.9%                          |       | 2.0%  | •       |
| Canada                             | 3.4%                          | •     | 1.6%  | •       |
| Australia                          | 2.2%                          | •     | 0.5%  | •       |



BETTER POLICIES FOR BETTER LIVES OECD Green Growth Indicators www.greengrowth/greengrowthindicato..

Figure 3: The percentage of green innovation and technology patenting and diffusion by country (from OECD data [9])

In addition, environmental management is always perceived as an increased administrative burden for SMEs, instead of an essential assistance to sustainable CE development. This phenomenon asks for a deep reflection of environmental management from the government: are there too many administrative processes? Are the targeted environmental goals for SMEs unrealistic? How can the penalties be utilized more effectively to improve the environmental performance of SMEs? Of course, the CE transition aims to attain a closed-loop economy, and the task of minimising the waste and emissions from the whole system is huge and can only be satisfied in the long term. The nature of this task can explain the unsatisfactory performance at both the government and SME levels. More importantly, it reminds all parties that collaboration and interaction between different actors should be put at the top of the list of priorities. As indicated by Prieto-Sandoval et al. [12], academics, policymakers, practitioners, government, and institutions are the key actors in facilitating CE adoption among SMEs in China.

## 4.2 The strategies for SMEs toward the circular economy transition

The resolution of financing issues will lead to a big step for the CE transition in Chinese SMEs. Different from borrowing money from banks or family members, venture capital (VC), as an alternative financing channel, is provided by VC companies to fund startups and emerging companies which present high growth potential. n article points out that VC is a promising source of finance, but in developing countries such as China, many SMEs have not realized the feasibility of VC yet or do not have a good strategy to attract relevant investors [13]. Hence, the same article investigated such strategies by conducting 23 interviews with 17 business leaders of SMEs that successfully financed themselves with VC in the past 5 years.

It turns out that the strategies to attract such investment can be categorized into four groups: (1) developing a unique and pioneering business model, (2) assembling а management team with industry experience, (3) indicating the use of raised funds in investing technology, and (3) engaging with superior principal endorsement. These four strategies clearly state what direction SMEs in China should work toward attracting VC. In addition, the priority of these strategies is determined by looking at the level of agreement among the interview participants toward each strategy.

After addressing financial issues, the next question is how SMEs in China can maintain sustainable CE development. Following up on the development and policy hotspots in China can help SMEs to adjust operations promptly. In the worldwide trend of new energy development, many coal-mining companies in China are faced with bankruptcy at the moment. However, the reason for their failure might not be the nature of their business. Instead, it can be attributed to their slow movement. Since the trend of new energies can be traced back to 2010 and even earlier (see Figure 4), many adjustments could be made for those coal-mining companies over 10 years.

| What strategies do SME<br>business leaders in China use<br>to attract VC investment? | Emergent group   | % of participant references |
|--|--|-----------------------------|
| Group 1  | Developing a unique and pioneering<br>business model   | 100                         |
| Group 2  | Assembling a management team with industry experience  | 75                          |
| Group 3  | Indicating use of raised funds in investing technology | 75                          |
| Group 4  | Engaging with superior principal<br>endorsement        | 50                          |

## Table 3: The interview outcome with SME leaders (adapted from [13]).

#### 1. Technology development

Green patents

This indicator is a count of priority patent applications, broken down by technological field, invention year, inventor country and international patent family size. It monitors the impressive growth of environmental innovation in the past 20 years.

The database is open to browsing on <a href="http://stats.oecd.org">http://stats.oecd.org</a>, under Environment > Patents. For a glimpse of the information provided, click on one of the fastest-growing environmental technologies below.

Fastest-growing environmental technologies in 2011, compared to 1990





Another trend that SMEs should pay attention to is industry 4.0, which is the buzzword referring to automatic, big data, machine learning and so on. A broader digital operation can lead to higher quality, less waste and more revenue, accelerating the CE transition in a revolutionary way. Strategies for SMEs to integrate the concept have been studied by interviewing 68 German managers [14]. The research suggests that common technology business models can be effective solutions and their potential is presented in Table 4. It clearly states what SMEs can benefit from establishing a partnership by sharing the investment and usage of new technology with other organisations.



| Category                          | Response rate (out of 68 managers) | Explanation  |
|-----------------------------------|------------------------------------|--|
| Reduction of financial commitment | 48.5%                              | The investment of all stages<br>is distributed between<br>binded companies                 |
| Distribution of risk              | 27.9%                              | The risk is undertaken<br>commonly by binded<br>companies                                  |
| Exchange of ideas                 | 16.2%                              | More new ideas can be<br>inspired with larger<br>purchasing power from<br>binded companies |
| Strengthened partnerships         | 5.9%                               | The interaction will become<br>more intensive due to closer<br>financial ties              |

Table 4: Potentials for common technology purchasing (adapted from [14])

### **05. The Implication for SME-Related Policy and Management**

Sustainable financing is the prerequisite for implementing a CE transition in Chinese SMEs. Attention should be paid to longlasting financing difficulties in SMEs. From the government's perspective, the historical interaction between SMEs and state-owned banks should be analysed, leading to a more suitable and considerate process for SMEs to make loans from banks. A direction work promising to on is strengthening the construction of digital transaction platforms [8] including the establishment of laws and regulations. What's more, such a digital platform should the same administrative not move processes from paper. Instead, a more efficient and credible system is available by taking full advantage of digital technology such as big data.

Internal management can be improved by establishing strategies including how to attract alternative financing channels and how to smartly absorb new technologies The distinguished gap between patents technologies registered and green developed is also asking for further investigation. The reflection is encouraged to dive into the relationships between multiple roles including academics and industries. It will help the government to allocate funding for technology innovation more efficiently. Meanwhile. relevant regulations should be made to monitor the funding as well as assist green technology innovation on an application level. In addition, the perception of a CE transition as a burden to SMEs reflects a rooted and KPI-dominated atmosphere in the country. Such a working culture is more likely to bring about greenwashing, which is always a product of unrealistic goals and little commitment. In such cases, governments and policies should find a way to balance speed and quality in the process of the CE transition.

Of course. SMEs should be the ones who undertake most of the responsibility for their development. Internal own management can be improved bv establishing strategies including how to attract alternative financing channels and how to smartly absorb new technologies. Last but not least, in order to act timely in uncertain market conditions. SMEs also need to follow up closely with international trends including the updated development of technology and theories. Based on a good understanding of their own advantages, SMEs should continue learning how to optimize their resource allocation and operation, especially when a change in manufacturing and consumption patterns is necessary for a CE transition.

### **06.** Conclusion

Looking at various data, the role of SMEs in China's CE transition is discussed from three aspects including the development characteristics of Chinese SMEs, more efficient contribution to China's CE transition, and the implication of SMEsrelated policies and management. It can be concluded that SMEs in China are faced with financing barriers but also present a huge potential for technology innovation. The conflicts are further embodied in the distinguished gaps between producing patents and applying the corresponding areen technologies. These situations impose a direct impact on the CE transition of SMEs in terms of financial and technological support. Several strategies for attaining financing from alternative capital and following up closely with industrial technology trends are presented. Last but not least, some suggestions are made for the modification of SMEs-related policies and management, which is expected to consider and satisfy the needs of SMEs through a deep reflection.

SMEs in China are faced with financing barriers but also present a huge potential for technology innovation



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