

## Chapter 12

# Fair Share of Supply Chain Responsibility for Low Carbon Manufacturing

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### ABSTRACT

*Large amounts of carbon emissions and pollution are generated during the manufacturing process for consumer goods. Low carbon manufacturing has been increasingly enquired or requested by stakeholders. However, international trade blurs the responsibility for carbon emissions reduction and raises the questions of responsibility allocation among producers and consumers. Scholars have been examining the nexus of producer versus consumer responsibility among supply chains. Recently, there have been discussions on the share of producer and consumer responsibility. Both producer and consumer responsibility approaches have intrinsic shortcomings and are ineffective in curbing the rise of carbon emissions in supply chains. Shared responsibility based on the equity principle attempts to address these issues. This chapter relates a case study of carbon impact on China's export and economy with scenarios which show that the benefits of carbon reduction by producers can trickle down along the supply chain and motivate the sharing responsibility under certain circumstances. The share of producer and consumer responsibility for low carbon manufacturing can be enabled when embodied carbon emissions in goods and services are priced and such accurate information is available. A mechanism engaging the global participation is recommended. The author calls for further research on the system pricing embodied carbon emission, the universal standard to calculate the embodied carbon emissions and to disclose the information, and the way to secure global cooperation and participation.*

### INTRODUCTION

Carbon dioxide is emitted at all phases of manufacturing process along the supply chain, from raw materials extraction, assembly, to distribu-

tion of the finished goods to final consumers. With escalating and alarming levels of global carbon emissions, the concept of low carbon manufacturing has been proposed. International trade and fragmented production complicate the

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responsibility for low carbon manufacturing and have an increasing influence on world carbon emission. Under the globalization of production and interconnectedness of economies, producers and consumers among the supply chain are often geographically separated. In one of the current key efforts – the Kyoto Protocol under the United Nations Framework Convention on Climate Change (UNFCCC), the responsibility for carbon emissions is allocated according to geographical area of the carbon emitters, which also follows producer responsibility approach. Only Annex B parties are legally bounded to emissions reduction targets against 1990 levels (UNFCCC, 2013a). Comparative advantage results in the relocation of labour and pollution intensive industries from countries with stringent environmental policies to countries without environmental policy. Carbon leakage and free riding are resulted. The responsibility of reducing carbon emission is then shifted to developing countries, while developed countries can still enjoy the goods and services through imports from developing countries. The increasing global carbon emission shows that carbon leakage undermines the efforts in achieving these mitigation targets and highlights the failure of the Kyoto Protocol.

The failure instigates many studies on consumer responsibility and quantitatively evaluating carbon emissions embodied in trade at global level, or regional level or bilateral trades in a bid to address carbon leakage. Under the consumer responsibility principle, consumers shoulder all the carbon emissions emitted in the manufacturing processes. However, it suffers some drawbacks like trespassing on the jurisdictional limits of national power (Cadarsó et al., 2012).

Producers and consumers constitute the supply chain and both enjoy the benefits from trade. Responsibility for low carbon manufacturing should not be allocated to single party. Therefore, the intermediate approach - sharing the responsibility among producer and consumers, is proposed

and studied by scholars. Its main advantage is to commit all agents including producers, industries, final consumers and/or countries in the supply chain to play a part to reduce the carbon emissions (Cadarsó et al., 2012). Nevertheless, the shared responsibility was only examined in application of carbon accounting. So far, there is no mechanism or policy to enable the share of responsibility among supply chain. This chapter is one of the efforts in finding out the mechanism enabling the share of responsibility.

To examine the possibility of sharing responsibility for low carbon manufacturing among the supply chain, China – the largest exporter is studied in this chapter. Over the last thirty years, China has been experiencing rapid economic growth and enjoying the benefits brought by export. In 2010, China became the world's largest exporter, and the second largest importer (OECD, 2013). Since the launch of the 'Open Door Policy', China has been encouraging and supporting foreign trades and investments, which turned the country into the world's factory at the cost of extensive use of energy and environmental degradation. Within a very short period of time, from 2002 to 2007, the carbon emissions in China have almost doubled. In 2010, China was responsible for 17.5% of global energy demand (IEA, 2012a) and 23.8% of world carbon dioxide emission and became the largest carbon emitter in the world (IEA, 2012b). Manufacturing is believed to be one of the driving forces and certain portion of the carbon emission in China is embodied in goods produced for export and consumed by other countries. Meanwhile, China's economy partly relies on export. Direct restriction of carbon emissions of manufacturing industries for export would bring detrimental impact on economy and would discourage the exporting countries to reduce the emission. Sole responsibility shouldered by producer would also limit the degree of reduction. The detailed analysis of the carbon impact on China's export and economy aims to find out policy criteria that

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