CASE STUDY

2022


# Product Social Impact Assessment of the Recycled Polycarbonate Supply Chain

LG Chem

# Case study LG Chem

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This case study has been developed as part of the partnership of LG Chem of the Social Value Initiative. It has been authored by Jessica Kwon, David Kim and Steven Kim, October 2022.

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The Social Value Initiative is a joined initiative of the following companies:

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## Acronyms

| | |
|---|---|
| PC | Polycarbonate |
| PCR | Post-consumer recycling |
| PIR | Post-industrial recycling |
| PSIA | Product Social Impact Assessment |

# 1 Introduction

LG Chem joined the Social Value Initiative as a Partner in 2021. With the PSIA Handbook and Social Topics report, LG Chem applied the PSIA methodology to primary and secondary data sources. LG Chem initiated the first case study on the recycled polycarbonate (PC) supply chain to test the methodology.

# 2 Definitions of recycling terminology

There are broadly two types of recycling:

- **Post-industrial recycling (PIR)** refers to recycling "within" the factory since out-of-spec intermediate goods are reworked in the process to produce in-spec finished goods.

- **Post-consumer recycling (PCR)** refers to recycling "out" of factory since finished goods delivered to the (end)customers are collected and then recycled.

In this case study the scope is limited to post-consumer recycling (PCR) of polycarbonate (PC). PCR can be subcategorized into two streams as defined by the types of plastic and final user as follows:

1 **Recycling common plastics from consumers.** The first stream is most familiar. In this stream soft drink bottles (polyethylene terephthalate/PET), food packaging (polypropylene/PP), fast food containers (polystyrene/PS) and so on from consumers and households are collected and then ultimately compounded into new, recycled products. The waste plastics are collected and separated at various recycling centers. Since the waste streams are often mixed with different plastics and contaminants, the quality of these pre-compounded raw materials suffers since they are difficult to separate.

2 **Recycling engineering plastics from businesses.** The second stream, which relates to this case study, is less familiar. Discarded polycarbonate (PC) in the form of semiconductor wafer trays or cleanroom sheets from semiconductor fabs are collected and turned into "virgin-equivalent" recycled PC. Unlike the first stream in which a mixture of multiple plastics is collected and separated in recycling centers, no such centralized facilities exist. Typically, multiple small enterprises collect one type of waste engineering plastic such as PC. The value chain is complex, but the quality of pre-compounded raw materials is superior to that of the first stream described above.

# 3 Methodology

The table below illustrates the PSIA methodology as defined by the Handbook.

| Steps | Tasks |
|---|---|
| Goal and Scope | • Define goal and scope |
| Value Chain | • Identify value chain |
| Data Collection | • Collect data from surveys. ESG/research reports, publicly available statistics |
| PSIA | • Evaluate using relative ranking |
| Interpretation | • Interpret PSIA results according to goal and scope |

## 3.1 Goal and Scope

This study aims to identify potential risks in our suppliers' value chain from raw material sourcing to production of polycarbonate (PC) post-consumer recycled (PCR) polymer pellets, with which LG Chem produces its final compounded pellets. The user phase and end of life of the final compounded pellets are out of scope.

| | Life-cycle stages | | | | |
|---|---|---|---|---|---|
| Stakeholders addressed | Supply chain Raw material extraction, manufacturing, retail | | Use | End of life | |
| | Small-scale entrepreneurs | Workers | Users | Small-scale entrepreneurs | Workers |
| | Local communities | | | | |

*Table 1 Stakeholder groups and life-cycle stages included in PSIA*

The table below illustrates how the scope was determined from reviewing the relevance of each of the five LG Chem materiality topics to the PSIA stakeholders and topics.

Of the five LG Chem materiality topics, "product safety/quality control", "chemical safety control" and "circular economy" were eliminated since they are associated with the use and the end of life, which are out of scope of this study.

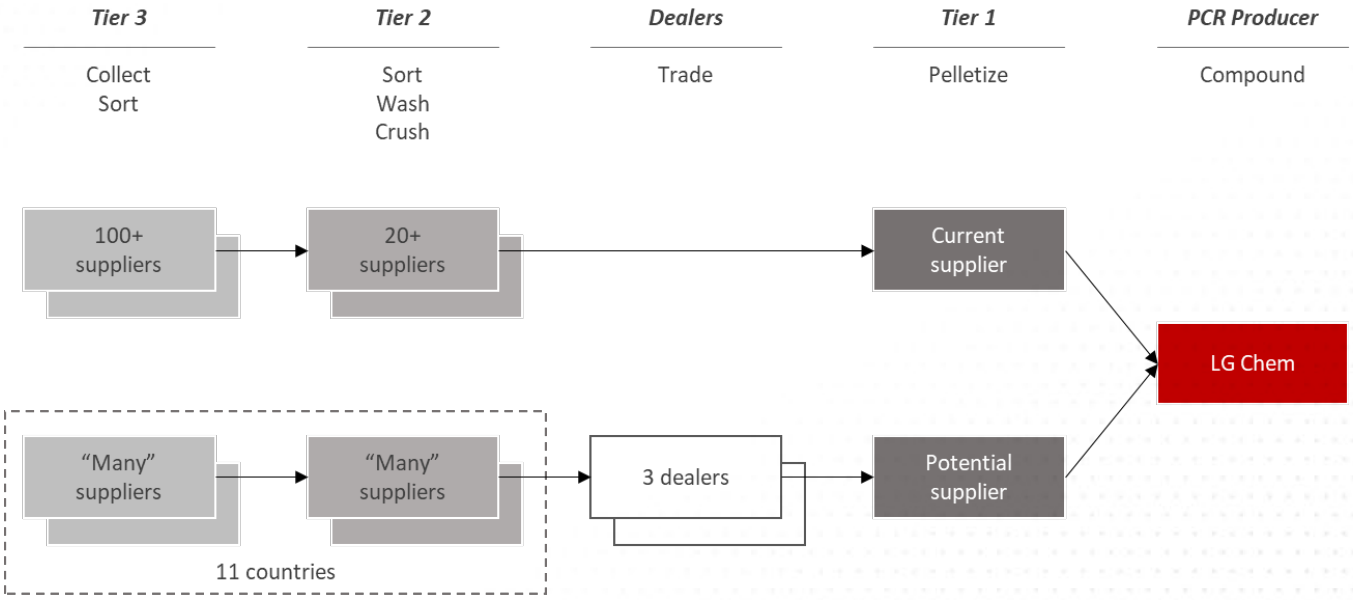
Next, the two remaining LG Chem materiality topics – "occupational safety and health" and "supply chain management" – were aligned to the PSIA topics. Of the relevant seven PSIA social topics, "freedom of association" was excluded since the suppliers in this investigation are primarily small companies. Therefore the workers' relations are less impacted by workers' associations.

As a result, the final scope focuses on the workers' perspective regarding health and safety, remuneration, child labor, forced labor, discrimination and work-life balance.

| LG Chem materiality topics | PSIA stakeholders | PSIA topics |
|---|---|---|
| • Occupational safety and health | • Workers | • Health and safety |
| • Supply chain management | • Workers | • Health and safety<br>• Remuneration<br>• Child labor<br>• Forced labor<br>• Discrimination<br>• Work-life balance<br>• *(Freedom of association)* |
| • *(Product safety/quality control)* | • *(Users)*<br>• *(Local community)* | • *(Health and safety)* |
| • *(Chemical safety control)* | • *(Users)*<br>• *(Local community)* | |
| • *(Circular economy)* | • *(Users)*<br>• *(Local community)* | • *(Access to resources)* |

## 2.2 Value Chain description

The figure below shows the two value chains that are being assessed – one for our current supplier (the Korean value chain) and the other one for our potential supplier (oversea value chain). Our existing Tier 1 supplier sources its materials from some 20 Tier 2 suppliers, which in turn receive their material from more than 100 Tier 3 suppliers. In contrast, our potential Tier 1 supplier sources its materials from 3 dealers with undisclosed Tier 2 and 3 suppliers from 11 countries.



## 2.3 Data Collection

Although the data collection process posed significant challenges, we overcame these issues with sensible sampling, reasonable approximation and trusted secondary data.

Regarding the value chain in Korea, obtaining information about the Tier 1 supplier was relatively straightforward. Primary data consisted of non-confidential company information, questionnaires, interviews and site audit results. However, due to the sheer number of Tier 2s and 3s, we resorted to sampling these suppliers based on the volume and business relationship with LG Chem as well as referencing secondary data from the NGOs, recycling associations and labor laws of relevant countries.

With respect to the potential value chain outside of Korea, accessing company-specific information proved to be difficult due to the scarcity of primary data. As a proxy, we collected country-level data by contacting our overseas offices, local NGOs as well as leveraging the statistics from international organizations and labor laws of each of the nations.

# 4 Results | Korean Value Chain

The existing value chain was assessed based on the submitted results of the LG Chem CSR Survey plus secondary sources where appropriate.

## Health and safety

The LG Survey notes that these small suppliers tend to be insufficient in conducting formal safety training or implementing risk management. In addition, the Ministry of Employment and Labor reported that 81% of the accidents occur at companies with fewer than 50 employees[1].

## Remuneration

The LG Survey notes that these suppliers comply with the labor law and pay their workers minimum wage which covers the living cost of the individual worker but may be insufficient to support a family.

## Child labor

The LG Survey notes that the suppliers never have hired employees under the age of 18. Moreover, the UNICEF report documents the child labor rate in Korea is zero[2].

## Forced labor

The LG Survey notes that these suppliers never have hired contract or dispatched workers. They have hired foreign workers and provided required insurance and return home trips for some.

## Discrimination

The LG Survey notes that most suppliers do not discriminate against gender, nationality or disability, but some admitted that hiring or compensation decisions are somewhat influenced on a case by case situation.

## Work-life balance

The LG Survey notes that these suppliers do not have strict overtime tracking, and some do not formally provide sufficient annual or parental leaves.

[1] 2020 industrial accident and death statistics announced by Korea Ministry of Employment and Labor
[2] 2019 Child labour data by UNICEF

# 5 Results | Overseas Value Chain

Since the potential Tier 1 supplier under consideration did not provide detailed Tiers 2 and 3 information, country-level statistics were used as a proxy. This potential supplier uses 3 dealers that source from 11 countries – China, Hong Kong, India and Japan in Asia; Mexico and the US in the Americas; Belgium, Netherlands, Spain and the UK in Europe; Saudi Arabia in the Middle East.

## Health and safety

The frequency of injuries per country was listed in ILOSTAT. The UK showed the best results with low fatal and non-fatal injuries. Belgium, Japan and Spain were mixed with low fatal injuries but high non-fatal injuries. India, Mexico and the US showed the worst results with high fatal and non-fatal injuries. Saudi Arabia lacked information.

## Remuneration

The gap between minimum wages[3] and the average living costs[4] were analyzed per country. Belgium, Saudi Arabia and the UK showed the best results with the smallest gap. Japan and Spain were next. Mexico and the US showed the worst results with the largest gap.

## Child labor

The child labor laws and the UNICEF child labor statistics were reviewed per country. The result was that India and Mexico are vulnerable to child labor exploitation in scavenging and sorting trash.

## Forced labor

The labor laws and statics[5] specific to the recycling industry were reviewed per country. None of the countries were susceptible to forced labor.

## Discrimination

Anti-discrimination legislations and cultural norms were analyzed by country. Saudi Arabia showed the highest risk due to its lack of laws preventing disability-related discrimination plus significant bias towards freedom of religion. India and Japan were next due to their bias towards lower social class in India and towards foreign nationals in Japan. For all other countries, laws are in place to protect against discrimination but gender-related wage discrepancy still exists.

## Work-life balance

Each country's labor laws aligned to the ILO requirements. ILO/OECD working hour statistics were reviewed. Japan, India, Mexico and Saudi Arabia showed the highest risks. The other countries, mostly Western, tend to have better balance between work and life.

[3] https://wageindicator.org/salary/minimum-wage
[4] https://www.numbeo.com/cost-of-living/
[5] Global Slavery Index (https://www.globalslaveryindex.org/2018/data/maps/#prevalence)

# 6 Learnings and path forward

This case study helped us to better understand the PSIA methodology to assess the social impact of products. We experienced challenges in identifying and collecting data from suppliers in the value chain. This is why the Handbook has a Hotspot identification phase.

In this case study, we selected the suppliers based on volume and relationship to focus on those with high priority. This assessment of the value chain can be accumulated and reused, which will lead to more effective and accurate assessment for future cases.

As a next step it is important to align the PSIA at the corporate level and engage other departments such as Procurement, CSR, Strategy, Human Resources, Operations and Supply Chain Management, in order to streamline the data collection and further fine-tune the process.

LG Chem with its life cycle assessment (LCA) implementation of our PCR offerings, our product development effort has already started to address the balance between the economics optimization and environment protection. Now with this first PSIA study, we gained new, meaningful insights about our value chain. To build on this momentum, we aim to collaborate with our partners to make our value chain more economical, environmental-friendly and socially responsible.