



The Poisonous Pearl

Occupational chemical poisoning in the electronics industry in the Pearl River Delta, People's Republic of China

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Colophon

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The GoodElectronics Network brings together trade unions, grass roots organisations, campaigning and research organisations, academia, and activists who are concerned about human rights, labour rights, and sustainability issues in the global electronics supply chain. GoodElectronics sees it as its mission to contribute to improving corporate and public policies and practices with regard to protecting and respecting human rights and the environment in the global electronics supply chain, with a specific focus on big brand companies.

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The Centre for Research on Multinational Corporations (SOMO) is an independent, non-profit research and network organisation working on social, ecological and economic issues relating to sustainable development. Since 1973, the organisation has been investigating multinational corporations and the consequences of their activities for people and the environment around the world. Read more: www.somo.nl.



LABOUR ACTION CHINA

Labour Action China (LAC) is a labour rights non-governmental organisation based in Hong Kong. LAC engages in research on the working conditions and labour relations of Chinese workers, supports grassroots organising, and campaigns for the protection of labour rights in China. The work of LAC is focused on Southern China. LAC aims to support labour activism and grassroots labour organisations formed by workers; provide a platform for study and training for Chinese workers on labour relations and worker representation; conduct research on labour conditions, labour relations and capital mobility in China; support campaigns for the protection of labour rights in China; build worker solidarity within China and with other countries. Read more: <http://www.lac.org.hk/newsite/en>.



Labour Education and Service Network (LESN) is an independent NGO established in Hong Kong in October 2001. It is comprised of experienced union organisers and labour researchers. LESN is one of the first Hong Kong labour NGOs to set up labour centres and labour programmes with workers and students in factories and communities in mainland China. LESN has established a broad partner network ranging from local labour organisations, lawyers, and academics, to the international labour movement. Read more: <http://www.lesnhk.org/>.

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Acronyms

CAS	Chemical Abstracts Service
CDCP	Centres for Disease Control and Prevention
CSO	Civil Society Organisation
CSR	Corporate Social Responsibility
EICC	Electronic Industry Citizenship Coalition
EPA	United States Environmental Protection Agency
FNV	Dutch Federation of Trade Unions
GHS	Globally Harmonised System of Classification and Labelling of Chemicals
HRSSB	Human Resources and Social Security Bureau
IARC	International Agency for Research on Cancer
ICRT	International Campaign for Responsible Technology
ILO	International Labour Organisation
LAC	Labour Action China
LESC	Labour Education and Service Network
LPTOD	Law on the Prevention and Treatment of Occupational Diseases
MCHC	Mother and Child Health Centre
MSDS	Material Safety Data Sheet
NGO	Non-governmental organisation
OHS	Occupational health and safety
OT	Overtime
PC-TWA	Permissible Concentration – Time Weighted Average
PC-STEL	Permissible Concentration – Short-Term Exposure Limit
PPE	Personal protective equipment
PRC	People’s Republic of China
PRD	Pearl River Delta
PTCOD	Prevention and Treatment Centre for Occupational Diseases (PTCODs are the official medical occupational diseases centres at city level, found throughout China).
SIL	Social Insurance Law
SOMO	Centre for Research on Multinational Corporations
UNGP	United Nations Guiding Principles on Business and Human Rights
US-OSHA	United States Occupational Safety and Health Administration
WHO	World Health Organisation

Executive summary

The aim of this research report is to examine and describe issues related to occupational chemical poisoning in the electronics industry based in the Pearl River Delta in China.

The globalised production chain of electronics products is characterised by numerous social and environmental issues that have been raised by trade unions, labour rights groups, research organisations and the industry itself, including: low wages, excessive overtime, discrimination of migrant workers, exploitation of student workers, and lack of freedom of association. More recently, local and international campaign groups and research organisations have highlighted the irresponsible use of chemical substances in the manufacturing of electronic products with workers being exposed to hazardous and poisonous chemicals. There is growing evidence that exposure to these chemicals may be linked to increased rates of cancer, reproductive damage, birth defects, and other serious illnesses among workers.

The Pearl River Delta (PRD) in China is the global hub for the production of consumer electronics. Big electronics brands are producing in the PRD. Taiwanese manufacturer Foxconn (Hon Hai), the world's largest contract electronics manufacturer, operates in this region.

Research team

The research project was carried out by two Hong Kong-based labour rights organisations – Labour Action China (LAC), and Labour Education and Service Network (LESN) – in collaboration with the Netherlands-based Centre for Research on Multinational Corporations (SOMO). Together, SOMO, LAC and LESN have solid experience in researching the electronics sector. LAC and LESN, in particular, have years of experience in monitoring the occupational health and safety consequences for electronics workers who work with hazardous chemicals like benzene and n-hexane. Benzene is used as a cleaning agent for electronic parts. N-hexane is used as an industrial solvent. In recent years, some big brands (including Apple) have made efforts to ban the usage of benzene and n-hexane in the final assembly processes executed by large manufacturers. Most electronics companies, however, have not yet formulated a 'no-benzene and n-hexane' policy. In the smaller factories the situation is worse. In the US and Europe benzene is considered a number one human carcinogen and strict maximum levels of exposure are in place; in China the exposure limits allowed are significantly higher. This is negatively affecting the health of tens of thousands of workers.

Ming Kunpeng – a tragic victim of chemical poisoning

The tragic case of Min Kunpeng triggered the GoodElectronics Network to commission research into Dutch electronics company ASM International N.V. (ASMI) conducted by SOMO in 2014. Ming worked for ASMPT, a Shenzhen-based factory in which ASMI holds an important minority share (40%). In 2009, Ming fell ill with leukaemia. In 2013, at the age of 27, and in despair at his deteriorating health and failing medical care, Ming took his own life. In the company profile on ASMI SOMO argued that ASMI should take responsibility for addressing health risks at the factories of its former subsidiary company.

Need for further research

Alarmed by continuous reports of chemical poisoning in the electronics industry in China, Good-Electronics commissioned this research at hand into working conditions in the Pearl River Delta. This research focuses on the experiences of (former) workers in the electronics industry who are victims of chemical poisoning, workers who fell ill and whose health (including reproductive health) was negatively affected. These workers worked in a range of large and small factories in the PRD-region that supply various international brand name companies, including members of the Electronic Industry Citizenship Coalition (EICC). 59 workers filled out a detailed questionnaire. Another 16 workers took part in in-depth interviews.

Some workers were the only worker to become ill in their factory, therefore pseudonyms have been used and the names of their factories withheld.

The main findings of the research

- Workers are poorly informed about the health risks posed by exposure to chemicals at work.
- When workers become ill, they often do not realise their illness may be work-related.
- Employers are not supportive when employees fall ill. They often actively counter and even obstruct workers' efforts to get a proper diagnosis or claim compensation for medical expenses. Employers do not live up to their contractual obligations. According to Chinese labour regulations employment contracts must stipulate health hazards but this is often not the case.
- Workers lack sufficient information, training, and adequate personal protective equipment. The effects of exposure to chemical substances may only become apparent after years. Because electronics companies usually have a high turnover, workers could have worked for several employers.
- When workers become ill they do not know who to turn to and often encounter difficulties in getting corporate recognition for their work-related illnesses and/or claiming compensation.
- Workers who are employed by labour or dispatch agencies and those on short-term contracts suffer the most difficulties, including financial hardship.

Corporate responses

Workers in the electronics industry in the PRD often do not know the identity of the factory's customers. Piecing together information provided by the workers who participated in this research, together with information found on the factories' websites, in total 36 client companies could be identified. We were however only able to find relevant contact details of 23 companies, namely Accton, Acer, Apple, Asus, BYD, Canon, Foxconn, Fuji, GE, Gilman Group, Haier, Huawei, Hyundai, Inventel, LG Electronics, Midea, Motorola, Nokia, Philips, Samsung, Sharp, Siemens and Sony. These 23 companies were asked to respond to a draft version of this report. The other client companies could not respond to the draft report and will therefore not be mentioned by name in this report.

The contacted companies were also asked to fill out a short questionnaire. SOMO asked the EICC to disseminate the questionnaire and the draft report to the identified EICC members. Eleven companies replied: Acer, Apple, Asus, Canon, Motorola, Foxconn, LG Electronics, Philips, Samsung, Sharp and Sony. Six companies filled out the questionnaire (Asus, Canon, Philips, Samsung, Sharp, and LG Electronics), while five provided information outside the framework of the questionnaire. All eleven corporate respondents stressed that they considered chemical poisoning a serious risk for workers in their supply chain but did not give details about substances used in the production of their products. All eleven said they were not aware of concrete cases of chemical poisoning in their supply chains. The six companies that completed the questionnaire said they followed the EICC code of conduct.

In their feedback Apple, Canon and Samsung specifically mentioned n-hexane and benzene. Canon said its standards define benzene as a “prohibited substance” and had requested suppliers not to use benzene for Canon products, including during the manufacturing process. Samsung said *“Benzene was never used in our semiconductor operations; it was strictly prohibited in our production operations for set devices since 2013. We publicly announced to prohibit these chemicals at our suppliers in Sept, 2014.”* Apple said *“Through Greenscreen, a benchmarking tool for assessing and recommending replacements for hazardous chemicals, we have identified and analysed over 500 chemicals; replacing, reducing and often outright removing the worst offenders. this includes phasing out beryllium, lead in solder, brominated flame retardants, arsenic, polyvinyl chloride, mercury and phthalates in our products, as well as benzene, n-hexane, chlorinated organic solvents in cleaners and degreasers in our manufacturing processes.”* On the basis of the research at hand, GoodElectronics cannot fully confirm or refute these claims. This research does, however, show, that there workers are very vulnerable and whatever steps may have been taken, there is still a lot to do.

Challenging the industry

In January 2015, the GoodElectronics Network and the International Campaign for Responsible Technology (ICRT) organised a meeting in San Francisco, USA. Along with key allies in occupational and environmental health and safety in the global electronics industry, they discussed a life cycle approach to the use of toxic chemicals. The meeting focused on developing a common understanding of the problems caused by irresponsible usage of toxic chemicals, building a unified platform, devising strategies to address these problems, and agreeing on better coordination of activities. Key topics for exchange and discussion included: the right-to-know about chemical hazards (for workers and communities); monitoring throughout the supply chain (in factories, waste discharges, bio-monitoring of workers); building capacity to make improvements throughout the life cycle of electronics (bearing in mind that fundamental labour rights include the right to freedom of association and collective bargaining).

Consequently, in March 2015, GoodElectronics, ICRT and their allies around the world issued a “Challenge to the global electronics industry” on the use of chemicals. In June 2015, GoodElectronics and ICRT published “Meeting the Challenge”, a document that includes detailed recommendations for the industry on how they might address the issue.

Recommendations

This report formulates a series of recommendations, for both companies and governments. Under international human rights law and in line with the United Nations Guiding Principles on Business and Human Rights (UNGPR), governments and companies have an obligation to protect and respect human rights and labour rights. The Guiding Principles apply to both the international electronics brands that outsource their production to China and the supplier factories in China. Companies must respect human rights and conduct due diligence in their supply chain to prevent violations. They must also guarantee access to remedy for victims. Companies claim to live up to the EICC industry code of conduct but this research makes it clear that adherence to this voluntary code is no guarantee for safe and healthy working conditions. Binding regulations are required. The Chinese government must improve labour legislation and implement existing regulations more strictly, particularly those relating to OHS. The Chinese government must ratify ILO Benzene convention C136. Governments of the home countries of brand-name companies and manufacturers also have a role in controlling companies and steering them towards more responsible business conduct.

GoodElectronics is calling upon the electronics industry to meet the “Chemical Challenge” that GoodElectronics formulated jointly with the International Campaign for Responsible Technology.

1 Introduction

1.1 Why this report?

The aim of this research report is to examine and describe issues related to occupational chemical poisoning in the electronics industry based in the Pearl River Delta in China. The globalised production chain of electronics products is characterised by numerous social and environmental issues that have been raised by trade unions, labour rights groups, research organisations and the industry itself, including: low wages, excessive overtime, discrimination of migrant workers, exploitation of student workers, and lack of freedom of association. More recently, local and international campaign groups and research organisations have highlighted the irresponsible use of chemical substances in the manufacturing of electronic products with workers being exposed to hazardous and poisonous chemicals. Many of these chemicals are linked to increased rates of cancer, reproductive damage, birth defects, and other serious illnesses. The Pearl River Delta region in China – an urban area that is now larger than Tokyo in both size and population – is the global hub for the production of consumer electronics.

This research project was carried out by two Hong Kong-based labour rights organisations – Labour Action China (LAC), and Labour Education and Service Network (LESN) – in collaboration with the Netherlands-based Centre for Research on Multinational Corporations (SOMO).

SOMO has conducted work on this sector since 2006, focusing on the entire value chain, with an emphasis on the manufacturing phase, the production of electronics components and the final assembly of electronics end-products¹. Since 2014, SOMO has focused more specifically on the use of hazardous substances in the production phase and on responsible chemicals management.

LAC and LESN have been working on occupational health and safety issues (OHS) in the electronics industry in the Pearl River Delta region for a number of years. They have worked with grassroots labour rights groups based in mainland China which deliver direct services to victims of occupational diseases including the provision of legal aid services to workers. These groups also regularly visit workers being treated for occupational injuries or diseases in the Guangzhou Occupational Disease Prevention Hospital and other city hospitals. LAC and LESN have witnessed and reported on an increase in the number of occupational benzene poisoning cases.

Benzene is used in the electronics industry mainly as a cleaning agent for electronic parts. In July 2013, LAC launched the Ban Benzene Campaign in the Pearl River Delta region calling for a blanket ban on the use of this carcinogenic chemical. A draft declaration attracted over 500 signatories from different countries².

In 2014, the campaign used the story of Ming Kunpeng to take the case to Europe. Ming worked for ASMPT, a Shenzhen-based factory. Dutch electronics company ASM International N.V. (ASMI) holds an important minority share (40%) in ASMPT. In 2009, Ming fell ill with leukaemia. In 2013, at the age of 27, and in despair at his deteriorating health and failing medical care, Ming took his own life. LAC contacted the GoodElectronics Network for assistance. On April 29, 2014, an expert

1 For an overview of SOMO's publications on the electronics industry, see here: <https://www.somo.nl/topic/electronics/>.

2 For more background information on the Ban Benzene Campaign, visit the campaign's website at <http://banbenzenecampaign.weebly.com>.

meeting on the issue of chemical poisoning in China was held in the Netherlands, under the auspices of GoodElectronics, the Dutch Federation of Trade Unions (FNV), and FNV Mondiaal. Those attending the meeting included Dutch trade union representatives, NGOs and other experts with a professional interest in manufacturing in China. The discussion focused on benzene because of its usage in different industrial processes in electronics, toys, shoe and furniture manufacturing. LAC asserts that western companies have double standards, abiding by the law in Europe, but exposing Chinese employees to hazardous substances³. The campaign's message was picked up by the Dutch media.⁴

The case of Min Kunpeng triggered GoodElectronics to commission research into ASMI which SOMO conducted. In this report SOMO argues that ASMI should take responsibility for addressing health risks at the factories of its former subsidiary company. Being a minority shareholder of ASMPT is no excuse for inaction, the report concludes⁵.

1.2 “Meeting the Chemical Challenge”

In January 2015, the GoodElectronics Network and the International Campaign for Responsible Technology (ICRT) along with key allies in occupational and environmental health and safety in the global electronics industry met to discuss a life cycle approach to the use of toxic chemicals. The meeting focused on developing a common understanding of the problems caused by irresponsible usage of toxic chemicals, building a unified platform, devising strategies to address these problems, and agreeing on better coordination of activities. Key topics for exchange and discussion included: the right-to-know about chemical hazards (for workers and communities); monitoring throughout the supply chain (in factories, waste discharges, bio-monitoring of workers); building capacity to make improvements throughout the life cycle of electronics (bearing in mind that fundamental labour rights include the right to freedom of association and collective bargaining).

Consequently, in March 2015, GoodElectronics, ICRT and their allies around the world issued a “Challenge to the global electronics industry” on the use of chemicals⁶. In June 2015, GoodElectronics and ICRT published “Meeting the Challenge”, a document which included detailed recommendations for the industry on how they might address the issue⁷. It calls upon the industry to adopt safer and more sustainable manufacturing practices and proactively reduce and eliminate chemical and physical hazards by developing and adopting safer alternatives. All of these changes are necessary to protect and promote human rights, workers' rights and the environment.

3 Chinese activists invited by FNV and GoodElectronics discuss chemical poisoning, 2 May 2014, <http://goodelectronics.org/news-en/chinese-activists-invited-by-fnv-and-goodelectronics-discuss-chemical-poisoning>, accessed on 8 July 2016.

4 Elektronica-industrie maakt vuile handen in China, EenVandaag, 16 April 2014, http://www.eenvandaag.nl/buitenland/50695/elektronica_industrie_maakt_vuile_handen_in_china; accessed on 8 July 2016.

5 ASM International Company profile, SOMO, April 2014, <https://www.somo.nl/wp-content/uploads/2014/04/ASM-International.pdf>.

6 Challenge to the Global Electronics Industry. Make the production process safer and prevent illness and cancer from dangerous chemicals, March 2015, http://goodelectronics.org/publications-en/Publication_4222.

7 “Meeting the Challenge” – detailed recommendations for the electronics industry regarding the use of chemicals, 12 June 2016, <http://goodelectronics.org/news-en/meeting-the-challenge-2013-detailed-recommendations-for-the-electronics-industry-regarding-the-use-of-chemicals>.

As part of the Challenge, GoodElectronics and ICRT call on the electronics industry to:

- Respect human rights, workers' and community rights, including:
 - The right to a safe and healthy workplace;
 - The right to healthy communities and a safe environment;
 - The right to know what hazards are present in electronics workplaces and surrounding communities;
 - The right to an effective remedy when harm occurs;
 - The right of workers to organise unions without interference and to bargain collectively.

Specifically, GoodElectronics and ICRT are challenging the industry to take concrete actions, throughout the supply chain:

- Be transparent;
- Use safer chemicals;
- Protect workers;
- Promote, guarantee and defend the participation of workers and communities;
- Protect communities and the environment;
- Compensate and remediate for harm to people and environment.

GoodElectronics and ICRT stress the Precautionary Principle: When an activity threatens harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically.

In the spring of 2015, LAC documented the cases of a number of Foxconn workers in the Pearl River Delta who were diagnosed with leukaemia. The Guangzhou Prevention and Treatment Centre for Occupational Diseases (PTCOD) confirmed that some of these workers were suffering from occupational benzene poisoning, and others from occupational cancer. In June 2015, LAC and a number of Taiwanese labour organisations together with independent trade unions organised activities around these cases: the "Anti-Sweatshop Technology Week" at the Hon Hai 2015 Annual General Meeting, including a public protest outside the Hon Hai Precision headquarters. (Hon Hai Precision is the Taiwanese parent company of Foxconn.)

1.3 Methodology

The research, and preparative activities, took place between November 2014 and May 2015. The research combined field research and desk research. Both qualitative and quantitative approaches for gathering data were used. Respondents were questioned through a questionnaire and in-depth interviews. Throughout the field research, LAC and LESN monitored the progress of the process. LESN was in charge of data analysis. LAC wrote up the findings. SOMO was in charge of the final editing and the review process. Because of the need to check and double-check information, some time has elapsed since the initial field research. It must also be noted that the overall socio-political environment in mainland China is not encouraging for labour rights organisations to conduct critical research. LAC and LESN have to operate very carefully.

What are benzene and n-hexane?

Benzene is a colourless, flammable sweet-smelling liquid which evaporates quickly when exposed to air. It is used mainly as a starting material in the production of other chemicals, including plastics, lubricants, rubbers, dyes, detergents, drugs, and pesticides. It is also used as an industrial solvent, i.e. a substance that can dissolve or extract other substances. In the USA, though benzene is widely used in industry, but its specific use as a solvent has decreased because of its adverse health effects¹.

In China, however, benzene is still used in abundance in glue for shoes, coatings for toys, cleaning agents for electronic parts, etc. even though the International Agency for Research on Cancer (IARC) has classified benzene as a Group 1 carcinogen². According to the IARC there is *“sufficient evidence in humans for the carcinogenicity of benzene. Benzene causes acute myeloid leukaemia/acute non-lymphocytic leukaemia. Also, a positive association has been observed between exposure to benzene and acute lymphocytic leukaemia, chronic lymphocytic leukaemia, multiple myeloma, and non-Hodgkin lymphoma. There is strong evidence that benzene metabolites, acting alone or in concert, produce multiple genotoxic effects at the level of the pluripotent haematopoietic stem cell resulting in chromosomal changes in humans consistent with those seen in haematopoietic cancer. It has been linked to various bone marrow anomalies including leukaemia and anaemia.”*³

GreenScreen for Safer Chemicals assigned benzene a GreenScreen® Benchmark Score of 1 (“Avoid-Chemical of High Concern”) as it has High Group I Human Toxicity (High carcinogenicity, mutagenicity, reproductive toxicity, and developmental toxicity). This score assignment is based on sufficient evidence in humans, clear evidence of genotoxicity and from its listing by almost all authoritative bodies⁴.

All occupational diseases have their own latency pattern⁵. The average latency period of benzene-induced leukaemia is 11.4 years⁶ where the average period of exposure was positively correlated to the risk of leukaemia⁷.

N-hexane is another potential harmful and toxic chemical used in the electronics industry. It is used as a solvent and is highly flammable. . A series of health risks are linked to n-hexane. The substance can be irritating to the eyes, respiratory system and skin.

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- 1 Benzene (CAS# 71-43-2) GreenScreen® for Safer Chemicals Assessment, page 2, Prepared by ToxServices LLC, June 25, 2014
 - 2 Benzene Monograph, Volume 100F, page 285, International Agency for Research on Cancer (IARC), <http://monographs.iarc.fr/ENG/Monographs/vol100F/mono100F-24.pdf>
 - 3 Idem, page 285.
 - 4 Benzene (CAS# 71-43-2) GreenScreen® for Safer Chemicals (GreenScreen®) Assessment, Prepared by ToxServices LLC, June 25, 2014
 - 5 James Leigh, Petra Macaskill, Eeva Kuosma and John Mandryk, ‘Global Burden of Disease and Injury Due to Occupational Factors’ (1999) 10(5) Epidemiology 626, 629.
 - 6 N Yin, G L Li, F D Tai, Z I Fu, C Jin, Y J Chen, S J Luo, P Z Ye, J Z Zhang, G C Wang, ‘Leukaemia in Benzene Workers: a Retrospective Cohort Study’ (1987) 44 Br J Ind Med 124, 126.
 - 7 A Yardley-Jones, D Anderson, D V Parke, ‘The Toxicity of Benzene and Its Metabolism and Molecular Pathology in Human Risk Assessment’ (1991) 48 British Journal of Industrial Medicine 437, 442.

It is very toxic to aquatic organisms and can cause long-term adverse effects to the aquatic environment. If n-hexane is swallowed or inhaled it can cause drowsiness and dizziness, impair fertility and seriously damage health⁸.

8 ChemicalBook, CAS DataBase List, 110-54-3, http://www.chemicalbook.com/CASEN_110-54-3.htm, accessed on 23 August 2016.

1.3.1 Respondents

Respondents were selected using convenience snowball sampling. Convenience sampling is a non-probability sampling technique in which subjects are selected because of their convenient accessibility and proximity to the researcher. Convenience sampling is the most common of all sampling techniques⁸.

LESN and LAC – with the help of grassroots labour rights groups in China – have built up a joint database of cases of workers who fell ill as a result of exposure to benzene and n-hexane. This database was used as a starting point to identify respondents for the research. Some respondents were found in hospitals in Shenzhen, Dongguan and Guangzhou. A total of 75 respondents were selected. 59 workers completed a questionnaire; another 16 workers participated in in-depth interviews.

Nearly 80 per cent of the respondents who filled out the questionnaire were female. The majority of electronic industry employees are women, and women workers are also, according to LAC and LESN, more likely than their male colleagues to contact grassroots support groups. It may, moreover, be possible that women workers are more susceptible than men to chemical exposure when it comes to the effects on reproductive health⁹. Almost 80 per cent of the female respondents were married.

The age range of respondents (at the time of the research) was 19 – 53 years old. About three quarters of the respondents were between 30 and 49 years old. The longest length of time the respondents had worked in the electronics industry was around 16 years. The shortest time was nine months.

Table 1: Gender and age of the 59 respondents who completed the questionnaire

Gender	Respondents	Age	Respondents
Male	11	under 20	1
Female	42	20 - 29	13
Unknown	6	30 - 39	21
		40 - 49	24
Total	59	Total	59

8 <https://explorable.com/convenience-sampling>.

9 Reset. Corporate social responsibility in the global electronics supply chain, GoodElectronics Network and MVO Platform, October 2009, http://goodelectronics.org/publications-en/Publication_3248.

Of the 16 workers interviewed in-depth, some were the only worker to become ill in their factory. In these cases, pseudonyms have been used and the names of the factories withheld.

1.3.2 Questionnaire and interviews

In November-December 2014, in close consultation with SOMO, the questionnaire and the guidelines for the in-depth interviews were developed. The questionnaire was pre-tested in advance and adapted on the basis of feedback. The final version of the questionnaire was translated into English and Mandarin. The mainland China partner organisations of LAC and LESN distributed and collected the completed questionnaires between January and April 2015. Workers who completed the questionnaire were found in Shenzhen, Guangzhou, Dongguan and Huizhou. The questionnaire was made up of 63 questions, divided into six sections:

- 1 Personal data;
- 2 Work experience;
- 3 Medical history;
- 4 The OSH policy and preventive measures of their employer/factory;
- 5 Legal issues;
- 6 Social services.

In April-May 2015, four researchers conducted 16 in-depth interviews, both by telephone and face-to-face. All the researchers had at least two years' experience in OHS. The team leader has an M.Phil. in Sociology, is well versed in research methodology, and has more than five years' experience in the field of OHS and chemical poisoning.

The overall findings and percentages presented in the report relate to the information provided by the 59 workers who filled out the questionnaire. The 16 in-depth interviews add further insight and detail. Worker testimonies are used in the report, in Boxes and in quotes.

1.3.3 Review

Piecing together information provided by the workers along with information found on the factories' websites in total 36 client companies could be identified. We were, however, able to find relevant contact details of 23 companies, namely Accton, Acer, Apple, Asus, BYD, Canon, Foxconn, Fuji, GE, Gilman Group, Haier, Huawei, Hyundai, Inventel, LG Electronics, Midea, Motorola, Nokia, Philips, Samsung, Sharp, Siemens and Sony. These 23 companies were asked to respond to a draft version of this report. The other client companies could not respond to the draft report and will therefore not be mentioned by name in this report. The contacted companies were also asked to fill out a short questionnaire. SOMO asked the EICC to disseminate the questionnaire and the draft report to the identified EICC members. Eleven companies replied: Acer, Apple, Asus, Canon, Motorola, Foxconn, LG Electronics, Philips, Samsung, Sharp and Sony. Six companies filled out the questionnaire (Asus, Canon, Philips, Samsung, Sharp, and LG Electronics), while five provided information outside the framework of the questionnaire.

2 Background

2.1 The electronics industry in the Pearl River Delta

China is the second largest economy in the world and a major production location for the electronics industry. It is well known as a 'global assembly hub' and has been nicknamed 'the world's factory'. The increase of China's gross domestic product over the last two decades is in part thanks to the strong growth of the electronics industry, which employs millions of workers in China. The Pearl River Delta is one of the biggest manufacturing centres in China and the world. It contains a large cluster of manufacturers from the electronics industry and forms a significant part of China's manufacturing heartland.

Until recently, the electronics industry in China has produced goods principally for international markets, but the domestic market is now rapidly becoming important too. In 2013, more than 70 per cent of revenue was held by foreign investors or Chinese companies based overseas in Taiwan, Hong Kong or South East Asia. Non-Chinese capital, then, is very important in the ICT sector. The following kinds of companies play a key role: foreign multinational companies (e.g. Samsung, Nokia (now Microsoft), IBM, Intel); Chinese companies based overseas in Taiwan, Hong Kong or South East Asia such as ECS (component supplier), AU Optronics (chip foundry), TSMC, Mediatek and ASE (development and assembly companies); Chinese state-owned enterprises and hybrid enterprises, i.e. state-owned hybrids with capital from international financial markets via Hong Kong (e.g. Lenovo, Huawei, ZTE, TCL, SMIC); Chinese private companies – mainly small and medium-sized – including successful start-ups like Celestial Semiconductor and Techfaith (chip and software design)¹⁰. Giant Taiwanese-owned contract manufacturer Hon Hai (parent company of Foxconn) has a key position as strategic supplier to numerous brand name companies.

The Pearl River Delta is one of China's leading economic regions. It includes the cities of Shenzhen, Guangzhou, Foshan and Dongguan. Shenzhen is the first special economic zone since the open door policy was adopted. Economic developments and living standards in Shenzhen are higher than its neighbours. Its statutory minimum wage is higher than Dongguan, Huizhou and even Guangzhou, the provincial capital¹¹.

International brands have found it extremely cost-effective to outsource their manufacturing and assembly processes to numerous first-tier suppliers in China. These suppliers may then subcontract to other smaller suppliers and component makers. As such, the manufacturing process tends to become highly specialised. Meanwhile, as almost all suppliers produce for several different brands and/or upper-tier suppliers, it is often difficult for workers to identify and link their work with any particular brand.

10 Improving working conditions in the global electronics industry. The ICT sector in the spotlight. Leverage of public procurement decisions on working conditions in the supply chain, Electronics Watch Consortium, c/o WEED e.V., 2014, http://electronicswatch.org/the-ict-sector-in-the-spotlight_723519.pdf, p 18.

11 General information on the Pearl River Delta: https://en.wikipedia.org/wiki/Pearl_River_Delta, accessed on 24 August 2016.

The respondents mentioned 36 different companies in total; 23 are mentioned by name in this report: Accton, Acer, Apple, Asus, BYD, Canon, Foxconn, Fuji, GE, Gilman Group, Haier, Huawei, Hyundai, Inventel, LG Electronics, Midea, Motorola, Nokia, Philips, Samsung, Sharp, Siemens and Sony. Four brands were mentioned more than the others: Apple (seven times), Sony (seven times), Samsung (four times), and Nokia (four times). 36 out of 75 respondents did not know the customers of their factory.

2.2 Trends in occupational disease in China

Alongside this economic success story, there is a darker side to the electronics industry. There has been an alarming increase in work-related injuries and occupational diseases, particularly in the small and medium-sized enterprises where migrant workers from other parts of China form the core of the workforce¹².

Available figures show that rates of occupational chemical poisoning and occupational cancer are increasing in China. A small drop in the number of reported cases was registered in 2013.

Table 2: Acute and chronic occupational poisoning in China, 2008-2013¹³

Year	# of cases of acute occupational poisoning	# of cases of chronic occupational poisoning	Total number of occupational poisoning	Compared to previous year	# of fatal cases
2008	760	1,171	1,931	nil	49
2009	552	1,912	2,464	+21.63	21
2010	617	1,417	2,034	-21.14	28
2011	590	1,541	2,131	+4.55	45
2012	601	1,040	1,641	-29.86	20
2013	637	904	1,541	-6.49	25

China's National Health and Family Planning Commission (formerly known as the Ministry of Health) highlighted in its Briefing on the Supervision and Management of National Occupational Health and Radiation Hygiene that *"an overwhelming majority of occupational chemical poisoning and occupational cancers were found in non-ferrous metals, agro-food processing, electronics,*

12 World Health Organization, 'Working towards Improving the Performance and Access to Occupational Health Service' (2009) 15 GOHNET Newsletter <http://www.who.int/occupational_health/publications/newsletter/newsletter_15_regions/en/index8.html>.

13 中华人民共和国国家卫生部 [Ministry of Health of China], 《关于2007年全国职业卫生和放射卫生监督管理工作情况的通报》 [Briefing on the Supervision and Management of National Occupational Health and Radiation Hygiene in 2007]; 《关于2008年全国职业卫生监督管理工作情况的通报》 [Briefing on the Supervision and Management of National Occupational Health in 2008]; 《通报2009年职业病防治工作情况》 [Briefing on the Prevention of Occupational Diseases in 2009]; 《通报2010年职业病防治工作情况和2011年重点工作》 [Briefing on the Prevention of Occupational Diseases in 2010 and Priorities in 2011]; 《关于2011年职业病防治工作情况的通报》 [Briefing on the Prevention of Occupational Diseases in 2011]; 《关于2012年职业病防治工作情况的通报》 [Briefing on the Prevention of Occupational Diseases in 2012]; 《关于2013年职业病防治工作情况的通报》 [Briefing on the Prevention of Occupational Diseases in 2013]; 《2014年全国职业病报告工作报告》 [Report of National Occupational Diseases in 2014].

footwear, metallurgy, machinery, and chemical industries where substances containing benzene are commonly used".¹⁴

China's official national statistics on this issue should, say LAC and LESN, be understood only as an indication of the situation. While they may show a macro tendency, they cannot be taken as absolute.

Dr Huang Hanlin, Head of the Guangdong Prevention and Treatment Centre for Occupational Diseases (PTCOD), the officially designated hospital on the provincial level, estimates that the actual figures for occupational diseases could be up to 40 times higher than those in national statistics, given what is happening in Guangdong province¹⁵. Dr Huang testifies that in Guangdong province from 2008-2014, 20 – 30 new cases were documented annually¹⁶

2.3 Leukaemia

Leukaemia is a cancer of the tissues that form white blood cells. Leukaemia is the most commonly occurring occupational cancer and is known to be caused by prolonged exposure to benzene. Acute (short-term) inhalation exposure to benzene may cause drowsiness, dizziness, headaches, as well as eye, skin and respiratory tract irritation, and, if inhaled at high levels, unconsciousness. Chronic (long-term) inhalation exposure in occupational settings has caused various blood disorders, including a reduction in the numbers of red blood cells and aplastic anaemia¹⁷.

Table 3: Leukaemia caused by benzene in China, 2008-2013¹⁸

Year	# of cases of leukaemia caused by benzene	Compared to previous year
2008	17	nil
2009	22	+23%
2010	29	+24%
2011	52	+44%
2012	53	+2%
2013	41	-29%

14 中华人民共和国国家卫生和计划生育委员会 [National Health and Family Planning Commission of China], 《关于2013年职业病防治工作情况的通报》 [Briefing on the Prevention of Occupational Diseases in 2013 (30 June 2014) <<http://www.nhfp.gov.cn/jkj/s5899t/201406/ed8ed220d0b74010bcb6dcd8e340f4fb.shtml>>.

15 Original text is written as “实际病例数，在年均六七百例基础上，还要再乘40倍”。广州日报[Guangzhou Daily], 《职业病四成尘肺三成中毒 新发病年增三成》 [40% Pneumoconiosis, 30% Poisoning, New Occupational Diseases Cases Annual Growth by 30%](26 November 2014).

16 Ibid.

17 United States Environmental Protection Agency EPA, Technology Transfer Network – Air Toxics Web Site, Benzene, <https://www3.epa.gov/airtoxics/hlthef/benzene.html>, accessed on July 13, 2016.

18 Ministry of Health of China (see footnote 22).

2.4 Reproductive health

Inhalation of high levels of benzene has also affected the reproductive health of women. Adverse effects on the developing foetus have been observed in animal tests.

The United States Environmental Protection Agency acknowledges the reproductive and developmental toxicity of benzene, as demonstrated in human epidemiological studies¹⁹. GreenScreen for Safer Chemicals assigned benzene a score of 'High' for reproductive toxicity based on data that classified benzene to the GHS category 1B and on being listed by an authoritative list. This is supported by the GHS category 1B evaluation result by the screening list GHS-New Zealand. GreenScreen® criteria classify chemicals as a High hazard for reproductive toxicity when they are classified to GHS category 1 and/or are listed by Prop 65 (CPA 2012a)²⁰.

2.5 International guidelines on occupational safety and benzene

In 1946, the United States occupational exposure limit for benzene, as decreed by the American Conference of Governmental Industrial Hygienists, was 325 mg/m³ (100 ppm).²¹

In 1967, the European Union classified benzene as a category 1 carcinogen.²²

In 1971, the International Labour Office (ILO) first adopted the Convention Concerning Protection against Hazards of Poisoning Arising from Benzene (Benzene Convention, C136).²³ The Benzene Convention highlights the availability of benzene-free substitutions²⁴ and states that, when using benzene-containing substances it is important to ensure that *“the process is carried out in an enclosed system or where there are other equally safe methods of work”*.²⁵ The Benzene Convention has been ratified by 38 ILO Member States; China has not yet ratified Convention 136.

European Council Directive (76/769/EEC) of 1976 puts restrictions on benzene that is sold on the market as a substance or as a constituent of mixtures in concentration equal to, or greater than, 0.1% by mass.²⁶

In March 2010, the ILO issued a revised list of occupational diseases, including 'occupational diseases caused by exposure to agents arising from work activities' and 'diseases caused by chemical agents'. It includes occupational diseases caused by benzene or its homologues as well as by nitro- and amino-derivatives of benzene or its homologues. Benzene and toxic nitro- and

19 United States Environmental Protection Agency EPA, Technology Transfer Network – Air Toxics Web Site, Benzene, <https://www3.epa.gov/airtoxics/hlthef/benzene.html>, accessed on July 13, 2016.

20 Ibid. <https://www3.epa.gov/airtoxics/hlthef/benzene.html>.

21 Alexander C. Capleton, Leonard S. Levy, 'An Overview of Occupational Benzene Exposures and Occupational Exposure Limits in Europe and North America (2005)' 153-154 *Chemico-Biological Interactions*, p. 43-53.

22 Council Directive 67/548/EEC of 27 July 1976 on the Approximation of the Laws, Regulations and Administrative Provisions of the Member States Relating to Restrictions on the Marketing and Use of Certain Dangerous Substances and Preparations Directive (1967) OJ 196/1.

23 Convention Concerning Protection against Hazards of Poisoning Arising from Benzene, opened for signature 23 June 1971 (entered into force 27 July 1973) ('Benzene Convention', C136).

24 Benzene Convention C136, art 2(1).

25 Benzene Convention C136, art 4.

26 Ibid.

amino-derivatives of benzene or its homologues are listed as agents causing occupational cancer²⁷.

Nowadays most European and North American countries have set the occupational exposure limit for benzene at 1.63–3.25 mg/m³ (0.5–1 ppm)²⁸.

2.6 Chinese legislation with regard to occupational health and safety

In China, the right to occupational health is enshrined in the Law on the Prevention and Control of Occupational Diseases (LPTOD)²⁹. In fact, four chapters and 46 articles of the LPTOD focus on the prevention and control of occupational diseases, the supervision and inspection of preventive measures and the legal responsibilities allocated between all levels of governments and employers. The Labour Law and the Work Safety Law also impose such duties³⁰. LAC and LESN assert, however, that there is a wide lack of awareness and even disregard for these laws. This research supports that view.

In China, the permissible concentration of hazardous chemical agents – time weighted average (PC-TWA) is 6 mg/m³ – whereas the permissible short-term exposure limit (PC-STEL) is set at 10 mg/m³³¹.

2.7 Occupational disease: from diagnosis to compensation

LAC and LESN, and their mainland China partners, have accompanied many workers suffering from an occupational disease as they attempt to get an official occupational disease diagnosis, medical care, compensation and redress.

27 International Labour Office, List of Occupational Diseases (Revised 2010): Identification and Recognition of Occupational Diseases: Criteria for Incorporating Diseases in the ILO List of Occupational Diseases (2010), http://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---safework/documents/publication/wcms_125137.pdf.

28 Alexander C. Capleton, Leonard S. Levy, 'An Overview of Occupational Benzene Exposures and Occupational Exposure Limits in Europe and North America (2005)' 153-154 *Chemico-Biological Interactions*, p. 43-53.

29 《中华人民共和国职业病防治法(2011修正)》 [Law of the People's Republic of China on the Prevention and Control of Occupational Diseases (2011 Amendment)] (People's Republic of China) National People's Congress, Order No 52, 31 December 2011, art 4.

30 Labour Action China, A Joint Parallel Report Concerning China for Consideration by United Nations on Economic, Social and Cultural Rights at its 51st Session (2014).

31 中华人民共和国卫生部 [Ministry of Health of the PRC] 《中华人民共和国国家卫生标准 (GBZ 2.1-2007) 工作场所有害因素职业接触限值化学：有害因素》 [Occupational Exposure Limits for Hazardous Agents in the Workplace: Chemical Hazardous Agents] (2007).

In line with Chinese labour law, LAC and LESN distinguish four phases that workers go through when an occupational disease is suspected:³²

- 1 A designated government hospital must provide an official diagnosis;
- 2 The local human resources and social security bureau must verify and confirm that the disease is work-related;
- 3 A worker's labour capacity (i.e. the level of disability resulting from the occupational disease) must be assessed;
- 4 Redress is sought through a private out-of-court settlement or litigation.

There are two opportunities during this process for both employee and employer to appeal any decisions that are made. If a private/out of court settlement agreement cannot be reached, mediation is the only available option remaining.

From experience, LAC and LESN say that, if there are no major hiccoughs, the entire process can take at least nine months. Complicated cases, however, can take four or five years, from first diagnosis to receipt of compensation. . LAC and LESN say many workers have found themselves trapped in unthinkably complicated bureaucracy.

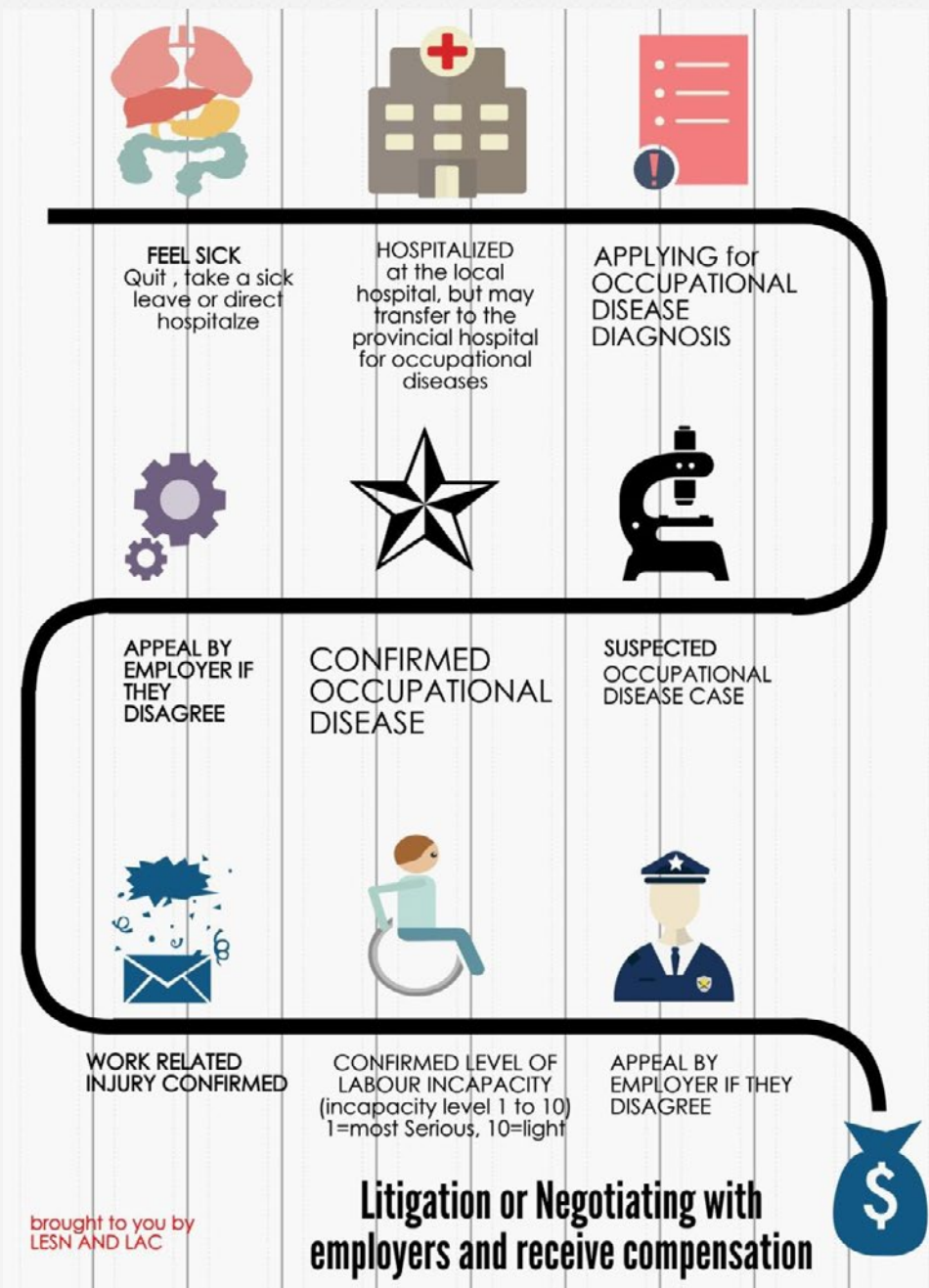
The onus of proof lies with the worker and the standard of proof required is high. Additionally, there are various other obstacles in China that complicate the victim's quest for recognition/compensation often fail as a result of these too:

- Workers are not employed by the factory where they work, but by a labour agency;
- Workers do not have a formal employment contract;
- Records of health checks go missing;
- Data of health and safety inspections go missing;
- Employers fail to report accidents or illnesses;
- Employers refuse to cooperate when workers apply for certificates to prove an injury or an illness;
- It takes a long time before workers get a formal diagnosis. Sometimes workers never get an occupational diagnosis or die before the process is completed.
- When workers fall ill and start showing symptoms of an occupational disease, their employer may force them to take unpaid sick leave.
- The contracts of workers on sick leave are often not renewed, leaving vulnerable workers in a financially precarious situation.
- In some cases, employers immediately terminate the contracts of workers who start litigation;
- If their contract is terminated, workers are not covered by social insurance.
- Often workers have to bear all the medical costs themselves. Some workers need to take medication for the rest of their lives. Sometimes, when workers are not able to bear the continuous costs of medication they have to stop treatment and they die.

32 According to the "Administrative Measures for Diagnosis and Identification of Occupational Diseases Regulation (Ministry of Health Order No. 91)" 《职业病诊断与鉴定管理办法》 (卫生部令第91号, "The Law of the People's Republic of China on Labour Dispute Mediation and Arbitration (Order no 80. of the President of the People's Republic of China)" 中华人民共和国劳动争议调解仲裁法(中华人民共和国主席令十届第 80 号), Regulations on Work-Related Injury Insurance of Guangdong Province (Standing Committee of the 10th People's Congress of Guangdong Province [2004] No. 24) 《广东省工伤保险条例》 .

DIAGNOSTIC PROCEDURE IN CHINA

in general situation

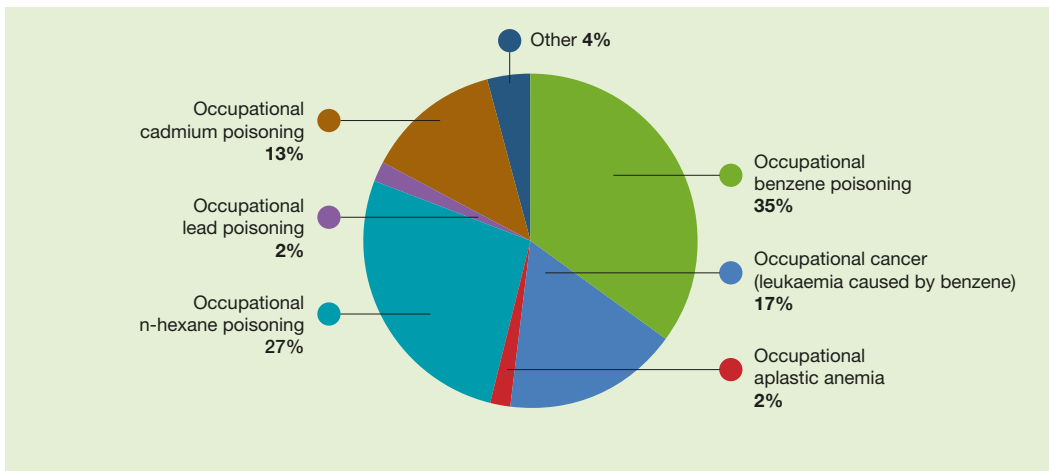


3 Findings and analysis

3.1 Benzene and n-hexane: serious threats to the health and life of Chinese electronics workers

Over one third (35 per cent) of the 59 workers who completed the questionnaire were diagnosed at the PTCOD or another authorised hospital as having occupational benzene poisoning. Over one quarter of respondents (27 per cent) said they were suffering from occupational n-hexane poisoning. Of the 59 respondents, 17 per cent reportedly received a diagnosis of occupational cancer (leukaemia) caused by benzene.

Figure 1: Diagnoses of the 59 respondents who completed the questionnaire



During the field research period from January to May 2015, most respondents were hospitalised. Less than one quarter of this group had been formally assessed to determine their level of disability.

Around one fifth of the respondents had started legal procedures to claim compensation, either by litigation or private settlement. Only one worker out of 59 respondents had obtained compensation from his employer during the research period.

Yang Yang's story

Yang Yang worked for a Hong Kong-owned company in Dongguan. His main job was making keyboards for brand name customers, including Hyundai. His work involved using cleaning solvents to remove dust from the surfaces of products. Yang Yang was the only interviewee who had received compensation at the time of the research.

In 2012, Yang Yang had a low fever and was soon hospitalised. In 2013, he received an official diagnosis of occupational leukaemia. His employer, however, refused to pay his medical expenses for the period prior to the diagnosis, and also refused to pay his wages for the period post-diagnosis. Financially, Yang Yang was struggling so he applied for a labour capacity appraisal. He was graded as Level 6. On the basis of this assessment, Yang Yang started litigation for compensation. In 2014, the court concluded that Yang

3.2 Women on the line

A large proportion of respondents to the questionnaire were women, most of whom were married. Their answers to the questionnaire and interview questions make it clear that many were first exposed to benzene when they were in their twenties. As with other occupational diseases, occupational benzene poisoning has its own incubation period before symptoms develop and it is likely that being exposed to different chemical substances at the same time or at consecutive moments during the working day will affect the latency period. LAC and LESN say that demanding physical labour and working night shifts also affect women's health³³.

3.3 Educational background

Over 65 per cent of respondents and 71 per cent of their spouses went to junior high school in their rural hometown, before migrating to the coastal urban area. This defines them as modestly educated. LAC and LESN conclude from the research that most workers have a low understanding of OHS risks and are ill-informed of their rights.

3.4 Migrant workers

All but two of the 59 respondents indicated they had a rural household registration or *hukou*, despite most having lived and worked in the urban areas of the Pearl River Delta for years. Internal migrant workers constitute a significant part of the workforce in this region. More than 70 per cent

33 Labour Action China, A Joint Parallel Report Concerning the People's Republic of China for Consideration by the United Nations Committee on the Elimination of All Forms of Discrimination against Women at its 59th Session (2014) [26]. See also 《中华人民共和国劳动法》[Labor Law of the People's Republic of China] (People's Republic of China) National People's Congress, Order No 28, 5 July 1994, arts 52-7; 《中华人民共和国安全生产法(2014修正)》[Work Safety Law of the People's Republic of China] (People's Republic of China) National People's Congress, Order No 13, 31 August 2014, arts 21 and 28-9; Law on the Prevention and Control of Occupational Diseases, arts 8-18.

Yuan Zi-mei's story

From 2013, Yuan Zi-mei worked in a small unregistered Chinese-owned workshop producing glass components. According to Yuan Zi-mei, Apple was one of their customers. Yuan regularly used cleaning solvents in her work and worked extremely long hours.

When she was four or five months pregnant, Yuan began feeling ill and weak. She did not have enough strength to stand up and fell if she tried to walk. Yuan's husband was the first to suspect that her sickness might be due to chemical poisoning.

When Yuan went to the mother and child health care centre for a regular check-up, the medical professional asked about her work. Yuan told the doctor what she did and about the cleaning solvents she used. The doctor immediately said that Yuan had an occupational disease and should have an abortion.

Because Yuan's pregnancy had not been approved by the family planning commission, she could not have an abortion at a major hospital and was in such poor health that the smaller hospital in her home town refused to admit her. Finally Juan had an abortion in the seventh month of her pregnancy.

Because the factory did not have a business licence, Yuan did not have an employment contract so cannot demand an occupational disease diagnosis. Her medical expenses are currently being paid by her employer but she constantly has to remind her boss and at one stage he owed the hospital RMB 10,000.

The late abortion damaged Yuan both physically and mentally and though she would love to have another baby she is too weak, her family is poor, and she is worried that her body might still be poisoned.

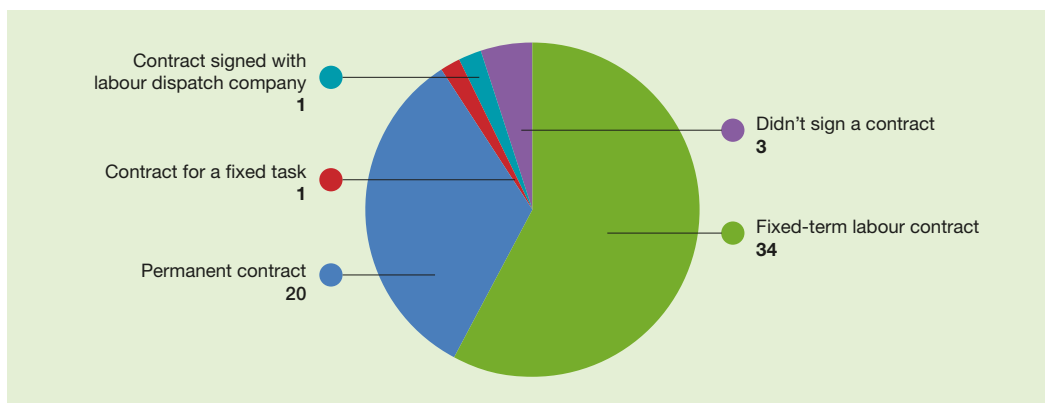
of the respondents have worked in either Shenzhen or Dongguan, both traditional industrial cities, since the adoption of the open door policy in the 1990s.

Half of the 59 respondents said their spouse was unemployed at the time of the research. LAC and LESN conclude that many of the respondents are likely to have experienced financial hardship.

3.5 Contractual questions

19 of the 59 respondents (33 per cent) had signed a permanent contract and 34 respondents (58 per cent) had a fixed-term contract. Of the latter group about a third had a one-year contract. The average contract period was three years.

Figure 2: Types of employment contracts of the 59 respondents



The Chinese Labour Contract Law came into effect on January 1, 2008. It stipulates that every worker is entitled to an employment contract with his or her employer and that employers must give workers a copy of the signed contract. Just under a third of respondents, however, said they had not received a copy of their signed contract. This is also significant in relation to Article 30 of the Law on the Prevention and Treatment of Occupational Diseases (LPTOD), which states that employers must disclose, in the employment contracts, all potential industrial hazards and proposed preventive measures. Workers have a right to be informed about industrial hazards which may affect their health but employers are clearly failing to comply with this requirement.

Lac and LESN stress that simply citing the list of chemicals and chemical substances in the contract does not help workers to understand, or protect themselves, from the health hazards posed by these substances.

3.6 Rotation

Rotation can be a good way of preventing over-exposure to hazardous chemicals. Nearly 80 per cent of respondents said, however, that management did not rotate their jobs on a regular basis.

Chen Lian-sheng's story

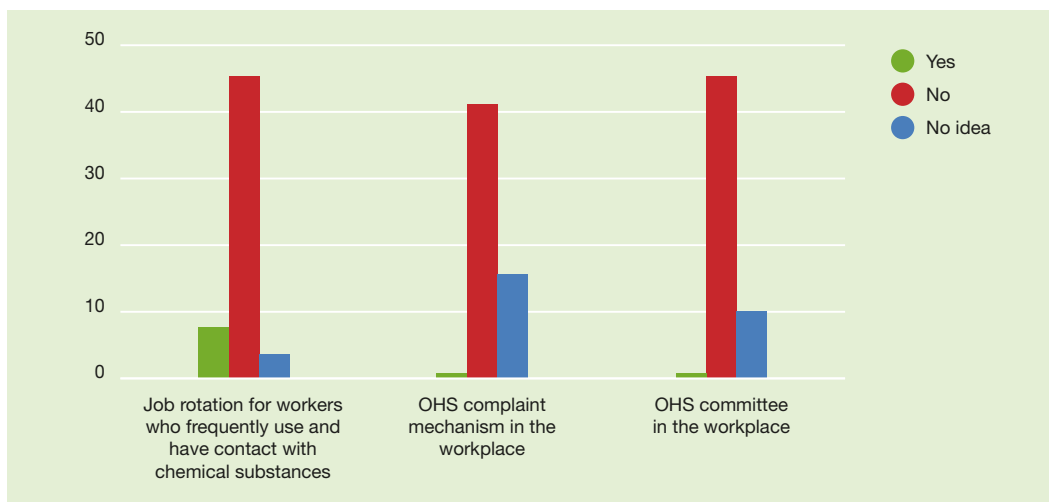
Chen Lian-sheng worked for a US-owned company. Her main jobs were screen printing and cleaning the shells of headsets. She handled 'oil solvent', 'thinner', 'clean oil', 'grease oil' and 'dirty oil'. Workers wore gloves when inspectors visited from the Human Resources and Social Security Bureau (HRSSB) but after the inspectors left, the workers were not allowed to wear any protection on their hands.

In 2013 Chen started to become ill. Her body was swollen and covered in acne. Her skin was itchy and painful. Following Chen's demands, the employer arranged a health check for her but then refused to let her see the results.

Chen continued to feel ill and found out, through one of her relatives who is a doctor, that she also had a low white blood cell count. She was finally hospitalised. She still has bad headaches and dizziness. Her medical expenses cost over RMB 20,000 a month though the factory only pays her RMB 1,808 a month (as per the current municipal statutory minimum wage).

Chen comes from the Bai tribe and, as an ethnic minority, is allowed to have two children. She has one child and would like another but her medication has stopped her menstruating. Her family suffers financial hardship.

Figure 3: OHS mechanisms in respondents' workplace



Some respondents explained how they were assigned a different position following complaints they had made about the bad odour of chemicals. Though timely rotation to another function may be better for the worker if it shortens his or her exposure time to hazardous chemicals, it does not

Yang Mei's story

Yang Mei worked for a Taiwanese company, who supplied components to Apple. On her employment contract, Yang's employers indicated that there were 'no industrial hazards' involved in her work, yet one of her jobs was cleaning mobile phones with alcohol or ethyl alcohol. Yang developed leukaemia and had to have a course of chemotherapy and a bone marrow transplant. The company severed employment relations with Yang.

Her illness has put a massive financial burden on her family. They have borrowed money to pay her medical expenses and her father, brother and boyfriend take it in turns to look after her. She is only 21 years old but has lost all her hair and strength because of the treatment which also involves regular intestinal drainage. Yang wants to fight for her rights. Labour rights activists have advised her to take the case to arbitration.

Shortly after being interviewed in spring 2015, Yang Mei suffered another relapse and was hospitalised again.

Cheng Shu-yi's story

Cheng worked in an OEM factory which received subcontracted orders from other factories. His main responsibility was to monitor quality control. He worked 12 hour shifts and, though he did not have much contact with chemicals, the plant was filled with fumes from soldering, cleaning solvents and thinner.

Cheng was diagnosed with leukaemia and spent time in hospital. Now he is looked after by his parents though his father is very ill. The family suffers great financial hardship. Cheng recalls seeing clients come to visit the plant every six months, *"They came to check our records for pay and benefits, and to rate efficiency. They might inspect the work environment and gave some recommendations such as the installation of fire extinguishers, but this was rare."*

really address the risks or protect other workers who are still being exposed to the chemicals. Rotation is, therefore, not a sufficient preventive measure. LAC and LESN found that management may simply rotate a worker to settle an individual worker's complaint rather than structurally address the OHS problems.

LAC and LESN found that, in some cases, workers were deployed to new positions where they were only paid a basic salary, without the benefits they enjoyed in their previous positions. This amounted to a pay cut. For those workers already ill and shouldering the cost of treatment, this loss of earnings added to their financial hardship.

3.7 Working hours and exposure time

Two thirds of respondents (66 per cent) had a standard contract of 40 hours per week although working overtime was common practice; 43 per cent of respondents indicated that they worked three to four hours of overtime a day. Approximately half of respondents reported that they had less than four days of rest per month. The number of hours spent working are important; longer working hours mean more exposure to hazardous substances.

Exposure limits are generally based on a standard eight-hour working day. In accordance with the US Occupational Safety and Health Administration (US-OSHA), the 1ppm Permissible Concentration-Time Weighted Average (PC-TWA) is based on an eight-hour work shift. The 5ppm Permissible Concentration – Short-Term Exposure Limit (PC-STEL) is based on a 15 minute sampling period³⁴. Measuring the PC-TWA of these workers, therefore, becomes meaningless.

Figure 4: Weekly contractual working hours of respondents

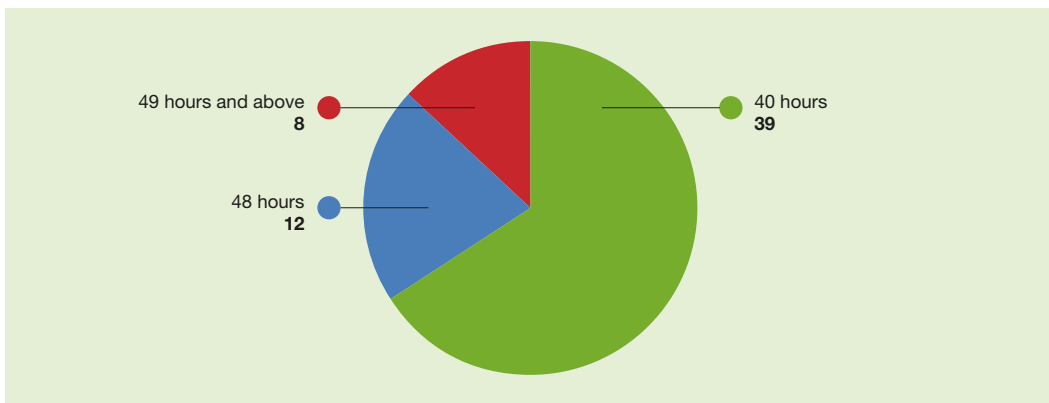
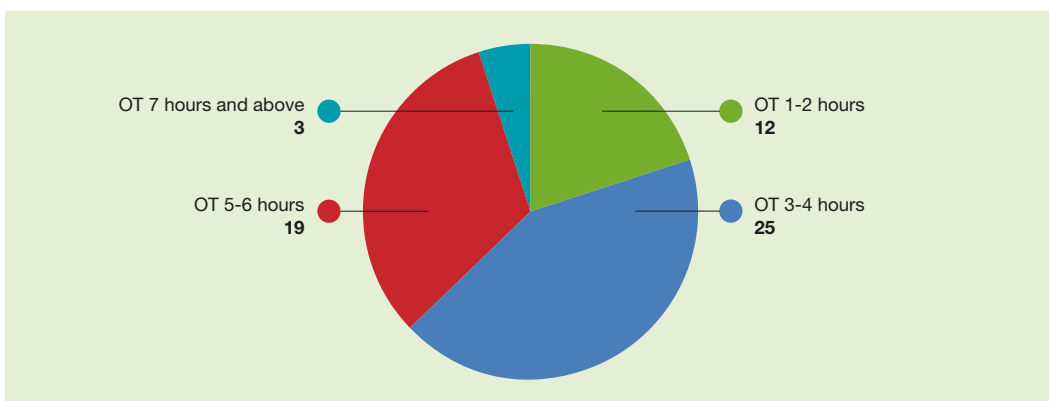


Figure 5: Daily number of overtime (OT) hours for respondents



34 US Department of Health and Human Services, Occupational Safety and Health Guideline for Benzene: Potential Human Carcinogen (1988).

Zhu Yishu's story

Zhu Yishu used to work in a plant which manufactured ICT products principally for Japanese brands, such as Sony, Panasonic and Toshiba. He had contact with thinner, alcohol, solvent naphtha and other chemicals. In 2006 Zhu started experiencing pain in his back, bones and joints. Medical tests also showed his uric acid level was high. He was diagnosed as having acute leukaemia. In 2008 Zhu had a bone marrow transplant but suffered a relapse four years later. He now needs another transplant and though he has found suitable bone marrow for this, the factory is refusing to pay for it.

Zhu claims that his workplace was never inspected by clients and when officials from the Centre for Disease Control and Prevention (CDCP) came to inspect the plant, the manufacturer was notified before the visit and workers were told to conceal things..

Tan Xin's story

Tan Xin worked for a supplier to Sony. Her employment contract listed 'benzene, toluene and xylene' as chemicals she would be using in her work. Her employer provided her with personal protective equipment and training. This did not protect Tan from suffering chemical poisoning. The factory has paid Tan's medical bills and handled her social insurance, but has refused to pay wages arrears, or other compensation. Tan would like to return to live with her family in Foshan, when her treatment ends, but cannot plan ahead until the factory pays her wage arrears.

Zhang Ping's story

By the time Zhang Ping was hospitalised in 2013 he was already suffering from acute leukaemia. He worked in the punch press department of a factory and was in frequent contact with solvent naphtha and anti-rust solvent.

Despite receiving a diagnosis of occupational leukaemia, the factory was reluctant to pay Zhang's medical expenses because they said they feared it would have a negative impact on production.

Zhang claimed that clients did come to audit the factory. *"We would start preparation for their inspection a couple of days beforehand. Management would teach us how to answer the questionnaires. Rewards were given if we answered correctly."*

3.8 Medium-large scale factories manufacturing for well-known brands

Over half of the respondents worked in medium-large scale manufacturing factories with over 500 workers. More than one fifth of these plants were owned by Hong Kong investors or a joint venture.

Figure 6: Size of factory where respondents worked

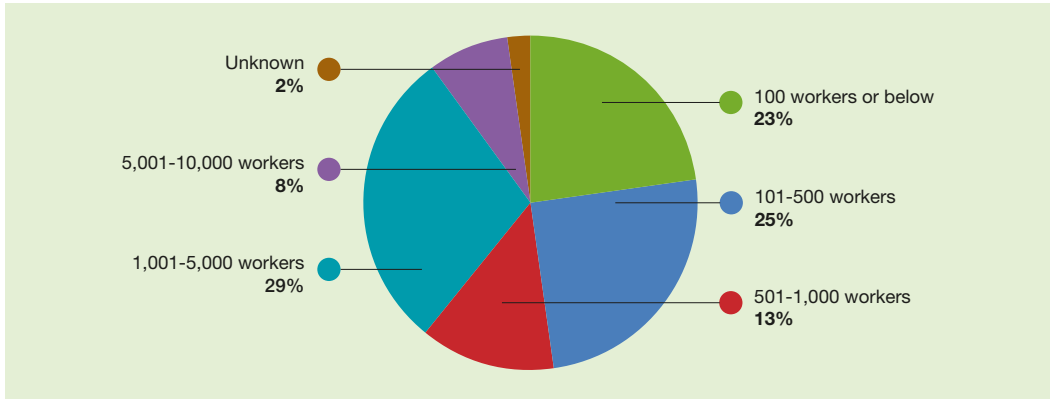
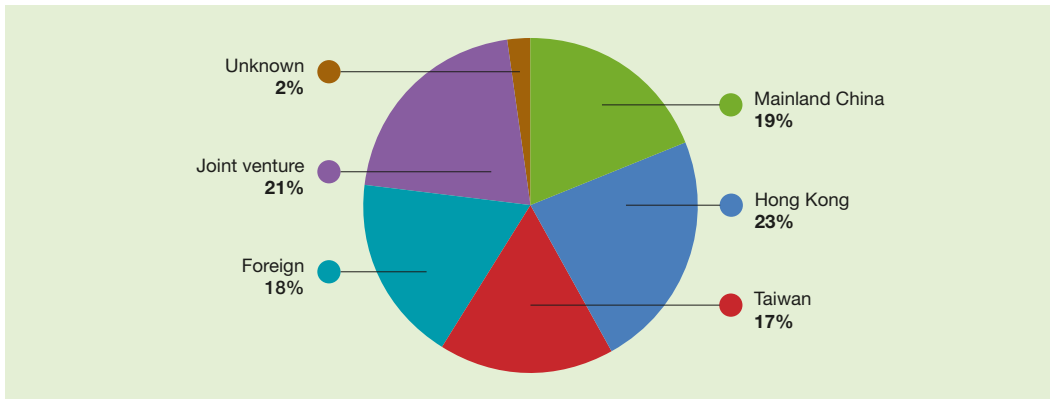


Figure 7: Source of investment for factories



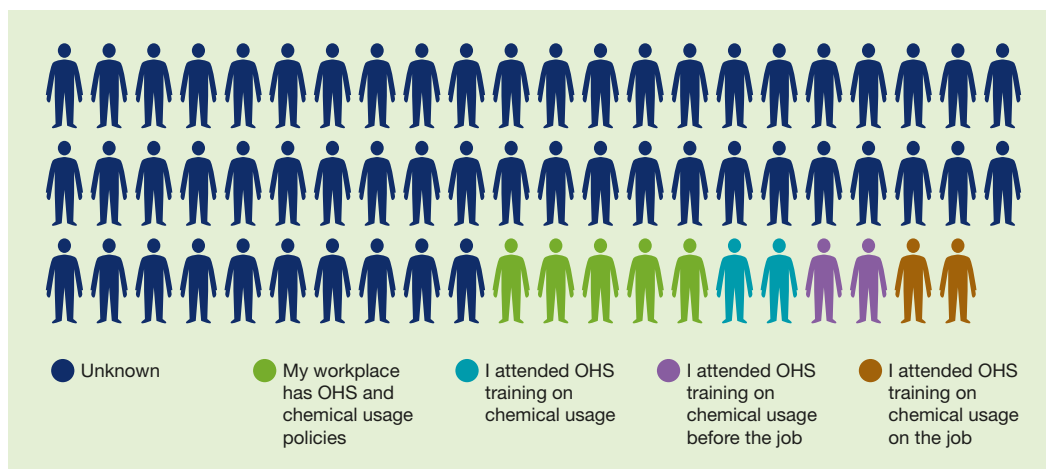
As discussed above, international brands outsource their manufacturing and assembly processes to first-tier suppliers in China. The following companies were mentioned by respondents as client companies of their factories: Accton, Acer, Apple, Asus, BYD, Canon, Foxconn, Fuji, GE, Gilman Group, Haier, Huawei, Hyundai, Inventel, LG Electronics, Midea, Motorola, Nokia, Philips, Samsung, Sharp, Siemens and Sony..

Respondents said that client companies would occasionally come to visit their factories for audits and inspections.

3.9 Poor occupational health awareness and training

The right to occupational health is enshrined in Chinese labour law but only 8.5 per cent of respondents said they had heard of the OHS policy in their workplace.

Figure 8: OHS policies and training in respondents' workplace



This study also revealed a lack of training for workers. The EICC has developed a code of conduct for its member companies, which states: “[w]here hazards cannot be adequately controlled by these means workers are to be provided with appropriate, well-maintained, personal protective equipment and educational materials about risks to them associated with these hazards”.³⁵ Only 3.51 per cent of respondents indicated that they had received any training either before beginning work or while working.

Of those who did receive training, 43 per cent said that the training did not cover and explain the usage of chemical substances (see Figure 10). Half of these respondents could not recall whether the training covered the name and Chemical Abstract Service (CAS) number of chemicals being used in their work, how to properly store these chemicals, and/or the potential hazards of working with such substances. Three quarters of those who received training said they did not understand the emergency treatment and the remaining respondents could not remember whether they received it or not. Two-thirds of respondents stated that they had not seen any material safety data sheet (MSDS) displayed near positions where chemicals were regularly used in the plant.

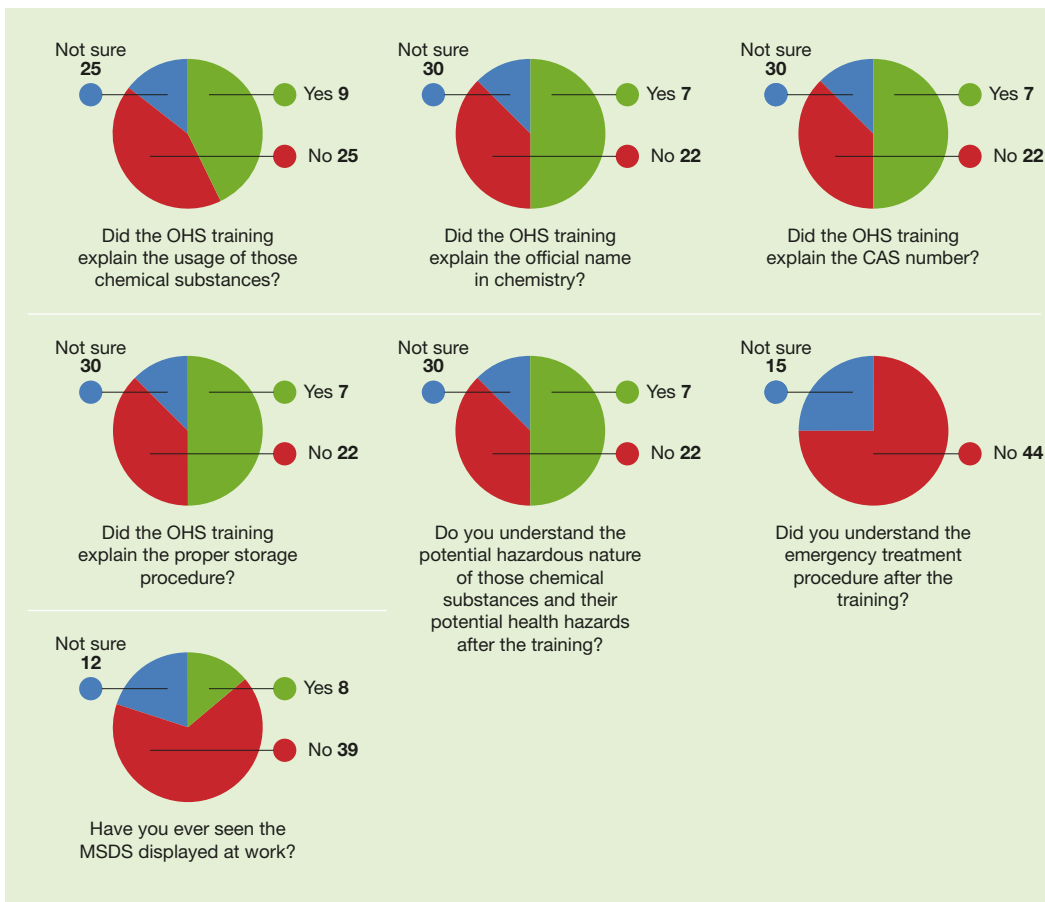
Over 95 per cent of respondents said they had received no OHS training. Lack of OHS training can lead to countless accidents, directly and indirectly. Of those respondents who had received OHS training, two were trained before beginning work, and the other two whilst working.

Whether workers received formal training or informal briefings, only one respondent could remember the training covering topics such as the names, classifications and applications of

35 Electronic Industry Citizenship Coalition, Code of Conduct (version 5.0) (2014).

chemical substances and mixtures, proper storage procedure, and potential hazards. It is crucial to ensure that OHS training sessions are taken seriously and not viewed as ‘water off a duck’s back’.

Figure 9: Actual OHS preventive training on chemical use in the workplace among respondents

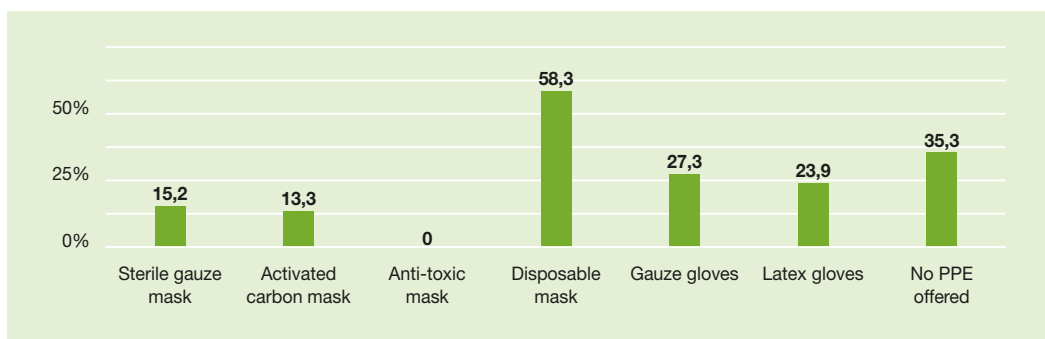


3.10 Poor protection for workers

Effective prevention is always the best way to curb work-related injuries and occupational diseases. Even with comprehensive OHS training on chemical usage, full prevention is not supplied until the worker has been offered the necessary personal protective equipment (PPE).

More than one third of the respondents said they received no protection at all. Where PPE was made available to respondents it was clearly below standard. Nearly 60 per cent of respondents mentioned they were given disposable face masks. More than half of respondents (51.2 per cent) were provided with gauze or latex gloves.

Figure 10: Types of Personal Protective Equipment (PPE) available to respondents



According to the Canadian Centre for Occupational Health and Safety, recommended PPEs for use with workplace chemicals such as benzene include chemical safety goggles, face shields, self-contained breathing apparatus or supplied air respirator (as approved by the National Institute for Occupational Safety and Health), and chemical protective clothing made of suitable materials³⁶.

In the United States, the National Institute for Occupational Safety and Health (NIOSH) has produced a rigorous list of protective equipment, broken down into four categories. Level D is defined as the least hazardous work environment where a worker is required to wear “coveralls or other work clothes, boots, and gloves”.³⁷ A disposable surgical mask or latex gloves obviously offers little protection against exposure to chemicals.

3.11 Symptoms and diagnosis of occupational disease

35 Respondents described the first symptoms of their illness as numbness and malaise.
37 people said they suffered chronic headaches and dizziness.

When the first symptoms of illness appeared, almost half the respondents (49 per cent), had no idea that these were the symptoms of occupational chemical poisoning/cancer because they were similar to the symptoms of many other diseases. As a result, they initially sought medical advice from a hospital at township level. Nearly 80 per cent did not receive the right diagnosis or treatment.

LAC and LESN state that it is open to question whether doctors in such primary healthcare facilities have either the expertise or experience to identify the symptoms of occupational chemical poisoning/cancer. Any delays in diagnosis could also critically affect establishing the causation of the disease which, in turn, affects the later processes regarding wages and compensation.

36 Canadian Centre for Occupational Health and Safety, OSH Answers Fact Sheets: Benzene (last updated 7 January 2013) http://www.ccohs.ca/oshanswers/chemicals/chem_profiles/benzene.html.

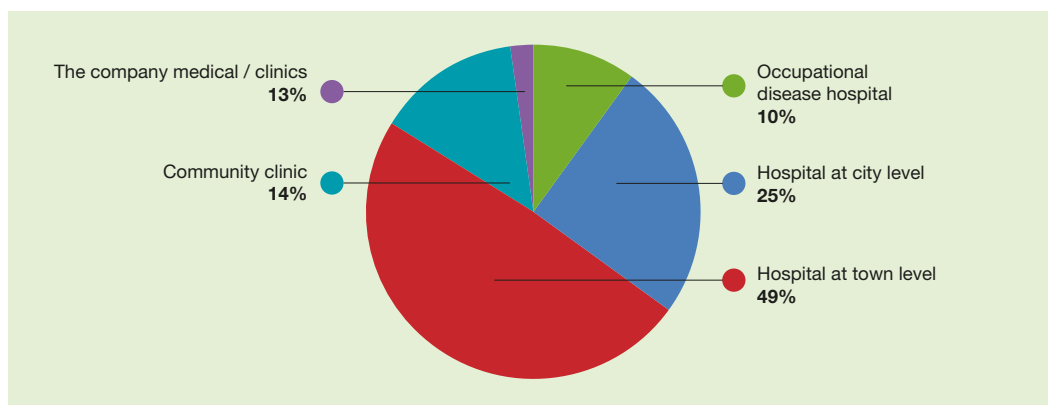
37 National Institute for Occupational Safety and Health, Benzene: Systemic Agent (last updated 6 June 2015) http://www.cdc.gov/niosh/ershdb/emergencyresponsecard_29750032.html.

Table 4: First symptoms of diseases displayed among respondents

Symptoms	Percentage of respondents
Red itchy skin	4,84%
Pale or yellow face	1,61%
Abnormal blood test index	0,81%
Vomit	1,61%
Long-term low-grade fever	3,23%
Skin purpura	2,42%
Lumbago	4,84%
Bleeding gums	2,42%
Easily get a cold	6,45%
Numbness, malaise	28,23%
Dizziness & headache	29,84%
Other	13,71%

In their contact with local hospitals, labour rights NGOs have found that many victims of occupational disease have been hospitalised in the haematology wards instead of in the wards designated for those with occupational diseases. This means that their issues might not be dealt with as a case of occupational disease until they are contacted by labour activists.

Figure 11: Where respondents sought initial medical treatment



3.12 Screening for health problems

Two-thirds of respondents for this research said they had medical tests before they started their new job. One respondent, Yang Mei, said it was as simple as taking blood and Hepatitis B tests, and having an ECG scan. However, the percentage of respondents who received annual on-the-job medical tests was 55.6 per cent. Only 21.4 per cent of respondents said they had undergone medical tests before they left their job. Medical tests prior to leaving a job are particularly important. Tan Xin, for example, was given medical tests when management decided to shut down her workshop. The results showed that she was a possible victim and she was referred

Tan Xin's story

Tan Xin worked in the printing department. She said that workers were given active carbon face masks, anti-static clothing and some finger sets. The plastic finger sets were flimsy and dissolved in the agent used for screen washing. Workers needed to change their sets several times a day.

Yuan Min-er's story

TYuan Min-er worked with 'printing oil', thinner and other solvents. Air circulation in the factory was poor, and exhaust fumes spread all through the plant. She would work 11 hours a day, six days a week with only a 90 minute break each day. She says that no gloves were provided for workers so they wrapped their hands in cling film. In 2013, Yuan's blood tests showed that she had a low level of white blood cells.

to the PTCOD for further examinations. Her case demonstrates the importance of medical checks at all stages of working life.

3.13 Complaint mechanisms

More than 80 per cent of respondents said there was **no OHS committee** in their factory. Complaint mechanisms in the workplace of respondents were found to be weak: 70.7 per cent of respondents said there was no complaint mechanism in place. Workers were also discouraged to speak out on OHS issues. Chen Lian-sheng testified that when the local authorities came to inspect, management threatened workers with dismissal if they said anything to the officials.

3.14 How employers respond to workers' OHS demands

The Chinese Government claims that it should take only nine months to complete the entire procedure from official occupational disease diagnosis to actual compensation. However, when the workers in this research study informed their employers that they were ill, the employers' reaction was mainly negative.

The onus of proof for an occupational disease diagnosis lies with the victim. When employers drag the process out through appeals, it causes greater hardship to the victims – financially, physiologically and psychologically.

The case of Yang Mei is an extreme example. Yang Mei's employer tried different ways to dismiss her while she was ill and unable to work. When Yang Mei first became sick, she was on sick leave

Li Bo's story

Li Bo worked with 'printing oils' and solvents. *"I needed to get a new pair of work shoes every fortnight because the solvent would corrode them."* The factory was also tightly sealed so air circulation was limited. In 2013 Li Bo was diagnosed with leukaemia. Li says that workers now have to wear masks to enter the screen printing room and that ventilation and chemical storage procedures have been improved.

for several months. The company did not inform her of her right to seek an occupational disease diagnosis, but instead suggested she leave her job, claiming that her inability to report for duty was causing production problems for the factory. In the end, management tricked her brother into signing an agreement on her behalf which terminated employment relations. By 'signing' the agreement Yang Mei 'accepted' one month salary, another month salary for economic loss, and RMB 20,000 for medical expenses. The company in this way cunningly terminated employment relations with Yang Mei, thereby avoiding any further responsibility for her illness.

3.15 Workers made to bear the costs of their occupational disease

LAC and LESN found that treatment for occupational chemical poisoning and occupational cancer is very expensive and workers have difficulties in paying their medical bills. Li Bo, for instance, said that he had already spent more than RMB 90,000 on treatment: *"The amount I spent on medical treatment is more than I earn in a year"*.

In 2013, the Dongguan municipal statutory minimum monthly wage increased from RMB 1,310 to RMB 1,510. In 2014, the Shenzhen municipal statutory minimum monthly wage increased from RMB 1,808 to RMB 2,030. On average, respondents received a monthly salary of RMB 1,324. Including overtime pay. Respondents' average monthly salary amounted to RMB 2,620.

The mean of their total monthly expenses, including medical expenses, however, amounted to RMB 451,866; that is 172 times a worker's monthly salary. An average of RMB 367,038 was spent on medical treatment. Comparing the average amount spent on medical expenses to the average monthly income of RMB 2,620, it would take about 140 months to earn.

Clearly, this is a huge financial burden. When entire families depend on the salary of one breadwinner, such levels of expenditure are ruinous. This stories shared by the respondents confirmed this. Many of the respondents fell ill in their prime years, and many had children. The mean number of dependent children that respondents were caring for was 0.39 and 0.75 respectively. Besides looking after children, many were also caring for aging parents. The average number of dependents per respondent came to 3.20 person. Half the respondents stated their spouses were also out of work for different reasons, leaving families often facing financial hardship.

Yi Xiao-na's story

Even now, Yi Xiao-na is not sure where she contracted her leukaemia. She only remembers a certain smell during a particular procedure. *“The smell was very strong and made me feel uncomfortable.”* Ventilation in the factory was poor. Yi became very weak and fainted in her workplace. She had tests at the Peking University Shenzhen Hospital (PUSH) which showed bone marrow poisoning and a high white blood cell count.

When Yi Xiao-na applied for an occupational disease diagnosis, the health authority at the city level demanded improvement following an inspection of the air quality at the plant where she worked. Every worker at the plant heard of that demand and understood its seriousness. Subsequently, the safety inspectorate asked for her cooperation with the inspection and Yi Xiao listed her work history in detail, which helped her obtain the diagnosis. Yi Xiao-na has been receiving hospital treatment for two years and the toll on her family has been enormous. Her parents have been made ill by caring for her and they constantly worry about medical expenses.

Table 5: Workers' income and medical expenditure

	Number of respondents	Min in RMB	Max in RMB	Mean in RMB
Workers' income				
Individual monthly contract salaries	56	340	2,300	1,324
Individual monthly actual salaries	51	1,100	5,200	2,640
Family income	39	1,000	2,100,000	42,046
Medical expenditures				
Total expenses	49	14,000	465,200	451,866
Medical expenses	15		232,600	367,039
Paid by				
Worker	18		320,000	71,555
Loan with employer	10		100,000	17,300
Contributions from other workers	10		170,000	34,700
Donation by employer	15		1,200,000	109,953
Insurance fund for work-related injuries	37		2,500,000	356,178

In some cases, factories asked workers to donate money for their colleagues who had become ill. Any funds collected were loaned or given to the sick workers. In most cases, however, workers had to wait until a diagnosis had been confirmed before their expenditure was covered by work-related injury insurance funds. Prior to confirmation of a diagnosis, the workers had to bear the expenditure themselves.

Li Bo's story

Li Bo's story is different: *"The factory was relatively cooperative. It was August or September when I submitted my [occupational diseases] application. The official diagnosis was issued 29 days later. They directly submitted the same environmental assessment report to the diagnostic authority. The report stated that it was benzene poisoning. With this result, I was diagnosed as having an occupational disease."*

Li Bo informed the General Manager, the Department Manager and the Production Manager about what he had learned about toxicity of the printing oil, thinner and other chemical substances that were used on the work floor. At first, Li Bo's superiors were shocked and took his side. Li Bo recalled their reaction: *"...they see workers as a family. They would issue me a subsidy of RMB 3,000 per month. If my medical expenses exceeded the coverage of medical insurance, [the management] could write a report each year and they would give me a sum of money for the medical fee. All in all, they wanted me to give up the diagnosis of occupational disease and had it written into an agreement."* Unfortunately, his management's attitude changed completely when Li decided to go through the official diagnostic process. From that moment, management was no longer supportive of Li Bo.

According to the Regulations on Work-Related Injury Insurance of Guangdong Province, the standard entitlement of sick pay is based on the average municipal rate of the monthly salary, including overtime payments. Nevertheless, some respondents like Ye Xiao-man, received sick pay set against the municipal minimum wage at that time without any payment for overtime.

According to these same Regulations the maximum period during which workers can receive sick pay is 24 months; after that, workers have to apply for an assessment of their labour capacity, or the level of disability in relation to the alleged occupational disease. Many workers told LAC and LESN they were worried about sick pay. Li Bo: *"My two years' medical period is going to expire. There are some other things in my life that I need to take care of. At the moment, I am entitled to RMB 4,500 sick pay. Recently, the management asked for my labour capacity (i.e. level of disability) assessment. The local HRSSB officials told me that my entitlement during my two years' medical period will not change. But what about the future? What am I entitled to after the labour capacity assessment? I am starting to worry"*.

3.16 Work-related injury insurance

Two-thirds of respondents were hospitalised by the time they answered the questionnaire for this research. Of these, 47 (almost 80 per cent of respondents) said their diseases had been assessed as occupational, which could fast track them to work-related injury insurance. The vast majority (89 per cent) were receiving work-related insurance benefits.

Ye Xiao-man's story

Yi worked for four years with cleaning solvents, thinners, paints etc. The smell of the chemicals was very strong throughout the factory and ventilation was poor. In 2010 Xiao-man began feeling unwell. She lost a large amount of hair, felt dizzy and had frequent bouts of flu. Later that year she was hospitalised.

In 2011, her mother-in-law passed away and her father-in-law died the following year. Because Ye's husband was responsible for looking after their children he was only able to take on freelance work. Ye received sick pay calculated against the minimum wage. As inflation rocketed, their income fell. She used to earn RMB 2,000 per month but now receives only RMB 1,700 despite the rise in inflation etc.

Article 41 of the Chinese Social Insurance Law (SIL)³⁸ guarantees that employers shall pay the work-related injury benefits when an accident has happened even if the employer did not subscribe to the social insurance on behalf of their workers. The legislative intent was to ensure that the medical expenses of injured workers would, at least, be advanced and covered. In practice, the actual implementation of advance payments for medical fees is a different story. In accordance with Article 75 of the Regulation on the Issuance of Work-Related Injury Insurance³⁹, an employer can apply for advance payment for their injured workers when they have not contributed to the work-related injury insurance premium. These employers do, however, have to prove that they have already repaid arrears or demonstrate their willingness to do so.

On the other hand, if an injured worker intends to apply for this advance payment, they must be able to demonstrate that their employer has refused to pay their work-related injury benefits. Hence, they need to present the proof of employment relations, the evidence issued by their local HRSSB, which states that their employer has refused to do so, as well as other relevant documents.

In reality, employers will not self-testify their refusal. As a result, it becomes clear why respondents paid their own medical expenses, or got a loan from their employer and/or received donations from their fellow workers. In some exceptional cases, the employer made a voluntary payment towards covering the medical bills of their employees.

38 Social Insurance Law of the People's Republic of China (adopted at the 17th meeting of the Standing Committee of the 11th National People's Congress of the People's Republic of China on October 28, 2010), NATLEX Database of national labour, social security and related human rights legislation, International Labour Organization (ILO), http://www.ilo.org/dyn/natlex/natlex4.detail?p_lang=en&p_isn=89811, accessed on 23 August 2016.

39 Regulation on Work-Related Injury Insurance (Order No.375 of the State Council of the People's Republic of China), NATLEX Database of national labour, social security and related human rights legislation, International Labour Organization (ILO), http://www.ilo.org/dyn/natlex/natlex4.detail?p_lang=en&p_isn=96076&p_country=CHN&p_count=1165, accessed on 23 August 2016.

4 How brands responded

Some workers interviewed during this research were able to identify the international brand name companies and manufacturers that bought from the factories where they worked. Some of these companies are global top-brands. In total 36 client companies could be identified. Where contact details were available, researchers wrote to 23 of the referred brand name companies and manufacturers identified by the workers. The letters were mainly addressed to the Corporate Social Responsibility (CSR) and sustainability departments. The 23 received an advanced draft of the report and were asked to respond to a questionnaire and give information on OHS and chemical poisoning in their supply chain in the Pearl River Delta region⁴⁰.

Eleven companies responded: Acer, Apple, Asus, Canon, Motorola, Foxconn, LG Electronics, Philips, Samsung, Sharp and Sony. Six (Asus, Canon, Philips, Samsung, Sharp, LG Electronics) answered the questionnaire. The other five replied in an open letter.

Those companies that completed the questionnaire (**Asus, Canon, Samsung, Sharp, LG Electronics**) said they followed the EICC code of conduct, though Canon and Sharp are not EICC members. **Philips** said to require *“suppliers to sign a Supplier Sustainability Declaration (SSD) as part of a commercial agreement; this SSD is based on the EICC Code of Conduct.”*

Asus, Canon, Philips, Samsung, LG Electronics said they had policies on OHS and chemical poisoning in addition to the EICC Code. Samsung referred to its EHS (Environment, Health and Safety) policy: *“reinforced our Chemical Substance Management Policy and Chemical Substance Regulations and require all our domestic and overseas production sites and suppliers to comply with this policies”*⁴¹ **Asus** referred to an additional policy in which suppliers are asked to assess all workplace risks to new, expectant and nursing mothers⁴². **LG Electronics** said it has its own standard for industrial safety & health and chemical poisoning prevention⁴³. **Philips** said that with respect to their suppliers they need to comply with Philips’ requirements defined in “Philips Regulated Substance List”. In 2015, Philips said, a voluntary Health & Safety programme was launched supporting suppliers to be prepared for an OHSAS18001 certification⁴⁴.

Some of the responding companies referred to the Chemical Management Task Force set up by EICC. This task force intends to raise awareness and involve EICC members in the safe use of chemicals; develop training and capability building activities to reduce worker exposure; explore how to phase out hazardous chemicals and pursue safer alternatives, where feasible⁴⁵.

On behalf of EICC members **Philips** has joined the Green America Clean Electronics Production Network (CEPN). Through the CEPN programme four projects were identified: targeting safer

40 The research team was able to write to the following companies: Accton, Acer, Apple, ASUS, BYD, Canon, Foxconn, GE, Gilman, Haier, Hitachi, Huawei, Inventec, LG, Midea, Motorola, Nokia, Philips, Samsung, SHARP, Siemens, SMK, and Sony.

41 Email sent by Mijoo Syn, Senior Manager, Global Public Affairs Group at Samsung on August 12, 2016.

42 Email sent by Jennie Lin of Asus on August 5, 2016.

43 Email sent by LG Electronics CSR team on August 12, 2016.

44 Email sent by Marcel Jacobs, Director Supplier Sustainability Philips Group Procurement on August 27, 2016. Information about Philips’ programmes and applicable policies can be found at <http://www.philips.com/a-w/about/company/suppliers/supplier-sustainability.html>.

45 Email sent by Marcel Jacobs of Philips.

substitutions; tracking and measuring exposure; cheaper, easier, faster process chemical reporting; worker engagement and empowerment⁴⁶.

With regard to the use of benzene and n-hexane, Canon said its “standards define benzene as a “prohibited substance” and the company requests suppliers not to use it for Canon products, including in the manufacturing process. Meanwhile, n-hexane is regulated as a “controlled substance” in the PRC’s relevant regulation and Canon’s standards request our suppliers to comply with local regulations”⁴⁷. Samsung stated that n-hexane had been strictly prohibited in its production facility since 2013 and, before then, in its semiconductor business. Samsung added: “benzene was never used in our semiconductor operations; it was strictly prohibited in our production operations for set devices since 2013. We publicly announced to prohibit these chemicals at our suppliers in Sept, 2014.”⁴⁸

All six respondents of the questionnaire (Asus, Canon, LG Electronics, Philips, Samsung, Sharp) said that, while they do consider chemical poisoning to be a great risk for workers in their supply chain, they have come across no cases of chemical poisoning at any of their suppliers in the Pearl River Delta in the past three years.

Philips said: “To the best of our knowledge so far no occupational illness cases have been diagnosed by local or regional authorities. In the activities undertaken as part of our on-going supplier sustainability approach we have not identified any cases of chemical poisoning”. In this context Philips mentioned to be want to intensify collaboration and cooperation with local NGOs in China⁴⁹.

Acer, Apple, Foxconn, Motorola, and Sony did not complete the questionnaire but chose to send an open response.

Acer Inc. is also a member of EICC and has adopted the EICC Code of conduct as its own. It says that it requires its suppliers to commit to the same Code through a declaration of compliance. Compliance is also validated through third party audits. Acer participates in both the EICC Environmental Sustainability Working Group and CMTF. Acer said it has conducted 76 audits in the Pearl River Delta in the past but did not say whether it has encountered cases of chemical poisoning⁵⁰.

Apple said that its code of conduct is aligned with the EICC’s code and even stricter in some cases. It conducts extensive on-site assessment to guarantee that suppliers adhere to its high standards and said they “verify that workers are informed and trained on handling chemicals safely, and thoroughly understand their risks, control mechanisms and emergency response procedures.” Apple has identified and analysed over 500 chemicals through a benchmarking tool called GreenScreen, which resulted in the phasing out of benzene and n-hexane, among other chemicals, in their manufacturing processes. Apple agreed that the risks associated with occupational illnesses are serious, and assured that “while we are not aware of any current cases, in the event of any diagnosed

46 Email sent by Marcel Jacobs of Philips.

47 Email sent by Tadakatsu Tsuruno, CSR Division, Canon Inc. on August 10, 2016.

48 Email sent by Mijoo Syn, Senior Manager, Global Public Affairs Group at Samsung on August 12, 2016.

49 Email sent by Marcel Jacobs, Philips.

50 Email sent by Grace Liu, Corp. Sustainability Office of Acer Inc. on August 19, 2016.

*occupational illness, Apple's suppliers are required to ensure the worker receives requisite medical treatment, disability coverage and compensation, and normal wages during the recovery".*⁵¹

Foxconn said that because of its privacy policy it could not comment on current or former employees. It did, however, recognise that a *"small number of our more than one million employees in our campuses across China have, sadly, been diagnosed with cancer"* but argued that there was no evidence the cases were work-related. It added that *"Foxconn does not allow any entity within our company to use benzene or n-hexane, and has not procured or used these chemicals in any aspect of our operations for many years."* Furthermore, Foxconn recognized that Yang Mai (a case mentioned in this report) was indeed a former worker of Foxconn but said that: *"The truth is not as the report said and we have official medical examination documents. The documents can prove that Yang's story was wrong."*⁵²

Motorola's response was that it expects its suppliers to comply with the EICC code of conduct and that it is part of the EICC's Chemical Management Task force (CMTF).⁵³ Similarly, Sony mentioned that it was an active member of the EICC and also engaged with the CMTF aiming to address chemical management issues. Sony added that the basic policies covered in the Sony Group Code of Conduct includes workplace safety and that it has established the Sony Supply Chain Code of Conduct and expects compliance from all its suppliers⁵⁴.

51 Email sent by Desta Raines on behalf of Paula Pyers, Senior Director Supplier social Responsibility at Apple on 23 Augustus 2016.

52 Email sent by Foxconn on August, 2016.

53 Email sent by Tama McWhinney, Head of Communications at Motorola Solutions on August 9, 2016.

54 Email sent by Mitsu Shippe, Senior Manager, Head of CSR Section, Sony Corporation, on August 12, 2016.

Conclusions

This research is about occupational chemical poisoning in the electronics industry in the Chinese Pearl River Delta, about how contact with hazardous chemicals can ruin the lives of workers in this industry. This research presents the stories of workers who have experienced the awful health effects of prolonged or intensive exposure to toxic substances, benzene and n-hexane in particular. They are marked for life. Some die.

This research involved 75 people, all (former) workers of smaller and bigger electronics factories. Obviously this is just a fraction of the entire electronics workforce in the Pearl River Delta. On the basis of this research GoodElectronics cannot say what the actual scale of the problem may be, it is, however, reasonable to assume this group of victims of occupational poisoning only forms the tip of the iceberg.

This research shows that workers are poorly informed about serious health risks of exposure to chemicals at work. Workers lack adequate information, training and personal protective equipment. When workers fall ill they often do not realise what is ailing them. It is very difficult to get the right diagnosis. When workers are diagnosed with occupational poisoning, employers are not supportive. Employers may dispute the diagnosis, force their employees to take unpaid sick leave, dismiss employees, refuse to pay compensation, etc. etc.

This research, however modest, is an important signal to factories and their client companies that something is wrong, and that positive action to protect workers from harmful exposure to chemicals needs to be taken.

GoodElectronics, together with the International Campaign for Responsible Technology is calling on the electronics industry to take up the “Chemical Challenge” that offers a holistic view on the problem of irresponsible chemical management at the level of the production of consumer electronics. The solutions presented by GoodElectronics and ICRT range from transparency about chemicals used during the production process, substituting hazardous chemicals by safer substances, to enhancing the participation of workers and their communities.

Under international human rights law and in line with the United Nations Guiding Principles on Business and Human Rights (UNGPs) governments and companies have an obligation to respect and protect human rights and labour rights. The Guiding Principles apply to both the international electronics brands that outsource their production to China and the supplier factories in China. Companies must respect human rights and conduct due diligence at their supply chain to prevent violations and guarantee access to remedy to victims. Companies must identify, assess, prevent and mitigate actual or potential adverse human rights impacts consequence of their own operations, products or services or as a result of their business relationships. Companies must have in place and implement policies on human rights due diligence, in order to identify, prevent, mitigate and account for their impacts on human and labour rights.

Recommendations

To electronics companies, supplier companies (final assembly and component makers) and client companies (brands, retailers)

When it comes to occupational illness the UNGP provide clear guidance to employers and client companies.

All companies have a responsibility to respect human rights, workers' and community rights, including:

- The right to safe and healthy workplace;
- The right to healthy communities and a safe environment;
- The right to know what hazards are present in electronics workplaces and surrounding communities;
- The right to an effective remedy when harm occurs;
- The right of workers to organize unions without interference and to bargain collectively.

GoodElectronics is calling upon the electronics industry to adopt safer and more sustainable manufacturing practices and proactively reduce and eliminate chemical and physical hazards by developing and adopting safer alternatives. All these changes are necessary to protect and promote human rights, workers' rights and the environment. Detailed recommendations are laid out in the "Meeting the Challenge" document⁵⁵. These recommendations address the electronics industry to take concrete actions throughout its supply chain to:

- Be transparent;
- Use safer chemicals;
- Protect workers;
- Promote, guarantee and defend the participation of workers and communities;
- Protect communities and the environment;
- Compensate and remediate for harm to people and environment.

⁵⁵ "Meeting the Challenge" – detailed recommendations for the electronics industry regarding the use of chemicals, 12 June 2016, <http://goodelectronics.org/news-en/meeting-the-challenge-2013-detailed-recommendations-for-the-electronics-industry-regarding-the-use-of-chemicals>.

In addition, the following recommendations ensue from the research at hand

To companies (supplier factories and client companies)

A reasonable percentage of the labour force at supplier factories must have permanent contracts. A cap must be put on the percentage of workers with short-term contracts and/or of workers who are hired through labour agencies instead of being directly employed.

Suppliers and client companies must see to it that workers enjoy stable and fair employment relations. This means that employers must stop forcing ill workers to take sick leave without pay. Employers must refrain from not renewing contracts of workers on sick leave. Employers must refrain from terminating workers who start litigation.

When workers are diagnosed with occupational illnesses, employers and client companies share a responsibility to ensure workers receive appropriate medical treatment, disability coverage and compensation paid by the employers, as well as guaranteeing that complete wages are paid during recovery and permanently in case of disability caused by the occupational disease.

To the Chinese government

The Chinese government must urgently take a number of steps, including:

- ratification of ILO Benzene Convention (C136);
- improve OHS legislation on the industrial use of benzene-containing solvents and agents by adjusting the allowed maximum exposure time to the highest standards.;
- look into developing a mechanism for the apportionment of liability needs which works in the interests of victims and takes into account the long latency period of occupational diseases. This mechanism should be able to establish the separate or joint liability of more than one employer and support workers in locating and addressing their former employers (taking into account the frequent closures, relocation and take-overs of factories). This mechanism should be based upon the principle that the onus of proof should of occupational disease be reversed to employers rather than workers;
- adopt and apply legislation to reduce precarious employment conditions in the electronics industry which favour long term contracts over short- term contracts, and encourage factories to directly employ workers rather than hiring labour through agencies;
- invest in, and monitor, the performance of Prevention and Treatment Centres for Occupational Diseases (PTCODs) and other specialised hospitals. Unimpeded access for workers to Prevention and Treatment Centres for Occupational Diseases (PTCODs) should be facilitated;
- contribute to the development, and implementation, of employer-funded compensation systems that are designed to support victims of toxic exposure in the workplace and the community. Fair compensation mechanisms must ensure that workers and community members harmed by exposure qualify/receive: emergency relief; adequate, just and timely compensation; treatment and rehabilitation for as long as required to fully address and, when possible, correct the harm;
- last but not least, ensure that workers victim of occupational illness or any business-related human rights abuses have access to effective remedy through appropriate mechanisms.

To governments of home countries of electronics client companies and governments of electronics importing countries

Government of home countries of electronics client companies and governments of electronics importing countries must ensure companies live up to UNGP and OED guidelines. To this end, governments:

- Take all necessary measures to prevent, investigate, and compensate labour rights abuses through implementation of effective policies and laws, as well as through trade and investment tools;
- Ensure that the relevant human rights legislation is amended at all levels and its legal system enhanced, so that all victims of human and labour rights abuses, including victims of occupational illnesses, have full and effective access to a competent tribunal and to an effective remedy;
- Enhance the effectiveness of existing mechanisms to ensure that all corporations registered on the home country respect human rights and labour rights standards when operating abroad.;
- Establish independent mechanisms with jurisdiction to investigate human rights and labour rights abuses committed abroad by home corporations or companies in their supply chain;
- Establish a legal framework that guaranteed remedies to workers who have been victims of occupational illness or other human or labour rights abuses due to activities abroad carried out by the home corporation, or companies within their supply chain;
- Ensure that effective grievance mechanisms are available for business-related human rights abuses;
- Governments must revert to socially responsible public procurement of ICT hardware. Joining Electronics Watch⁵⁶ is a concrete step governments may take.

56 Electronics Watch. Responsible public procurement. Rights of electronics workers. Electronics Watch is an independent monitoring organisation that assists public sector buyers to meet their responsibility to protect the labour rights of workers in their global electronics supply chains more effectively and less expensively than any single public sector buyer could accomplish on its own. www.electronicswatch.org.

Annex

“Meeting the Challenge” – detailed recommendations for the electronics industry regarding the use of chemicals

1 Transparency

To safeguard workers and community residents from harmful chemical exposure, both workers and communities must know what chemicals are being used and stored on the production site, what is being transported to and from the facility, what is being discharged and released both inside and outside the factory, and what hazards these substances pose to people (including reproductive hazards) and the environment. Workers must know what substances they are handling in their daily work. This transparency requires companies to provide *full materials disclosure* to workers, community residents and their representative organizations.

Brands must disclose their complete supply chain as well as all of the materials used by all of their suppliers. Where inadequate hazard data are unavailable for any chemical, this also needs to be disclosed. Transparency and disclosure require action. Companies must:

- **Provide health and safety information.** Workers and community residents must receive full, up-to-date, understandable and free-of-charge health and safety information about chemical hazards. These published and peer-reviewed studies should make clear who has to do what to ensure a safe work environment when hazardous chemicals are being used. In addition, fully referenced scientific/technical data upon which this information is based must be provided upon request. It is the brands' responsibility to ensure that contract manufacturers, ODMs, component manufacturers and others in their supply chains provide this information to workers, communities and the general public.
- **Share hazard information without restriction.** Information on the health, safety and environmental effects of substances used in production and present in electronics and electrical products must be shared without restrictions with workers, communities and their representative organizations. Even when specific material formulas are confidential, the hazard information shall not be so considered.
- **Provide all Safety Data Sheets (SDS).** Globally Harmonized System (GHS)-compliant safety data sheets must be freely and easily available to workers, communities and their representative organizations, for all materials stored, used and discharged from the workplace. For substances whose environmental or human health effects are inadequately or incompletely characterized, the principles outlined below at the end of Section 2 apply.
- **Cooperate with education and training initiatives.** Companies shall cooperate with governments, non-governmental organizations, trade unions, health care providers, and other third party experts to provide ongoing education and training for workers, community representatives and emergency medical responders. Brands must ensure training and education throughout their supply chains. Education and training must cover:

- monitoring and early warning systems for dangerous chemicals used or created during production;
 - detailed information about hazardous substances in production, and best practices for protection from and reduction of exposure to those hazards;
 - how to recognize early signs of adverse health impacts;
 - implementation of good industrial hygiene practices to prevent and/or minimize exposures or the risks that these exposures create. Implementation entails controlling hazards at or as closely as possible to the potential source, along the exposure path if control at the source is not possible, and with personal protective equipment only as a last resort when engineering controls at or close to the source do not provide sufficient protection.
- **Maintain and disclose chemical inventory.** Companies shall maintain an inventory of all materials and chemical substances used and generated throughout the production process following the Globally Harmonized System (GHS). Companies will disclose this information to workers, communities and their representative organizations at least annually (updated) and make this information publicly available. Brands will include contract language with their suppliers requiring disclosure of all materials used in production processes, not just those substances that appear in the final products. In addition, brands shall implement an effective system to accept and manage all chemical disclosure information in real time in order to track chemical use and management by suppliers.

2 Use safer chemicals

The electronics industry (brands, manufacturers, and suppliers) and governments of countries where production occurs must reduce hazardous exposures by eliminating or substituting the most hazardous substances and most hazardous production processes, i.e. those processes where exposure to multiple hazardous chemicals occurs and particularly where women of child-bearing age are the majority of the workforce. This priority activity covers substances brought into the production process, created during production and substances which remain in the product and become problematic when the product is used, recycled or disposed. This action can be accomplished by assessing hazardous materials used in manufacturing throughout the product lifecycle and replacing them with safer alternatives wherever possible, as described below:

- **Conduct alternative assessments.** The brands and chemical suppliers, with full participation by trade unions representing their workers (or workers' representatives freely chosen by them if no trade union exists), shall conduct ongoing alternatives assessments of chemicals of concern and hazardous materials used in products and in production. Assessment, including potential non-chemical-based alternatives, will be used to implement green design alternatives and select safer substitutes for hazardous materials used in production. Assessment processes acceptable to all parties will be the basis for informed substitution where safer alternatives exist, or for innovation in new formulations and materials, or for product redesign. These assessments are best led by workplace Joint Health and Safety Committees or, where none exist, with the full participation of those who face the risks.

- **Chose safer substitutes.** When reducing the use of substances of concern, companies shall select substitutes that are inherently safer than the substances they replace. Substitutes include safer chemicals, materials and products as well as eliminating the need for the chemicals in the first place. Brands must integrate these principles into their corporate chemicals policy.
- **Consider a broad range of hazardous properties.** Chemicals proposed as safer substitutes must be significantly less hazardous than those they replace. This means they should be significantly less toxic, persistent, bio accumulative or bio concentrating, carcinogenic, mutagenic, neurotoxic, endocrine disrupting, or hazardous to reproduction and development, etc. than the chemicals they replace. Industry lists of preferred chemicals will be subject to periodic review with the full participation of trade unions or workers' representatives where no unions exist.
- **Research safer substitutes.** The brands and chemical suppliers shall develop safer substitutes and safer production processes in all cases, prioritizing those where none currently are known. Robust, innovative, independent and transparent research is needed.
- **Use the same, highest standards worldwide.** Hazardous chemicals and processes that are no longer used in developed countries are often still in use in developing countries. Environmentally harmful technologies or products that cause severe environmental degradation or are harmful to human health shall not be transferred to other countries. Prohibited processes or products must never be used anywhere in the supply chain.
- **Follow hierarchy of controls to prevent exposure.** Where knowledge does not currently permit production risks to be eliminated by substitution, the brands will ensure that risk is reduced to a minimum by application of preventive measures and exposure controls. These include, in order of priority:
 - **Engineering controls and use of inherently safer equipment and materials** to avoid or minimize the release of hazardous substances which may present a risk to the safety and health of workers and the community.
 - **Protective measures applied at the source or as close as possible to the risk**, such as adequate local ventilation, barriers, and/or appropriate work procedures and organizational measures.
 - **Application of individual protection measures as a last resort** where exposure cannot be prevented by other means, including personal protective equipment, provided free of charge and replaced regularly by the employer.

Where the environmental or human health effects of a substance are unknown, its use shall be avoided; where it is inadequately or incompletely characterized, the precautionary principle⁵⁷ shall apply until all relevant hazard testing is available. Where there is inadequate information available to fully assess a particular material, the company has a duty to inquire to the chemical manufacturer to seek additional information about potential hazards and will either avoid its use or provide workers with the best possible protection until the hazards are clarified.

⁵⁷ Precautionary Principle: When an activity raises threats of harm to human health or the environment, precautionary measures shall be taken even if some cause and effect relationships are not fully established scientifically.

3 Protect Workers

The brands shall ensure that their own and all workplaces throughout the supply chain are safe for all workers, regardless of gender or age. Risks from hazardous substances to the safety and health of workers, who are routinely exposed to low levels of multiple chemicals on the job, must be eliminated or reduced to a minimum, including risk to the pregnant worker and her fetus. This responsibility includes the prevention of harmful toxic discharges into communities surrounding manufacturing facilities and throughout the product lifecycle, beginning in mining communities, continuing with workers in chemical manufacturing and communities, and ending with workers involved in informal and formal e-waste recycling.

- **Map processes.** The brands must map each manufacturing process used to make its products. Each supplier must document which processes are used, at which locations, to manufacture materials, components, and subassemblies, and in final assembly.
- **Identify potential for harm.** The brands must assess the potential for harm connected with each of the processes identified above. The assessment process shall be conducted by industrial hygienists knowledgeable about the relevant toxic materials and an occupational medicine specialist.
- **Identify the chemicals generally used (and generated) in each process.** The brands must take responsibility for the safe use of chemicals used for each process, including the best methods for safe management of each chemical during transport, storage, and manufacturing, and as waste.
- **Inventory the actual chemicals used (and generated).** The identity and volume of all chemicals used in each process shall be disclosed on a quarterly basis as well as how each chemical is managed as waste. Brands and suppliers share this responsibility. Periodic testing shall be done to identify all of the materials in the waste stream, including those generated during production.
- **Determine hazard potential.** The brands and suppliers shall (based on advice of qualified experts) evaluate each material used and generated to determine which have potential to cause harm when released into the workplace air, external air, wastewater, waterways or onto land.
- **Develop and implement comprehensive workplace hazard monitoring protocols and methods that take into account privacy and are gender- and culture-sensitive.** The brands must develop and implement, jointly with affected and interested workers and their organizations, comprehensive hazard monitoring to assure a safe and healthy workplace throughout the product lifecycle. This includes:
 - Participatory training of all workers and managers potentially exposed to Materials of Concern;
 - Capacity building for all workers and managers potentially exposed to Materials of Concern;
 - Comprehensive ongoing industrial hygiene and environmental monitoring to measure the release of and exposure to all Materials of Concern used and/or generated in manufacturing/production;

- Ongoing independent comprehensive health surveillance by qualified experts that is occupationally-relevant, for all workers, to identify and prevent diseases. Results shall be disclosed to workers in a detailed, timely manner;
- Recognition of workers' rights to negotiate regarding hazardous working conditions and to refuse hazardous work without fear of retaliation.

Comprehensive monitoring, including industrial hygiene monitoring to measure exposures and health surveillance to identify and prevent disease, must be extended to all workers in the supply chain, including workers involved in extraction of raw materials, processing of raw materials, manufacture and assembly of components and products, as well as workers involved in re-use and recycling, especially workers in the informal sector.

- **Conduct monitoring, measuring and documenting exposures.** The brands shall create, oversee and manage procedures for all suppliers to use in monitoring and measuring releases of hazardous chemicals to the workplace, to the external air, wastewater, waterways, and to land (see Appendix A). Properly calibrated or otherwise verifiable equipment shall be used and maintained for required monitoring and measurement. Measurements of worker exposure shall evaluate ongoing exposures, as well as short-term spikes in exposures. Monitoring shall be conducted by a certified Industrial Hygienist, or equivalent.

4 Guarantee worker and community participation

Workers and community residents potentially affected by hazardous exposures must be encouraged and allowed to participate fully in the sound management of chemicals and wastes in their workplaces and communities. To achieve this goal of inclusion, workers must be able, without interference from employers, to organize in the workplace, join unions, develop democratically elected worker health and safety committees and effective training programs, and pursue other organizing activities to make their workplaces safer.

- **Workers have the right to collectively bargain** as a fundamental human right guaranteed by the UN's Universal Declaration of Human rights (1948) and by the ILO Declaration on Fundamental Principles and Rights at Work (1998). The brands, with the full participation of workers and their representatives shall enhance and implement ILO safe work standards and ILO guidelines⁵⁸ on occupational safety and health, with special care for vulnerable or precarious workers, including women and immigrants. Besides the right to organize, these protections shall include the right to monitor and enforce effective health and safety protections in the workplace; to refuse or shut down unsafe or unhealthy work; and to be protected from retaliation for exercising their rights (right-to-act and "whistle-blower" protection).
- **Joint Health and Safety Committees** in the workplace, are to be encouraged even if not required by law, with the worker representatives to be fairly elected by their peers. The brands and suppliers shall develop frameworks to promote the active and meaningful participation

58 For more information on the ILO Safe Work Program and OSH guidelines, see: <http://www.ilo.org/safework/lang--it/index.htm>; and <http://ilo.org/global/topics/safety-and-health-at-work/lang--en/index.htm>; http://www.ilo.org/legacy/english/protection/safework/worldday/facts_eng.pdf and http://www.ilo.org/safework/info/standards-and-instruments/WCMS_107727/lang--en/index.htm.

of all stakeholders in the sound management of chemicals and wastes, including community representatives, non-governmental organizations, managers, workers, and trade unions.

All hazard communication, education and training shall be conducted in appropriate languages understood by the workers.

5 Protect communities and the environment

Prevent harm throughout the product lifecycle by conducting effective, transparent, independent monitoring and public reporting of all discharge streams from all facilities, and eliminate hazardous exposures and discharges to air, waterways, and land. When there is evidence that pollution from an electronics facility or a recycling facility has polluted the air, water and/or land, the company shall be responsible for all clean-up and remediation costs. It is particularly important to ensure that communities near rare earth mineral processing facilities and communities near mines, including those of conflict minerals and rare earths, are provided with effective levels of health protection.

6 Compensate and remediate for harm to workers, communities and the environment

Because the work of electronics manufacture is characterized by multiple exposures to chemicals and substances which may be incompletely tested, inadequately regulated, and frequently changed, it is particularly important that governments develop and implement employer-funded compensation systems designed to support victims of toxic exposures in the workplace and the community. Fair compensation mechanisms must ensure that workers and community members harmed by exposure qualify for and receive emergency relief; adequate, just and timely compensation; and treatment and rehabilitation for as long as is needed to fully address and, when possible, correct the harm.

Remedies and funding mechanisms must be designed to ensure that the brands shoulder responsibility for potential harm by internalizing all costs of health and environmental degradation that are currently externalized. This will incentivize the use of safer materials and processes to prevent future harm.



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