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GLOBAL WATCH MISSION REPORT

# Eco-design and environmental management in the electronics sector in China, Hong Kong and Taiwan

NOVEMBER 2003

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# Eco-design and environmental management in the electronics sector in China, Hong Kong and Taiwan

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## EXECUTIVE SUMMARY

The Department of Trade and Industry (DTI) Global Watch Service sponsored a scoping study to investigate the 'state of the art' of eco-design and environmental management in the Chinese, Hong Kong and Taiwan electronics sector during 17-28 November 2003.

The team comprised representatives from:

- The Centre for Sustainable Design at the Surrey Institute of Art & Design, University College
- Fujitsu Services Ltd
- Plextek Ltd

Support was provided by the British Embassy in Bejing (China) and the British Consulates in Guanzhou (China), Taipei (Taiwan), and Hong Kong.

The team met twenty-nine companies, universities and government departments in China, Hong Kong and Taiwan, and gave a presentation at Hsinchu Business Park, Hsinchu, Taiwan to over forty organisations.

The organisations visited were:

### CHINA

- Ministry of Information Industry (MII)
- China Electronics Technology Group Corporation (CETC)
- National Development and Reform Commission (NDRC)
- State Environmental Protection Administration (SEPA)
- Tsinghua University
- Legend Group Ltd (Lenovo)
- Huawei Technologies Co Ltd
- Konka Group Co Ltd
- ZTE Corporation
- Shenzhen HYT Science & Technology Co Ltd (HYT)
- TCL Corporation
- Huizhou Municipal Government
- Siemens VDO Automotive Huizhou Co Ltd

### HONG KONG

- Hong Kong Polytechnic University (HKPU)
- Hong Kong Productivity Council (HKPC)
- Philips Consumer Electronics
- Elec & Eltek International Ltd
- Environmental Protection Department (EPD)
- Business Environment Council (BEC)
- Hong Kong University (HKU)
- Hong Kong Electronic Industries Association (HKEIA)

### TAIWAN

- Industrial Development Bureau (IDB) at the Ministry of Economic Affairs (MOEA)
- Kinpo Electronics Inc
- Acer Inc
- Quanta Computer Inc
- Industrial Technology Research Institute (ITRI)
- Taiwan Semiconductor Manufacturing Co Ltd (TSMC)
- Winbond Electronics Corporation
- United Microelectronics Corporation (UMC)

This report is based on visits to the above organisations and desk research. It is difficult to judge the actual level of knowledge and sophistication of some companies visited (particularly in mainland China) as the organisational positions of those interviewed varied considerably.

## S.1 Key findings

### *S.1.1 China*

- The major economic development is on the South-East/South coast
- There seems to be regional competition between Shanghai and Guanzhou provinces
- The 'Closer Economic Partnership Arrangement' (CEPA) has been signed by mainland China and Hong Kong which creates a free-trade zone from 1 January 2004 for 270 products including electrical and electronic items
- There was evidence of a variety of high quality consumer electronics, information and communications technology (ICT) and home appliances
- There was concern expressed by companies over the quality of electronics components produced in China – many of the companies visited were using components from the US, Japan and Europe
- There are complex ownership structures, eg state owned enterprises, companies led by entrepreneurs, and hybrids. TCL Corporation is run entrepreneurially but the biggest shareholder is the city of Huizhou
- Companies had grown fast, eg Legend (Lenova) is 19 years old, Huawei is 15 and Konka 23
- There seemed to be growing and significant investment in R&D, eg Lenova claimed that 25% of employees were in R&D, and Huawei around 40%
- There was no clear strategic plan for environmental legislative development in the electronics sector, but there were indications that a 'learning by doing' approach is being applied using European and Japanese laws as models
- There seemed to be confusion amongst domestically funded Chinese companies over the business implications of the Waste Electrical and Electronic Equipment (WEEE) and Restriction of Certain Hazardous Substances (RoHS) EU Directives
- There was no awareness of the proposed Energy-using Products (EuP) or Registration, Evaluation and Authorisation of Chemicals (REACH) EU Directives
- 'Chinese RoHS' is being developed based on the RoHS Directive
- There is initial development of the Chinese equivalent of the Japanese Home Appliances Recycling Law (HARL)
- There seems to be lack of enforcement of environmental laws due to grassroots corruption and lack of funding of the State Environmental Protection Administration (SEPA)
- A second e-waste ban in Guandong has been put in place, but there are question marks over the effectiveness of implementation, eg there were indications that illegal importation, poor quality recycling, and pollution were continuing
- There was no evidence of a professional electronics recycling network
- There appears to be a major domestic second-hand computer and white good products market, and the National Development and Reform Commission (NDRC) seem to be developing testing standards for refurbished products to ensure quality and consumer safety
- There was no evidence of awareness and development of the concept of eco-design, eg no implementation in companies, government-funded projects, or training and education, or research programmes in universities and institutes
- Several companies seem not to have recognised that ISO 14001 primarily focuses on manufacturing processes, and had neglected coverage of product-related issues in their environmental management systems

### *S.1.2 Hong Kong*

- There was evidence of awareness of the RoHS and WEEE Directives
- One organisation was aware of the proposed EuP Directive
- There was evidence of significant investment by Hong Kong companies in manufacturing facilities in mainland China
- There were a number of government funded eco-design projects
- A number of electronics companies have achieved ISO 14001 certification (see Appendix B)
- One company was starting to determine the social impacts of suppliers in mainland China

### *S.1.3 Taiwan*

- There was evidence of significant investment by Taiwanese companies in manufacturing facilities in mainland China
- There is political uncertainty about the relationship with mainland China – however, this does not seem to be creating significant economic problems within the country
- There was evidence of awareness amongst companies of the RoHS and WEEE Directives
- There was evidence of awareness amongst companies of the Green Purchasing Law (GPL) and HARL in Japan
- Green procurement requirements appear to be being passed down supply chains from Japanese companies
- There was no awareness of the proposed EuP Directive
- A Green Procurement Law – established in 1999, two years ahead of the GPL in Japan – seems to be fuelling increased interest in eco-labelling
- The Industrial Technology Research Institute (ITRI) plans to launch a programme based on ISO TR 14602 (integrating environmental aspects into product design and development) in 2004
- A number of companies appear to have developed quite sophisticated approaches to eco-design; however, the focus is on WEEE and RoHS compliance rather than integrating eco-design principles early into the innovation process
- Three years ago the Industrial Development Bureau (IDB) at the Ministry of Economic Affairs (MOEA) initiated an eco-design awareness raising programme, eg conferences, workshops and training
- The Green Design Network (GDN) – an information platform on eco-design – was launched with government funding in September 2003 and already has 130 members
- The Green Purchasing Network (GPN) was established in late 2003
- There seems to be a mirroring of Japanese approaches, eg Green Design Network (Eco-design Network in Japan) and Green Purchasing Network (Green Purchasing Network in Japan)
- There are indications of increased networking and cooperation with other South East Asian countries on eco-design and green procurement issues
- A number of companies have started green procurement activities
- One company was starting to determine the social impacts of suppliers in mainland China

### *S.1.4 Overall*

- There was concern that RoHS targets would not be met by mainland Chinese companies, especially small or medium sized enterprises (SMEs), due to lack of awareness, financial resources and expertise

- There seemed to be a lack of understanding that when selling into the EU it is those companies that have their 'badge' on products that will have financial responsibility under WEEE
- Awareness of environmental legislation seems to be a function of ownership, eg awareness is higher in European and Japanese joint ventures and in companies that are in Japanese companies' supply chains
- There was concern amongst Chinese and Taiwanese companies over the quality of electronic components produced in China
- Some companies claim to be running partial lead-free production lines to ensure that they are building up knowledge prior to RoHS and increased lead-free requirements by Japanese companies
- Taiwan and, particularly, Hong Kong may be useful entry routes for UK companies into mainland China due to proximity and existing contacts
- There were 'question marks' over the extent to which companies in the region fully adhere to ISO 14001 requirements when the spotlight is off

## S.2 Key gaps

### *S.2.1 China*

- There seems to be a lack of awareness and understanding of the RoHS and WEEE Directives; and fundamentally, there seems to be little knowledge of the European Commission's (EC) legal structures and processes, eg Directives and regulations
- There appears to be no knowledge and experience of the development and implementation of eco-design, eg in the integration of environmental considerations into product design and development
- There is a lack of professional electronics recycling infrastructure
- Product-related aspects seem to have been ignored in ISO 14001 certification and environmental management systems
- There seem to be good opportunities to build contacts related to eco-design, green procurement and recycling in the ICT, electronics and white goods sectors

### *S.2.2 Hong Kong*

- There seems to be a lack of electronics recycling infrastructure

### *S.2.3 Taiwan*

- It appears that there is a 4$^{th}$ generation electronics recycling system in place – however, very limited information seems to be available
- There was little recognition of the potential to include environmental aspects in the innovation process

### *S.2.4 Overall*

- There seems to be an opportunity to provide guidance for companies in the region on the implementation of WEEE, RoHS, EuP, REACH, HARL, LPEUR and GPL in the consumer electronics, ICT, home appliances and electronics sectors

## S.3 Key implications

### *S.3.1 China*

- China is becoming a major player in the global ICT and white goods sectors
- It is likely that many small or medium-sized electronics suppliers will not meet the RoHS requirements
- There is considerable concern over intellectual property right (IPR) issues – the auditing of suppliers over IPR protection is likely to be a growing issue

- There are concerns over the quality of domestically produced Chinese components, therefore companies sourcing from China need to ensure robust quality control processes are in place

### *S.3.2 Hong Kong*

- As a result of the former English colonial links, Hong Kong provides a potentially useful entry point into mainland China
- There seem to be relatively experienced environmental management multipliers, eg Business Environment Council (BEC) and Hong Kong Productivity Council (HKPC)

### *S.3.3 Taiwan*

- ITRI indicated that there are financial incentives for environmentally-related R&D within Taiwan

### *S.3.4 Overall*

- The 'Greater China' region is already a major powerhouse of electronic manufacturing – but there are growing questions over the environmental and social performance of electronics suppliers in China

## S.4 Key opportunities

### *S.4.1 China*

- Building long-term environmental technology partnerships
- There seem to be good opportunities to build contacts related to eco-design, green procurement and recycling in the ICT, consumer electronics and white goods sectors
- There is a huge need to educate Chinese manufacturers about environmental issues and to transfer appropriate technology, skills and know-how
- There are likely to be growing opportunities for experienced social auditors in the electronics sector

### *S.4.2 Hong Kong*

- Hong Kong provides a good base for UK companies to enter the Chinese market
- There seem to be good opportunities to build contacts related to eco-design, green procurement and recycling in the ICT, consumer electronics and white goods sectors
- There is likely to be growing interest in consultants that have experience of implementing CSR programmes

### *S.4.3 Taiwan*

- There are specific incentives to establish environmental technology R&D projects at ITRI – IPR protection should be assessed
- There may be opportunities related to stimulating eco-innovation

### *S.4.4 Overall*

- There seems to be an opportunity to organise a full mission to China, Hong Kong and Taiwan to complete further research, build links and develop opportunities related to environmental management, environmental technologies, eg recycling and eco-design, with the electronics companies
- This mission could be accompanied by a roadshow on the business implementation of WEEE, RoHS, EuP, REACH, HARL, LPEUR and GPL to be organised in Beijing, Shanghai, Shenzhen, Hong Kong and Taipai

# 1 INTRODUCTION AND RATIONALE

Environmental and social issues are increasingly starting to impact on the global consumer electronics, information and communications technology (ICT), white goods and electronic components sectors; these developments have significant implications for manufacturers and assemblers in countries in South-East Asia that export or plan to trade with the EU and Japan.

Particular drivers are a range of recent legislative developments focusing on hazardous materials reduction, recycling and eco-design in these sectors. In Europe this includes the Restriction of Certain Hazardous Substances (RoHS) and Waste Electrical and Electronic Equipment (WEEE) Directives passed on 11 October 2002, and the recently adopted Energy-using Products (EuP) Directive (see 'legislation' on www.cfsd.org.uk/seeba).

The WEEE and RoHS Directives broadly cover ten product categories, whilst EuP is a framework Directive covering all energy-using products excluding cars. The WEEE Directive is based on Article 175 (which means that the scope can be broadened and the targets strengthened in national transposition) and RoHS on Article 95 (based on the single market approach with the scope and targets fixed at national transposition).

In Japan there has been the implementation of the Home Appliances Recycling Law (HARL) that covers four products, the Law for the Promotion of the Effective Utilisation of Resources (LPEUR) and the Green Purchasing Law (GPL) in April 2001 – this has led to a range of green procurement and supply chain initiatives amongst Japanese companies, Sony's Green Partnering Programme (GPP) being the most prominent.

With more outsourcing and contract manufacturing migrating to South-East Asia, and particularly China, there will be increasing requirements for suppliers to become more aware of environmental issues, especially product-related aspects related to reduced toxicity, materials reduction, energy efficiency and increased recycling. However, outside of the subsidiaries or joint ventures of Japanese or European transnationals in South-East Asia, it is likely that many domestically owned companies are likely to have little awareness and understanding of environmental issues, and few governments in these countries will have started awareness-raising programmes covering eco-design, hazardous materials substitution and recycling.

The WEEE and RoHS Directives will effectively come into force in 2006. WEEE sets recycling and recovery targets for ten categories of products (see below) and RoHS places a ban on four heavy metals from 1 July 2006 (lead, cadmium, mercury and hexavalent chromium) and the brominated flame retardants PBB and PBDE used in those products (with an exemption for medical equipment under RoHS):

- Large household appliances (eg fridges and washing machines)
- Small household appliances (eg vacuum cleaners, irons)
- IT and telecommunication equipment (eg PCs, photocopiers, telephones)
- Consumer equipment (eg TVs, videos, hi-fi equipment)
- Lighting equipment (eg fluorescent lamps)

- Electrical and electronic tools (eg drills, sewing machines)
- Toys (eg video games)
- Medical equipment systems (eg radiotherapy)
- Monitoring and smoke equipment (eg smoke detectors)
- Automatic dispensers (eg drinks machines)

The timetables for the two directives are as follows:

WEEE Directive
- 02/2003 – EU law (15 February)
- 08/2008 – Transposition
- 08/2005 – Producer responsibility
- 08/2005 – Separate collection
- 02/2006 – Collection target
- 12/2006 – Recovery targets
- 12/2006 – Recycling targets

RoHS Directive
- 02/2003 – EU law (15 February)
- 08/2004 – Transposition
- 07/2006 – Substances ban

The EC proposal for a framework Directive to promote the eco-design of energy-using products was adopted in early August 2003 (see 'legislation' on www.cfsd.org.uk/seeba). The Energy-using Products (EuP) Directive creates no legal obligations for manufacturers – these will only arise when the EC adopts separate implementing measures for different product groups. The requirements will only be applied to product groups with a significant volume of sales and a major environmental impact. There are likely to be considerable implications for component suppliers to UK electronics companies – which will also create major challenges in relation to supply chain management.

Japan has also developed legislation geared towards the 3Rs (reduce, reuse, recycle) in the house appliance and office equipment sectors. The implementation in 2001 of the GPL, HARL and LPEUR is fuelling significant changes in product design and recycling practices. HARL focuses on four product categories (TVs, refrigerators, air conditioners and washing machines) and LPEUR covers a range of products including photocopiers and PCs (for business use). As a result, Japan is making considerable strides in eco-design and recycling alongside its already advanced programmes in lead-free solders and technologies. Missions sponsored by DTI in 2001 and 2002 on lead-free soldering and eco-design discovered serious commitment at board level in Japanese companies to building a recycling-oriented economy and developing greener products.

There are structural changes in the consumer electronics, ICT and white goods sectors with a considerable amount of manufacturing migrating to China, Hong Kong, Taiwan and other South-East Asian countries, eg Thailand. In addition, an increasing number of companies are becoming 'systems integrators' (service providers) with a tight customer focus, and supply chain management becoming of growing importance. This also means that 1st tier suppliers are receiving increased environmental requirements from customers. These trends mean that there will be growing challenges in relation to implementing eco-design (materials, energy, toxicity) amongst outsourced and contract manufacturers, and through complex networks of suppliers of components and sub-assemblies.

A recent trip (Q1 2003) to Taiwan by Martin Charter had also indicated evidence of increasing product-related questions being sent to Taiwanese suppliers by Japanese electronics companies, eg Sony's GPP. In addition, there was the recent announcement by the Chinese government of an equivalent to RoHS and WEEE – Management Methods for the Prevention and Control of Pollution from Production of Electronic Information Products (see Appendix A) – with a target of January 2006 which provoked considerable concern amongst global manufacturers due to the non-alignment with the RoHS deadline of July 2006 (note: after considerable lobbying the date was put back to 1 July 2006).

In view of the implementation deadlines of the WEEE and RoHS Directives and the fact that many UK companies are sourcing suppliers and outsourcing or contract manufacturing from China, Hong Kong and Taiwanese companies, it is essential to gain an understanding of the extent of the understanding and implementation of environmental management and eco-design (materials, energy, toxicity) programmes. For example, if a supplier does not have plans about how it is going to move to lead-free then they could create significant risks bearing in mind the ban will come into force in July 2006.

# 2 NEED FOR INFORMATION

There is a considerable desire for information on developments in South East Asia amongst British companies. The ETMUEL project, developed and organised by The Centre for Sustainable Design (www.cfsd.org.uk/etmuel), produced over 430 trainees and there was a clear requirement for updates on legislative developments and industry best practice. SEEBA (South-East Environmental Business Association) has highlighted continued interest through its website, workshops and conferences (www.cfsd.org.uk/seeba). The dissemination event for the DTI Global Watch Mission covering the 'state of the art' of eco-design in the Japanese electronics sector, organised by The Centre for Sustainable Design (CfSD) on 12 November 2002, attracted over 70 delegates.

In view of the potential costs to UK industry of the WEEE and RoHS Directives and the implications for competitiveness, it is important to understand how suppliers in China, Hong Kong and Taiwan are dealing with environmental management and eco-design issues in the electronics sector. Therefore it was proposed to form a mission to China, Hong Kong and Taiwan to investigate the 'state of the art' in environmental management and eco-design in the electronics sectors and to explore measures being planned and implemented by Chinese, Hong Kong and Taiwanese companies in developing greener electronic products.

# 3 OBJECTIVES AND OUTCOMES

1 To determine the preparedness of Chinese, Hong Kong and Taiwanese electronics companies for the Waste Electrical and Electronic Equipment (WEEE) and Restriction of Certain Hazardous Substances (RoHS) Directives and the proposed Energy-using Products (EuP) Directive
2 To determine the preparedness of Chinese electronics companies for the new law: Management Methods for the Prevention and Control of Pollution from Production of Electronic Information Products
3 To determine government approaches to disseminating information on environmental management and eco-design to the electronics sector in China, Hong Kong and Taiwan
4 To determine the 'state of the art' in environmental management and eco-design tools in Chinese, Hong Kong and Taiwanese electronics companies; to determine if there is a difference between domestic and foreign owned or part-owned companies
5 To investigate how companies are integrating environmental considerations into product design and development in Chinese, Hong Kong and Taiwanese electronics companies; to determine if there is a difference between domestic and foreign owned or part-owned companies
6 To investigate how Chinese, Hong Kong and Taiwanese electronics companies are implementing environmental management and eco-design requirements in (a) supply chain management and (b) procurement
7 To investigate if and where product-related environmental questions are arising, eg from Japanese, European or US customers
8 To determine the extent of environmental management and eco-design training for (a) specialists and (b) management in Chinese, Hong Kong and Taiwanese electronics companies
9 To determine the extent and use of ISO 14001 and ISO TR 14062 in relation to eco-design management systems in the Chinese, Hong Kong and Taiwanese electronics sector
10 To understand the political and structural relationship between mainland China, Hong Kong and Taiwan and the implications for the electronics sector

## 3.1 Preparedness for EU directives

*Objective: To determine the preparedness of Chinese, Hong Kong and Taiwanese electronics companies for the Waste Electrical and Electronic Equipment (WEEE) and Restriction of Certain Hazardous Substances (RoHS) Directives and the proposed Energy-using Products (EuP) Directive*

### *3.1.1 China*

Amongst the domestic Chinese companies visited (Legend (Lenovo), Huawei, ZTE, HYT, TCL) there were low levels of awareness and confusion over the WEEE and RoHS Directives, and technical standards. Legend (Lenova) mentioned that they kept up to date with European legislation through the State Environmental Protection Administration (SEPA) website, however they thought WEEE and RoHS were voluntary! ZTE had recently been visited by BT who had mentioned

WEEE and RoHS requirements. Siemens VDO appeared to be more informed and employees seem to attend an annual environmental conference in Shanghai organised by Siemens staff from Germany.

A workshop on WEEE and RoHS had been organised by DTI with the support of the Ministry of Commerce in September 2003 in Beijing which attracted over 100 delegates. Feedback appeared to indicate high level of awareness and understanding of key technical challenges/issues. However, the experience from the mission has indicated there is likely to be a substantial difference in environmental awareness between foreign direct investment (FDI) and domestically owned companies.

However, companies visited during this mission seemed confused over WEEE and RoHS and lacked awareness of the proposed EuP Directive, or of Registration, Evaluation and Authorisation of Chemicals (REACH). Many companies seemed to be confused over the difference between EC Directives, national European regulations and international standards – and there seemed to be little recognition that non-compliance with European regulations could mean criminal penalties.

There are complex ownership structures in Chinese companies, eg state owned enterprises (SOEs), companies led by entrepreneurs, and hybrids, eg TCL is run by an entrepreneur but the biggest shareholder is the city of Huizhou. The split of foreign direct investment (FDI) to domestic funded companies is 70:30, but the aim is to reverse this over the next 10 years. There are 189 SOEs, eg China Power, China Telecom, China Great Wall, China Post (Source: CCTV, 21 December 2003).

Experience seemed to reinforce the hypothesis that the level of preparedness for the legislation and environmental awareness will be determined by the extent to which companies are involved in European and Japanese markets and are involved in foreign owned companies (eg in Japanese or European joint ventures or strategic alliances).

A number of Chinese electronics and information and communications technology (ICT) companies visited appear to be selling primarily to the US and into Russia and parts of Africa. In these countries, there is a lack of existing or planned environmental laws related to recycling and hazardous materials substitution, hence a lack of customer pressure in these areas.

There seemed to have been limited involvement in the European market by the companies visited. This may be set to change with Chinese companies starting to increase their presence or enter the market, eg TCL buying the assets of the bankrupt Schneider Electronics in 2002 and taking over Thomson's television business (including RCA and Thomson brands) in November 2003. This will mean, in effect, that TCL subsidiaries will have to bear financial responsibilities under WEEE – there was uncertainty as to whether TCL had recognised this and built financial considerations into acquisition deals.

In European consumer markets it is likely that many Chinese companies will implement a market entry strategy of acquisition, joint venture or strategic alliance, eg using existing European brands rather than exporting domestic brands. However, interestingly, the Legend Group has developed a brand name – Lenovo – as part of its internationalisation strategy. The process of building awareness of Chinese brands in overseas markets will be a long-term marketing exercise.

### *3.1.2 Hong Kong*

Philips are preparing for WEEE and RoHS by providing free consultancy on lead-free issues for suppliers. The level of preparedness is clearly dependent on the position in the supply chain, eg the impacts of the WEEE and RoHS laws on component manufacturers are likely to be minimal. Elec & Eltek were aware of potential impacts of legislation but recognised it would be minimal.

Quanta (Taiwan) appeared to have completed a green manufacturing audit of one Elec & Eltek overseas facility.

### *3.1.3 Taiwan*

There are indications that the Government of Taiwan aspires to position the country as the 'Green Silicon Island'.

Most companies visited were aware of WEEE and RoHS, but not EuP or REACH. However, many appear to be driven by Japanese customers ahead of European customers, eg Sony's Green Partnering Programme (GPP) was mentioned on several occasions. For example, as a result of Sony's GPP, Asus, a motherboard manufacturer, completed a green manufacturing audit of Winbond semiconductor manufacturing facilities.

A major company was incorrectly trying to pass 'producer responsibility' requirements of WEEE to the 1st tier of the supply chain, eg to Quanta and others.

## 3.2 Preparedness for China's law

*Objective: To determine the preparedness of Chinese electronics companies for the new law: Management Methods for the Prevention and Control of Pollution from Production of Electronic Information Products*

The Ministry of Information Industry (MII) is now in the 12th draft of the proposed restricted substances law similar to RoHS and has determined roles and responsibilities. There seems to have been considerable change to the text since its 1st draft (see Appendix A) – which covered a polyglot of issues including the substitution of restricted substances, recycling, packaging and eco-design.

MII seem to have separated out the restricted substitution element under what they are calling 'Chinese RoHS' and have transferred the recycling element to the National Development and Reform Commission (NDRC). 'Chinese RoHS' seems to following the same six chemicals as RoHS with the implementation date now put back to 1 July 2006 rather than 1 January 2006 as originally published in the 1st draft. The shift seems to have occurred due to pressure from both domestic and foreign direct investment (FDI) companies to fall in line with RoHS.

'Chinese RoHS' now seems to be being developed as a framework law covering electronic information products, however the target sectors do not appear to have been announced as yet. MII were aiming for the drafting process to be completed by the end of 2003. It was unclear as to how 'Chinese RoHS' was going to be implemented and enforced. MII seem to have a coordinating role with other ministries, MII provincial offices and customs.

The NDRC Department of Environment and Resource Conservation seem to have been given the responsibility to develop a recycling law similar to Japan's Home Appliance Recycling Law (HARL) – with the scope covering air conditioners, refrigerators, TVs, washing machines (as with HARL) but adding computers. The categories have been chosen on the basis of being high volume and heavy weight products. It seems that a number of pilot projects are being established to determine

the extent of recycling of the five product categories in three major cities before recycling rates are to be set. It appeared that Tsinghua University would be involved in coordinating the research in Bejing. However, a key issue is the lack of a professional electronics and ICT recycling infrastructure in China. This means that even if the law is implemented that there will be a lack of treatment facilities and technologies to enable recycling.

In addition, NDRC discussed the need to add standards and professionalism to the market for the 2nd life refurbishment and reconditioning of ICT, consumer and home appliances. There was clear concern over the illegal importing of US e-waste into the Guangdong area, where dismantling of computers for electronics components has been undertaken using few health or environmental protection standards – it appeared that the activity in this region had been recently closed down. However, there was a feeling that the problem might be shifted elsewhere – where there is less media visibility, eg to West or Central China – but that it would not stop, due to its income-generating opportunities for poor rural populations.

A key issue is the extent to which the Chinese laws will be implemented and policed. One of the reasons is the lack of financial and human resources allocated to the electronics area at SEPA to police the laws. In one instance in the textiles area, there was mention of bribery of environmental protection officers in mainland China – this was cited as one of the reasons for relocation of a company from Hong Kong to China, eg to avoid paying water pollution permits and fines.

There was uncertainty over the awareness of domestic environmental regulation. For example, Lenova mentioned that they were aware of 'Chinese RoHS', however the company did seem to know about the proposed NDRC recycling law.

In addition, there appear to be two other key environmental laws: the Cleaner Production Promotion Law (CPPL) passed around 2000; and the Prevention and Control of Solid Waste Law (PCSWL) which is targeted to be passed in 2004 and aims to promote 'producer responsibility'. The CPPL appears to be very broad in scope, covering areas such as environmental impact assessments (EIAs), pollution control and waste management; and no specific industry sectors are mentioned. It aims to encourage cleaner production research, technical development and international cooperation. A timetable is to be established that aims to phase out production technologies, processes, equipment and products that are hazardous and wasteful. Areas highlighted for technological upgrading include materials recycling and the introduction of the life-cycle design concept into product and packaging design.

## 3.3 Government information

*Objective: To determine government approaches to disseminating information on environmental management and eco-design to the electronics sector in China, Hong Kong and Taiwan*

### *3.3.1 China*

#### Environmental management

There was no evidence of government approaches to disseminate information on environmental management in the electronics sector.

#### Eco-design

There was no evidence of government approaches to disseminate information on eco-design in the electronics sector.

### *3.3.2 Hong Kong*

#### Environmental management

Hong Kong's Environmental Protection Department (EPD) highlight on their website companies that have completed ISO 14001 (see Appendix B for a list of electronics companies). They had also completed a study with Touche Ross on environmental management for SMEs. EPD seem to be working with ACCA in the UK on an environmental reporting award scheme for Hong Kong based companies.

#### Eco-design

Hong Kong Productivity Council (HKPC) had received HK$4 million to complete 20 eco-design reviews and produce a CD-ROM of the results – interestingly, several mainland Chinese companies had participated in the programme. Hong Kong Polytechnic University (HKPU) had received government money to produce a booklet and CD-ROM featuring a series of case studies on eco-designed products – this seemed be to based on eco-(re)design material produced by the Centre for Design at RMIT University in Australia. The Business Environment Council (BEC) aim to re-launch their eco-products award in 2004, building on a competition undertaken in 1999.

### *3.3.3 Taiwan*

#### Environmental management

During the last thirty years, Taiwan has experienced fast industrial growth, which in turn has contributed to serious environmental degradation. In the mid 1980s, numerous programmes were established to improve the environmental performance of industry. In 1986, the Environmental Protection Administration (EPA) was established to formulate policies and oversee regulatory programmes. Alongside EPA, the Ministry of Economic Affairs (MOEA) was given the responsibility of developing appropriate incentive mechanisms to encourage industries to implement environmental management.

Taiwan started environmental protection in 1980 with end-of-pipe (EOP) solutions, progressing to waste minimisation in 1989, cleaner production in 1994, environmental management systems (EMS) in 1996, and began a move to eco-design and green procurement in 2001.

In 1989, the Joint Waste Reduction Task Force (JWRTF) was formed by MOEA and EPA to plan and implement waste minimisation programmes. Initially, the focus was on public education, training, information services and technology demonstration. In the second phase, the programme switched to providing technical assistance and financial incentives. In 1995, additional elements were added to promote environmental management systems (EMS) under ISO 14000 and corporate synergy systems (CSS) which aimed to encourage large firms to form supply chain management systems to recruit their suppliers – primarily small or medium-sized enterprises (SMEs) – to environmental management and waste minimisation programmes.

In 1995, the National Centre for Cleaner Production (NCCP) was established to develop, disseminate and exchange information and cooperate with the domestic and international business community. In 1997, the National Council for Sustainable Development (NCSD) set up the ISO 14000 working group to establish a system for promoting environmental management. Between 1996 and 2001, the Industrial Development Bureau (IDB), under MOEA, subsidised 184 ISO 14001 demonstration projects and provided training programmes and information on the ISO 14000 series. In 1998, the Working Group for Sustainable

Industry (WGSI) was initiated by IDB with the aim of promoting sustainable development through a coalition of government agencies.

In 1999, IDB began a five-year project covering a range of areas such as training and information exchange, specifically:

- **Industrial demonstration and assistance:** diffusion of management and technical tools, eg life-cycle assessment (LCA) and eco-design, and assistance in their use
- **Indicators and annual reports:** establishment of eco-efficiency indicators and editing of corporate environmental reports in line with the Global Reporting Initiative (GRI)
- **Training courses/seminars:** holding between five and ten technical seminars each year with international experts invited to introduce advanced concepts and methods
- **Industrial promotion:** providing a consulting service to major industrial associations, and developing partnerships with two or three industrial associations each year
- **Information distribution:** publishing 'Cleaner Production E-mail News' (biweekly) and providing an information service to specific industries through the Sustainable Industrial Development Information Network (SIDIN) and technical information abstracts – this includes reporting on domestic and international cleaner production status and technology developments

As at 2003, there were an estimated 1,200 companies certified to ISO 14001, approximately 30% from the electronics sector. However, the uptake of ISO 14001 is low amongst SMEs, which represent 96% of firms in Taiwan – with less than 15% of SMEs certified.

## Eco-design

There has been a range of activities completed on eco-design in Taiwan. Conferences have been organised in 2001, 2002 and 2003. In 2001, a group of local experts were invited to discuss the dissemination of eco-design to companies – as a result, awareness-raising seminars were planned and promotional brochures completed.

With the increasing pressure of European and Japanese requirements on Taiwanese electronic and electrical products, the experts recommended the establishment of the Green Design Network (GDN) to accelerate green product development. GDN was established by Taiwan Environmental Management Association (TEMA) in September 2003 with sponsorship from IDB, building on existing knowledge from CETRA and the Electronic Testing Centre (ETC). Initially, GDN has been designed as an information platform to provide companies with information on eco-design tools, case studies, regulation, references, terms/definitions, websites, experts, and local and international activities.

GDN has a website (www.gdn.ema.org.tw) which provides members with a range of eco-design information. Currently, the website covers eight areas:

- Local and international eco-design organisations
- Relevant regulations, eg WEEE, RoHS, recycling and packaging
- Local and international activities, eg international eco-design conferences
- Eco-design case studies in different categories, eg electrical and electronic products, office equipment, furniture
- Eco-design tools, eg LCA, simplified LCA, QFDE etc
- Terms and definitions used in eco-design
- Relevant websites
- References including books, conference proceedings and research reports

In addition, the GDN Electronic News is published every two months and sent to all GDN members. Each issue contains a theme from the editor and news related to organisations, regulations, events, tools and case studies.

The GDN Secretariat and Expert Group is responsible for:

- Updating and maintaining the website
- Publishing the bimonthly electronic newsletter
- Recruitment of members and provision of services to those members
- Arrangement and preparation of activities
- Establishment of the Expert Group
- Communication and interaction with other relevant organisations

The Expert Group comprises one member from government, three from academia, three from companies and two from NGOs and provides input into the development of GDN. They meet twice each year to discuss the GDN website, electronic news, activities, recruitment and future plans. Routine activities of GDN include training, workshops, expert visits to member organisations, seminars and exhibitions. The Secretariat has established a network amongst members, organisations and experts and is expanding its contacts within SE Asia to Japan, Korea, Malaysia and Thailand.

As at December 2003, GDN had over 130 members, primarily from the electronics sector. All company members must obtain management approval and designate a formal representative to GDN. Expert and government members are on an invitation basis. Individual members are primarily from academic or research organisations, with student members encouraged to join but to assist in the GDN activities on a voluntary basis. At present, only members receive the bimonthly electronic news and are sent a password to enter into all parts of the website. Non-members can only have access to the public part of the website.

No membership fee will be charged in the first two years of GDN, but from 2006, members will have to pay a fee for the service.

Taiwan's Business Council for Sustainable Development (BCSD) and Electronic Testing Centre (ETC) funded the Centre for Sustainable Design (CfSD) in the UK to produce a report outlining an eco-design strategy for the Taiwan electronics sector (October 2003). In addition, CfSD have undertaken eco-design training for Taiwanese companies in Taiwan in September 2003.

Researchers at the Centre for Environmental, Safety and Health Technology Development (CESH) at the Industrial Technology Research Institute (ITRI) have recently prepared an eco-design handbook, are developing simple eco-design tools and promoting skills in the area.

### 3.4 'State of the art'

*Objective: To determine the 'state of the art' in environmental management and eco-design tools in Chinese, Hong Kong and Taiwanese electronics companies; to determine if there is a difference between domestic and foreign owned or part-owned companies*

#### *3.4.1 China*

Several companies visited had achieved ISO 14001, eg Konka – however, there was an apparent misunderstanding that it would make them compliant with WEEE and RoHS. It appeared that many of the companies had focused ISO 14001 registration on manufacturing processes but had not covered 'product-related' aspects and therefore had not considered eco-design. This lack of application is likely to leave companies 'open' under RoHS.

Konka considered the achievement of ISO 14001 to be a de-facto requirement for entering the European market. At Lenova, product-related environmental approaches

were focused on single elements, eg packaging reduction or energy efficiency, but did not appear to be tied to an overall approach. Haier had recently announced an eco-design project with Tsinghua University. However, Haier are at present determining what eco-design means for them before starting the project.

### *3.4.2 Hong Kong*

Hong Kong seemed to act as the headquarters for many companies, with manufacturing based in mainland China. Therefore it is unclear if the relatively large number of ISO 14001 registrations (see Appendix B) relate to headquarters or manufacturing operations.

There seems to be a small network of environmental management providers through the Hong Kong Productivity Council (HKPC), Business Environment Council (BEC) and Environmental Protection Department (EPD). HKPC and EPD seem to have been cooperating on developing a simple EMS toolkit. A 'state of the art' eco-design project had been undertaken by HKPC, and Hong Kong Polytechnic University (HKPU) had completed a booklet of examples.

### *3.4.3 Taiwan*

Various companies visited had attained ISO 14001 and there was evidence of relatively advanced approaches to eco-design. However, the focus appeared to be on eco-design compliance, eg removal of hazardous substances (RoHS) and on 'design for recycling' (WEEE and HARL). There was no evidence of broader implementation of eco-design, eg reduction of materials, increased energy efficiency, reduced packaging, increased recyclability and removal of hazardous substances.

At the meeting with Quanta there was recognition that the integration of the five 'focal areas' of eco-design might be a useful stimulus to creativity in the idea generation phase of product development. The eco-design approaches being undertaken by the companies visited could be characterised as eco-design compliance rather than 'eco-innovation'.

ITRI mentioned that they were going to start a project focused on promoting awareness of ISO TR 14062 (Integrating Environmental Aspects into Product Development and Design).

## 3.5 Integrating environmental considerations

*Objective: To investigate how companies are integrating environmental considerations into product design and development in Chinese, Hong Kong and Taiwanese electronics companies; to determine if there is a difference between domestic and foreign owned or part-owned companies*

### *3.5.1 China*

There was little recognition amongst domestic companies that environmental considerations were being integrated into product design and development. Siemens VDO clearly was receiving information and guidance from Germany, having recently attended a conference in Shanghai.

### *3.5.2 Hong Kong*

Philips were clearly advanced in their approaches to eco-design, and substantial work had been completed with suppliers.

### *3.5.3 Taiwan*

The Taiwanese companies visited – particularly Kinpo and Quanta – had developed quite sophisticated approaches to eco-design but were mainly focused on eco-design compliance as previously mentioned.

Quanta clearly have invested time in green procurement and were building an intranet-based information system to support decision-making.

### 3.6 Implementing requirements

*Objective: To investigate how Chinese, Hong Kong and Taiwanese electronics companies are implementing environmental management and eco-design requirements in (a) supply chain management and (b) procurement*

#### *3.6.1 China*

There was little evidence of approaches to green procurement being undertaken outside of Siemens VDO. An interesting finding was that many mainland Chinese companies were sourcing components from Europe, the US and Japan due to quality problems associated with domestic suppliers.

#### *3.6.2 Hong Kong*

Philips appeared to be working closely with suppliers, especially in relation to lead-free technologies and social issues. As part of a broader strategic alliance with Nike, Nike appeared to be providing social auditing training to Philips' personnel – this seemed to be building on and extending SA 8000 guidelines to include new areas such as intellectual property (a major issue in China).

#### *3.6.3 Taiwan*

Quanta seem to be working closely with suppliers to determine environmental capabilities. This was being driven, in part, as a result of Acer's approach of incorporating environmental requirements into supplier specifications to the 1st tier of the supply chain.

### 3.7 Product-related questions

*Objective: To investigate if and where product-related environmental questions are arising, eg from Japanese, European or US customers*

#### *3.7.1 China*

Many of the Chinese companies visited were not supplying Europe at present – the prime existing key markets seemed to be the US, Russia and Africa. Therefore, for them, there were few product-related environmental questions and pressures arising from customers.

#### *3.7.2 Hong Kong*

Elec & Eltek mentioned that some Japanese and European customers, eg Siemens and Ericsson, were starting to make product-related environmental enquiries, especially in relation to use of lead and halogens. However, as yet the impact on them was minimal – but they were aware that the 'floodgates' might open once technical aspects of RoHS are finally agreed.

#### *3.7.3 Taiwan*

There was evidence of Japanese companies starting to request more product-related environmental information, eg Sony was mentioned on several occasions. Some semiconductor manufacturers were also being requested by customers to have green manufacturing audits.

### 3.8 Training

*Objective: To determine the extent of environmental management and eco-design training for (a) specialists and (b) management in Chinese, Hong Kong and Taiwanese electronics companies*

### *3.8.1 China*

There was little evidence of environmental management and eco-design training.

The Union of EcoDesigners in Japan with the Chinese Society for Environmental Sciences (CSES) is sponsoring the 1st Ecodesign Symposium on Electronics on 22-23 March 2004 in Shanghai. This is being managed by the International EcoDesign and Microlectronic Packaging Research Institute (ECOPAC) in cooperation with IEEE CPMT Beijing Chapter, China Electronic Packaging Society and China International Cultural Exchange Centre. ECOPAC seems to be an initiative resulting from the China eco-design project established by Professor Suga at the University of Tokyo.

Tsinghua University appeared to have a researcher focused on ISO 14001 but it is uncertain what projects have been completed.

Around the year 2000 there was the launch of a Chinese arm of the Business Environmental Learning and Leadership (BELL) network – a US-led initiative aimed at greening of business schools – but it is unclear how this is progressing.

### *3.8.2 Hong Kong*

It is unclear what specific education and training programmes are being provided on environmental management in Hong Kong. BEC and HKPC appear to provide ad-hoc training courses related to environmental management and auditing, but eco-design appears to be a new area. Hong Kong University (HKU) seemed to be completing various environmental management research projects and are about to launch a new Masters course in 2004 covering environmental management and corporate social responsibility (CSR). Hong Kong Polytechnic University (HKPU) seemed to have a small group of researchers interested in eco-design, but outputs are limited by a lack of funding.

### *3.8.3 Taiwan*

There seems to be ad-hoc environmental management training provided through various organisations, but this seems to be spearheaded by TEMA. CfSD also undertook for TEMA various eco-design training courses in September 2002. One of the services being offered by the Green Design Network (GDN) is training – but it is unclear what will be covered and when courses will be run.

## 3.9 ISO 14001 and ISO TR 14062

*Objective: To determine the extent and use of ISO 14001 and ISO TR 14062 in relation to eco-design management systems in the Chinese, Hong Kong and Taiwanese electronics sector*

### *3.9.1 China*

There seems to be little coverage of 'product aspects' in existing ISO 14001 systems. ISO TR 14062 is a new area.

### *3.9.2 Hong Kong*

'Product aspects' seem to be less well covered in existing ISO 14001 systems. ISO TR 14062 is a new area.

### *3.9.3 Taiwan*

'Product aspects' do not appear to be covered adequately in existing ISO 14001 systems, and this seems to have been recognised in many of the companies visited. ITRI announced that they are about to launch an ISO TR 14062 programme, but further details were not given.

## 3.10 Political and structural

*Objective: To understand the political and structural relationship between mainland China, Hong Kong and Taiwan and the implications for the electronics sector.*

### *3.10.1 China*

There seem to be many Taiwanese and Hong Kong businessmen who own factories in mainland China.

There appears to be infighting between the south and east coast provinces as to which is the 'best' and the 'best place' to do business.

There appears to be delegated autonomy and budgetary power to the provinces in many areas.

There is a high degree of sensitivity between Beijing and Taipei in view of Taiwan's recent referendum linked to the election – there are different factions in Taiwan that are pro-Beijing and pro-Taipei. It appears that Beijing wants to hold up Hong Kong as a shining light of Chinese social-capitalism, however their attitude to Taiwan is less clear.

### *3.10.2 Hong Kong*

The country operates under the heading of 'one country, two systems' and seems to retain many English elements, eg law.

### *3.10.3 Taiwan*

Taiwan and Hong Kong appear to view each other as competitors. There appears to be a significant US interest in Taiwan – a figure of 500 US government officials in residence compared to 1 from the EC was quoted.

# 4 QUESTIONS AND ANSWERS

## 4.1 Strategic implications

### *4.1.1 Position on sustainable development in Chinese, Hong Kong and Taiwanese electronics sectors and implications for product design and development?*

#### China

MII stated that there have been recent developments that have made sustainable development more important.

A major goal has recently been established to promote the sustainable development of electronics industries – this seems to have arisen from an environmental protection viewpoint.

The 'First China Forum on Sustainable Consumption and Production' was held in Changsha during 6-8 December 2003 and attracted over 400 delegates. The meeting was organised by SEPA, the government of Hunan province, China Science and Technology Association (CSTA), the Chinese Society for Environmental Sciences (CSES), and the United Nations Environment Programme (UNEP). Wang Yuqing, Vice-Minister on Environmental Protection, stressed the need to explore the concept of a 'circular economy' to reduce consumption of natural resources and pollution.

#### Hong Kong

Further research is required.

#### Taiwan

The government seem to have adopted the words of sustainable development in policy terms. However, it is unclear as to the actual implementation of programmes. The ROC Business Council for Sustainable Development (BCSD) was established several years ago, with membership from a variety of large companies.

### *4.1.2 Company level and industry wide environmental R&D in China, Hong Kong and Taiwan?*

#### China

Most companies visited did not appear to have started R&D into lead-free soldering and processes. The extent of diffusion to SMEs is likely to be virtually non-existent. Siemens VDO claimed to be running a lead-free line to start to build-up experience over the technical and organisational changes that will be required. There is likely to have been support from Siemens' central environmental department in Germany to enable Siemens VDO to start the process.

#### Hong Kong

One company Chairman interviewed had started R&D into lead-free soldering and processes – however, the extent of diffusion to SMEs is likely to be extremely limited. Surface Mount Technology (Holdings) Ltd claimed to have been running lead-free and leaded lines for around two years and to be building-up a learning curve. Philips were intervening directly with suppliers by providing free consultancy on lead-free alloys, machinery, etc. They felt that this pro-activity was necessary to bring suppliers up to speed, as they were lagging behind the necessary timescales.

### Taiwan

ITRI has a key role in environmental R&D through the environmental centre that employs over 300 people on a range of projects. These range from projects related to electronics recycling to eco-design tools – with an eco-design manual recently published. ITRI itself employs over 6,000 people at various locations in Taiwan – with a stated emphasis on SMEs, although large companies also seem to be involved in projects.

Companies visited had started R&D into lead-free soldering and processes – however, the extent of diffusion to SMEs is likely to be extremely limited, unless they are in the supply chains of pro-active Taiwanese companies.

#### *4.1.3 Areas of eco-design, recycling and materials development needing further R&D in China, Hong Kong and Taiwan?*

### China

Eco-design overall and specifically in the electronics sector is at a very early stage of development, therefore it could be characterised as immature or even at pre-birth stage. There was no evidence of eco-design being undertaken in companies or government sponsored projects. One research project seems to be emerging at Tsinghua University with Haier – however, as yet the details have not been finalised. Electronics recycling seems to be primarily in the informal sector with considerable questions over health and safety, and pollution associated with processes.

### Hong Kong

An eco-design demonstration project and research had been undertaken. Philips also mentioned that eco-design elements were being implemented through the supply chain, eg in hazardous material, and that they were disseminating requirement on lead-free soldering, cables and packaging. They were also putting a lot of effort into lead-free components and had achieved one total 'lead-free' product.

### Taiwan

There seemed to be considerable progress on eco-design within the companies visited. Research has been undertaken within institutes and universities. Professor Jahau Lewis Chen of National Cheng University (Department of Mechanical Engineering) has been researching into the use of the TRIZ innovation methodology and its potential application in eco-innovation. Companies visited appeared aware of eco-design, and built elements into systems, however, most approaches seemed to be focused on compliance issues. ITRI has been undertaking research into eco-design tools aimed at design engineers and had completed a project on the eco-design of a mouse.

#### *4.1.4 Chinese, Hong Kong and Taiwanese government eco-design programmes for SMEs, their funding, development and implementation?*

### China

There was no evidence of programmes for SMEs.

### Hong Kong

There was no evidence of programmes for SMEs.

### Taiwan

ITRI are undertaking a range of eco-design projects but it is uncertain to what extent this has focused on SMEs.

#### *4.1.5 Influence of WEEE, RoHS, EuP, HARL, LPEUR and GPL on Chinese, Hong Kong and Taiwanese government policies related to environmental management, eco-design and recycling?*

China

There seems to be a fundamental lack of awareness and confusion over the WEEE and RoHS Directives, and no awareness of EuP and REACH. However, there was some evidence of the influence of Sony's GPP on companies.

Hong Kong

The companies visited seem to be aware of WEEE and RoHS, but not of EuP and REACH – however, the sample is small and no generalisations should be made from this. The government seems to have funded HKPC's eco-design demonstration project, in association with HKEIA – however, the motivation for funding the project is unclear. There was a proposal for a follow-up project.

Taiwan

As a result of Taiwan being an export oriented economy, the government and companies seem to be highly aware of green legislative developments in Europe and Japan. In the 1990s there seems to have been considerable investment in ISO 14001 approaches. Since 2001, eco-design and, latterly, green procurement projects seem to have received funding. There appears to be a 4th generation electronics recycling system but no information was available.

#### *4.1.6 Voluntary agreements involving eco-design in the electronics sector in China, Hong Kong and Taiwan?*

China

There was no evidence of voluntary agreements on eco-design.

Hong Kong

There was no evidence of voluntary agreements on eco-design.

Taiwan

There was no evidence of voluntary agreements on eco-design.

#### *4.1.7 Key drivers for environmentally friendlier products: B2C, B2B, B2G, B2D?*

China

There seems to be the recognition of few external or internal stimuli for the development of greener products.

Hong Kong

There seems to be the recognition of few external or internal stimuli for the development of greener products.

Taiwan

There are a mix of drivers. The prime driver is B2B on the 1st tier of the supply chain, eg Acer requirements being passed on to Quanta, and Sony's GPP on to various suppliers. However, the government's green procurement law seems to be having an impact on the development of a range of greener products, but the impact on the ICT and white goods sectors is uncertain.

#### *4.1.8 Incorporation of environmental management and eco-design in curricula in design, engineering and business schools in China, Hong Kong and Taiwan?*

### China

The Department of Environmental Science and Engineering at Tsinghua University appeared to have a researcher on ISO 14001 and are about to start a project with Haier on eco-design. Separately, Tsinghua University are involved in the Eco-design China conference in March 2004. In addition, a senior Chinese researcher seconded to the University of Tokyo is working on a China eco-design project. The US-led BELL network held two conferences on the greening of business schools in China but it is uncertain how this has progressed. University of Tokyo seem to have targeted involvement in China, with Professor Yamamoto being a visiting professor to many Chinese universities, and Professor Suga leading eco-design activities in the electronics sector.

### Hong Kong

HKPU have undertaken a research project on various product-specific eco-design cases. Activities appear to be ad-hoc and based on a couple of motivated researchers and lecturers. At HKU, an environmental management and corporate governance programme has been developed, with a new Masters programme on corporate social responsibility (CSR) set to be launched in 2004.

### Taiwan

There seems to be a range of environmental management and eco-design research projects. To what extent this has moved into university curricula is unclear. Eco-design training has been undertaken by overseas experts, eg CfSD (UK) and RMIT University (Australia).

#### *4.1.9 Incorporation of environmental management and eco-design in training within electronics companies in China, Hong Kong and Taiwan?*

### China

It is unclear what environmental management training is being undertaken within companies. There was no evidence of eco-design training programmes.

### Hong Kong

HKPC and BEC undertake a range of environmental management training. There was no evidence of eco-design training programmes.

### Taiwan

A range of organisations have provided environmental management training programmes, eg TEMA. CfSD undertook two eco-design training programmes amongst electronics companies in 2003. There was no other evidence of eco-design training programmes being undertaken within companies.

#### *4.1.10 Corporate social responsibility (CSR) and corporate responsibility (CR) as issues in the electronics sector in China, Hong Kong and Taiwan?*

### China

There was no specific mention of CSR/CR initiatives.

### Hong Kong

There were indications that there is growing interest in CSR/CR. There was mention that Stephen Timms, CSR Minister at DTI would attend a major CSR/CR conference in Hong Kong in early 2004. Philips have started to

assess the social impacts of suppliers in China and are being trained by Nike personnel who are going beyond SA 8000. HKU were developing a new Masters programme related to CSR to be launched in 2004.

### Taiwan

Kinpo have started to assess the social impacts of suppliers in China. BCSD have a role in disseminating best practice on CSR/CR to larger companies – but its activities in this area are unclear.

## 4.2 Supply chain

#### *4.2.1 Impacts on the electronics sector in China, Hong Kong and Taiwan of the GPL in Japan and of green procurement programmes of Japanese companies?*

### China

There were few mentions.

### Hong Kong

There was evidence of awareness of WEEE, RoHS and Sony's GPP at Elec & Eltek; however, as a component supplier they have assessed the risk, but this is likely to be minimal. Philips were clearly very aware of the issues and were taking initiatives to raise awareness of environmental issues, especially lead-free considerations, in their supply chain.

### Taiwan

As a result of external drivers, Acer have passed many issues to the 1st tier of their supply chain. As a result, Quanta are responding to customer requirements and product-related environmental information systems are being developed that focus on materials and toxicity issues. The information system has been built on pro-active green procurement activities initiated a couple of years ago.

#### *4.2.2 Links between eco-design and procurement and supply chain management in Chinese, Hong Kong and Taiwanese electronics companies; and relevant tools that are being developed?*

### China

There was no evidence of developments in this area.

### Hong Kong

Philips are starting to use internal consultancy services for suppliers related to lead-free technologies. In addition, they have formed a partnership with Nike to train Philips' in-house auditors on social issues.

### Taiwan

Kinpo seem to be using eco-design as a process to gain better information from suppliers. Quanta have developed a sophisticated information system that has been launched on the company intranet.

#### *4.2.3 Management of collection and analysis of environmental information from suppliers in electronics companies in China, Hong Kong and Taiwan?*

### China

There was no evidence of developments in this area.

### Hong Kong

Philips seem to have recognised that they need to take a pro-active approach with suppliers, to bring them up to speed on 'lead-free' issues.

### Taiwan

Quanta seem to be using questionnaires.

#### *4.2.4 Eco-design training partnerships with suppliers and their influence beyond tier 1 suppliers in the electronics sector in China, Hong Kong and Taiwan?*

China

There was no evidence of developments in this area.

Hong Kong

There was no evidence of developments in this area.

Taiwan

Acer seem to be building product-related environmental compliance into contracts. However, there was evidence of a misunderstanding of the WEEE Directive, which indicated that incorrect and unreasonable requirements related to 'producer responsibility' may be being built into contracts.

### 4.3 Organisational considerations/ management systems

#### *4.3.1 Electronics companies in China, Hong Kong and Taiwan with ISO 14001 certification, and attitudes to certification?*

China

It is unclear how many Chinese electronics companies have achieved ISO 14001 certification. It appears that some companies that have gained 14001 may then return to earlier lower standards after certification, if they perceive there is an opportunity to get away with it. This attitude was reinforced on a couple of occasions from outside the corporate community.

Hong Kong

51 electronics companies have achieved ISO 14001 (see Appendix B). Philips are going beyond requirements of SA 8000 to include not just labour standards but also intellectual property rights (IPR).

Taiwan

It is estimated by TEMA that about 350 electronics companies have achieved ISO 14001 in Taiwan. One company visited has started to assess its social impacts.

#### *4.3.2 Use of ISO TR 14062 to help implement eco-design in the electronics sector in China, Hong Kong and Taiwan?*

China

There is no evidence of awareness of ISO TR 14062.

Hong Kong

There is no evidence of awareness of ISO TR 14062.

Taiwan

ITRI will be starting a programme on ISO TR 14062 in 2004.

#### *4.3.3 Organisational challenges and approaches for the integration of environmental considerations and eco-design into the product development process in electronics companies in China, Hong Kong and Taiwan?*

China

Many of the companies have grown fast, and environmental issues are new. It appeared at Konka that ISO 14001 implementation had

been picked up within the quality function, however the environmental considerations did not seem to have permeated through to product development.

### Hong Kong

It was not clear what organisational challenges had been faced by the 20 companies that had completed the eco-design demonstration project initiated by HKPC. Eco-design issues were not seen as really impacting on Elec & Eltek as they are a components manufacturer.

### Taiwan

At Kinpo, eco-design activities seem to have been led by a Vice President. At Quanta, there seems to be a range of technical and R&D functions involved in eco-design. Acer were passing the requirements through their 1st tier suppliers.

#### *4.3.4 Degree of focus on eco-design issues for ISO 14001 certifiers in China, Hong Kong and Taiwan?*

### China

There was no evidence of product elements being emphasised in ISO 14001 certification.

### Hong Kong

There was no evidence of product elements being emphasised in ISO 14001 certification.

### Taiwan

There was no evidence of product elements being emphasised in ISO 14001 certification. However, ITRI were initiating a project on ISO TR 14062.

#### *4.3.5 Engagement of 'marketing' in eco-design in Chinese, Hong Kong and Taiwanese electronics sectors?*

### China

There was no evidence of the marketing function being involved in eco-product development and promotion.

### Hong Kong

There was no evidence of the marketing function being involved in eco-product development and promotion.

### Taiwan

There was no evidence of the marketing function being involved in eco-product development and promotion.

#### *4.3.6 Assessment of (a) cost and (b) benefits of eco-design in electronics companies in China, Hong Kong and Taiwan?*

### China

No methods seem to be used in companies visited.

### Hong Kong

No clear approaches were seen. However, from previous experience, it is known that Philips have developed their own methodologies, metrics and performance measurement approaches linked to the five focal areas of eco-design (materials, packaging, energy, recycling and hazardous materials).

### Taiwan

No methods were presented by companies visited. However, experience suggests that this will be an area that will be explored – possibly through ITRI and/or the Green Design Network (GDN).

#### *4.3.7 Measurement of environmental performance improvement of products and services in electronics companies in China, Hong Kong and Taiwan?*

China

No methodologies were seen in companies or universities.

Hong Kong

No methodologies were seen in companies or universities.

Taiwan

ITRI seemed to be working on an approach for products, but the methodology was not presented.

#### *4.3.8 Communication of eco-design improvements to B2C, B2B and B2G customers in China, Hong Kong and Taiwan?*

China

An eco-label was developed in 1992 but it is unclear how many ICT, consumer electronics or white goods companies have achieved it. There are also low levels of awareness in business-to-consumer (B2C) markets and the awareness and success of the programme is likely to be extremely limited.

Hong Kong

It was unclear when the Hong Kong Green Label was established and how many ICT, consumer electronics or white goods companies have achieved it. There are low levels of awareness in B2C markets.

Taiwan

The Green Mark was developed in 1993 but it is unclear how many ICT, consumer electronics or white goods companies have achieved it (see Appendix E). A major stimulus to eco-label developments has been the government's green procurement law passed in 1999 (see Appendix D), two years before Japan's GPL. Therefore the prime use has been in business-to-government (B2G) markets, and it is unclear to what extent eco-labels are being utilised in B2B markets. The impact of eco-labels is likely to be minimal in B2C markets due to low levels of environmental awareness amongst domestic consumers.

#### *4.3.9 Estimation of costs of eco-design improvements in China, Hong Kong and Taiwan?*

China

There was no evidence of eco-design cost estimation being completed in companies visited.

Hong Kong

There was no evidence of eco-design cost estimation being completed in companies visited. However, Philips and probably other overseas subsidiaries are likely to have developed methodologies in-house.

Taiwan

There was no evidence of eco-design cost estimation being completed in companies visited. However, experience suggests that Taiwanese companies are likely to be developing approaches.

## 4.4 Recycling

### *4.4.1 Extent to which 'end of life' considerations have been incorporated into eco-design in electronics companies in China, Hong Kong and Taiwan?*

#### China

It appeared that eco-design and recycling is not being practised by domestic Chinese companies. However, eco-design and recycling requirements are likely to be passed down to subsidiaries of foreign owned companies.

#### Hong Kong

Twenty companies participated in the eco-design demonstration project organised by the HKPC. The motivation or focus of the strategies implemented were unclear. More research is required.

#### Taiwan

Eco-design seems to be first dominated by hazardous materials substitution, eg lead, cadmium, etc in line with RoHS and Japanese requirements. Some companies seemed to be exploring 'design for recycling' (DFR) issues in relation to B2B customer requests.

### *4.4.2 Integrated models of inverse manufacture, recycling and eco-design in China, Hong Kong and Taiwanese electronics companies?*

#### China

There was no evidence of integrated models.

#### Hong Kong

There was no evidence of integrated models.

#### Taiwan

There was no evidence of integrated models.

### *4.4.3 Recycling measures in electronics companies in China, Hong Kong and Taiwan?*

#### China

There is a lack of a professional recycling system for ICT, consumer electronics and white goods. However, there appears to be a major market for refurbished or 2nd life products.

#### Hong Kong

There seemed to be a lack of a robust electronics recycling system for ICT, consumer electronics and white goods.

#### Taiwan

An electronics recycling infrastructure does seem to exist, but no information was available.

### *4.4.4 Use of recycled materials in products in electronics companies in China, Hong Kong and Taiwan?*

#### China

There was no evidence of the use of recycled materials in ICT products.

#### Hong Kong

There was no evidence of the use of recycled materials in ICT products.

#### Taiwan

There was no evidence of the use of recycled materials in ICT products. Under the green procurement law, ROC government agencies have the priority of buying three types of green products (see Appendices D and E). Type 2 products seem to incorporate 'regenerated material':

- Products that can meet the requirements of 'regenerated material, recyclable production and energy saving', yet do not fit into the Green Mark category – however, the products or product materials have to be verified and awarded a certificate by a public third party

However, it is unclear what types of products have been certified as 'Type 2' products.

#### *4.4.5 Design stage assessment of the costs of recycling their products in Chinese, Hong Kong and Taiwanese electronics companies?*

China

There was no evidence of assessments.

Hong Kong

There was no evidence of assessments.

Taiwan

There was no evidence of assessments.

### 4.5 Tools

#### *4.5.1 Degree of life-cycle thinking (LCT) involved in development of eco-design tools in Chinese, Hong Kong and Taiwanese electronics companies?*

China

There was no evidence of eco-design tools being used.

Hong Kong

There was no evidence of eco-design tools being used.

Taiwan

There were no specific descriptions of eco-design tools being used in companies. A few companies seem to be undertaking life-cycle assessments (LCAs). However, ITRI had been developing a range of eco-design tools and have just published a booklet.

#### *4.5.2 Use of 'simple' eco-design tools in Chinese, Hong Kong and Taiwanese electronics companies?*

China

There was no evidence of eco-design tools being used.

Hong Kong

There was no evidence of eco-design tools being used.

Taiwan

ITRI had been working on the development of simple eco-design tools – although details were not available.

#### *4.5.3 Eco-tools for other business functions in the product development process, eg marketing in Chinese, Hong Kong and Taiwanese electronics companies?*

China

There was no evidence of the development of eco-tools for other business functions.

Hong Kong

A simple approach to environmental management systems (EMS) seemed to be being developed by the Environmental Protection Department. There was no evidence of the development of eco-tools for other business functions.

Taiwan

A range of EMS tools appears to have been developed and disseminated in the late 1990s.

Outside of development of eco-design tools by ITRI, there was no evidence of the development of other eco-tools for business functions.

## 4.6 Engineering

### *4.6.1 Changes made to manufacturing processes and technologies to take account of the move to lead-free, cadmium-free, etc in Chinese, Hong Kong and Taiwanese electronics companies?*

#### China

Siemens VDO had mentioned that they were undertaking a pilot project on lead-free manufacturing.

#### Hong Kong

The Chairman of Surface Mount Technology (Holdings) Ltd stated that his company had been trialling lead-free manufacturing for the last two years.

#### Taiwan

It was uncertain as to the extent that companies were trialling lead-free manufacturing lines.

### *4.6.2 Attitudes and responses of suppliers to domestic Chinese, Hong Kong and Taiwanese electronics markets regarding lead-free, etc issues?*

#### China

As a result of 'Chinese RoHS', Chinese companies selling purely to the domestic market will have to develop substitute lead, cadmium, etc in 'electronic information products' by 1 July 2006. However, there is major uncertainty as to how and if the law will be enforced. Many domestic-owned exporters are likely to be unaware of RoHS requirements and may well be unable to comply with customer specifications.

#### Hong Kong

As a result of 'Chinese RoHS', Hong Kong owned Chinese companies selling purely to the domestic Chinese market will have to develop substitute lead, cadmium, etc in 'electronic information products' by 1 July 2006. However, there is major uncertainty as to how and if the law will be enforced. Many exporters are likely to be unaware of RoHS requirements and will be unable to comply with customer specifications

#### Taiwan

As a result of 'Chinese RoHS', Taiwanese Chinese companies selling purely to the domestic market will have to develop substitute lead, cadmium, etc in 'electronic information products' by 1 July 2006. However, there is major uncertainty as to how and if the law will be enforced. Many Taiwanese companies own firms in China that export, however the extent to which RoHS requirements are being passed through manufacturing processes is uncertain. The companies visited seem to be very aware of green legislative developments, and the likelihood is that green aspects are being built into procurement and supply chains.

### *4.6.3 Investigation of alternative plastics or new technologies for flame retardants?*

#### China

Further research is needed.

#### Hong Kong

Further research is needed.

#### Taiwan

Further research is needed.

# Appendix A

## CHINA – SUPPLEMENTARY INFORMATION

### Management Methods for the Prevention and Control of Pollution from Production of Electronic Information Products (draft for comment)

#### Chapter 1 General principles

*Article 1*
Pursuant to relevant regulations promulgated in the Law of PRC on Environmental Protection (hereinafter referred to as Law of Environmental Protection) and the Law of PRC on Promotion of Cleaner Production (hereinafter referred to as Law of Cleaner Production Promotion), in order to strengthen the prevention and control of pollution from production of electronic information products from the source, minimise the environmental pollution and public hazard from the disposal of these products, realise cleaner production and sustainable development in the industry, safeguard human health, and improve resources utilisation efficiency, this regulation is drafted.

*Article 2*
Electronic information products as referred to herein include products such as, and relevant materials for, radar and accessories, telecommunication equipment, broadcasting and television equipment, computers and accessories, household appliances, electronic equipment for special purposes, instruments, electronic components and special materials.

*Article 3*
This regulation is applicable to all producers of electronic information products within the territory of the PRC.

The Ministry of Information Industry (MII) shall publish a catalogue of electronic information products applicable under this regulation in a timely fashion when necessary.

*Article 4*
MII shall, based on laws and regulations promulgated in the Law of Environmental Protection and the Law of Cleaner Production Promotion, make beneficial policies and regulations for the prevention and control of pollution from production of electronic information products, encourage and support scientific research, technological development and international cooperation on the prevention and control of pollution from production of electronic information products, organise the publicising and popularising of the knowledge of the prevention and control of pollution from production of electronic information products, increase the environmental protection awareness of the entire industry, spread the technology on the prevention and control of pollution from production of electronic information products, comprehensively utilise resources, and protect and improve the environment.

*Article 5*
The administrative authorities in charge of the information industry at every level shall integrate responsibility for the prevention and control of pollution from production of electronic information products into their overall responsibilities.

Within their respective scope of responsibility, the administrative authorities in charge of economic trade, environmental protection, industry and commerce administrative management, quality and technology

supervision, inspection and quarantine at every level shall assume responsibility for supervision and management.

*Article 6*
The administrative authorities in charge of the information industry at every level may appraise and reward organisations and individuals with outstanding achievements in the prevention and control of pollution from production of electronic information products and related activities.

*Article 7*
MII may provide production and development funds for organisations that actively research and develop new environmentally friendly electronic information products.

## Chapter 2 Pollution prevention and control in the production of electronic information products

*Article 8*
Electronic information product design should take into consideration the product's impact on the environment and human health, and use non-toxic, non-harmful, easily decomposed and recyclable materials as much as possible, provided that design requirements can be met.

*Article 9*
Producers of electronic information products (hereinafter referred to as producers) should use materials, technologies and processes that are resource efficient, easily recyclable, and environmentally friendly in the production process.

*Article 10*
Packages of electronic information products should be made of non-toxic, non-harmful, easily decomposed and recyclable materials, and the material compositions of the packages should be labelled on the packages.

*Article 11*
Producers should start to reduce the usage of toxic and harmful materials from 1 July 2003. Products that enter the market after 1 January 2006 and are on the catalogue of national key electronic information products should not contain lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE).

MII, or together with other relevant state authorities, shall uniformly draft and issue the catalogue of national key electronic information products.

MII and the administrative departments of quality and technology supervision, inspection and quarantine shall uniformly make, issue and implement specific testing standards for products listed in the catalogue of national key electronic information products.

*Article 12*
Producers must mark on their electronic information products the names, content levels, and symbols of recyclability of toxic and harmful materials. Under exceptional circumstances due to volume or functional limitations, the aforementioned information may be stated on the product packages or product manuals.

Symbols of recyclability consist of three categories: fully recyclable, partially recyclable, and non-recyclable. The appearances and forms of the symbols shall be uniformly determined by MII, or together with other relevant state authorities.

*Article 13*
Producers must mark on their electronic information products the product safety periods, and provide detailed explanations in the product manuals.

The appearances and forms of the product safety periods shall be uniformly determined by MII, or together with other relevant state authorities.

*Article 14*
Producers should timely submit indexes of their products' safety periods to MII for record keeping when the product designs are finalised.

MII shall uniformly publish the recorded indexes to the public.

*Article 15*
Producers should make corresponding recycling contracts with state-approved discarded and used electronic information product recyclers and entrust the recyclers to recover products that exceed their safety periods.

*Article 16*
Producers should assume corresponding costs of recovery and disposal of discarded and used electronic information products. The specific forms and amounts of costs shall be determined by MII and other relevant state authorities.

*Article 17*
Producers that import electronic information products for integrative production (including processing businesses) should require the suppliers to mark on the products the name of the country of origin and to provide evidentiary documents by state approved domestic recyclers agreeing to recover and dispose of the imported products. Otherwise, the rules of Article 16 shall apply.

For the importation of electronic information products for other purposes, the preceding article applies.

## Chapter 3 Supervision and management

*Article 18*
The administrative authorities in charge of the information industry at every level may coordinate with the authorities of environmental protection, industry and commerce administrative management, quality and technology supervision, inspection and quarantine to inspect electronic information products and producers for compliance with this regulation.

*Article 19*
Entities and individuals have the right to report or complain about entities or individuals that cause pollution from production of electronic information products.

*Article 20*
Producers who fail to mark, or falsely mark, on their electronic information products the names, content levels, or symbols of recyclability, in violation of Articles 12 and 13 of this regulation, shall be ordered to make corrections within certain time limits by MII and the administrative authorities in charge of quality and technology supervision, inspection and quarantine; offenders who refuse to make the aforementioned corrections shall be warned, or have their identities circulated, or have their electronic information products production permit revoked and their identities publicised, depending on the severity of the violations.

*Article 21*
Imported products for integrative production without marks of their country of origin, or imported products for integrative production without evidentiary documents on their recovery and disposal, in violation of Article 17 of this regulation, shall not be allowed to enter customs.

*Article 22*
Entities in violation of rules contained in Chapter 2 of this regulation shall be denied their applications for development funds for three years.

*Article 23*
Government employees who abuse their authorities and cause serious consequences, or who acquiesce or connive at violations of this regulation for personal considerations or embezzlements, or who assist violators of this regulation to escape penalties, shall be warned, given disciplinary sanction, or expelled from government positions. Actions sufficient to become crimes shall be pursued and investigated, and criminal liabilities shall be imposed according to the law.

**Chapter 4 Supplementary provisions**

*Article 24*
MII is responsible for the interpretation of this regulation.

*Article 25*
This regulation takes effect as of yy/mm/dd.

# Appendix B

## HONG KONG – ISO 14001 CERTIFICATIONS IN THE ELECTRICAL/ELECTRONICS SECTOR (2003)

AIT (Hong Kong) Ltd
ASAT Ltd

Bandai (HK) Co Ltd
Bel Fuse Ltd
Belton Industrial (International) Ltd

Carvan Circuits Ltd
Casio Computer (Hong Kong) Ltd
Century Printed Circuit Ltd
Compass Technology Company Ltd
Computime Ltd/Hai Yan Electronics Plant

Eastern Pacific Circuits (HK) Ltd
Elec & Eltek PCB Ltd
Epson (Hong Kong) Ltd
Epson Precision (HK) Ltd

FCI Connectors HK Ltd
Fittec Electronics Co Ltd (PC)
Fittec Electronics Co Ltd (audio)
Fortune (HK) Engineering & Materials Ltd
Fyrnetics (Hong Kong) Ltd

Group Sense (International) Ltd

Hang Kei Watch Electro-Plating Co Ltd
Hitachi Koki Asia Company Ltd
Hong Yuen Electronics Ltd

Igarasi Electric Works (HK) Ltd

Kalex Circuit Board (China) Ltd
Kyosha IDT (Holdings) Co Ltd

Lafe Technology Ltd

Matsushita Electronic Components (Hong Kong) Co Ltd
Matsushita Seiko Hong Kong International Manufacturing Co Ltd
Mica-Ava (Far East) Industrial Ltd
Mitsui High-Tec (Hong Kong) Ltd
Mutek Electronics Ltd

NEC Technologies Hong Kong Ltd
Neolite Electronic & Lighting (HK) Ltd

Oriental Printed Circuits Ltd

Philips Electronics Hong Kong Ltd
– Business Creation Unit Audio
Philips Electronics Hong Kong Ltd
– Light Factory
Philips Lighting Asia Pacific
Philips Semiconductors
– Electronics Devices Ltd
Possehl Besi Electronics Hong Kong Ltd

Ricoh Hong Kong Ltd

Sanyo Energy (Hong Kong) Co Ltd
Schlumberger Technologies (Asia) Ltd
Skyway Electronic Co Ltd
Standard Success Electrical Co Ltd
Sun Hang Kei Vacuum Electo-Plating Co Ltd

Toko Electronic Manufacturing Co Ltd
Tomy (Hong Kong) Ltd
Topsearch Printed Circuits (Holdings) Ltd

Uniden Hong Kong Ltd
Up-Today Industrial Co Ltd/OTO Corporation Ltd/Nam Hoi City Tai Chun Up-Today Electronics Factory

*Source: The directory of ISO 14001 certified companies in Hong Kong; Environmental Protection Department, Hong Kong (10 July 2003)*

# Appendix C

## TAIWAN – KEY STAKEHOLDERS IN ENVIRONMENTAL MANAGEMENT

### C.1 Public Construction Commission (PCC)

PCC is a government department under the Executive Yuan of ROC (Taiwan – Republic of China). PCC is in charge of government procurement, including implementing the Government Purchasing Law and the Government Procurement Law. The requirement of green procurement in government agencies is under the Government Procurement Law. The PCC website www.pcc.org.tw contains government procurement information, including local and international procurement items and amount.

### C.2 Environmental Protection Administration (EPA)

EPA was established in 1987 and is a government department under the Executive Yuan of ROC to oversee all environmental affairs. In addition to drafting all the environmental regulations, EPA also promotes waste minimisation, cleaner production, ISO 14000 standards and sustainable development.

In May 1999, PCC (see above) drafted the Government Procurement Law requiring all government agencies to practise green purchasing. EPA is responsible for implementating and monitoring this, and they set targets of 30% and 50% for 2001 and 2002, respectively. EPA trained all the government agencies to fulfil the requirements, and at present they are compiling reports on different government agencies for overall assessment. In addition, EPA provided funding support to EDF (see below) for establishing the Green Mark programme. At the same time, EPA promoted the greening of offices, which also facilitated green purchasing in government and companies, especially on office supplies.

### C.3 Environment and Development Foundation (EDF)

EDF was spun off from ITRI as an NGO in 1997. EDF's aim was to implement the eco-label programme in ROC and was provided with a budget of NT$5 million. EDF provides environmental certification and consulting services to government, businesses and consumers in Taiwan and overseas, such as:

- Certification of green products, ie operating the Green Mark programme and the US EPA-initiated Energy Star programme
- Certification of ISO 14001 EMS
- Promotion of green consumption and local initiatives such as the green office campaign, recycling and reuse of kitchen residue, community environmental service corps and recycling scheme for military agencies
- International contact and liaison

EDF is taking the lead on promoting green purchasing in ROC, but mostly in government agencies, and so far does not have sufficient resource to extend to the private sector. Each year, EDF organises a local and international workshop, seminar and exhibition of eco-labelled products. EDF is an active and leading member of the Global Eco-labelling Network (GEN).

### C.4 Business Council for Sustainable Development (BCSD)

ROC BCSD is part of the World BCSD (WBCSD). In the last few years, BCSD and EDF have been publishing Business and the Environment magazine in which they promote green procurement in private enterprises. Last year, BCSD cooperated with Taiwan Electronic Testing Centre (ETC) and TEMA (see below) to organise an international conference on green procurement and green design, inviting international experts to ROC to speak on greening of the supply chain and green purchasing.

### C.5 National Chung Kung University (NCKU)

NCKU is the only academic organisation in ROC conducting research on greening of the supply chain. On 15 March 2003, NCKU organised the Sustainable Product and Enterprise Conference which included a special section on green procurement and greening of the supply chain.

### C.6 Industrial Development Bureau (IDB)

IDB, under the ROC (Taiwan – Republic of China) Ministry of Economic Affairs (MOEA), has been promoting environmental protection and sustainable development in the manufacturing sector for the last 20 years. Beginning with promotion of end-of-pipe treatment, and moving on to waste minimisation, cleaner production and environmental management systems (EMS), IDB is now focusing on green design and green purchasing.

IDB has been providing funding to organisations such as TEMA to promote greening of the supply chain and green purchasing in the manufacturing sector. In 2001, the funding support related to the collection of information; in 2002, it was on an international conference, local seminars and publication of promotion brochures. Future promotion will include publication of green procurement guidelines for the industry and a directory of green product suppliers.

### C.7 Taiwan Environmental Management Association (TEMA)

TEMA is an NGO involved in promoting EMS, green productivity (GP) and tools such as environmental performance indicators (EPI), corporate environmental reporting (CER), environmental cost accounting (ECA), eco-design and green procurement. TEMA receives funding support from IDB for projects to promote these activities.

In 2001, TEMA started collecting information on greening of the supply chain and green procurement from Japan, USA and Canada. TEMA is now working in close cooperation with EDF, BCSD, ITRI, NCKU and ETC on green procurement. In 2002, TEMA organised seminars on green procurement, published a booklet, and organised an international conference. In 2004, TEMA is planning to publish a directory of suppliers of green products, and provide technical assistance to industry, helping them to establish green procurement policy, guidelines and specifications.

# Appendix D

## TAIWAN – GOVERNMENT GREEN PROCUREMENT LAW

### D.1 Background

The Public Construction Commission (PCC) and the Environmental Protection Administration (EPA) of ROC (Taiwan – Republic of China) jointly promulgated the Government Green Procurement Regulation in May 1999 (see www.pcc.gov.tw). These measures were established pursuant to Paragraph 3 of Article 96 of the Procurement Law that mandated government agencies to give preference to the purchase of green products. As a result, ROC became the first country in the world to mandate preferential purchase of green products.

### D.2 Requirements of the law

Under the law, ROC (Taiwan – Republic of China) government agencies have priorities to buy three types of green products:

- **ROC Type 1:** products awarded the Green Mark (ROC eco-label) or a foreign country's eco-label having a reciprocal agreement with the Green Mark programme, eg USA and Canada (this is equivalent to eco-label products under ISO 14024 requirements)
- **ROC Type 2:** products that can meet the requirements of 'regenerated material, recyclable production and energy saving', yet do not fit into the Green Mark category – however, the products or product materials have to be verified and awarded a certificate by a public third party
- **ROC Type 3:** products which reduce social cost and have been certified by a responsible agency, eg a different government agency or a public third party

ROC Type 1 is the same as ISO Type 1 eco-label products. In the government procurement process, government agencies have to purchase eco-label products as the first priority.

An example of ROC Type 2 is a recycled product. Government agencies can purchase recycled products if a Type 1 is not available, and many ROC Type 2 products are actually ISO Type 2 self-declaration products.

ROC Type 3 products aim to 'increase social benefit or reduce social cost'. These products have characteristics which, during the design, manufacturing or use stage, allow reduced reliance on non-renewable resources, reduced resource consumption, use of new resource or other similar characteristics. Examples include Energy Star, Energy Saving and other single criterion label products.

Government agencies conducting procurement of green products with the above criteria can apply a price preference. However, the price preference should not be higher than 10%. Under this condition, if the supplier of an un-green product has the lowest price while the green product has a higher price, within the price range, the supplier of a green product may still be awarded the contract. For example, the supplier of a green product is given a chance to reduce the price if the quoted price is higher, but within 10% of the lowest price of the un-green product, and if agreed, the contract will be awarded to the supplier of the green product.

Article 16 of this regulation enables government agencies or persons who have made significant contributions to the implementation of procurement of green products to receive an award from EPA. However, there is no penalty under the law for government agencies that cannot meet the target.

### D.3 Monitoring targets

The law was enacted in 1999 but not promoted until 2000, when EPA promulgated the green procurement action plan (the 'Plan') that laid out implementation measures and yearly targets for government agencies. The Plan required all central government agencies (including state-owned enterprises and schools), and municipal agencies of the two largest cities (Taipei and Kaohsiung), to start implementing green procurement in 2001.

The first yearly target was set at 30%, based on the ratio of budgeted/purchased green products amount to overall purchase amount in designated product categories (excluding service and engineering contracts). Green office products were identified as the first target category.

All agencies involved are required to report their implementation results and statistics to EPA every six months. EPA then compile the results, evaluate the performance of each agency, and report their performance to the Executive Yuan for appropriate rewards.

In 2002, all government agencies were required to increase targets from 30% to 50% procurement on green products. For 2002 and after, government agencies required to implement green procurement were expanded to include all local government (municipal and county). In addition, several major appliances and water-saving products were also added to the designated product categories.

In 2001, the monitoring of government green procurement began but reporting was inaccurate due to missing or incorrect data.

In 2002, statistics released by EPA indicated that over 80% and 92% of central and local government agencies respectively achieved the 50% target. This represented a target of 66%, or over US$77 million worth of green products. Government agencies such as EPA and Taipei City government achieved 90% green procurement but many other agencies achieved less than 10%. Among 36 ministries and committees, 29 reached the target of 66%, and amongst the 25 counties and cities, 23 reached the target of 65%.

In 2003, the government further expanded the designated product categories, and nearly doubled the targeted green purchase amounts to NT$5 billion (approximately US$146 million), while maintaining the 50% target.

The ROC (Taiwan – Republic of China) government does not require a centralised government procurement system but encourages government agencies to use the Central Trust, which implements a large amount of central procurement for government agencies for products such as computers and office supplies. Now EPA is suggesting that the Central Trust implement higher levels of green procurement to achieve targets with less effort. EPA provides green procurement training and promotion to relevant government agencies, and also acts as the coordination agency to central, city and local governments. In 2002, EPA provided training to government hospitals, schools and companies.

Since implementation of the above green purchasing measures, applications for use of the Green Mark logo have increased nearly threefold (2002) when compared with previous years and the trend is continuing to rise, indicating an increasing interest in green products. There were only about 200 applications each year during 1997-2001, but

there were 600 applications in 2002.
In late 2003, the Green Purchasing Network (GPN) was launched by the Environment and Development Foundation (EDF) with support from EPA. In 2004, GPN will start to recruit members, create an electronic newseletter, and organise workshops. In the future, the Green Design Network (GDN), GPN and other product development organisations will cooperate more closely. Furthermore, GDN and GPN are planning to increase cooperation and networking in the SE Asia region, eg the Eco-Design Network and GPN in Japan, GPN in Korea, and GPN in Malaysia.

### D.4 Conclusion

The successful implementation of a green government procurement programme in ROC (Taiwan – Republic of China) requires the presence of several important factors, such as government mandate/legislation, green product criteria/requirements, and a monitoring/reporting system. Over recent years, the ROC government has gradually put these factors in place and initiated the implementation process.

The reported initial implementation results are quite encouraging, as evidenced by the increasing trends of Green Mark applications, total green products purchased, and green purchasing ratios observed. The leading role that the ROC government has played in promoting green procurement has given an incentive to product manufacturers and service providers to develop green products.

# Appendix E

## TAIWAN – ECO-LABEL PRODUCTS

The eco-labelling programme (the 'programme') in Taiwan was established in 1993, based on the regulation 'Fundamentals for Promoting the Use of the Taiwan Eco-label' promulgated by the ROC government in August 1992. In 1992, the Environmental Protection Administration (EPA) commissioned the Centre for Pollution Control Technologies (CPCT) at the Industrial Technology Research Institute (ITRI) to implement the programme.

EPA and ITRI then decided to establish the Environment and Development Foundation (EDF) to manage all eco-label activities and participate in international activities. EDF was spun off from ITRI in 1997 and provided with a budget of NT$5 million. In October 2001, Dr Yu of EDF was elected onto the board of the Global Eco-labelling Network (GEN) and became chairman in 2003. In October 2002, EDF hosted GEN's international conference and exhibition.

### E.1 ISO Type 1 eco-label products

In 1993, the Green Mark programme relating to ISO Type 1 eco-label products (ISO 14024) was established by EPA and implemented by EDF (see www.edf.org.tw). During 1993-1996 there was an awareness-raising programme and EDF was certified to ISO 9001. In 1997, EDF started to receive applications under Green Mark. During this period, the Green Mark Review Committee was set up, product criteria developed, product testing and inspection methodology procedures devised, and a laboratory established.

By 2002, 77 product criteria had been developed, 1,057 products certified, and about 250 licences granted for the Green Mark since 1997. During 1997-2001, there were about 200 applications each year. However, in 2002 as a result of the Government Procurement Law and pressure on government agencies to purchase green products, there were about 600 applications. Some companies, however, did not renew their Green Mark licence, and that is why the total number of certified products was only 1,057.

As of the end of August 2003, 1,861 products from 406 manufacturers, worth over US$896 million, had been awarded the Green Mark, and product categories had increased to 80.

The Green Mark programme falls under a mutual recognition agreement with the US Green Seal and Canada Environmental Choice programme, so a product that obtains an eco-label in the US or Canada can be recognised in ROC and vice versa.

EPA provides EDF with 90% of the funding on product criteria development, promotion and training. Income is generated on eco-label product applications and this part is expected to be self sufficient in future.

### E.2 ISO Type 2 eco-label products

ISO Type 2 relates to self-declared eco-products according to ISO 14024, such as non-ozone depleting products (products not containing CFCs) and recycled products. As they are self-declared products, there are no statistics, and there is no central directory of these products.

However, due to government procurement, many of these ISO Type 2 products are registered under ROC Type 2, including categories such as eco-cable for electrical, electronic and telecommunication purposes, drinking water machine, recycled PU material, computerised control lift, recycled coloured glass, and recycled printer ink.

### E.3 ISO Type 3 eco-label products

At present, there are no ISO Type 3 eco-label products in ROC because of the lack of reliable life-cycle assessment (LCA) databases to perform the analysis.

### E.4 Green consumerism

Green consumerism in ROC is weak because of the economy and culture. In addition, the Consumer Council, an NGO, lacks influence and funding to promote green consumerism. Difficulties and barriers in green purchasing in the private sector include:

- Cultural and economic development, eg buying cheap products or imitation products on the street
- Green procurement has only recently been launched in ROC
- Little pressure is coming from buyers and export requirements – Japan and EU requirements will still take 2-3 years to become mature
- Support from top management in companies, government and consumers

### E.5 Cases

From a recent survey in the ROC electronic and electrical industry, an estimated 10% of companies are practising some degree of green procurement, but mainly restricted to office supplies. However, the head offices of a number of large Japanese, European and US based companies are starting to drive the implementation of green procurement systems.

Epson Industrial Taiwan (EIT) is the Seiko-Epson investment in Taiwan producing small and medium sized liquid crystal displays (LCDs) for cellular phones, pagers, calculators and watches for markets in Taiwan, Hong Kong, Japan, Singapore, Europe, Korea and USA. Seiko-Epson has started green procurement in Japan and is requesting all its global companies to follow. Under the influence of Seiko-Epson, EIT started to practise green procurement two years ago in the following three areas:

- **General supplies:** by 2002, about 17% was achieved focused on Green Mark 19 product types in ROC including toilet tissue, printing paper, paper box, name card paper, toilet bowl, LCD monitor, tape, non-mercury battery, recycled-paper envelope, detergent, water pigment, refrigerator, washing machine, light bulb, correcting fluid, and humidifier

- **Production supplies:** by 2002, EIT achieved 100% as they import most of their production supplies from Japan and they use the same suppliers as Seiko-Epson

- **Equipment:** by 2002, EIT achieved only 8% as it is rather difficult to practise green procurement in this area due to problems in setting procurement criteria, and shortage of suppliers

Hitachi Taiwan has been implementing a green procurement system following the parent company's model. However, they have not been monitoring the exact amount of green purchasing they have achieved. Inside their green procurement system, they have set up guidelines for green procurement. Hitachi Taiwan requests suppliers to obtain ISO 14001 certification and 10% have achieved this. In addition, they request chemical suppliers to provide material safety data sheets (MSDS), and by 2006 all their procurement should be free of hazardous material.

# Appendix F

## INDUSTRY SUMMARIES – CHINA, HONG KONG AND TAIWAN

### F.1 China

China faces two broad challenges and opportunities: developing its own brands; and manufacturing for others.

China's electronics industry has grown rapidly in recent decades. The fast expansion of production capacity has made China one of the major producers of electronics products, particularly low to medium end consumer electronics.

China's information and communication technology (ICT) industry has been encouraged by the government to develop high-tech products via different kinds of incentives. This is exemplified by the identification of certain key products for development during the Ninth Five-Year Plan period. There are now a number of Chinese enterprises in the ICT sector endowed with advanced technology and technical expertise. Despite these, the industry in China suffers from inconsistent quality control, and is generally weak in commercialisation of technology.

Product-wise, audio-visual (AV) equipment is the largest segment, including television (TV) sets, radios, audio recorders, video recorders, and broadcasting equipment. This is set against the background of a huge production capacity of AV products developed over recent decades amid substantial foreign direct investment (FDI), eg JVC (Beijing), Samsung (Tianjin), Matsushita (China), Kenwood (Shanghai) and Philips. The fast expansion is also due to favourable government policies towards certain AV items like TV sets and cathode ray tubes (CRTs). Sichuan Changhong, Konka, TCL, Panda, Haixin and Zhongshan Jiahua are local giants in this field.

China is now a major volume producer of a number of finished AV products, including colour TV sets, radios, compact disc (CD) players, video compact disc (VCD) players and CRTs. Although the industry still relies on imports of certain core components and semiconductors, it has developed the capacity to design and assemble advanced products like digital TV sets and plasma liquid crystal display (LCD) TVs.

China's electronics industry produces a wide range of semiconductors and other electronic parts and components. There are a number of wafer fabrication plants producing products including certain complementary metal oxide semiconductor (CMOS) items, processors, read-only memories (ROMs), erasable programmable ROMs (EPROMs), amplifiers and other logic chips. Prominent semiconductor enterprises in China include: Shanghai Huahong Ridian Co; Bejing Capital Steel Ridian; Shanghai Advanced Semiconductor Co; Wuxi Huajing Group; Motorola-Tianjin; Shanghai Bekking; Shenzhen Saige Group/Italian-France SGS-Thomson Co.

The communication equipment sector is dominated by wired and wireless terminal and transmission equipment, as well as exchangers and switching apparatus. On the back of the growing importance of information technology (IT), the government has also designated the communications equipment sector as one of the priority industries for further development, whilst the increasing demand for communications services locally and abroad has also stimulated the appetite for communications equipment.

The industry has volume production of terminal items like domestic telephone sets, pagers, mobile phones, navigation items and satellite receivers, and there are a number of manufacturers producing system equipment, including programmed exchangers, public switched telephone network (PSTN) equipment, private automatic branch exchanges (PABXs) and other switching apparatus, mobile phone base stations and other signal transmitting apparatus.

It is also noteworthy that both local enterprises and foreign companies, including Sino-foreign joint ventures, are major players in the industry. Companies like Motorola, Siemens (Shanghai), Matsushita, TCL-NEC, Ericsson, Fujitsu, Shanghai Bell Telecom Equipment, Shenzhen Huawei Technology Co, Beijing Telecommunication Equipment Factory, Haixin and Panda are significant manufacturers. While these companies have advanced design capabilities and/or production facilities, they still have to rely on a clustering of electronics companies to provide subcontracting services and supply parts and components of high precision and quality for their production.

Along with the growing importance of IT, computer products have also become one of the growth segments in China's electronics industry. Major products include personal computers (PCs), notebooks, printers, monitors, modems, network apparatus such as local area network (LAN) switches and routers, as well as a variety of computer parts.

Although the industry relies on imports of core components like certain central processing units (CPUs) and memory chips for production, a number of local companies have successfully developed their own brands. In particular, Lenovo (Legend Group) is the biggest PC manufacturer in China, and at the same time is among the top PC suppliers in the world market. Other prominent local players include Founder, Great Wall, Tontru, Shida and Haixin, while foreign companies like IBM, HP, Dell and Compaq also have production facilities.

### *F.1.1 The China market – figures and trends*

China aims to quadruple its economic growth by 2020, and has a 1.3 billion population.

The 'open door' policy was established in 1979.

An annual growth rate has been sustained over the last two decades. The Chinese economy is now the sixth largest in the world, the seventh largest exporter and eighth largest importer.

Electronics is the largest industry in China with an annual growth rate of nearly 20%.

China is now the world's number one producer of TVs, VCD players, telephones, calculators, refrigerators and air conditioners. China is number one in the cellular phone market and number two in integrated circuit (IC) consumption.

Environmental awareness does exist but it does not translate into better practice. There seems to be a sense of lethargy in implementing improvements and an insufficient understanding of the need to adopt a proactive strategy, except in some leading companies such as Haier. Small or medium enterprises (SMEs) lack resources and knowledge to adopt environmentally sound production techniques.

Chinese electronics products manufacturers have low level recognition of environmental and health issues in key export markets – which is likely to have a detrimental impact on the sector.

Local industry associations do not seem to promote environmental issues in their existing programmes.

Waste problems are created by the disposal of PCs (currently more than 10 million per annum) and electrical appliances (more than 1,500 million per annum). Recycling is expensive due to transport costs and the imposition of excise taxes.

China's share of technology-intensive products (primarily electronics) in global exports has increased from 3% in 1985 to 22% in 2000 (UNCTAD, 2003). An estimated 60% of China's electronics exports originate from factories owned by Taiwanese companies.

China is ranked 3rd worldwide in electronics production. There are 11,700 electronics companies in China. Pearl River Delta and the Yangtze River Delta have been the two key manufacturing bases. In Bejing and Guangzhou there are an estimated 5,000 companies.

*(Source: Reference 1 in Appendix K)*

## F.2 Hong Kong

### *F.2.1 Industry features*

Hong Kong's electronics industry is the largest merchandise export earner, accounting for 42% of Hong Kong's total exports in 2003. In 2001, Hong Kong was the largest world exporter of calculators, and the second largest exporters of radios and telephone sets in value terms.

With respect to finished goods, which constitute about 40% of Hong Kong's electronics exports, the majority are consumer electronics for domestic and personal use. The largest category is audio-visual (AV) equipment, consisting of radios, cassette recorders and players, cassette and CD walkmans, hi-fi equipment, music centres, TVs, video cassette recorders (VCRs), video compact disc (VCD) players, digital versatile disc (DVD) players, etc. Meanwhile, electronic toys, games and related articles, including battery-powered toys and TV games, as well as electronic watches and clocks, also share a significant portion of total exports. Moreover, Hong Kong exports a variety of computer products, such as desk-top, notebook and palm-top computers and magnetic and optical disc drives, as well as telecommunications products like corded telephones and cordless phones. Other items with smaller export value include calculators, digital diaries, digital organisers, electronic dictionaries and translators, batteries and personal security and smoke alarms.

Regarding parts and components, which constitute about 60% of Hong Kong's electronics exports, the major items include parts and accessories for computers. Hong Kong also re-exports a large amount of integrated circuits (ICs) and micro-assemblies, in particular, to the Chinese mainland for outward processing production. Hong Kong produces and exports a variety of parts and accessories for telecommunications items, AV equipment, office machines, calculators and electronic watches and clocks, as well as components like resistors, capacitors, diodes, transistors, inductors, crystals, resonators, speakers, switches, buzzers, liquid crystal displays (LCDs), printed circuit boards (PCBs) and transformers.

Today, most manufacturers have relocated the labour-intensive production processes to the Chinese mainland to maintain cost competitiveness. Their Hong Kong offices are mainly responsible for product development, quality control, management, marketing and logistic support. Due to the relocation of production facilities, most of the companies have been reclassified as non-manufacturing establishments, despite the fact that they have manufacturing activities across the boundary.

Yet there are a number of companies still maintaining high value-added and/or capital-intensive production in Hong Kong, eg IC

packaging, production of multi-layer PCBs, manufacturing of flexible substrates for IC assembly, lead-frame bonding and PCB assembly by surface mount technology (SMT) for high-value products.

Hong Kong's electronics industry is characterised by heavy dependence on imported parts of key components, especially ICs and dies. Given its free port status and the advanced telecommunications infrastructure, Hong Kong allows companies to source freely worldwide. For other parts and components, such as PCBs, passive components, speakers, metal parts, plastics, connectors, gift-boxes and other packing materials, Hong Kong companies may source from other manufacturers locally, or local Chinese enterprises in the mainland.

The success of Hong Kong's electronics industry also lies in efficient management. Against the fast changing markets, Hong Kong companies emphasise quick response to ensure effective marketing services to their customers, and to monitor the changing product trends. Moreover, due to the growing concern of quality conscious buyers, more and more companies have strengthened their quality assurance systems. This is evidenced by a growing number of Hong Kong companies certified as complying with ISO 9000, an internationally recognised standard for quality management systems, as well as ISO 14000, a standard for environmental management systems, amid growing concerns for environmental protection.

### *F.2.2 Sales channels*

Hong Kong manufacturers of finished electronic items mostly produce on OEM and ODM basis for reputable brand names in overseas markets. Some of these major buyers have set up buying offices in Hong Kong for direct sourcing. Hong Kong companies also sell to specialised importers and traders in North America and Europe, who may distribute the merchandise under their own channels or resell to their clients for further distribution.

For Japan, although imports of electronics are dominated by reverse imports from Japanese production facilities in Asia, some brands like Kenwood, Hitachi, Sharp, Toshiba, Sony, Matsushita and Sanyo may have OEM arrangements with Hong Kong suppliers. In any event, after-sales services are usually undertaken by overseas buyers, while Hong Kong suppliers provide technical support for repair and maintenance.

There are also a number of large Hong Kong companies marketing electronic products under their own brand names, including Truly, V-Tech, Group Sense, Venturer, GP and SMC. Their sales network covers not only the advanced countries, but also emerging economies like Latin America and Eastern Europe.

As for parts and components, many manufacturers produce on custom-made basis for famous US, European and Japanese companies, eg parts and accessories for computers, recorders and radio receivers, as well as components like PCBs and LCDs. Meanwhile, standard components are usually exported directly to distributors and manufacturers in overseas markets, although some Hong Kong companies also have their own sales offices and/or representative offices abroad.

Hong Kong is an important trading hub for electronic parts and components in Asia-Pacific. Apart from Chinese products, many items from Japan, Taiwan, the US and South Korea are re-exported via Hong Kong. A number of multinational manufacturers of parts and components have set up offices in Hong Kong, engaging in sales, distribution and sourcing activities in the Asia-Pacific region.

Promotion via participation in trade fairs is an effective way for Hong Kong electronics companies to explore market opportunities. Important trade fairs include the CES Show and COMDEX held in the US; CeBit Fair and Electronica in Germany; Japan Electronics Show; Taipei International Electronics Show in Taiwan; CommunicAsia in Singapore; and Hong Kong Electronics Fair organised by the Hong Kong Trade Development Council (HKTDC). Business missions organised by the HKTDC to the Chinese mainland and other emerging markets also provide opportunities for Hong Kong companies to establish connections with potential buyers.

### *F.2.3 Industry trends*

Along with intensified competition, other Asian suppliers have posed an increasing threat to Hong Kong's electronics exports. But Hong Kong continues to be a popular sourcing centre for higher-end consumer products. This is because competition from less advanced suppliers is confined to low-end mass-market items and simple products, while more advanced competitors like Taiwan and Singapore have different product mixes from Hong Kong. More worrying is the competition from the mainland's indigenous enterprises. In fact, the Chinese mainland has a well-established industrial base for domestic electronics items and poses an obvious threat to Hong Kong exporters in the international market, especially in OEM production.

Against this background, Hong Kong companies have enhanced their value-added. While maintaining their OEM production, they have focused more on ODM business, rendering increased value-added services to overseas customers. Although this would normally require more investment in aesthetic and technical designs than OEM production, developing ODM business is deemed to be an important strategy for Hong Kong's electronics companies to enhance their competitiveness. The most important attribute of their success in ODM business is product design and development capability, while knowledge of world product trends and different consumer tastes and preferences in different markets are also their edge.

As more design works are being undertaken by Hong Kong companies, there is a tendency of overseas importers to shift liabilities arising from defective products to local manufacturers and traders. It has thus become increasingly critical for Hong Kong exporters to observe laws and regulations in relation to consumer protection and product liabilities in overseas markets.

While parts and components for consumer electronics are selling well in Asia, major players have repositioned to supply parts and components for commercial and industrial equipment like computers, telecommunications and navigation systems. For example, many PCB manufacturers have shifted to the production of fine pitch multi-layer boards for sophisticated products, while some LCD companies have developed high-resolution LCD modules for high-value products. In any event, these manufacturers tend to adopt a strategy of higher degree of vertical integration to increase value-added. PCB layout, schematic drawing, tool-making, production and/or quality assurance are all done under one roof.

On the other hand, the fast changing consumer pattern has resulted in low inventory levels in major export markets, requiring quick response for inventory replenishment. Product life cycles have also shortened amid the advancement in technology, leading to the need for more frequent changes to product features and cosmetic designs in order to lure consumers. In this respect, Hong Kong companies are well known for their adaptability and responsiveness to the rapidly evolving consumer tastes and

technological changes. They have constantly upgraded their capability in product and aesthetic designs. Some companies also re-engineer their procurement and production management systems, in a bid to shorten delivery lead time.

In addition, amid the growing significance of information technology (IT), e-commerce has become an important development in the business world. For Hong Kong's electronics manufacturers and exporters, getting on-line has gradually become a fundamental element to support their marketing activities. Apart from using their web pages for promotion and cataloguing, firms are adopting electronic means to foster their business, including Internet facilities to communicate with their customers for data exchange and logistics arrangement. Some companies also make use of the Internet to stimulate sales, allowing consumers to update or enhance, through downloading relevant software from designated web sites, the functionality of their the products like certain computer equipment, electronic gadgets and electronic toys.

*(Source: Simon Duan, DTI International Technology Promoter (ITP) for Electronics & Materials – Greater China)*

## F.3 Taiwan

The Taiwan electronics industry has enjoyed remarkable success. From a standing start in the 1970s, it is now a major world player in a wide variety of product markets, eg main boards, notebooks, scanners, monitors, power supplies, CD-ROMs, network equipment and modems. With a strong skill and manufacturing base it is well placed for future success in achieving its aim of being the largest OEM/ODM supplier in the world.

In view of the major contribution of the electronics sector to the Taiwanese economy, its future success is of vital national importance. For this reason issues, such as environmental performance, which may affect the competitiveness of the industry, are important for national as well as business strategy.

The main business challenge of the industry is in maintaining and enhancing its competitive position in the face of changing markets and strong international competition, especially from other Asian countries. Future success will depend on developing technologies that can be commercialised and add value.

### *F.3.1 General*

Starting in the 1960s, the electronics/electrical industry is now Taiwan's leading industry and fundamental to the country's trade and economy. It is a focus for promoting high technology manufacture, Taiwan's strategy for growth and jobs, and its national goal of fully developed status. While Taiwan's manufacturing sector declined from 33.3% to 28.1% between 1990 and 1995, electronics manufacturing increased from 12.7% to 18.4% of GDP.

In the 1970s, Taiwanese firms entered the component manufacturing market with such products as CRTs and ICs; in the 1980s, manufacturing semiconductors, PCs and colour monitors. During this period, Taiwan Semiconductor Manufacturing Company (TSMC) was established, electronics became the number one export and Taiwan became the fifth largest producer of PCs.

In the 1990s, Taiwan moved into microelectronics manufacturing and became the number one supplier of motherboards, monitors, scanners and mice. In 1995, Taiwan became the number three supplier of computers. In 1995, Taiwan began mass production of 16-Mbit dynamic random access memories (DRAMs) and opened four of 20 planned 8-inch wafer fab operations.

Taiwan's government decided to get out of electronic games and toys (considered intellectually unhealthy for children), and consumer electronics fell from 30.9% to 7.3% of output between 1986 and 1995.

While telecommunications has remained a small proportion of output it is targeted as an emerging growth industry for the future. Also targeted are the markets for semiconductors, optical-electronics, displays and packaging.

### *F.3.2 Semiconductor industry*

Taiwan's semiconductor industry started in the packaging business in 1966. Through industry, government and academic enterprise and cooperation, and heavy investment in R&D, the industry is now a major global player.

Taiwan is the world's leading OEM wafer producer, and second only to South Korea in semiconductor design. It produces the greatest volume of 8-inch wafers. It is well placed to maintain that lead in the future after much progress in setting up 12-inch wafer production. Such efforts highlight the importance of Taiwan in the global wafer supply chain. It is the second largest supplier of semiconductor designs and closely follows Silicon Valley in the USA. Taiwanese manufacturers are continually upgrading with new technology in all aspects of design and production.

Taiwan's semiconductor industry has a sophisticated structure, which makes it highly competitive.

There are four different types of semiconductor manufacturer: those involved in semiconductor design, wafer production, packaging, and testing. Currently there are over 100 design companies, about 20 producing wafers, over 40 involved in packaging, and some 30 involved in testing. Leading firms have focused on developing own-brand products and designs and include Mosel Vitelic, Macronix, VIS, Holtek, HMC and NTC. Some companies have entered into joint ventures with foreign enterprises, such as TSMC with Texas Instruments.

### *F.3.3 Information technology industry*

Manufacturers in Taiwan's information technology (IT) industry have formed a comprehensive and integrated upstream and downstream supply and support system. Many have become the core of Taiwan's electronics industry with capacity for international production and overseas expansion. They are primary suppliers to major international OEM companies such as Dell, IBM and Hewlett-Packard. One in seven notebook computers in the world is made by Quanta, who supply similar or identical products to competing OEM companies. The latter claim to differentiate on detailed design features, quality control and other factors.

One challenge for the IT industry is that since the value of finished product assembly has dropped off dramatically, some manufacturers are emphasising the production of key parts and components. A growing trend is towards more investment in R&D to stay ahead in the industry. This is due to the short life cycle of IT products and the speed of their displacement.

Taiwan-made IT products are divided into four main categories:

- **Parts/components,** including motherboards, keyboards, graphic cards, power supplies, printed circuit boards (PCBs) and conductors
- **System products,** including desktops, notebooks, workstations, servers and handheld computers
- **Peripheral products,** including monitors, mice, scanners, terminals, hard discs and floppy disc drives
- **Digital transmission products,** including LAN cards, modems and routers

Taiwan can now supply all of the components for the computers it assembles except hard disc drives.

Institute for Information Industry (III) statistics show that the production value of Taiwan IT hardware products totalled US$42.686 billion in 2001. The production lines in Taiwan accounted for 47.1% and production lines in China 36.9% of total production value. The total value represented a fall of 9.2% compared to 2000 due to global recession.

Customer demands for reduced prices and increased productivity have led to Taiwan manufacturers increasingly manufacturing in and delivering products from mainland China.

### *F.3.4 Communication industry*

Taiwan's communication industry has been growing rapidly with the opening up of the domestic telecommunications market. Major manufacturers are gaining international status through receiving orders for OEM/ODM products developed by Japanese, US and European enterprises.

Major Taiwan communications products include modems, telephones, wireless phones, LAN cards, telephone/telegram switching systems, fax machines, optical fibre communication facilities, communication network equipment and beepers. The nation's communication industry has integrated the Internet with IT while mobile phone manufacturers are rapidly building on their global network by expanding markets overseas.

ITRI statistics show that the production value of Taiwan communication facilities amounted to NT$177.66 billion in 2001, representing 28.5% growth from 2000 despite economic recession. The continuously growing value is fuelling demand for broadband equipment and wireless communication facilities, and growth in Taiwan's share of high-level products.

### *F.3.5 Consumer electronics industry*

Taiwan is a significant producer of consumer electronics products, including such items as audio/video products and stereo parts/components. Although the market for traditional consumer electronics has matured, and faces severe international price competition, the market for digital multimedia products is still expanding. The market focus of the next stage is expected to be 3C and 1A related product grades. This is expected to be the turning point for traditional consumer electronics manufacturers.

Both traditional product manufacturers and peripheral system manufacturers produce an array of 1A products. Existing 1A products include thin client, net TVs, screen phones and smart handheld devices (SHDs). The 1A Alliance combines the efforts of many domestic 1A manufacturers in a massive joint effort for 1A development. Considerable support has also come from the Industrial Development Bureau (IDB) of the Ministry of Economic Affairs (MOEA).

These efforts are aimed at focusing the 1A industry on consolidating upstream and downstream production, better interaction and cooperation, and better use of resources. The 1A Alliance also aims to link local manufacturers to international leading brands to enable technology transfer and strategic cooperation for the local industry to enter the global market. By 2005, the Alliance aims to increase the production value of 1A products to US$6.4 billion.

### *F.3.6 Optical-electronics industry*

The Taiwan optical-electronics industry has achieved significant growth, averaging 10% per annum in recent years and total production value of NT$464.9 billion in 2001. It now accounts for 6% of global production value. Production value of the three main sub-industries – optical storage, optical

output and optical input – totalled NT$250.32 billion and accounted for 56.5% of the total Taiwan production value.

In spite of global recession, market demand remains strong for Taiwan-made products such as CD-RW players, CD-Rs, digital cameras, TFT-LCDs and optical displays. The optical-electronics industry is expected to grow as one of Taiwan's leading high-tech industries through the above products and also STNs, DVD players, scanners, LEDs and LDs.

Particular development is needed in this area in relation to core techniques and the development of key parts and components.

*(Source: www.tappeitradeshows.com.tw)*

### *F.3.7 Market and competitive issues and concerns*

Within an overall picture of growth, success and good prospects there are a number of strategic issues which give rise to concerns or threats:

- **Uncertainties in the US economy:** Taiwan is a key supplier of computers and components to US companies, and the health of Taiwan's electronics industry rises and falls with that of the USA. The industries suffered declines in 2001.

- **International competition:** Along with strong competition from other Asian countries, with China's rapid entry into electronics there are few barriers to technology transfer across Asia.

- **Maintenance of competitiveness:** The ability to maintain competitiveness is dependent on the ability to develop technologies rapidly and having the engineering and design capability to utilise technologies early. Taiwan and Singapore have leadership in engineering talent. Can they maintain it?

- **Investment in China:** Outsourcing of manufacturing has been a key strategy for cost cutting, productivity and other reasons. Uncertainties and tensions in relations with mainland China give rise to concerns about over-investment and dependence on resources, markets and political influence.

- **Dependence on laptops and PCs:** Finished goods production is 70% information industry, 20% consumer appliances, and 2% communications. Post-WTO changes to the market may shift the balance to 90% information. Price competition may put low-tech products such as rice cookers and air conditioning into decline unless there is substantial investment in product R&D, international consumer demand and promotion. (Source: ITRI)

- **Lack of branding:** With the exception of Acer, most major Taiwanese companies don't have their own brand name. To overcome the barrier of brand investment and head-on competition with Japanese or Korean companies, the Taiwan government should encourage local firms to invest more in product R&D and dedicate more resources to global market analysis and brand development. (Source: ITRI)

- **Dependence:** The Taiwan economy and electronics industry is dependent on large companies whilst most firms are SMEs. Small firms lack resources to build a strong R&D position.

- **The industry is not fully self-contained:** Most of the original raw materials come from South America, China or South East Asia, and fine raw materials from Japan. However, most of the active and passive components are now manufactured in Taiwan.

# Appendix G

## ORGANISATIONS VISITED – WEBSITES AND SELECTED FACTS/FIGURES

### G.1 China

Ministry of Information Industry (MII)
www.mii.gov.cn

National Development and Reform Commission (NDRC)
www.ndrc.gov.cn

State Environmental Protection Administration (SEPA)
www.zhb.gov.cn

Tsinghua University
www.tsinghua.edu.cn

China Electronics Technology Group Corporation (CETC)
www.cetc.com.cn

- Wide range of R&D activities related to the electronic information industry
- Established: 1 March 2002
- Previously part of MII
- Combines 46 research institutes and 26 firms
- Registered capital: 6.35 billion yuan (US$765 million)
- Employees: 54,000 including 33,000 technical personnel

Legend Group Ltd (Lenovo)
www.lenovo.com

- Laptops, notebooks, OCs, printers, servers, digital cameras, mobile phones, handheld devices
- Established: 1984
- April 2003 launched new logo (brand): Lenovo
- Regional offices: 8
- Manufacturing bases: Beijing, Shanghai, Huiyang
- Overseas offices: US, UK, Netherlands, France, Germany, Spain, Austria
- Employees: 12,600
- Turnover (2002/3): HK$ 20,233 million
- 10 million users in China
- 27.3% of Chinese computer market (2002)
- R&D: 4 centres and 47 labs; 400-500 million yuan per annum
- Patents filed: 572 (2002), 50% invention-related

Huawei Technologies Co Ltd
www.huawei.com

Konka Group Co Ltd
www.konka.com

- Colour TVs, mobile phones, LCDs, tablet computers, refrigerators, air conditioners, DVD players (and precision moulds, injected plastic, tuners, PCBs, flyback transformers (FBTs), handset batteries and related components)
- Established: 1980
- Brand value: 9.815 billion yuan (2001)
- Exports: 80 countries
- R&D: 6 centres
- Certifications: ISO 9000 and ISO 14001

ZTE Corporation
www.zte.com.cn
- Telecommunications equipment manufacturer and network solutions provider
- Established: 1985
- Employees: 12,961 (2001)
- Total assets: US$1.50 billion (2002)
- Turnover: US$1.33 billion (2002)
- Overseas branches: 50
- Exports: 40 countries
- R&D: 13 centres, 10% of revenue
- Patents: owns 700 (87% are original innovations)
- Certifications: ISO 9000 and ISO 9000 (2000)

Shenzhen HYT Science & Technology Co Ltd (HYT)
www.hyt.com.cn
- Wireless communications equipment and products
- Established: 1993
- Employees: 350
- Exports: 10 countries
- Certifications: ISO 9000 (2000)
- Patents: 10

TCL Corporation
www.tcl.com
- TVs, mobile phones, PCs, DVD players, household appliances
- Established: 1981
- Major shareholder: city of Huizhou
- Strategic investors: Philips and Toshiba
- Turnover: US$3.8 billion (2002), 70% in China
- Profit: US$180 million (2002)
- R&D: 500 employees (forecast: 2003), 5% of turnover (target: 2008)

Huizhou Municipal Government
www.huizhou.gov.cn
- Major shareholder of TCL Corporation

Siemens VDO Automotive Huizhou Co Ltd
www.vdo.com.cn

## G.2 Hong Kong

Hong Kong Polytechnic University (HKPU)
www.sd.polyu.edu.hk

Hong Kong Productivity Council (HKPC)
www.hkpc.org

Philips Consumer Electronics
www.philips.com.hk

Elec & Eltek International Ltd
www.eleceltek.com
- PCBs, LCDs, magnetic products, IT
- Established: 1972
- Manufacturing facilities: 13 (Hong Kong, China, Thailand)
- Overseas offices: 17
- Certifications: ISO 9002 (all manufacturing plants) and ISO 14001 (most manufacturing plants)

Environmental Protection Department (EPD)
www.epd.gov.hk

Business Environment Council (BEC)
www.bec.org.hk

Hong Kong University (HKU) – Corporate Environmental Governance Programme
www.hku.hk/cegp

Hong Kong Electronic Industries Association (HKEIA)
www.hkeia.org

## G.3 Taiwan

Industrial Development Bureau (IDB)
www.moeaidb.gov.tw
- Based at the Ministry of Economic Affairs (MOEA)

Kinpo Electronics Inc
www.kinpo.com.tw

Acer Inc
www.acer.com

Quanta Computer Inc
www.quantatw.com

Industrial Technology Research Institute (ITRI) – Centre for Environmental, Safety and Health Technology Development
www.cesh.itri.org.tw
- Employees: 300

Taiwan Semiconductor Manufacturing Co Ltd (TSMC)
www.tsmc.com

Winbond Electronics Corporation
www.winbond.com.tw

United Microelectronics Corporation (UMC)
www.umc.com

# Appendix H

## SPECIFIC COMPANY VISITS

### H.1 China

| H.1.1 | ZTE Corporation |
|---|---|
| Company/market | A large organisation focusing on the telecommunications industry. Very heavily into base station/infrastructure products. Rapid growth, No 1 in China CDMA, WCDMA markets. 40% of employees in R&D, 30% in sales/marketing. ZTE also supply PCBs and components to the electronics industry. |
| Technical competence | Very high technical competence, although it was suspected that there was very little knowledge over WEEE and RoHS. |
| Awareness of legislation | It appeared that their awareness was largely related to a recent visit from BT which had provided them with awareness of WEEE and RoHS, and it was therefore perceived that there was a very limited knowledge of the requirements. They were aware that Motorola were already supplying lead-free components, although this could have been derived from BT. |
| Status in preparation for legislation | ZTE stated that they were aware of European development, and that they are in the process of obtaining ISO 14001. ZTE asked a question about what Europe is doing about recycling. A further comment was made: 'This is happening in 2004 and we do not need to do anything yet'. This suggests there is some naivity amongst manufacturers regarding the requirements as well as a misunderstanding of timescales. |
| Interest in the mission | The company was not prepared for the mission. It was stated that they had only been given notice the previous day of the visit, hence they were only represented by one person. |
| Supply chain | Unknown. |
| General | No comments. |

| H.1.2 | Konka (Schenzen) |
|---|---|
| Company/market | Konka is a large organisation producing primarily for the 'domestic' market. They produce TVs, multimedia products, CRTs, PCBs, batteries, etc. Currently the majority of their market is North America, South East Asia, Russia, Indonesia, Thailand and Australia. Konka are not considering entering the Japanese market. |
| Technical competence | Konka is a structured organisation and have a Vice President with quality responsibility who has been tasked recently with developing environmental management. |
| Awareness of legislation | Konka have been researching into this area. It was noted that eco-design awareness related to materials and energy and was received through information from their European suppliers. It would appear that awareness is being generated from the 'bottom-up'. |
| Status in preparation for legislation | Konka have achieved ISO 14001. The R&D department have been working on an energy efficient product in response to market trends. |
| Interest in the mission | Konka were very interested in the mission, and it was felt that they are hungry for more information. They expressed interest in more information on lead-free components. |
| Supply chain | The majority of their supply chain, at least in terms of electronic components, is from Europe (other than plastics). They feel that, to some extent, this will protect their sources of material in terms of meeting legislative needs. |
| General | Konka were keen to understand what the methods would be for testing/determining levels of lead in electronics. |

| H.1.3 | HYT (Schenzen) |
|---|---|
| Company/market | HYT are a small organisation, currently specialising in the handheld (industrial quality) PMR market and are China's largest walkie talkie manufacturer. Despite their size, this is a well organised 'high quality' company, having FCC qualification in the US and ISO 9001. They are currently acting at full capacity and will be moving into a new specially built factory in the spring of 2004. Whilst their market is focused domestically, they are keen to be global suppliers, and have been selling into the UK, France, Holland and Spain over the past year through distributors who 'badge' them (which removes HYT's responsibilities for product under WEEE). |
| Technical competence | A technically competent, although very focused organisation. |
| Awareness of legislation | HYT showed their ignorance of legislation by asking whether ISO 14001 compliance would mean that they would comply with WEEE and RoHS. They have heard of legislation, but did not have any knowledge. |
| Status in preparation for legislation | There is no preparation in this area. |
| Interest in the mission | Good interest in the mission and a desire to gain further information. |
| Supply chain | The majority of the supply chain is from Japan and America, apart from domestic supply of plastic components. |
| General | No comments. |

| H.1.4 | TCL (Huizhou) |
|---|---|
| Company/market | TCL is a very large organisation with five main divisions:<br>• Multimedia<br>• Telecom<br>• IT<br>• Home appliances<br>• Lighting<br>The majority of their market is domestic. However, they do have some export through Philips in Europe, who are a strategic partner. |
| Technical competence | TCL appear to be a well structured and a competent company. |
| Awareness of legislation | TCL were aware of the legislatory requirements but were not informed of details. |
| Status in preparation for legislation | TCL use SGS Yarsley as consultants to assess their material supply chain. This is a historical activity, however the advantage of this is clear in that it provides TCL with all the up-to-date requirements of relevant legislation and helps them to keep their supply chain 'clean'. |
| Supply chain | Unknown. |
| General | No comments. |

| H.1.5 | Desay/Siemens VDO (Huizhou) |
|---|---|
| Company/market | This is a company formed from Siemens VDO and Desay: Siemens VDO 70%, Desay 30%. The organisation cooperates with Siemens, GE, Tandy, Toshiba and Sony. They have 755 employees and are certified to ISO 9001, QS 9000, VDA 6.1, ISO 14001 and TS 16949. They supply VW, Citroen and Philips, and currently export 28% of their business to UK/Rover and SV trading. Their key competitors are Clarion, Pioneer, Alpine, Panasonic and JVC. |
| Awareness of legislation | Desay/Siemens VDO are able to access the Siemens Intranet which includes information on eco-design and training programmes. However, Desay/Siemens VDO are basically expected to look after themselves in terms of setting up their own internal design procedures. They cannot depend on the corporate company to provide this because they have their own R&D facilities, and therefore there is a corporate expectation that they organise their own internal design procedures. Corporate training is carried out reasonably regularly on lead-free issues. |
| Status in preparation for legislation | They have invested in new capital equipment (ovens, wave solder machines, etc) as and when re-investment is required, rather than strategically. They are not making special purchases to enable them to comply, and are only updating when specific items of capital equipment need replacing. |
| Supply chain | 70% of their materials are imported through the Siemens global supply chain. This is an advantage as the corporate supply chain will sort out their components with regard to compliance, etc. |
| General | There was an apparent awareness of ISO TR 14062. |

## H.2 Hong Kong

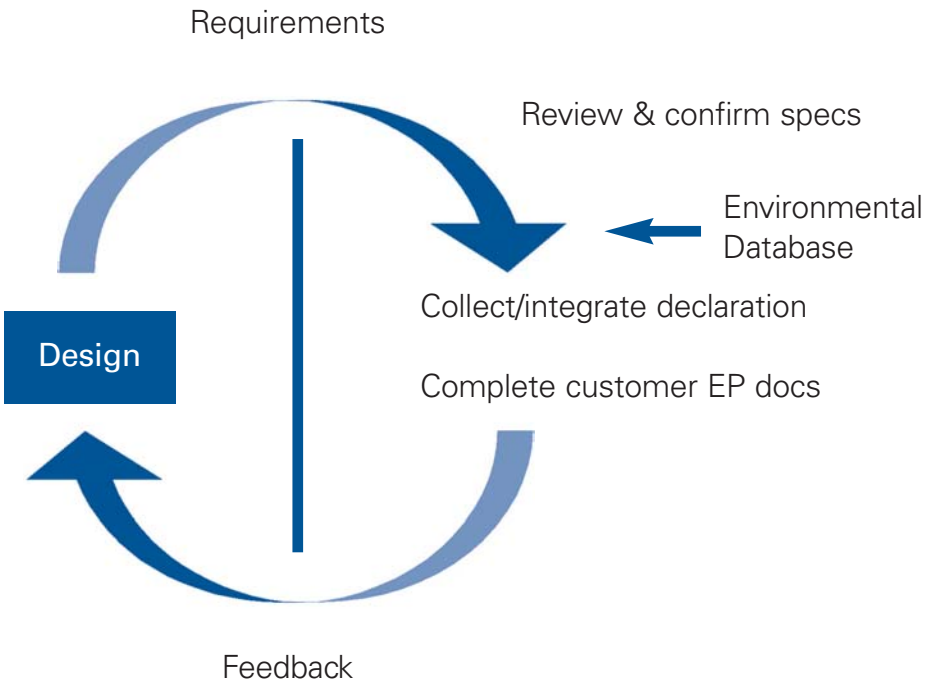
| H.2.1 | Philips |
|---|---|
| Company/market | This is a subsidiary of the main Philips organisation. This facility's main focus is air conditioners and lighting, and they have 14 design facilities in China. Nike and Wallmart are currently 'branding' Philips products. |
| Status in preparation for legislation | Philips has a philosophy:<br>• to be ahead of legislative needs<br>• to adopt an LCA approach in all areas<br>• to involve suppliers<br>• to benchmark as best in class<br>Currently Philips has only one product which is 100% lead-free, but by 2004 it is their intention to be 100% lead-free (but they will not necessarily be RoHS compliant). Nike are cooperating with Philips on social management of suppliers and seem to be going beyond this standard. SA 8000 is very important in relation to the Philips and Nike/Wallmart co-brandings. |
| Supply chain | Currently 60-70% of the components used by Philips are lead-free. It was stated that Chinese component supply is not reliable enough for them to use. Philips' suppliers are very confused about the legislation. Philips are having to educate them about what lead-free means and they are giving free consultancy on alternative materials.Philips will audit their suppliers down to 2nd tier levels. |
| General | It was stated that the Chinese suppliers will always try to escape their responsibilities where they can, unless they are forced to comply, eg 'when your back is turned they will resort back to the old (cheaper) ways'. It is perceived that it will take 10 years for the Chinese approach to be changed. Although 'Chinese RoHS' will apply from 1 July 2006, some domestic suppliers may still not go lead-free. |

| H.2.2 | Elec & Eltek |
|---|---|
| Company/market | This is a large PCB bare board manufacturer with 23% of their market in Europe. 80% of their production is in China and the rest in Thailand. |
| Technical competence | This is a very technically competent company. |
| Awareness of legislation | The company is very aware of the legislative requirements, although the impact on their own products is limited. The two areas affected will be the main substrate material itself, FR4 (which will need to be replaced with halogen-free materials), and the surface finish on the PCBs which will no longer be able to be a tin/lead finish. The company already has access to and has supplied non-halogenated materials to some clients, although this is not a frequent thing (only 2% to Ericsson). They currently produce their own substrate materials and are making provision to have their own manufacturing capabilities by 2004, to reduce costs. They have also developed their capabilities in non-lead finishes, and currently 50% of their sales are in this area. |

## H.3 Taiwan

| H.3.1 | Kinpo Electronics Inc |
|---|---|
| Company/market | A well structured company producing calculators, PDAs, printers for HP, mice for Microsoft, VOIP for NEC. There are 12,800 employees of whom 4,000 are in China, 8,000 in Thailand and 800 in the R&D head office in Taiwan. Their main markets are in Europe and Japan. |
| Technical competence | A well organised and technically competent company that is advanced in most project management techniques. Kinpo have been using lead-free components for a while and currently do not perceive a difference in product reliability in the 2-5 year product life cycle. |
| Awareness of legislation | Kinpo seem very aware of the requirements of legislation. They have to a large extent learnt the requirements from their customers, particularly the Japanese. |
| Status in preparation for legislation | Kinpo are following the 3Rs (reduce, reuse, recycle) and carry out DFM, DFE, DFR, DFT and DFS. They currently use a RoHS requirement list in an approval sheet during their developments. They are already using lead-free solder in their production, in parallel with ordinary leaded solder. Currently the solder joint quality is not as good as with leaded solder (200 ppm as opposed to 50 ppm), however they see this improving as the technology matures. Kinpo complete their own environmental testing internally. An eco-design project is being completed with the aim of generating a better product, and they are in discussion about an energy efficient design for a digital camera. |
| Supply chain | Kinpo use an external laboratory at ITRI for their product testing. They do use some Chinese manufactured components but this is through Taiwanese distributors who keep tough quality control. |

| H.3.2 | Acer Inc |
|---|---|
| Company/market | Acer has in recent times changed its market position into being an Original Design Manufacturer (ODM). They now only produce the performance specification for their product and then rely on their strategic design and supplying groups. Acer had 39,000 employees globally although it was not clear if this is now reduced due to their restructuring. 58% of their market is in the EU, Middle East and Africa. |
| Awareness of legislation | It was perceived by the study team that one of the reasons why Acer moved into ODM was as a method of allying their responsibilities towards legislative requirements. They appeared to be surprised by the information provided suggesting that if their name is on the product, then it is their responsibility. Acer have only been coming up to speed on environmental legislation in the last 12 months. |
| Status in preparation for legislation | Acer have developed a roadmap for legislation compliance:<br>• 03/2004 – start/construct recycling/recovery system<br>• 03/2004 – request vendors to provide environmental policies and contact person<br>• 08/2004 – request ODM vendor to provide environmental evaluation report<br>• 08/2004 – WEEE designed in for new products<br>• 12/2004 – recycling and recovery rule/system set up finished<br>• 01/2005 – shipped product with WEEE solution<br>• 07/2005 – RoHS designed into new products<br>• 01/2006 – shipped product in compliance with RoHS<br>Acer have a 3-4 month design cycle which, although tight, should enable them to meet their 'tight' schedule for the above roadmap. |
| Supply chain | Unknown. |
| General | Acer is a member of the Green Design Network (GDN). |

| H.3.3 | Quanta Computer Inc |
|---|---|
| Company/market | Quanta are now the strategic manufacturer for Acer among many others, including Sony. They use their Taiwan head office factory to do new product introduction, and then place the main manufacture into their Chinese factories. |
| Technical competence | This appears to be a very technically competent company with many 'big name' customers. They have ISO 14001, OHSAS 18001, ISO 9001 and ISO 9002. They are already producing a lead-free product along with their other leaded products. |
| Status in preparation for legislation | Quanta have established an ECO-Lab on site, enabling them to carry out material testing for lead-free. They currently also use external labs to do heavy metals and flame retardant testing, but should have their own facilities to do this in China in 2006 and 2008, respectively. Quanta have their own environmental support team who appear to be very active in the company. Quanta run an environmental database which is core to their business, as shown in the accompanying diagram.<br>  <br><br>Quanta have set up a questionnaire to their suppliers to gain data. Currently their database system can take eight weeks to generate a new part into the system, and they are predicting that when RoHS is much more involved in the system it could take up to six months to get new data. They see that in the medium term this area will be very painful for them. |
| Supply chain | Quanta do not source from mainland China. |
| General | No comments. |

## H.3.4 Semiconductor symposium: UMC, Winbond and TSMC

- The semiconductor industry has had to clean up its act over the last few years (water usage is very high on the list)
- UMC currently have a 99% recycle rate of bad material internally – total recycling including garbage is >80%
- Wafer fabrication is concentrating on green process, not green product design
- None of the metals used in the wafer fabrication process come under RoHS
- Mercury was used as part of a testing method but this has now been phased out
- Auditing of their supply chain is done, but not down to the mining level – they do take action on their suppliers and do not use them if they do not comply

# Appendix I

## SPECIFIC NON-COMPANY VISITS

### I.1 China

#### *I.1.1 Ministry of Information Industry (MII) – Bureau of Economy System Reform and Economy Operation*

- Previously part of the Ministry of Electronic Industry
- Have responsibility for development and implementation of Chinese RoHS – which aims to be finalised by the end of 2003
- It appeared that MII would implement Chinese RoHS through cooperation with its provincial offices, SEPA, customs and other Ministries
- MII have organised seminars related to electronics recycling

#### *I.1.2 China Electronics Technology Group Corporation (CETC)*

- CETC was previously part of MII
- It appears that CETC might be a state-owned enterprise
- There are 46 research institutes involved in CETC, with 54,000 employees
- As yet, CETC did not seem to be generating revenue

#### *I.1.3 National Development and Reform Commission (NDRC)*

- NDRC has responsibility for developing the Chinese equivalent of Japanese HARL
- There is a major 2nd life market for ICT/consumer electronics/white goods
- NDRC are developing standards in an attempt improve performance in refurbishment and testing

#### *I.1.4 State Environmental Protection Administration (SEPA)*

- SEPA have limited resources, eg people and money
- There are no experts on the electronics area at SEPA
- It was unclear what role SEPA would have in the implementation and enforcement of Chinese RoHS and HARL

### I.2 Hong Kong

#### *I.2.1 Hong Kong Polytechnic University (HKPU)*

- HKPU is focusing on eco-design for SMEs, doing case studies, seminars and providing consultancy
- They have created an eco-design manual with government funding
- SMEs need help because they do not have the information chain – they are doing their own research into the areas but do not have the contacts in Europe
- HKPU have completed a few eco-design product studies, eg kettles and toasters
- Eco-design projects are not to be related to legislative compliance, eg RoHS, but good eco-design
- Large companies have established eco-design skills, but these will not necessarily be applied until customers are asking for it

### *I.2.2 Hong Kong Productivity Council (HKPC)*

- Aware that legislation has been coming for past 12 years
- In 2002, HKPC carried out a government-funded eco-design project for industry and have produced a CD of findings in cooperation with Hong Kong Electronic Industries Association (HKEIA). They looked at 20 existing consumer electronic products and audited them using Simapro life-cycle assessment (LCA) software. Advisors at HKPC helped companies to use the software. This project provided visibility, but has not really been implemented into new product development
- Currently carrying out an eco-design marketing campaign, with a general message along the lines of 'don't be afraid, it is not as complex as it sounds, join our green club'
- Lots of information gathered from Industry Council for Electronics Recycling (ICER)
- They are interested in increasing help to local industry and are cooperating with HKEIA in a joint proposal to government
- Huawei have asked HKPC to do an eco-design audit for them
- HKPC are looking to do a collaborative exercise in training/workshops
- Few companies in Hong Kong are looking at SA 8000, but large companies in China are being forced to deal with this from some of their customers – SA 8000 audits are being completed by mainland Chinese companies

### *I.2.3 Environmental Protection Department (EPD)*

- This is a rapidly growing group now:
  – Auditing
  – EMS
  – Environmental reporting
- They have not been involved in a specific eco-design project
- They are looking into how they can help the electronics industry in Hong Kong through the Business Environment Council (BEC)
- There are complaints from industry that there is not enough help from government in developing ISO 14001, EMAS etc
- They believe that North America will be shortly following RoHS/WEEE, etc
- Support from government is unlikely to help in financial ways, but EPD are trying to provide communication links, partnerships linking technology and know-how
- Particularly, help with lead-free issues is needed
- EPD are playing a role of facilitator and are developing a help desk for SMEs
- Chinese legislation will just be another Chinese copy, but there will be problems of enforcement with a lack of investment of staffing at the State Environmental Protection Administration (SEPA). The laws are also likely to be susceptible to corruption because of the low pay of SEPA employees. Southern China are more likely to avoid the rules, as they are more opportunist than the North
- SMEs in Hong Kong and China are looking for a 'quick fix'
- Corporate awareness is very low with an attitude of 'there is no immediate benefit, so I won't do it'
- The domestic Chinese market is so large that there needs to be a public awareness exercise to drive this through: 'information is important'

- Hong Kong has invested heavily in water treatment, but by the time that it was installed the manufacturing had moved North to South China, and it is now polluting there instead
- EPD are pushing for an annual environmental report from SMEs, but have been asked to think about how this will really work, as some authorities in the public sector will find it difficult to apply this

#### *I.2.4 Business Environment Council (BEC)*

- BEC are trying to bridge the communication gap and are working with EPD
- A project is being organised on 'producer responsibility' with a pilot programme on a mobile phone battery
- Hong Kong companies are starting to have CSR agencies
- CSR is now a larger part of BEC strategy
- The 2nd use market is well developed, but there is a very big 'black market' economy
- It is important that Hong Kong should feed the legislative information into mainland China
- BEC will be running a 'green product award' programme in 2004

#### *I.2.5 Hong Kong University (HKU) – Corporate Environmental Governance Programme*

- Chinese companies will do what you want them to if they can make money at it
- They will do it while you are watching, but will revert back when your back is turned!
- The Provinces are where the power is. Due to the Olympics, Beijing companies are being told to clean their act up in three years or else they will be kicked out
- Business schools do not consider environmental aspects as part of core business

#### *I.2.6 Hong Kong Electronic Industries Association (HKEIA)*

- Europe is watching the Japanese – and the Japanese are testing the water
- It may take 20 years to sort out the green issue in mainland China
- Very strong opinion that Chinese companies will not be able to comply with RoHS by 2006
- A major concern over lead-free reliability
- 30% of Surface Mount Technology (Holdings) Ltd's products are lead-free
- How do you keep track of the reliability of your supply chain?
- Cadmium test equipment costs US$100,000
- Rightly or wrongly, HKEIA believe that there will be a major concession for the Chinese on the implementation of RoHS
- Perceived threat that if China says that it is not going to do it then the industry will collapse
- Perceived that there maybe a scenario where America/China will club together to sell non-green products, as Europe is not seen as a big market (will this change post EU expansion?)
- China will follow the position taken by the US
- SMEs may focus on domestic and non-compliant export market
- Nokia handsets in China will not comply with lead-free requirements

### I.3 Taiwan

#### *I.3.1 Ministry of Economic Affairs (MOEA) – Industrial Development Bureau (IDB)*

- Two years ago companies started to work on issues related to the new legislation, but it was only six months ago when they really started to take interest – many of the large companies are starting projects although it is felt that there are some points that are still unclear

- MOEA have been feeding information to industry through training programmes
- Less than 10% of companies have sent questionnaires to suppliers
- The majority of companies do not know where to start, they need some form of standard questionnaire
- Large Taiwanese companies are very clear that having ISO 14001 does not automatically qualify them for legislation requirements
- IDB have been funding eco-design training and green supply chain initiatives to help companies comply with buyers requirements, such as Sony
- ITRI are trying to collaborate with them
- Thailand are strong in development of the legislative requirements

### *I.3.2 Industrial Technology Research Institute (ITRI)*

- ITRI have developed an eco-design tool using an importance level against a weighting – this gives a good overall view
- ITRI see future opportunities: (1) International seminar before July 2004; (2) Exchange researchers; (3) Cooperation in information sharing. ITRI are keen to build up relationships, and they have governmental funding to be proactive in these areas

# Appendix J

## THE MISSION AND ITS MEMBERS

### J.1 Sponsoring organisation

*The Centre for Sustainable Design (CfSD)*
*www.cfsd.org.uk*

Established in 1995 and based at the Surrey Institute of Art & Design, University College, CfSD has three core programmes: managing eco-design, sustainable solutions, and environmental communications.

Sectorally, CfSD has a particular interest in the electronics sector and has completed the ETMUEL project (www.cfsd.org.uk/etmuel) – a major training project that delivered eco-design training to over 430 individuals in the UK electronics sector. In addition, within CfSD, a regional business club (www.cfsd.org.uk/seeba) focuses on 'producer responsibility' issues in the electronics, automotive and packaging sectors. CfSD is also involved in a range of European networks covering 'green' electronics. In 2002, Martin Charter, Director of CfSD, successfully led a mission to Japan to determine the 'state-of-the-art' in eco-design in the electronics sector.

### J.2 Mission members

#### *J.2.1 Martin Charter*

*Director and Visiting Professor of Sustainable Product Design, The Centre for Sustainable Design (CfSD), Surrey Institute of Art & Design, University College*
*mcharter@surrart.ac.uk*

Since 1988, Martin Charter has worked at director level in 'business and environment' issues in consultancy, leisure, publishing, training, events and research. Prior to this he held a range of management positions in strategy, research and marketing in gardening, construction, trade exhibitions, financial services and consultancy, including being a launch Director of Greenleaf Publishing and Marketing Director at the Earth Centre. Martin is the former coordinator of one the UK's first green business clubs for SMEs and presently also directs a regional network focused on 'producer responsibility' issues related to the electronics sector.

Martin is presently editor of the Journal of Sustainable Product Design and was the previous editor of The Green Management Letter and Greener Management International (where he retains Editorial Board involvement). He is a member of the international advisory board of CARE electronics network, a judge on the ACCA's sustainability reporting awards, an advisor on sustainable innovation to Hampshire's Natural Resources Initiative, and an advisory board member of the Sustainable Trade and Innovation Centre (STIC) and the South East England Development Agency (SEEDA) Environmental Technology Taskforce.

Previous responsibilities include a being a member of the Judging Panel of Design Sense and member of ISO and BSI groups on 'Integrating Environmental Aspects into Product Development' (ISO TR 14062).

He is the author, editor and joint editor of various books and publications including Greener Marketing (1992 and 1999), The Green Management Gurus [e-book] (1996), Managing Eco-design (1997), Sustainable Solutions (2001) and Sustainable Value (2004).

Martin has an MBA from Aston Business School in the UK, and has interests in sustainable product design, green(er) marketing and creativity & innovation.

### *J.2.2 Joy Boyce*

*Head of Corporate Environmental Affairs, Fujitsu Services Ltd*
*Joy.Boyce@services.fujitsu.com*

Joy Boyce was appointed ICL's first corporate environmental affairs manager in 1993 and was made responsible for ICL's environmental programme worldwide. With 20 years experience in the IT industry, she has held positions in marketing, public relations and strategic development functions and spent several years as a director in a consultancy practice.

She is Chairman of ICER (Industry Council for Electronic Equipment Recycling) and Chair of the Federation of the Electronics Industry (FEI) Environment Policy Committee. She also sits on the environmental policy committee of the European Electronics Information and Communications Technology Association (EICTA) and is a member of the Steering Board of CARE Electronics.

Joy is a member of the ECMA TC 38 working group which has devised the TR/70 standard for environmental profile declarations for electronics products and is now working on a standard for chemical emissions from electronic and consumer electrical products. She is asked regularly to present papers on environmental problems and solutions at scientific, technical and managerial conferences and seminars.

ICL has always had an arm's length relationship with Fujitsu of Japan, but in April 2002 it was decided to change ICL's name to Fujitsu Services to reinforce the branding and image. The ICL name has been retained in the continent of Africa.

### *J.2.3 Dave Burrell*

*Senior Technical Consultant, Engineering Services Group, Plextek Ltd*
*DB@plextek.co.uk*

Dave Burrell has been involved in the design-for-manufacture (DFM) and new product introduction of electronic and electro-mechanical products since 1981. His career has spanned many well known and respected companies including Siemens, Solartron, Raytheon and Nokia. Currently he is the Senior Technical Consultant in the Engineering Services Group at Plextek Ltd, one of Europe's largest independent design consultancies in its field.

Dave's ability to apply new technologies from the design arena into real product from commercial to defence has placed him in many pivotal roles. During his career at Nokia Telecommunications one of his roles was as the DFM specialist on new products, analysing assembly efficiency and working on the early concept stages of design-for-environment (DFE) principles. Other roles include work within the logistics group providing global supply chain input from the manufacturing engineering aspect.

In his role at Plextek, Dave has established the 'design for' culture and is now leading the introduction of WEEE and RoHS into the company design procedure. During 2002/2003 he worked on the steering group committee to produce a new Envirowise guide 'Sustainable design of electronic products to comply with legislation and reduce costs'. His appreciation of the application of WEEE and RoHS into the design cycle has led him to present to SMEs and clients as part of a campaign to prepare them for the new legislation.

# Appendix K

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# Appendix L

## GLOSSARY

| | |
|---|---|
| 3G | third generation |
| 3Rs | reduce, reuse, recycle |
| ACCA | Association of Chartered Certified Accountants (UK) |
| aka | also known as |
| AV | audio-visual |
| B2B | business-to-business |
| B2C | business-to-consumer |
| B2D | business-to-distributors (eg retailers) |
| B2G | business-to-government |
| BCSD | Business Council for Sustainable Development (Taiwan) |
| BEC | Business Environment Council (Hong Kong) |
| BELL | Business Environmental Learning and Leadership network (US) |
| CD | compact disc |
| CDMA | code division multiple access |
| CD-R | CD-recordable |
| CD-RW | CD-rewritable |
| CEPA | Closer Economic Partnership Arrangement (China/Hong Kong) |
| CER | corporate environmental reporting |
| CESH | Centre for Environmental, Safety and Health Technology Development (ITRI, Taiwan) |
| CETC | China Electronics Technology Group Corporation |
| CETRA | China External Trade Development Council (Taiwan) |
| CFC | chlorofluorocarbon |
| CfSD | Centre for Sustainable Design (UK) |
| CMOS | complementary metal oxide semiconductor |
| CPCT | Centre for Pollution Control Technologies (Taiwan) |
| CPMT | Components, Packaging and Manufacturing Technology Society (IEEE) |
| CPPL | Cleaner Production Promotion Law (China) |
| CPU | central processing unit |
| CR | corporate responsibility |
| CRT | cathode ray tube |
| CSES | Chinese Society for Environmental Sciences |
| CSR | corporate social responsibility |
| CSS | corporate synergy systems |
| CSTA | China Science and Technology Association |
| DFE | design for environment |
| DFM | design for manufacture |
| DFR | design for recycling |
| DFS | design for serviceability |
| DFT | design for test |
| DRAM | dynamic random access memory |
| DTI | Department of Trade and Industry (UK) |

| | |
|---|---|
| DTV | digital television |
| DVD | digital video/versatile disc |
| EC | European Commission |
| ECA | environmental cost accounting |
| ECOPAC | International EcoDesign and Microelectronic Packaging Research Institute (China) |
| EDF | Environment and Development Foundation (Taiwan) |
| EMS | environmental management system |
| EOP | end-of-pipe |
| EPA | Environmental Protection Administration (Taiwan) |
| EPD | Environmental Protection Department (Hong Kong) |
| EPI | environmental performance indicators |
| EPROM | erasable programmable read-only memory |
| ETC | Electronic Testing Centre (Taiwan) |
| EU | European Union |
| EuP | Energy-using Products (proposed EU directive) |
| FBT | flyback transformer |
| FDI | foreign direct investment |
| FEI | Federation of the Electronics Industry (UK) |
| GDN | Green Design Network (Taiwan) |
| GDP | gross domestic product |
| GEN | Global Eco-labelling Network |
| GP | green productivity |
| GPL | Green Purchasing Law (Japan) |
| GPN | Green Purchasing Network (Taiwan) |
| GPP | Green Partnering Programme (Sony, Japan) |
| GRI | Global Reporting Initiative |
| HARL | Home Appliances Recycling Law (Japan) |
| HK | Hong Kong |
| HKEIA | Hong Kong Electronic Industries Association |
| HKPC | Hong Kong Productivity Council |
| HKPU | Hong Kong Polytechnic University |
| HKTDC | Hong Kong Trade Development Council |
| HKU | Hong Kong University |
| HK$ | Hong Kong dollar |
| HYT | Shenzhen HYT Science & Technology Co Ltd (China) |
| IC | integrated circuit |
| ICER | Industry Council for Electronic Equipment Recycling (UK) |
| ICT | information and communications technology |
| IDB | Industrial Development Bureau (Taiwan) |
| IEEE | Institute of Electrical and Electronics Engineers (US) |
| IPR | intellectual property right(s) |
| ISO | International Standards Organisation |
| IT | information technology |
| ITRI | Industrial Technology Research Institute (Taiwan) |
| JWRTF | Joint Waste Reduction Task Force (Taiwan) |
| LAN | local area network |
| LCA | life-cycle assessment |
| LCD | liquid crystal display |

| | |
|---|---|
| LCT | life-cycle thinking |
| LD | laser diode |
| LED | light-emitting diode |
| LPEUR | Law for the Promotion of the Effective Utilisation of Resources (Japan) |
| MII | Ministry of Information Industry (China) |
| MOEA | Ministry of Economic Affairs (Taiwan) |
| MSDS | material safety data sheet |
| NCCP | National Centre for Cleaner Production (Taiwan) |
| NCKU | National Chung Kung University (Taiwan) |
| NCSD | National Council for Sustainable Development (Taiwan) |
| NDRC | National Development and Reform Commission (China) |
| NGO | non-governmental organisation |
| NT$ | new Taiwan dollar |
| ODM | original design manufacturer |
| OEM | original equipment manufacturer |
| PABX | private automatic branch exchange |
| PBB | polybrominated biphenyls |
| PBDE | polybrominated diphenyl ethers |
| PC | personal computer |
| PCB | printed circuit board |
| PCC | Public Construction Commission (Taiwan) |
| PCSWL | Prevention and Control of Solid Waste Law (China) |
| PMR | private mobile radio |
| ppm | parts per million |
| PRC | People's Republic of China (aka China) |
| PSTN | public switched telephone network |
| Q1 | first quarter |
| QFDE | quality function deployment for environment |
| R&D | research and development |
| REACH | Registration, Evaluation and Authorisation of Chemicals (proposed EU directive) |
| ROC | Republic of China (aka Taiwan) |
| RoHS | Restriction of Certain Hazardous Substances (EU directive) |
| ROM | read-only memory |
| SEPA | State Environmental Protection Administration (China) |
| SHD | smart handheld devices |
| SME | small or medium enterprise |
| SMS | short message service |
| SMT | surface mount technology |
| STN | supertwist nematic |
| TEMA | Taiwan Environmental Management Association |
| TFT | thin-film transistor |
| TRIZ | Teorija Resenija Isobretatelskih Zadac (theory of inventive problem solving) |
| TSMC | Taiwan Semiconductor Manufacturing Co Ltd |
| TV | television |
| UK | United Kingdom |
| UMC | United Microelectronics Corporation (Taiwan) |
| UNCTAD | United Nations Conference on Trade and Development |
| UNEP | United Nations Environment Programme |

| | |
|---|---|
| US(A) | United States (of America) |
| US$ | US dollar |
| VCD | video compact disc |
| VOIP | voice over internet protocol |
| WBCSD | World Business Council for Sustainable Development |
| WCDMA | wideband code division multiple access |
| WEEE | Waste Electrical and Electronic Equipment (EU directive) |
| WGSI | Working Group for Sustainable Industry (Taiwan) |
| WTO | World Trade Organisation |

# Appendix M

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# Appendix N

## FURTHER INFORMATION

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Contact:
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