



**StEP**  
SOLVING THE E-WASTE PROBLEM

**A N N U A L  
R E P O R T  
2 0 1 0**





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In a brief review many people will remember 2010 as the year of natural disasters with such incidents as the devastating earthquakes in Haiti, the flooding in Pakistan and the heat wave in Eastern Europe and Russia just to name a few. 2010 was also a year of uprisings and protests against national governments due to the introduction of austerity packages resulting from the financial crisis. There were also more positive occurrences including large sports events such as the Winter Olympics in Vancouver and the Soccer World Cup in South Africa. We also closely followed the survivor story of the Chilean miners and explosion of Deepwater Horizon in the Gulf of Mexico, causing an unthinkable oil-spill at the US coastline. 2010 was also the year in which many new technologies widely entered the market, especially with

the popular tablet computers and ebooks. But we were also forced to re-consider our way of working, when, for example, volcanic eruptions in Iceland substantially impacted the international community, even affecting StEP and leading to the postponement of the annual StEP General Assembly. On a positive note, we were forced to be creative and learned that modern conference technologies can substantially contribute to cooperative work, though not replacing the key physical meetings every now and again.

2010 also embarked some new developments for StEP, making it another productive year since its formal launch in March 2007. A particular highlight was the grant agreement with the US Environmental Protection Agency, which seeks to help in

the quantification of trade flows of used electronics, particularly from North America and provide support to nations in both Africa and Asia that are coping with e-waste imports and their exponentially increasing amounts through identification and demonstration of approaches to sustainable management of used electronics and e-waste. We are confident that our next report will highlight many activities at these ends. Another feature was the signing of the Memorandum of Understanding with the Global e-Sustainability Initiative (GeSI) which will help build capacity in e-waste management especially in developing countries and strengthen collaboration on research to identify key success factors for e-waste policies.

In October 2010 StEP members finally succeeded in gathering in

## Strategic Partnerships



Following the Memorandum of Understanding between StEP and the Secretariat of the Basel Convention, which was signed in 2008, StEP has now also strengthened its collaboration with the Global e-Sustainability Initiative (GeSI). A Memorandum of Understanding between StEP and GeSI was signed accordingly in 2010. Considering that all three organizations share substantial areas of mutual interest and undertake complementary activities, these partnerships represent a big step forward in synergizing efforts and strengthening the collaboration between key platforms working towards a sustainable solution to the e-waste problem.



GeSI is an international strategic partnership of Information Communications Technology ("ICT") companies and industry associations committed to creating and promoting technologies and practices that foster economic, environmental, and social sustainability and drive economic growth and productivity. Formed in 2001, GeSI's vision is a sustainable world through responsible, ICT-enabled transformation. GeSI fosters global and open cooperation, informs the public of its members' voluntary actions to improve their sustainability performance, and promotes technologies that foster sustainable development. <http://www.gesi.org>



The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal is the most comprehensive global environmental agreement on hazardous and other wastes. The Convention came into force in 1992 and aims to protect human health and the environment against the adverse effects resulting from the generation, management, transboundary movements and disposal of hazardous and other wastes. The Secretariat, located in Geneva, Switzerland, is administered by the United Nations Environmental Programme and facilitates the implementation of the Basel Convention and related agreements. <http://www.basel.int/>



person for the annual General Assembly hosted by Cisco Systems in London. Two new members, the Basel Convention Coordination Centre for Africa (Nigeria) and Renewable Recyclers (Australia), were approved and we expressed our deep thanks and said goodbye to our dear friend Charuek Hengrasmee who had served on the StEP Steering Committee since its launch and is now enjoying his retirement from his Presidency of EEI in Bangkok. Yet StEP is looking forward to next year as the new Steering Committee for the 2011/2012 term was elected.

Throughout 2010, StEP's five Task Forces (TF) were hard at work advancing the e-waste agenda on many fronts. TF Policy continued its work on a comparative analysis of various national policies and legislation in order to make sound recommendations on "best" e-waste policies. It also started with laying down the framework for a White Paper on (e)-waste definitions and continues to expand on the link between climate change and e-waste and consequently develop potential mitigation strategies. TF ReDesign completed a comprehensive study on worldwide impacts of substance restrictions of ICT equipment. TF ReUse took action on Best Practices by analyzing re-use case studies and identifying barriers and common success factors in current re-use operations. Yet another Subgroup on Transboundary Shipments was established and will continue developing a StEP position on transboundary shipments to developing countries. TF ReCycle continued its work on Recycling Standards which will provide guidance and recommendations to stakeholders on the development of effective and efficient electronics end-of-life standards. Additionally

the "Best of 2 Worlds" project, investigating the eco-efficiency of the manual dismantling of e-waste in China with control over environmental fractions, has revitalized its work. TF Capacity Building is taking action to strengthen the future involvement of small and medium-sized enterprises and representatives from ministries and enforcement authorities in developing countries. A Subgroup was established to further develop the Recycling Trainer Online proposal, an online capacity building tool offering much potential, especially in the developing world. Also, the "Annual Dynamic Digital Reporting on the global Ewaste Status (ADDRESS)" project has started to look into amounts of electrical and electronic equipment placed on the market, e-waste generated and officially collected and treated. It will report on the e-waste solution progress per country or state as an integrator of key take-back system information and resulting in an important communication aid towards all stakeholders and will incorporate the trade flows work StEP and EPA are partnering on.

Another major highlight in 2010 was the 2nd annual NVMP-sponsored StEP E-waste Summer School which took place in Eindhoven, Netherlands, and Hoboken, Belgium, co-sponsored and co-hosted by Philips and Umicore and supported by Empa with an interdisciplinary student composition of 19 participants representing 18 countries worldwide. This successful endeavour created a unique opportunity for participants working on advanced degrees to learn from experts in the field and share experiences that they all can take home to apply and further develop as their own countries identify approaches to manage their e-waste problems.

The e-waste issue is raising more and more interest around the world and StEP is well positioned to make a difference towards the development and practical implementation of sustainable solutions.

We hope you find this Annual Report informative on StEP's endeavours in 2010 and the challenges still ahead.

Washington/Bonn, April 2011



*Stephanie Adrian,  
Chair Steering Committee  
StEP Initiative*



*Ruediger Kuehr,  
Executive Secretary  
StEP Initiative*



## Welcome to StEP

StEP is an initiative developed by various United Nations organizations with the overall aim to solve the e-waste problem. Together with members from industry, governments, international organizations, NGOs and academia actively participating in StEP, we initiate and facilitate approaches towards the sustainable handling of e-waste.

only step by step attracting the public interest. There was a need for analysis and dialogue from a neutral, scientific-based standpoint in order to find solutions that reduce environmental risks and enhance development. This is why we began developing the StEP Initiative in late 2004 which has grown to a 50+ member initiative as of today.

Every day a vast number of electrical and electronic devices end up as waste; some of them ready for scrap, others just obsolete. All this is gradually mounting up to a serious environmental problem, which is

As its name already says, StEP is an initiative, i.e. a network of actors who have joined to exchange ideas and experiences and work with each other toward the realization of common aims.

### StEP's prime objectives are to:

- Optimize the life cycle of electrical and electronic equipment
- Improve supply chains and close material loops
- Reduce contamination
- Increase utilization of resources and promote re-use of equipment
- Exercise concern about disparities such as the digital divide between the industrializing and industrialized countries
- Increase public, scientific and business knowledge

### StEP's core principles:

1. StEP's work is founded on scientific assessments and incorporates a comprehensive view of the social, environmental and economic aspects of e-waste.
2. StEP conducts research on the entire life-cycle of electrical and electronic equipment and their corresponding global supply, process and material flows.
3. StEP's research and pilot-projects are meant to contribute to the solution of e-waste problems.
4. StEP condemns all illegal activities related to e-waste including illegal shipments and re-use/recycling practices that are harmful to the environment and human health.
5. StEP seeks to foster safe and eco/energy-efficient re-use and recycling practices around the globe in a socially responsible manner.



## Membership

StEP is generally open to all organizations interested in and committed to actively participating in its work and activities. In order to join StEP, a potential member is required to sign a so-called Memorandum of Understanding which lays down the key principles and objectives of the StEP Initiative. Furthermore, the potential member needs to elaborate on what it expects from their StEP membership, but also how it is going to contribute. All membership applications are reviewed by the StEP Steering Committee and then voted upon by the General Assembly. Associations are not entitled to full, but only an associate membership (see below).

The StEP Secretariat is hosted by the United Nations University (UNU), the academic arm of the United Nations implementing research and educational programmes in the area of sustainable development with the aim of assisting developing countries. The same as UNU, StEP

does not receive any funds from the United Nations core budget, but relies solely on member contributions as well as on successful project acquisitions. Thus, each member is expected to contribute through an annual monetary contribution which is based on the type of organization and its size.

For small companies, research institutes, associations or NGOs, in particular from emerging and developing countries, which oftentimes cannot afford the annual contribution for a full membership or are only interested to contribute to a specific project, the StEP General Assembly approved the inclusion of an asso-

ciate membership with a reduced annual contribution in 2008. Associate members have access to StEP information and scientific databases and contribute to project work but are not permitted to vote in StEP's strategic decision making.

In exceptional cases and on a case-by-case basis, the StEP Steering Committee may decide to waive an organization's annual contribution. However, in such a case, the respective member must contribute to the overall progress of the StEP Initiative through in-kind contributions; this can be via content-related contribution to a project or any other service.

### StEP's annual contributions can be broken down as follows:

Type of organization	Amount
Large-size companies	EUR 10,000
Medium-size companies	EUR 5,000
Small-size companies (including micro-enterprises)	EUR 1,000
All other full members	EUR 1,000

(status April 2011)





## Organization

The key organizational organs of the StEP Initiative are a Steering Committee, a Secretariat, five Task Forces involving its coordinators and members, the General Assembly comprising all members as well as Regional Focal Points who serve as regional links.

**The Steering Committee**, consisting of seven members, is responsible for the overall progress of the StEP Initiative. Its chief responsibility is to monitor and steer the overall developments of the StEP Initiative. Steering Committee members are elected for two years and of the members on the Steering Committee, one assumes the voluntary role as the permanent Chair, the appointment being rotated among elected members every 1 July and 1 January.

**The Secretariat** functions as the internal and external operations hub of the StEP Initiative. It coordinates and manages the flow of information and relevant developments among the StEP Task Forces and members. The Secretariat is also responsible for the executive management, administration and daily operational work of the Initiative and serves as the liaison between United Nations Agencies and the individual StEP members. In addition it assists the Task Forces, particularly in stakeholder dialogues, development of publications, marketing, networking, liaising and fundraising.

The StEP Secretariat is being hosted by United Nations University Institute for Sustainability and Peace – Operating Unit SCYCLE (UNU-ISP SCYCLE) in Bonn, Germany. The Secretariat is headed by the Executive Secretary who serves as the chief academic project and adminis-

Elected on 18 October 2010, the Steering Committee members for the term 2010 – 2012 are:



Stephanie Adrian, United States  
Environmental Protection Agency  
(Chair since 1 January 2011)



Jean Cox-Kearns, Dell



Per Döfnäs, Ericsson



Christian Hagelüken, Umicore  
Precious Metals Refining



Jinhui Li, Basel Convention  
Coordinating Centre for Asia &  
the Pacific & Tsinghua University



Guido Sonnemann, United  
Nations Environment Programme  
(Chair from 1 January to 30 June 2010)



Rolf Widmer, Swiss Federal  
Laboratories for Materials  
Testing and Research (EMPA)  
(Chair from 1 July to 31 December 2010)

### Ex officio:

Ruediger Kuehr,  
Executive Secretary of the StEP Initiative,  
United Nations University





"It is great to see the ongoing addition of new participants coming in to the StEP initiative and the strong progress made this year in all the Task Forces."

*Jean Cox-Kearns, Dell*

trative officer of the StEP Initiative and is responsible for the overall management of StEP and its strategic progress towards overarching objectives.

The five **Task Forces**, Policy, Re-Design, ReUse, ReCycle and Capacity Building are devoted to research, analysis and facilitation of pilot-projects that are set up and carried out in line with StEP's objec-

## Knowledge Management – StEP's Website, File Depository & Member Newsletter

In addition to its website at <http://www.step-initiative.org> the Secretariat maintains an online file management system, the so-called File Gallery, to which all members have access. The File Gallery is an online database and provides an up-to-date platform consisting of relevant StEP documents and guarantees internal knowledge sharing. Part of the File Gallery is publically accessible; therefore, non-StEP members interested in the work of the Initiative can gather insight into StEP's activities without having access to sensitive data. The StEP File Gallery can be found at <http://files.step-initiative.org/>.

Additionally, all members receive a regular StEP Newsletter via email, which provides updates on latest project work, events and relevant publications etc.

tives. StEP members actively contribute to at least one of the Task Forces by implementing or participating in projects. Each Task Force is coordinated by two StEP members who are responsible for representing each Task Force, managing the overall coordination within the Task Force, as well as maintaining positive momentum and ensuring Task Force activities fall in line with StEP's overall objectives.

The overall objective of **Task Force Policy** is to report on and analyze the status of existing approaches and particular policies for waste electrical and electronic equipment (WEEE) and used electronic products. Based on this, members explore recommendations on new types of policy



Coordinator TF Policy  
Cédric Grossart,  
Telecom Business School



Coordinator TF Policy  
Ruediger Kuehr,  
United Nations University

measures to solve the e-waste problem. StEP's Task Force Policy is coordinated by Cédric Gossart, Telecom Business School, and Ruediger Kuehr, United Nations University.

StEP's **Task Force ReDesign** is dedicated to product design aspects. Its members contribute to the StEP

aim of solving the e-waste problem by fostering the re-design of electric and electronic equipment (EEE) in order to reduce negative impacts of their entire life cycle. The status in



Coordinator TF ReDesign  
Karsten Schischke,  
Fraunhofer Institute for Reliability  
and Microintegration (IZM)



Coordinator TF ReDesign  
Chirapat Popuang, Electrical and  
Electronics Institute (EEI),  
Thailand

industrializing countries is taken into particular account. Coordinators of Task Force ReDesign are Karsten Schischke, Fraunhofer IZM, and Chirapat Popuang, Electrical and Electronics Institute EEI.

In **Task Force ReUse** its members focus on the development of replicable and sustainable re-use/refurbishment/spare parts development systems in order to minimize environmental, health and safety impacts – especially in industrializing countries. The Task Force supports the development of globally consistent re-use practices, principles and standards for EEE products from business-to-business and business-to-consumer users that are economically, socially and environmentally appropriate. Task Force ReUse is coordinated by Colin Fitzpatrick, University of Limerick and John Dickenson, AER Worldwide.



The major aim of **Task Force ReCycle** is to enhance infrastructures, systems and technologies to realize sustainable e-waste recycling, especially in industrializing countries.

Environmentally and socially sound solutions. StEP's Task Force ReCycle is coordinated by Mathias Schluep, Swiss Federal Laboratories for Materials Testing and Re-

public, scientific and business awareness regarding the global e-waste problem. Its members want to achieve this by offering open access to the knowledge and experiences



Coordinator TF ReUse  
Colin Fitzpatrick, University of Limerick  
(since April 2010)



Coordinator TF ReCycle  
Mathias Schluep, Swiss Federal Laboratories for Materials Testing and Research (Empa)



Coordinator TF Capacity Building  
Claudia Luepschen, United Nations University  
(since April 2010)



Coordinator TF ReUse  
John Dickenson, AER Worldwide



Coordinator TF ReCycle  
Jason Linnell, National Center for Electronics Recycling (NCER)  
(since April 2010)



Coordinator TF Capacity Building  
Jaco Huisman, United Nations University/Delft University of Technology  
(since April 2010)

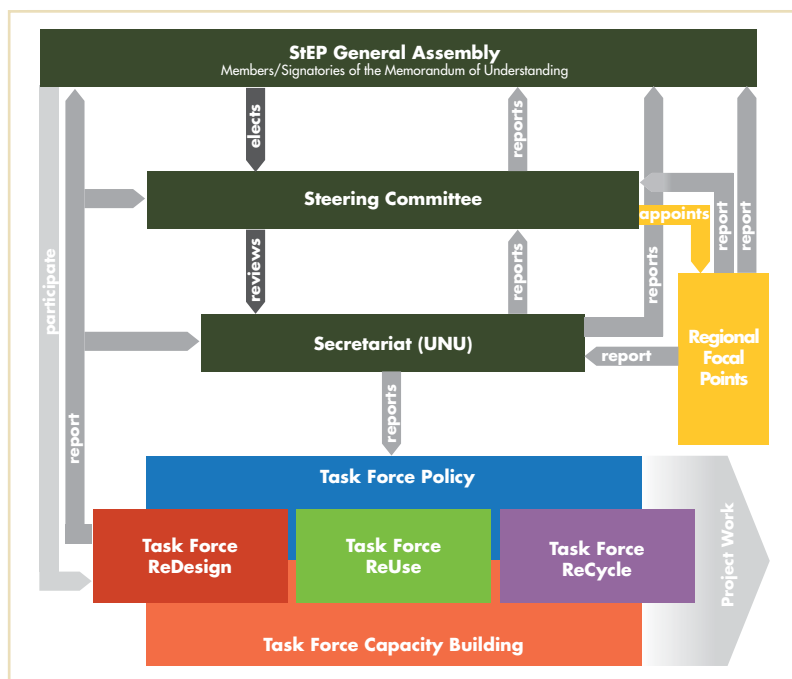
As a neutral arena its members seek to initiate international, inter-stakeholder cooperative activities and dialogues on a scientific basis in order to find economically, en-

vironmentally and socially sound solutions. StEP's Task Force ReCycle is coordinated by Mathias Schluep, Swiss Federal Laboratories for Materials Testing and Re-

The mission of StEP's **Task Force Capacity Building** is to increase

gained in the activities of the Task Forces 1–4 as well as on related and welcomed initiatives in global e-waste management and by actively engaging in training and capacity development. Coordinators of Task Force Capacity Building are Claudia Luepschen and Jaco Huisman, both United Nations University.

The **General Assembly** functions as the primary body of the StEP Initiative. The General Assembly meets at least once per year to vote on prospective new members, elect the Steering Committee, approve annual budgets and other financial matters such as project seed-funding, approve policy proposals and set up committees and subgroups. Each full member has one vote in the above fields. The 2010 General Assembly was hosted by Cisco in London, UK.





# ABOUT THE STEP INITIATIVE

The primary purpose of the **Regional Focal Points** is to serve as a link between the StEP Secretariat and StEP members, activities and issues in their corresponding regions. Aware of the fact that much of StEP's work is still centred in Europe and North America, three more Regional Focal Points were appointed in 2010 in order to successfully integrate more regional expertise and needs.

**StEP Regional Focal Point for North America:** Jeremy Gregory and Randy Kirchain, Materials Science and Engineering Systems, Massachusetts Institute of Technology (MIT), USA



Jeremy Gregory, Materials Science & Engineering Systems, Massachusetts Institute of Technology (MIT), USA



Randy Kirchain, Materials Science & Engineering Systems, Massachusetts Institute of Technology (MIT), USA

**StEP Regional Focal Point for the Middle East and North Africa:** Hossam Allam, Center for Environment and Development for the Arab Region and Europe (CEDARE), Egypt



Hossam Allam, Center for Environment & Development for the Arab Region and Europe (CEDARE), Egypt

**StEP Regional Focal Point for South East Asia:** Chirapat Popuang, Electrical and Electronics Institute (EEI), Thailand



Chirapat Popuang, Electrical and Electronics Institute (EEI), Thailand

**StEP Regional Focal Point for East Asia:** Jinhui Li, Basel Convention Coordinating Centre for Asia and the Pacific (BCRC China), China



Jinhui Li, Basel Convention Coordinating Centre for Asia and the Pacific (BCRC China), China

**StEP Regional Focal Point for the South Pacific:** Sunil Herat and David Thiel, Griffith University, Australia

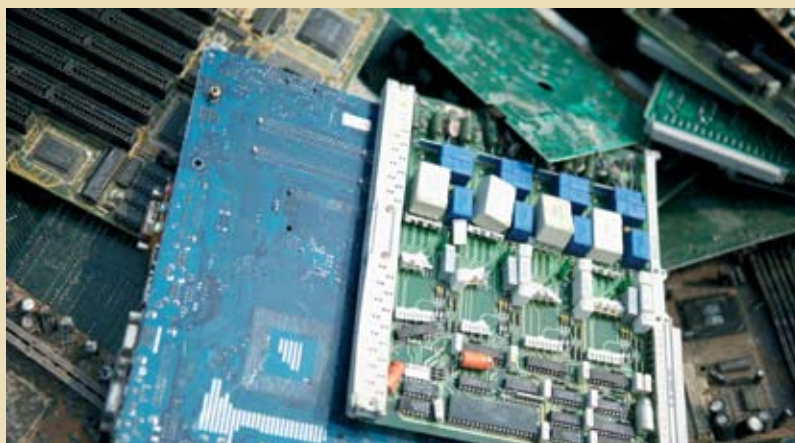


Sunil Herat  
Griffith University, Australia



David Thiel, Griffith University, Australia

StEP envisions a future in which societies have reduced to a sustainable level the e-waste-related burden on the ecosystem that results from the design, production, use and disposal of electrical and electronic equipment. These societies make prudent use of lifetime extension strategies in which products and components – and the resources contained in them – become raw materials for new products.

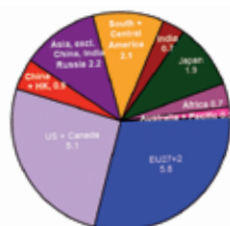




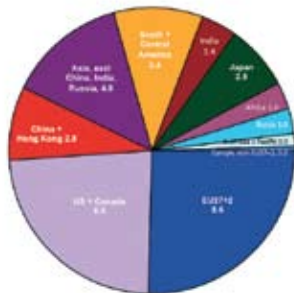
## StEP Task Forces Explore Sustainable Solutions

### Task Force 1 – Policy

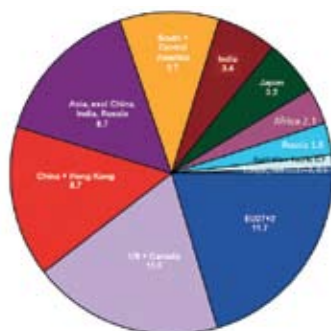
In 2010 Task Force Policy continued its activities to support policies aiming to solve the e-waste problem in both developed and developing coun-



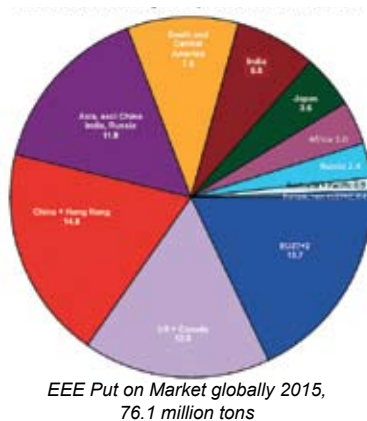
EEE Put on Market globally 1990,  
19.5 million tons



EEE Put on Market globally 2000,  
34.0 million tons



EEE Put on Market globally 2010,  
57.4 million tons



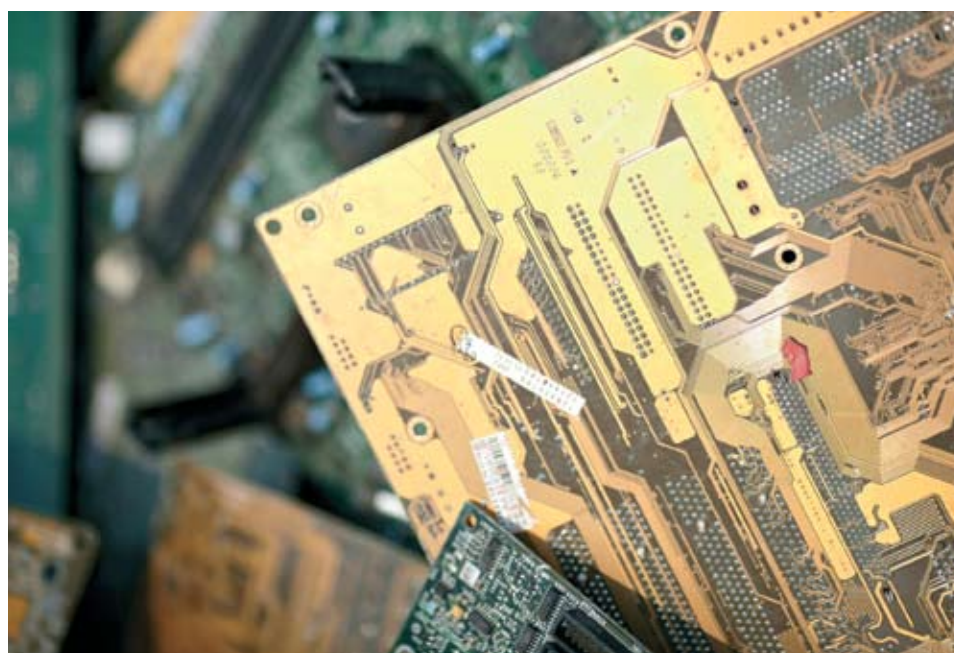
EEE Put on Market globally 2015,  
76.1 million tons

tries. Several projects have been completed such as the Indicators Project, a paper supporting the development of EEE legislation in Nigeria and the first part of a project investigating the interrelations of EEE & Climate Change. New projects are now being developed such as the E-waste Solutions Index, a White Paper on E-waste Definitions as well as a White Paper on Transboundary Shipments of (W)EEE, a Green Paper on Resource Scarcity related to electronics production and recycling as well as a new cycle in the commenting of the recast of the European Union's WEEE Directive. Through the below activities, its international and multi-stakeholder forum as well as its science-driven approach, Task Force Policy seeks to identify best policy practices and provide policy advice.

### The Indicators Project

This exploratory project aimed at compiling different indicators used to evaluate the solutions developed to solve the e-waste problems in various countries. The guiding idea for

setting up this project was that identifying comparable indicators would enable us to benchmark countries and eventually to highlight best practices. Governments, especially from developing countries, are very interested to learn from other countries' experience in trying to solve the e-waste problem. It is one of StEP's missions to diffuse best practices so that countries can learn from one another. In order to identify a set of indicators that could be used to construct a comparative framework, a group of four countries (Netherlands, Belgium, France and Switzerland) was selected. The selection was made as they were pioneers in e-waste legislation and for reasons of data availability. In a first step, indicators used in these four countries were collected and organized so that in a second stage data could be collected for these indicators. It appeared that even for such "easy" cases, it was not possible to use the collected data to compare the performance of countries and that a more simple approach was needed, such as the E-waste Solutions Index introduced below. A Green Paper to





summarize the project results will be published in 2011.

### The E-waste Solutions Index (ESI)

This project is the fruit of collaboration between the StEP Task Forces Policy and Capacity Building as part of the Annual Dynamic Digital Reporting on the global EwaSte Status (ADDRESS) project. It aims to construct a composite index enabling comparison of country performance and efforts in solving the e-waste problem. The aforementioned indicators project concluded that comparing the performance of countries regarding their capacity to solve the e-waste problem was better served by a simple set of indicators that could be graphically represented rather than by developing a complex set of indicators that will not be usa-



"With the help of e-waste policy instruments, whose development is supported by StEP in all coun-

tries around the world, France now collects 25% of e-waste put on its market, as opposed to 0% a couple of years ago."

*Cédric Gossart,  
Telecom Business School*

ble for comparative purposes, notably because of incomplete datasets or data heterogeneity. ESI will follow a four-step-approach: first, the general index will be developed based on our experience of e-waste solutions acquired in previous projects and validated by the StEP members. Five "performance areas" have been selected and weighed, each of them containing several indicators. In a second stage, the respective data will be collected. In a third stage, this data will then be analyzed and pre-

sented in a graphic form. Finally, the results will be published so that they can stimulate the efforts of governments in solving the e-waste problem. Financial support and further expertise have been secured from the Global e-Sustainability Initiative (GeSI) to make faster progress in the project.

### Databases for E-waste Policies

The overall aim of this project is to make an overview on global e-waste legislation and policies available online in an annotatable database. To achieve this objective, a partnership has been made with C2P - Compliance & Risks Ltd in order to have access to their database constructed to monitor the evolution of environmental legislation around the world, including e-waste legislation. This partnership will be particularly useful to collect data for the E-waste Solutions Index as described above.

### EEE and Climate Change

This project intends to inform the United Nations Framework Convention on Climate Change (UNFCCC) and other relevant stakeholders on the effects on greenhouses gases (GHG) through EEE and especially WEEE. A survey is being sent out to StEP members to investigate the

possibility to buy carbon credits out of voluntary markets (e.g. similar to the SENS International project or similar organizations). Discussions are ongoing with International Telecommunication Union and GeSI in order to define common and standard procedures as well as a methodology to evaluate and quantify the GHG emissions reduction allowed by the proper recycling of e-waste. A final report has been produced and future steps are being discussed.

### Policy Recommendations for Nigeria

StEP is regularly receiving requests from developing countries to support them in their efforts to solve the e-waste problem. This year StEP was approached by the Nigerian government for assistance and policy advice to inform the rapid development of its e-waste legislation. This is a key milestone for this country to regulate and treat e-waste flows and stocks accumulating in the country. In February 2011, comments on the "Nigerian E-waste Regulations" were submitted to the Nigerian government as "not for quotation" to the Nigerian authorities.

### White Paper on E-waste Definitions

This White Paper seeks to develop a consensual definition of "e-waste"





endorsed by all StEP members. A subgroup has been formed and has assigned itself three consecutive tasks to succeed in publishing this White Paper. In the first stage, the C2P database will be used to identify existing definitions including their source, and missing sources and definition items will be listed. Secondly, a critical analysis of the results of the first stage will be carried out, and finally a StEP definition will be proposed and diffused. A publication is expected for 2011.

#### **White Paper on Transboundary Shipments**

This project originated from discussions that took place under the auspices of Task Force Policy and Task Force ReUse about the need for StEP to contribute to the current transboundary shipment debates. This topic is of large concern for most stakeholders due to, among others, the environmental and health risks resulting from inappropriate treatment of imported EEE, the loss of scarce and valuable resources,

but also strategies to extend the lifetime of EEE products and close the digital divide. This White Paper is developed in close coordination with the Secretariat of the Basel Convention, which is also carrying out advanced consultation on this issue. A subgroup has been established and commenced its activities and a publication is expected in 2011.

#### **Green Paper on Resource Scarcity**

This paper explores the international policy framework surrounding the supply and demand of geochemically scarce metals, seeking to discover where international policies have advanced to this end. Emphasis is hereby given to geochemically scarce metals, with a focus on indium and tellurium, used in "thin film" photovoltaic (PV) power systems, a clean energy technology whose demand is expected to increase in the coming years. The subgroup's work is to be completed in spring 2011 and then opened for the review of other interested StEP members; a publication is expected by this summer.





## Task Force 2 – ReDesign

StEP's Task Force ReDesign is dedicated to product design aspects. To keep substances of concern out of electrical and electronics products is a key strategy to reduce life cycle impacts of these products, in particular at end-of-life. Smart product design can support and enhance the re-use and recycling of the equipment, but is challenged by the technical requirements and reliability concerns. As end-of-life conditions vary broadly throughout the world and even within individual countries, product design cannot be matched with a standard end-of-life scenario, but has to consider possible consequences under several disposal and recycling conditions. Task Force members develop re-use friendly products, research end-of-life implications of electronics with regard to product design issues, and explore policy measures globally to foster the trend towards "Green Electronics".



## Desk Study on Worldwide Impacts of Substance Restrictions of ICT Equipment

The StEP Initiative launched a desk study to investigate the current status of substance restrictions for electrical and electronics equipment worldwide. Several regions, including the European Union, China and US state of California, adopted legislation restricting the use of certain substances. The California Restriction of the Use of Certain Hazardous Substances (RoHS) Law is modeled after the European RoHS Directive with a reduced scope and regulates the same four heavy metals, but not the brominated flame retardants, PBB and PBDE. However, pentabromodiphenyl ether (pentaBDE) and/or octabromodiphenyl ether (octaBDE) are addressed by legislation in several US and Canadian states, including California, Hawaii, Maine, Michigan, New York and Washington. Other pieces of legislation restricting the use of mercury were implemented in the US and in Canada. In Japan, the ministerial ordinance Japanese Industrial Standard for Marking of Specific Chemical Substances (J-MOSS), effective from 1 July 2006, directs that personal computers, unit-type air conditioners, television sets, refrigerators, washing machines, clothes dryers and microwaves exceeding a specified amount of the six toxic substances restricted by the RoHS Directive must carry a warning label. South Korea and Turkey also promulgated regulations that have aspects of RoHS. In India the Draft Notification of E-waste (Management and Handling) Rules 2010 was published in May 2010, including a rule on the reduction in the use of hazardous materials in the manufacturing of electrical and electronic equipment listing 20 substances that are intended to be restricted in electrical and electronic

equipment and the threshold limits. The reduction in use of hazardous substances shall be achieved within a period of three years from the date of commencement of these rules.



"As substances of concern are phased out by the product manufacturers bit by bit, electronics get

a shade of green, and attention shifts towards rare resources and their availability for new technologies."

*Karsten Schischke,  
Fraunhofer IZM*

The implementation of the RoHS Directive resulted in the substitution of the restricted substances by non-restricted substances. To meet the requirements of RoHS, the printed circuit board industry had to move away from lead containing solders and surface finishes to alternative materials; the electronics industry did not adopt a universal alternative. The alternatives for surface finishes include organic solderability preservatives, electroless nickel/immersion gold, immersion silver and immersion tin. In 2004, lead-containing soldering retained 55% market share of the final finishes used in manufacturing of printed-circuit boards. This worldwide market share was estimated to have decreased to 37% in 2008. According to a recycler of production waste of the electronics industry in Malaysia, the use of substitution materials during production is continuously evolving: The recycler first observed a decrease of the lead content in the production waste associated with an increase of the content of precious metals, especially palladium, and after some months a decrease of the precious metals content due to



the use of more resource-efficient manufacturing processes. The implementation of the lead restriction hardly changed, or did not change at all, like the production volumes of the bulk metals like lead, zinc or copper. In contrast the lead substitution drastically increased the demand for and production of metals like bismuth and tin, whereby production volumes are much smaller. Silver, as one of the lead replacements for soldering in electronics, faced an increase in consumption for the electrical and electronics sector in the years 2001 to 2007, and a decreasing consumption thereafter. However, this trend is rather linked to the general economic development and the lead ban is only of secondary importance for these fluctuations.

A trend towards the restriction of an extended number of hazardous substances is easily recognizable in large companies producing electronic products for consumers. This trend was not only caused by the implementation of the RoHS Directive, but also by voluntary actions that are a part of the marketing strategy aimed at "greening" the products. However, it is ques-

tionable whether this trend can be observed for products placed on business-to-business markets and for products manufactured by small



"The raising public awareness on the need of a sustainably secure access to critical metals (see also

the EU Raw Material Initiative) underlines the crucial role which efficient recycling of WEEE can play. For Umicore as a leading recycler of numerous critical metals our engagement in StEP has thus even gained more importance than before."

*Christian Hagelüken, Umicore  
Precious Metals Refining*

and medium enterprises: Almost 30% of the Spanish and German small and medium enterprises (SMEs) contacted in the frame of a survey conducted in 2009/10 were not familiar with the RoHS Directive, meaning that in the case they were affected, they were not aware of it. The above research will be published as a StEP Green Paper shortly.





## Task Force 3 – ReUse

The search for solutions to the e-waste problem is a multi-faceted endeavour and re-use is a key part of the e-waste solutions toolkit. Its prominence in discussions can be explained as a response to the shortening of product lifespans which is leading



"We are managing to shine a spot-lamp on the complicated world of re-use and helping to untangle some of its complexities."

Colin Fitzpatrick  
University of Limerick

to greater pressure on resource extraction and increased manufacturing burdens in addition to the burgeoning quantities of e-waste. The concept of re-use should therefore be viewed as being largely reactionary to the trend of products being disposed of much earlier than necessary and is about the optimization of the use phase. Re-use, then, is not a solution to the e-waste problem in its own right but seen as a means of alleviating, or moderating the existing problems until such a time that products are utilized to a much more optimal level before being recycled in the most efficient means possible.

However, the practice of electronics re-use also happens to generate another wide range of ancillary benefits. These range from providing employment and training opportunities for people with disabilities or the long-term unemployed to providing access to good equipment for people with low incomes in both the developed and the developing world helping to bridge the digital divide. It is also a major source of IT equip-

ment for businesses and educational establishments in the developing world resulting in the promotion of vital economic development. Re-use also plays a significant role in the provision of spare parts for long-life and high-value equipment where the manufacturing of new parts may be rather expensive. The renewed focus on the availability of certain critical materials further strengthens the logic for considering re-use as a part of a business strategy.

During 2009/10 the Task Force ReUse primarily focused its efforts on two projects that examine best practices in re-use and also how re-use can be re-evaluated as part of e-waste management.

### Best Practices in Re-use – Success Factors and Barriers for Re-use Operating Models

The Best Practices project which ran from August 2010 until April 2011 is the first known study of formal re-use practices in the electronics sector. The study had a twofold purpose, aiming firstly to define a typology for the most common re-use operating models and secondly to identify specific and generic success factors and barriers for the different models derived from this typology. A set of 28 case studies was analyzed, which includes both for-profit and nonprofit re-use orga-

nizations from Africa, Latin America, North America and Europe. These organizations engage in the preparation and redistribution of information and communication technology (ICT) products or large household appliances for re-use. Based on a theoretical framework for operating models, semi-structured interviews were conducted with representatives from each case study partner. From analyzing and comparing the interview data, a generic typology for re-use operating models was derived and generic success factors for these models were identified. A survey among the interviewees finally allowed for a prioritization of the success factors and barriers concerning their importance.

As for success factors and barriers, the interview data showed clear differences between the different operating models. The nonprofit models especially have distinct success factors and barriers due to the export of used equipment to developing countries, where recycling and disposal of distributed products poses a major problem, or due to the nature of large household appliances requiring different collection and preparation for re-use processes.

However, the analysis also confirmed some generally known generic success factors and barriers for re-use operations, such as having access





to good quality equipment or the lack of clear definitions and a globally recognized quality standard, which could be used for certification of re-use organizations. Such a standard should consider the generic success factors for re-use operating models and could be designed as a platform, based on which sub-standards for different operating models can be defined.

Moreover, the report suggests focusing on two areas for further research: While this study focused at describing and categorizing re-use operating models in qualitative terms, further research could be undertaken to quantifying the qualitative frame and the flow charts for the different models on a more solid statistical basis; this could include data for average volumes processed by the different models, the size of the different customer segments, or more detailed information about the financial structure of the different models. Another potential for further research consists in the analysis of best practices in the implementation of critical success factors identified in this study, such as track-and-trace documentation of product flows from collection to preparation for re-use to distribution to recycling and final disposal. This best practices investigation could build the basis for a benchmarking reference framework for re-use organizations. A publication is foreseen for summer 2011.

### Re-evaluate

The Re-evaluate project, funded by the Irish Environmental Protection Agency (EPA), is being lead by the University of Limerick and supported by the social enterprises Rehab and Clondalkin Community Recycling Initiative with UNU sitting on the Steering Committee. The project is aiming to examine how re-use of e-waste

could become a mainstream activity in Ireland with a specific focus on the role of the social economy.

The project has undertaken field trips to several social economy re-use enterprises around Europe to explore the important success factors from not only an operational perspective but also considering the external legal and policy factors that enable re-use to occur on a significant scale. One of the key findings is that due to the clear lack of emphasis on re-use in the various national implementations of the WEEE Directive, the opportunity to undertake re-use is often lost. For each EU Member State, re-use and recycling targets are combined. The combined target can be achieved from recycling alone, which many EU Member States have opted for. Consequently, WEEE with potential for re-use does not have to be made available to operators who are interested in preparing it for re-use. This is acutely felt in the social economy sector where most re-use activities take place and in disadvantaged communities that are generally the main beneficiaries of refurbished goods.

From an operational perspective the findings of the Re-evaluate project are largely in line with the Best Practices project. The project recommends that re-use should be a regulated activity and participants should work towards pre-defined standards. The PAS 141, a publication on the re-use of used waste electrical and electronic equipment, shows promise for such a set of standards since its publication in March 2011. The project has also examined the issue surrounding the life cycle impacts of re-use and when recycling should be the preferred option. This is a particularly important issue for large household appliances since the use phase dominates the envi-



ronmental impacts. The conclusion from this work, based on a literature review and surveying the existing marketplace, is that only appliances with an energy rating equivalent to the rating of the cheapest new appliances on the market should be considered for re-use. The project is also conducting trials to determine the potential for re-use in e-waste from the sources of collection and aggregation in the Irish WEEE management system. The preliminary results indicate that while both business-to-business (B2B) IT equipment and business-to-consumer (B2C) large household appliances have a significant potential for re-use, only the re-use potential of B2B IT equipment is being fully realized. A very interesting comparative analysis of re-use and recycling of B2B IT has shown that, for Rehab, preparation for re-use created 11 times more employment and generated 15 times more revenue than recycling an equivalent amount of material.

The project is now entering a phase of examining if the potential for re-use can be increased by making strategic changes to the reverse logistics of large household appliances. Moreover, Re-evaluate has also been conducting novel research in the use of radio frequency identification technology (RFID) in reverse logistics for e-waste re-use which will culminate in a proposal for how RFID could be used to streamline EEE re-use.



## Task Force 4 – ReCycle

Task Force ReCycle continued its activities in 2010 with the overall objective to enhance global recycling infrastructures, systems and technologies to realize sustainable e-waste-recycling systems. Specific projects of the Task Force in 2010 included the development of a comprehensive Paper on the Standards for Collection, Storage, Transport and Treatment of E-Waste, the continuation of the Best of Two World projects and activities to support the development of the e-waste recycling infrastructure through projects in Africa. In addition to these projects highlighted below, 2010 saw the official release of the UNEP/StEP study Recycling – From E-waste to Resources, which highlighted the need for sustainable innovation requiring a sound market concept to address the increasing amounts of WEEE in the developed world. Although the report was drafted in 2009, it garnered significant media attention worldwide this past year and continues to be cited and referenced by the international community. Proper recycling activities, including pre- and end-processing techniques, in developing countries can substantially mitigate the adverse ecological and biological impacts of e-waste mismanagement.

### Standards for the Collection, Storage, Transport and Treatment of E-waste: Basic Principles and Key Requirements

Task Force ReCycle, working within a targeted subgroup, drafted a paper entitled “Standards for the Collection, Storage, Transport and Treatment of e-Waste”. The paper is not a standard, but rather an att-

standards should, however, abstain from prescribing the use of specific technologies; even best available technologies (BAT) should only be used for orientation to deduce high quality targets, but should not be prescribed. Operators should be given flexibility to decide on the technologies and procedures they want to apply to comply with the requirements and to achieve the targets of



empt to provide recommendations to key stakeholders on the development of high-quality end-of-life (EoL) standards, their conformity assessment and means for implementation in order to effectively and efficiently improve the situation in the management of e-waste. With the increasing development and adoption of EoL standards for e-waste, StEP wants the paper to provide orientation on this topic. For example, it recommends basic principles for the setup of EoL standards, proposes key requirements and discusses whether and under which conditions further requirements beyond the key requirements should be taken into account. EoL standards, as an example for a basic principle, should be target-oriented: They should set requirements and targets for operators and clearly define the conditions under which operators have to meet these requirements and targets. EoL

an EoL standard within the defined framework conditions, which will then also trigger the development of more effective and efficient technologies.

While the removal and adequate treatment of hazardous substances and components from e-waste is an indispensable and thus a key requirement, setting of collection and recycling targets in an EoL standard may only be useful under certain conditions. As soon as EoL standards are used to achieve a certain quality in the EoL processes, conformity assessments are needed that reliably prove that EoL operators working under an EoL standard actually comply with its requirements and targets. The paper proposes third party conformity assessments in such cases and proposes an auditing scheme supporting the auditor independence. Finally, the paper suggests measures to avoid down-



“TF ReCycle is taking on the big challenges to enhance global recycling infrastructures and create more sustainable recycling systems. Our work on how to evaluate recycling guidelines, and efforts to share the best knowledge of proper and sustainable electronics recycling methods from the developed to the developing countries is helping to solve some of the key challenges in the industry.”

Jason Linnell, National Center for Electronics Recycling



turn competition between different standards and to minimize operators' bureaucratic burdens from the compliance with EoL standards. A publication is expected for 2011.

### Best of 2 Worlds

The Best of 2 Worlds (Bo2W) is an ongoing research project of Task Force ReCycle aiming to investigate the idea of combining safe manual dismantling in developing countries and environmentally-sound treatment of critical fractions in best available technologies in industrialized countries as an eco-efficient approach to handle local e-waste in emerging economies. Moreover, this combination of manual dismantling and managing critical fractions will increase resource efficiency while simultaneously reducing emissions and adverse environmental impacts. China was originally the target country to test and implement this concept since 2007, considering its low labour cost, fast generation of domestic e-waste and lack of treatment facilities. Due to a change of business focus in 2010 of one industrial partner responsible for carrying out this project, the implementation location of the China project is planned to be transferred to Hong Kong. Further development of this project will be discussed and decided according to the proposal and progress of this partner in Hong Kong. Meanwhile, the Bo2W project is not exclusively confined to China, and on parallel thinking, project proposals based on the Bo2W philosophy were explored for expanding application in other countries (mainly in Africa), with the consideration of equipment and component re-use, as well as sustainable treatment of e-waste.

Task Force ReCycle is now drafting a paper on the Bo2W concept as a StEP supported framework to

summarize the implementing models and experiences of developing such projects in countries such as China and India. The paper explains the fundamental thinking behind the Bo2W model to fully utilize the advantage of manual dismantling and smartly share the global recycling infrastructures. Results of laboratory testing and the pilot trial on desktop computers in China are used to illustrate the benefit of this approach in environmental and economic gains. Lessons learnt, success factors, barriers and other influential factors from the existing case have been analyzed and suggestions have been made for an improved execution of this model. The paper will be finalized in June 2011.



"We made a big step forward in establishing and promoting the Best of 2 Worlds approach as one of the main StEP philosophies for sustainable e-waste management in developing countries."

*Mathias Schluep, Swiss Federal Laboratories for Materials Testing and Research (EMPA)*

### Integrated Waste Management in Western Africa

One example of taking the concepts learned in the Bo2W project and applying them elsewhere is in the Integrated Waste Management in Western Africa (IWWA) project. IWWA aims to establish and promote Integrated Solid Waste Management (ISWM) systems in Western African countries by empowering all stakeholders participating in the waste management chain through the reinforcement of institutional and legal frameworks and open transfer of knowledge and technology. This

initiative requires high participation levels from the interested parties and focuses its activities on 4 target countries: Côte d'Ivoire, Ghana, Nigeria and Senegal. As a representative sample of Western African countries, IWWA also seeks to provide synergies for the establishment of ISWM across the region while raising public awareness.

The project consortium consisting of more than 20 partners including StEP members is analyzing the current situation in the target countries by identifying main gaps and constraints of any type (i.e. technological, sociological, organizational, etc.) and selecting best practices and suitable management systems from European and non-OECD countries. According to the results obtained thus far, the project will provide valuable decision making tools that may be used in future implementation strategies such as guidelines for the identification of Integrated Waste Management Systems adapted to targeted countries' regional situations, guidelines for the implementation of Integrated Waste Management Systems and guidelines for the implementation of policy strategies in Integrated Solid Waste Management. Currently, two of six work packages are fulfilled, including an analysis and evaluation of the current situation in the targeted countries. The project duration is until June 2012.

Through the above activities Task Force ReCycle is holistically aiming to enhance infrastructures, systems and technologies to realize sustainable e-waste recycling. In turn TF4 provides an international, multi-stakeholder forum for collaboration and scientific discussions critical for the sustainable development of economically, environmentally and socially-sound solutions for recycling.



## Task Force 5 Capacity Building

Capacity Building is understood as an ongoing process through which individuals, groups, organizations and societies enhance their ability to identify and meet development challenges.

StEP's Task Force Capacity Building strives to develop infrastructures for a sustainable, effective and target group-oriented capacity development to increase awareness on and strengthen coping capacity for the growing e-waste problem. This is partially accomplished by providing training and resources, but also through access to information and scientific data. Hence, in 2010, its members have focused their efforts mainly on continuing work on the Annual Dynamic Digital Reporting on the global EwaSte Status (ADDRESS) project, the development of an Online Recycling Trainer and the continuation of the successful StEP E-waste Summer School.

### **ADDRESS - Annual Dynamic Digital Reporting on the global E-waSte Status**

With the recast of the EU WEEE Directive, currently a key issue in the discussion is the new collection target definition and target level setting. The proposed target will either be based on 65% of EEE Placed on Market (POM) to be collected based on two or three preceding years of sales and/ or as a target of 85% based on amounts of WEEE Generated (GEN). However, for both targets, what these mean in practical compliance terms is still very uncertain. Regardless of the final outcome, both targets will be complicated to use in practice because the total amounts to be collected cannot provide a simple statistical average

that can be applied to all individual products, product categories or collection categories. More diversified data is obviously needed.



"Within the Task Force Capacity Building and the StEP ADDRESS project the e-waste quantification

efforts are steadily leading to a better worldwide assessment of the size, nature and location of the e-waste problem. This research work will provide the various stakeholders involved globally the very basic facts and figures. This groundwork will support the electronics industry, policymakers, recyclers and academia with the starting points and insights to work more focused and efficient on long term national and international solutions for e-waste collection and treatment."

*Jaco Huisman, United Nations University & Delft University of Technology*

The StEP Initiative has identified a strong need for global e-waste information as well as compilation of and emphasis on exploitation of best practices. Such data would not only shed more light on the actual "size" and "nature" of the problem, but also help to develop sustainable solutions based on scientific knowledge and practical lessons learned. The work intends to track take-back systems progress made in specific countries and regions. Thus, Task Force Capacity Building and ReCycle have initiated a long-term project entitled "Annual Dynamic Digital Reporting on the global E-waSte Status" (ADDRESS).

As a first step, the ADDRESS project will look at amounts of electrical and electronic equipment placed on the

market (EEE POM), WEEE generated (WEEE GEN) and e-waste officially collected and treated (C&T). Secondly, reporting on the e-waste solution progress per country or state is intended as an integrator of key take-back system information and resulting in an important communication aid towards all stakeholders involved in developing, maintaining and improving take-back systems. A key factor is to comprehensively report on the system development rather than on the performance of individual stakeholders; the focus on country achievements is done by developing and executing specific country benchmarks. Such benchmarks will be backed up by a select group of independent e-waste experts from the large international network of universities and knowledge institutes present within StEP. The indicators used will be based on quantifiable and objective system characteristics that describe the level of achievement of end-goals rather than starting principles. These characteristics will for instance include e-waste amounts collected, the status of legislation, the presence of consumer education and availability of recycling infrastructure as well as enforcement levels (see the Task Force Policy project on the ESI). Thirdly, the development of an E-waste Knowledge Transfer Hub aims at establishing improved access to more concise and worldwide e-waste data; more importantly, this enables stakeholders to derive lessons from past take-back system development towards other countries and regions. The starting point is to take more efficient use of existing information hubs by processing and streamlining information, enhancing access to available and not-yet available information as well as scanning for voids from a worldwide perspective. The outcomes will support e-waste policy develop-



ment and take-back system improvements by training and educating all stakeholders involved. The three sub steps of this part are: 1. Gathering additional types of key system related information per country; 2. Development of an e-waste 'lessons learned' database; 3. Continuous, dynamic and comprehensive online reporting on the global e-waste status. A subgroup within Task Force Capacity Building is progressing steadily.

#### NVMP-StEP E-waste Summer School in its Second Edition



**NVMP-StEP  
E-waste  
Summer  
School**

The second edition of the NVMP-StEP E-waste Summer School took



place from 29 August – 7 September 2010. The theme for the 2010 Summer School was "Enabling Sustainable EEE Cycles".

The Dutch Foundation Disposal of Metalelectro Products (NVMP) was the main sponsor, with StEP members Philips Consumer Lifestyle and

Umicore Precious Metals Refining co-hosting and co-sponsoring the Summer School in Eindhoven, Netherlands, and in Hoboken, Bel-

"Managing E-waste is important – the Summer School was such a motivation boost. I feel like working in this field makes sense." \*

gium, respectively. The organization of the Summer School was lead by UNU and supported by EMPA who were closely involved in the development of the content and programme. Many other StEP members namely Cisco, Nokia, PCRR, BCRC Nigeria, TU Delft, Ecoped, Dell, Oeko Institute, SAT Austria, Telecom Business School, MIT, Fraunhofer IZM, TU Braunschweig, were involved in the Summer School through their time and in-kind support, and played a pivotal part in making this a truly successful StEP project.

The aim of the Summer School was to bring together a group of dynamic young e-waste researchers from around the world in order to look at solving the e-waste problem from

"I am not the only nut case out there researching such a "niche" topic." \*

different disciplinary perspectives. The main objectives were to link the researchers to experts from industry, academia and policymakers and also to develop a sustainable, multidisciplinary network of young scholars who will function as multipliers in their respective academic and geographic areas. The Summer School had a diverse and truly international group of 19 participants who between them represented 18 countries of origin or place of study. There was a balance of students from developing and developed countries as well as those from technical and social research areas. The issues discussed during the 10 days ranged from environmental justice to toxic hazards in electronics to recycling technology. The programme included expert lectures, workshops and study tours as well as a group

"Practical Insight on the issue of E-waste hopefully some lasting friendships!" \*

work assignment for all participants. One of the highlights of the Summer School 2010 was the dismantling session conducted by Jaco Huisman and Ab Stevels where students had a chance to dismantle flat screen TVs, vacuum cleaners and hi-fi music systems. The Summer School culminated with the presentation of the group work within the context of a case study set in Ghana looking at three specific aspects – 1. transboundary movements of e-waste, 2. the development of a Business Case for better recycling in a developing country and 3. producing a "media story" on e-waste on both previous two topics. The entire session was broadcast over WebEx with viewers from around the world, including StEP members, alumni from the 2009 Summer School as well as others interested in the work of the Summer School students.



The next StEP E-waste Summer School 2011 is being sponsored by SWICO Recycling in Switzerland, Nokia, Dell and HP with Philips Consumer Electronics and Umicore once again being generous hosts. The theme for the Summer School 2011

"A great deal of information. It was a very good idea to have such a mix of people so that we could all get a wide view of the e-waste situation." \*

is "Closing material loops – complexities and solutions in managing e-waste". It will be held from 11 – 22 September in Eindhoven, Antwerp and Davos, including participation at the World Resources Forum. More information on the Summer School 2011 as well as an overview of the past years, including presentations and photographs can be found online at <http://www.step-initiative.org/summerschool>.



## Online Recycling Trainer

Many developing countries are facing huge challenges in the management of electronic waste – which is either internally generated or imported. Because of lacking infrastructures and knowledge on the proper and safe handling of this waste stream, these wastes are oftentimes buried, burnt in the open air or dumped into

surface water. To recover material, recycling practices are used which are unsafe, highly-polluting and inefficient. Taking into account the great demand for training on safe and sustainable e-waste treatment, in particular by small enterprises in developing countries, Task Force Capacity Building has initiated the Recycling Trainer Online project.

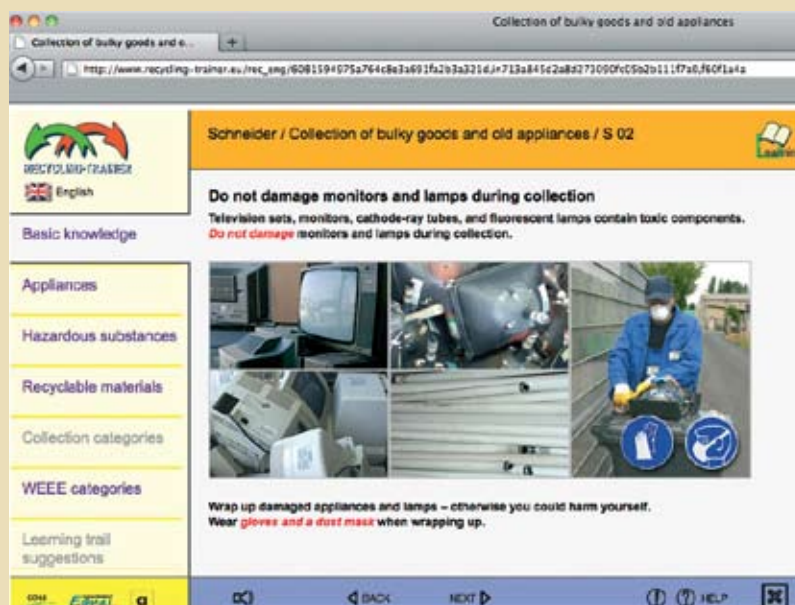
The primary objective of this project is to build on the existing version of Recycling-Trainer-online (RT-online) developed by StEP member GOAB (see <http://www.recycling-trainer.eu>), and to revise and extend the existing version to a learning and information system for the e-waste recycling and re-use sector in emerging and developing countries. As the existing version of Recycling-Trainer-online is mainly based on European conditions, there is a clear demand for revision and amendments to update and expand its content as well as didactics. Guiding ideas for the revision are:

- More emphasis on environmental aspects: Not to consider environmental protection as a luxury for industrial countries but as a base

for the mid and long-term development of emerging and developing countries

- Involvement of the subject re-use/refurbishment, as this section has a more significant meaning in emerging and developing countries than in Europe
- Stronger accentuation of occupational safety and health protection under consideration of the local circumstances and possibilities in emerging and developing countries
- Adjustment of the didactic presentation for the new target audience (problem "illiteracy") as well as adjustment to the local and familiar conditions to make the messages appealing, considering the technical framework conditions in these countries
- Stronger accentuation and explanation of the reverse supply chain: Which parties are involved and how should the tasks be divided among them to ensure a maximum amount of recyclable materials?

A project subgroup has been established and is now attempting to secure funding for formally initiating this project.



\* Comments by Summer School Participants 2009/2010



## Reports by the Regional Focal Points

### StEP Regional Focal Point for North America

The primary activity of the North American Focal Point has been the development of a StEP project characterizing transboundary flows of used electronics with a particular emphasis on the United States. This project is the result of a new partnership between StEP and the United States Environmental Protection Agency (US-EPA). The US-EPA has provided funds to StEP which will be used to support the effort. The



project will commence in 2011 and will be led by the Materials Systems Laboratory (MSL) at the Massachusetts Institute of Technology (MIT) – as StEP's Regional Focal Point for North America – and the National Center for Electronics Recycling (NCER) – as Coordinator of StEP's Task Force ReCycle.

There are numerous challenges related to collecting data on the transboundary movements of used electronics around the world. In spite of these challenges, a characterization of the sources, destinations and quantities of used electronics flows would be instrumental in the development of policies to monitor and control the movements of these products. In addition, this information would inform the decisions of stakeholders within the used elec-

tronics reverse supply chain on the logistics and destinations of their products. The project will include a qualitative characterization of the routes by which used electronics are leaving the US and an assessment of methodologies that may be used to quantify the amounts of electronics with a particular emphasis on data collection. A broad range of stakeholders will be consulted throughout the project to ensure that the activities are well-informed and harmonized with other efforts in the field. A major strength of the project is its collaborative nature: having high profile sponsors like the US-EPA and StEP will ensure broad stakeholder participation from across the world and will enable the project team to coordinate its activities with those of the stakeholders.

Specific objectives in the initial phase of this effort include:

1. Identify key stakeholders working in this area and invite them to attend a meeting to discuss collaborative efforts
2. Describe existing efforts to characterize exports of used electronics
3. Develop a qualitative characterization of the mechanisms for exporting used electronics including an analysis of the financial incentives
4. Examine official customs product and commodities definitions, their

impact on tracking efforts and potential modifications

5. Propose several methodologies to quantify the flow of used elec-



"The MIT Materials Systems Laboratory worked with the National Center for Electronics Recycling, the United States Environmental Protection Agency, and the StEP Secretariat to successfully develop a research project that will characterize the transboundary flows of used electronics. This project will be launched in 2011 and will include consultation with a broad range of stakeholders (many of whom are StEP members) and harmonization with other efforts in the field."

*Jeremy Gregory,  
Massachusetts Institute of Technology*

tronics and assess data collection feasibility

6. Demonstrate a calculation methodology through the tracking of a specific product type including a prototype data repository system

The outcomes of this one-year project will act as the foundation for other activities, such as the expansion of the application of the calculation methodology to more product types, the implementation of other calculation methodologies and further development of the data repository system. Moreover, the findings will add to and build on the existing StEP ADDRESS project.





## StEP Regional Focal Point for the Middle East and North Africa

Continuing on promoting StEP in North Africa and the Middle East, StEP cooperated in organizing the Second E-waste Management Forum "Green Business Opportunities" held in Marrakech, Morocco, on 23 - 24 November 2010. The Forum was organized by the Center for Environment and Development for the Arab Region and Europe (CEDARE), the United Nations Environment Programme (UNEP/ROWA) and the Moroccan Cleaner Production Centre (CMPP) in collaboration with StEP.

Based on the success of the First E-waste Management Forum "Circulating Success" which was held in Cairo, Egypt, in 2009, the Forum piloted and called for innovative and competitive solutions in e-waste management to create green business opportunities. The main objective of the Forum was to showcase how sustainable e-waste management contributes toward achieving considerable breakthroughs in generating business opportunities, conserving natural resources, adding value and creating jobs along the supply chain and abating health and environmental hazards effects by presenting lessons learned and success stories. A key objective of this Forum was to share knowledge about e-waste management success stories from an international, regional and national perspective. More than 120 participants

attended the Forum from 14 countries, representing various governmental organizations, private sector enterprises and non-governmental organizations in addition to representatives from international and regional organizations.

The Forum concluded with the below recommendations:

- Urging the Arab countries to evaluate the current situation concerning regulations and legislation related to the e-waste issue in order to enhance the actions required to face this challenge
- Benefiting from the multi-stakeholder partnerships which were established to implement the necessary policies and incentives required for sound environmental management of e-waste in the Arab region
- Establishing a productive partnership and creating future commercial opportunities between the concerned national, regional and international parties, including governments, the industrial and the private sector, non-governmental organizations, financial institutions, research and academic centres and international organizations
- Establishing awareness campaigns to increase awareness within the efforts of the countries to transfer to a green economy when managing the e-waste issue; this transfer would be done in cooperation with the National Cleaner Production Centres and any other concerned party
- Calling upon the United Nations Environment Programme and the Center for Environment and Development for the Arab Region and Europe and the regional and

international organizations, in cooperation with the National Cleaner Production Centres, to provide technical and logistical support concerning the sound environmental management of e-waste

- Calling upon funding parties to provide financial support in order to support projects aiming to enhance the environmental sound management of e-waste
- Urging industrial associations in the Arab countries to force the producers and distributors in applying the Extended Producer Responsibility framework
- Calling upon producers and distributors of electrical and electronic equipment to provide effective support in the collection and recycling of e-waste through participating in technology transfer and providing technical and financial support



"The StEP Initiative is an efficient platform for knowledge transfer and the establishment of partnerships for combating the e-waste problem on national and international levels."



Hossam Allam  
Centre for Environment and Development for  
the Arab Region and Europe



## StEP Regional Focal Point for South East Asia

The primary activity of the Electrical and Electronics Institute (EEI) as StEP's Regional Focal Point for South East Asia has been a project assessing Thailand's development of estimation methods on electrical and electronic waste quanti-



"EEI is, at the domestic level, estimating e-waste quantities in Thailand, and at the regional level,

participating in the Asian E-waste Summer School for Government Representatives, which may be held in Thailand."

*Chirapat Popuang, Electrical and Electronics Institute (EEI)*

ties where a close cooperation with StEP is envisaged and in which technical assistance from StEP is being sought.

In the project, EEI is implementing the following activities:

1. Review and collect information on existing database systems, data management and methods of estimating e-waste quantities in Thailand and five other countries
2. Propose a survey method, a study guide and information collection tools necessary to design an appropriate e-waste management database and information system in Thailand
3. Organize a focus group meeting on how to survey and collect the required information for the above information system
4. Organize a seminar to transfer knowledge on information ma-



nagement and e-waste quantities estimation

5. Carry out a survey and collect data on end-of-life product disposal, recycling and treatment as well as consumer behaviour and attitudes. This should comprise data for 13 products, namely TVs, VDO cameras, VCD/DVD players, printer/fax machines, telephones, personal computers, air conditioners, refrigerators, fluorescent lamps, dry cell batteries, microwave ovens, washing machines and electric fans
6. Propose an information system to support e-waste management in Thailand; this should include comparing advantages and disadvantages of the past methods employed overseas, assessing primary and secondary information sources available in the country to forecast e-waste quantities, constructing prediction models on e-waste quantities (utilizing existing models domestically and internationally) and designing a database system to support future e-waste management by connecting to existing WEEE tracking, flows, types and quantities of re-

used, recycled and recovered materials

7. Estimate e-waste quantities for the above 13 products
8. Organize a focus group meeting to generate feedback on the information analysis and the database system
9. Disseminate related information to all relevant stakeholders





## StEP Regional Focal Point for East Asia

The Basel Convention Coordinating Centre for Asia and the Pacific (BCRC China) as StEP's Regional Focal Point for East Asia plays a key role in the promotion of the StEP Initiative in East Asia and in linking this important region to StEP. In 2010 BCRC China was instrumental in carrying out the following tasks in the region:

- Presented StEP at various conferences and fora, e.g. the 2010 ISRI Convention & Exposition in San Diego, USA, and the International Congress on Solid Waste Disposal and Environmental Perspectives in Beijing, China
- Promoted the Bo2W project through participating in its implementation and by participating in the related project "Studies on the development and application of industry-specific technology of municipal cycle economy development in Suzhou - pilot project on e-waste recycling, 2006-2010"
- Co-organized together with the Partnership for Action on Computing Equipment (PACE) Working Group the Third Physical Meeting PACE, which was held from 13-15 December 2010 in the Sino-Italian Tsinghua Environment and Energy-Efficient Building (SIEEB), Tsinghua University, Beijing, China.

E-waste collection and treatment has been one of the main research fields of BCRC China. In 2010 BCRC China undertook several research projects in the fields of e-waste policy research and support, take-back and collection management research, treatment technology and technical specifications of e-waste recycling.



Based on past work and combined with the domestic need of China, BCRC China plans to push forward future work in the following four areas:

1. Consider the characteristics of e-waste, such as potential pollution, material complexity and resource scarcity, as well as the different treatment technologies



"My team has proposed to solve the e-waste problem by using Best Available Technologies/Best

Environmental Practice (BAT/BEP) and supported this with research. Now this principle has been adopted by the Regulation for the Administration of Recycling and Treatment of Waste Electric and Electronic Equipments in China, we will follow up with StEP also as Regional Focal Point on this."

*Jinhui Li, BCCC & Tsinghua University*

and management requirements, BCRC China plans to establish best available technologies in e-waste treatment on the basis of investigation, comparison and evaluation of existing treatment facilities, pollution control facilities and technologies at a national level to support best environmental practice

2. Plan to develop a project which investigates the rationalization of system operating and e-waste treatment costs, which is urgently needed in line with the implementation of the Chinese "Regulation on Recovery Processing of Waste Electrical and Electronic Equipment"
3. Considering the different treatment levels of e-waste in China and to generally improve and enhance the awareness of the e-waste problem, BCRC China intends to hold technical seminars, trainings and/or workshops and invite experts and scholars involved in e-waste management and treatment technology both from China and abroad to introduce their own experiences and opinions



## StEP Regional Focal Point for the South Pacific

Griffith University hosted E-waste2010, a South Pacific Regional E-waste Workshop, on 21 July 2010 in Brisbane, Australia. The objective of the workshop was to identify the major challenges and strategies for fostering environmentally sound management of e-waste in the South Pacific Region. The workshop attempted to develop a synthesis of the existing situation and discuss suitable approaches to deal with the challenges ahead.

E-waste2010 was well attended with over 100 delegates from the South Pacific Region participating in the event. The Keynote Address by Christian Hagelüken from Umicore Precious Metals Refinery in Belgium was of great interest, as were the 14 Plenary Presentations, from local, national and international speakers. E-waste2010 was sponsored by the Brisbane City Council, The Department of Environment and Resource



Management, Close the Loop Limited, Boliden Mineral AB and the Australian Mobile Telecommunications Association, and was supported by the StEP Initiative, the Secretariat of the Basel Convention, the Australian Information Industry Association, Product Stewardship Australia and the Consumer Electronics Suppliers' Association.

The afternoon discussion session, at which delegates broke off into groups to discuss key e-waste issues, proved very productive and the points raised were presented to all delegates in the final session of the day. Key discussion points comprised challenges and strategies for governments, the manufacturing and recycling industry, NGOs/civil society and academia/researchers. It is expected that these points will be discussed in-depth during the proposed StEP Regional E-waste Workshop for South Pacific Region to be held in 2011 or 2012.

Copies of all the presentations can be downloaded from the workshop website

<http://www.ewaste2010.org>



"Griffith University, as the StEP Regional Focal Point for the South Pacific Region, organized

Ewaste2010 workshop which brought together important stakeholders in the region to discuss the current state of e-waste management especially in Australia and New Zealand and the challenges faced. It is expected that the recommendations from this workshop will be further discussed during the proposed StEP Regional Workshop in 2012."

*Sunil Herat,  
Griffith University*



The following overview summarizes various international conferences and events which have been organized by StEP.

## StEP Events

1 February 2010

Joint PACE – StEP Meeting hosted by United Nations University in Bonn, Germany

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19 – 21 May 2010

StEP Virtual General Assembly via Webex

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21 July 2010

E-waste2010 South Pacific Regional E-waste Workshop organized by Griffith University in Brisbane, Australia – [www.ewaste2010.org](http://www.ewaste2010.org)

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29 August – 7 September 2010

Second NVMP-StEP E-waste Summer School hosted by NVMP and Philips in Eindhoven, the Netherlands, and Umicore in Hoboken, Belgium – [www.step-initiative.org/summerschool](http://www.step-initiative.org/summerschool)

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18 – 20 October 2010

StEP General Assembly 2010, hosted by Cisco in London, UK

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23 – 24 November 2010

Second E-waste Management Forum "Green Business Opportunities" in Marrakech, Morocco – <http://ewasteforum2010.cedare.int/>

The following reflects StEP Publications for the year 2010:

## StEP Publications

1 October 2009, revised 22 March 2010

StEP White Paper "On the Revision of EU's WEEE Directive – COM(2008)810 final"

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April 2010

StEP Annual Report 2009

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July 2009, published 2010

UNEP Sustainable Innovation and Technology Transfer Industrial Sector Studies: "Recycling – From E-Waste to Resources"

Please also see <http://www.step-initiative.org/events.php>  
and <http://www.step-initiative.org/publications/index.php>



**StEP Announcements**

Joint International Congress and Exhibition  
Electronics Goes Green 2012  
9 – 13 September 2012, Berlin (Germany)



This conference, held every four years, brings you the latest in legislative developments regarding the European Ecodesign Directive, material restrictions and e-waste legislation worldwide, life cycle engineering, new technologies and corporate social responsibility in the electronics sector. Substitution and recycling of critical resources as well as Green IT are key topics for the 2012 event, which is expecting again more than 500 participants from leading industry companies, academia, governments and NGOs. More than 100 speakers will present latest trends and findings in over 30 sessions. Remember the Electronics Goes Green in 2004? This was where the idea of the StEP Initiative was presented and discussed with a broader audience for the first time.

Further information:

<http://egg2012.izm.fraunhofer.de/>

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**PACE Guidelines available on the web**

The Partnership for Action on Computing Equipment (PACE) finalized and approved the overall Guidance Document on Environmentally Sound Management of Used and End-of-Life Computing Equipment (website: <http://www.basel.int/industry/compartnership/index.html>). Parties, Signatories and stakeholders are invited to submit any comments on this overall Guidance Document to the Secretariat of the Basel Convention by 31 May 2011.

(E-mail: [Matthias.kern@unep.org](mailto:Matthias.kern@unep.org), or fax: +41 22 797 3454)

The Partnership further finalized and approved the following documents which are being published on the same website for information:

- Report on ESM criteria recommendations-approved on 9 March 2009 and revised on 15 March 2011
- Glossary of Terms
- Guideline on Environmentally Sound Testing, Refurbishment and Repair of Used Computing Equipment
- Guideline on Environmentally Sound Material Recovery and Recycling of End-of-Life Computing Equipment
- Guidance on Transboundary Movement (TBM) of Used and End-of-Life Computing Equipment

The two technical guidelines (Environmentally Sound Testing, Refurbishment and Repair of Used Computing Equipment and Environmentally Sound Material Recovery and Recycling of End-of-Life Computing Equipment) will be evaluated in a facility type of environment and subsequently revised taking into consideration results of these evaluations.



## StEP Members (as of April 2011)



### International Organizations

- Basel Convention Coordinating Centre for Asia and the Pacific (BCRC China)
- Basel Convention Coordinating Centre for the African Region (BCCC Africa)
- Center for Environment and Development for the Arab Region and Europe (CEDARE)
- Secretariat of the Basel Convention (SBC)
- United Nations Conference on Trade and Development (UNCTAD)
- United Nations Environment Programme (UNEP)
- United Nations Industrial Development Organization (UNIDO)
- United Nations University (UNU)

### Industry

- AER Worldwide
- Cisco Systems Ltd.
- Compliance & Risks Ltd.
- Dataserv Group
- Datec Technologies Ltd.
- Dell
- Ericsson
- Flection
- Global e-Sustainability Initiative (GeSI)\*
- GOAB mbH
- Hewlett Packard (HP)
- MicroPro
- National Center for Electronics Recycling (NCER)
- Nokia Corporation
- Philips Consumer Lifestyle
- PT PLUS KG
- Sims Recycling Solutions
- Taizhou Chiho Tiande
- Umicore Precious Metal Refining
- Vertmonde cia. Ltda.\*





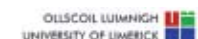
### Governmental & Development Cooperation, Nonprofit Organizations

- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)
- Enda Europe\*
- Renewable Recyclers
- Swiss State Secretariat of Economics (SECO)
- TechSoup Global
- United States Environmental Protection Agency (US-EPA)

### Academia & Research

- Austrian Society for Systems Engineering and Automation (SAT)
- BIO Intelligence Service
- Chinese Academy of Sciences (CAS)
- Delft University of Technology
- GAIKER Foundation
- Griffith University
- Institute for Applied Ecology (Öko-Institut)
- Swiss Federal Laboratories for Materials Testing and Research (EMPA)
- Fraunhofer Institute for Reliability and Microintegration (IZM)
- KERP research
- Korea Institute of Geoscience & Mineral Resources (KIGAM)
- Massachusetts Institute of Technology (MIT)
- Rifer Environmental
- Sustainable Electronics Initiative
- Braunschweig University of Technology
- Telecom Business School
- Thai Electrical and Electronic Institute (EEI)
- University of Limerick
- WEEE Forum\*
- 3P Consortium for Sustainable Management

\* Associate Member





## The StEP Initiative

Initiated by various UN organizations, the “Solving the E-waste Problem (StEP) Initiative” works with representatives from industry, governments, international organizations, NGOs and academia to initiate and facilitate approaches that promote the sustainable handling and management of e-waste. Organized in five Task Forces, feasible, just and environmentally safe solutions for the e-waste problem are developed through analysis, planning and pilot-projects.

For more information please visit [www.step-initiative.org](http://www.step-initiative.org).

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## The United Nations University

The United Nations University is an organ of the United Nations established by the General Assembly in 1972 to be an international community of scholars engaged in research, advanced training and the dissemination of knowledge related to the pressing problems of human survival, development and welfare. The University operates through a worldwide network of research and postgraduate training centres. For more information please visit [www.unu.edu](http://www.unu.edu)

## Photos

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## StEP Vision

StEP envisions a future in which societies have reduced to a sustainable level the e-waste-related burden on the ecosystem that results from the design, production, use and disposal of electrical and electronic equipment.

These societies make prudent use of lifetime extension strategies in which products and components – and the resources contained in them – become raw materials for new products.



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