Swiss Please!

ISWA National Committee member **Ian Williams** provides his second report on what he learned during a study tour in Switzerland supported by the CIWM's JC Dawes Award, specifically about its "cleantech" innovations

Switzerland is renowned for its distinctive "picture-postcard" environment; its pristine natural waters, lush green countryside and fresh clean air are world-famous. It is perhaps less well-known that its unadulterated natural wealth is no accident. The Swiss are constantly developing improved methods of resource management using the latest technologies to protect both their natural and urban environments. A willingness to be innovative, visionary and evidence-based has made Switzerland one of the world's leaders in the development of "cleantech" products and services. I learned about some of Switzerland's cleantech innovations by participating in a "Workshop on Urban Mining and the Circular Economy" hosted by EMPA, the Swiss Federal Institute for Materials Science & Technology, earlier this year. Here are some highlights…

Securing Primary Metals

PATRICK WÄGER, head of EMPA's Technology & Society Laboratory (TSL), introduced the workshop by explaining that its mission was to "create and transfer knowledge to shape the transition to a sustainable society". David Turner, from TSL's Advancing Life Cycle Assessment Group, presented the status and ongoing work on EMPA's project to update and expand the ecoinvent Database.

Such databases lay the foundation for a range of environmental studies, including life cycle assessment and management; carbon and water footprinting; environmental performance monitoring; product design; eco-design; and environmental product declarations.

Life Cycle Inventory (LCI) analysis entails generating an inventory of flows to and from nature for a product system. Inventory flows include inputs of energy, water and raw materials, and releases to water, land and air. To develop the inventory, a flow model of the technical system is constructed using data on inputs and outputs. The current ecoinvent Database contains almost 13,000 LCI datasets in areas such as agriculture, biofuels, biomaterials, bulk and speciality chemicals, construction materials, energy supply, transport, wood and waste treatment.

EMPA's project, for release via ecoinvent v3.5 (late 2017) and ecoinvent v3.6 (late 2018), focuses on critical and scarce metals, aiming to ensure that representative and regionalised LCI datasets for primary metals are available globally for users.

Prospecting Secondary Raw Materials

PATRICK WÄGER provided an overview of the part-EU, part-Swiss funded ProSUM (Prospecting Secondary raw materials from the Urban Mine and Mining waste) Project. In Europe, millions of tonnes of waste electrical and electronic equipment (WEEE) and end-of-life vehicles (ELVs) are generated annually, and >1m tonnes of batteries are sold.

These products are a potentially huge cache of secondary critical raw materials (CRMs) in the urban mine. For example, 99 percent of global Gallium use is in integrated circuits and optoelectronic devices; 74 percent of Indium in flat panel displays; and 27 percent of cobalt in rechargeable batteries. Similarly, previous and active mining deposits contain untapped reserves of CRMs.

Data on CRMs has been produced by a range of institutions including industry, government agencies, universities and NGOs. Such data is thus dispersed in discrete databases, formats and reports, making it problematic to aggregate or compare.

The ProSUM project will deliver the First Urban Mine Knowledge Data Platform, a centralised database of all available data and information on arisings, stocks, flows and treatment of WEEE, ELVs, batteries and mining wastes. ProSUM will provide data for improving the management of these wastes and enhancing the resource efficiency of collection, treatment and recycling. The project started in January 2015 and will be completed in December 2017.

Recycling Electronics From ELVs

ROLF WIDMAR presented a complimentary project to ProSUM entitled Project EVA ("ElektronikVerwertungAltautos"; literally translated as Electronics – Recovery – ELVs).

This is a successor to the project "Recycling potential of scarce technical metals from automotive electronics in Switzerland" and is commissioned by the Swiss Federal Office for the Environment. The project evaluates the possible inclusion of automotive electronics into the WEEE recycling system, as well as the potential recovery of critical metals from automobile shredder residue.

Project EVA involves innovative WEEE dismantling, removal and disposal tests alongside analytical work, scenario development, material flow analysis and life cycle assessment. It is an example of how a proactive approach to potentially problematic wastes can secure critical resources from an urban mine via circular economy thinking.

Swiss E-Waste Management

HEINZ BÖNI, head of the Critical Materials and Resource Efficiency group, presented the e-RECMET project ("Recovery of Indium and Neodymium from Electronic devices"). Funded by the Federal Office for the Environment and Swico Recycling and supported by the WEEE recyclers of Switzerland, the project asked a fundamental research question: does it make sense and is it possible to recover critical metals from WEEE from a technical, economic and environmental perspective? The results confirmed that the recycling of indium and neodymium would be ecologically sound and economically viable, although technical feasibility is not yet possible.

Heinz also provided an overview of Switzerland's three take-back systems (SENS, Swico and SLRS) that ensure the resource-efficient collection, recycling and proper disposal of WEEE. In 2015, the systems disposed of 134,600 metric tons of WEEE, corresponding to 16kg/person/year. Through international networking, these organisations also help to set cross-border standards for the WEEE recycling.

Conclusions

FROM THE world's first waste strategy, devised by Corbyn Morris in 1751; to the 19th century focus on improving public health led by Sir Edwin Chadwick; to the landmark report on urban waste collection and disposal produced by JC Dawes in 1929; to the Landfill Practices Review Group's ground-breaking "Waste Management Papers"; to the pioneering work of UK universities and organisations such as Keep Britain Tidy, WasteWatch and WRAP – the UK has a long and proud history of leading the way in resource management.

The British have always recognised that progress and innovation are driven by vision. There is widespread agreement that highly developed countries, such as the UK, have a particular responsibility for environmental protection and sustainable development. As money – inevitably – becomes tighter post-Brexit, our globally renowned inventive and creative outlook and innovative spirit will become more important than ever.

However, we must also keep an international outlook and learn from the inspiring work of others. As the world inexorably develops, demand for products, goods, services and processes with smaller environmental footprints will drastically increase. Switzerland has always deliberately and proactively invested in cleantech using state-of-the-art scientific and engineering expertise.

The annually published "Swiss Cleantech Report" shows clearly that – via continually increasing cleantech jobs and companies created, contribution to Gross Domestic Product and sparkling urban and natural environments – Switzerland is reaping the rewards of its investments environmentally, socially and economically. When it comes to cleantech innovation for resource management, we *still* need to be more Swiss. ■

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