The University Of Sheffield.

AREC
Creating the Supply Chain of the Future.

Welcome to the Advanced Resource Efficiency Centre's 2019 Newsletter. The Newsletter contains updates about our new and existing projects, recent publications, and activities.

AREC'S MISSION

To create a world leading supply chain resource efficiency and sustainability infrastructure addressing critical resource existentiality and challenges using a combination of method, tool, model, technology, process and system.

AREC'S VISION

To reengineer future supply chains by integrating supply chain resource efficiency and sustainability into strategic decision making in government, industry and education for improved competitiveness internationally.

OVERVIEW

"This year has seen much development and growth in AREC's global arms. Relationships have been strengthened and deepened with our international counterparts particularly with AREC China and AREC USA. There have been multiple visits to our research facilities in each continent and we will continue to deepen our partnership with our shared vision and expertise.

Jointly we have maintained our commitment to providing industry and government on a global level with the tools and research required for them to embed sustainability considerations into their decision making.

AREC has secured major funding in several areas from industry and governments which will allow us to continue our research and we have many exciting projects ongoing. I hope you will find the articles in this newsletter to be both fascinating and inspiring as we strive to make practical and realistic changes feasible for both industry and government which will impact our world and society to create a more sustainable future.

This year has also seen the launch of SCEnAT 4.0 which is a great achievement added to our SCEnAT suite. This software suite and our research principle are used internationally and have already made tangible financial and efficiency gains for businesses and governments around the world with real impact including the alleviation of the volume of waste material and energy, and the integration of resource efficiency, supply chain resource sustainability and lifecycle thinking into policy formulation.

Looking ahead, we will continue to strategically expand our operations with a global outlook including alignment with the flagship Energy Institute."

Professor Lenny Koh, Director of Advanced Resource Efficiency Centre (AREC)

January 2019

AREC UK hosted strategic partners from China – CECC/CCIEE and DRTTA

Professor Lenny Koh welcomed our strategic partners DRTT and CECC/CCIEE to Sheffield University. Ken Pan (DRTTA Director of international collaboration, Head of AREC China Hub in Beijing) together with Angela Lu (CECC/CCIEE in Beijing) travelled to Sheffield to deepen their partnership with AREC through a series of workshops and meetings.

Four days of meetings commenced with the AREC Research meeting. Mutual areas of interest such as each AREC Hubs, LC3M and SCEnAT 4.0, Circular Economy, Economic and Management PhD research were discussed. Professor Neil Hyatt joined the group to discuss URI Energy including civil nuclear followed by N8 Agrifood including URI Food with Professor Peter Jackson, Dr Seyed Ebrahimi and Dr Harry Langford.

A tour of Energy 2050 / URI Energy at the Ella Armitage building and Lab hosted by Professor Lin Ma was followed by a tour of the PACT Facility hosted by Dr Kris Milkowski. This was then followed by a cultural visit and stay in Matlock in Derbyshire to see the start of the industrial revolution (sponsored by Teresa Hitchcock, Senior Partner, DLA Piper).

On Thursday 17th January, our partners attended a breakfast and networking event with key stakeholders from local/regional government (Sheffield City Council and Sheffield City Region), business and academic hosted by DLA Piper. The breakfast and networking event was attended by Cllr Jack Scott (Cabinet Member for Transport and Development, Sheffield City Council), and board members of Sheffield City Region Sustainability Partnership, Sheffield Green City Partnership, representative from Sheffield City Region Local Enterprise Partnership, business/industry leaders and University representatives. This was an excellent opportunity to build on the Sino-British strategic platform for key areas of collaborations, and mutual appreciation and high level dialogues were conducted. Following this, the AREC Executive Board met: Professor Lenny Koh (Director of AREC and Head of AREC Global and UK), Professor Ian Reaney (Head of AREC USA), Professor Panos Ketikidis – Vice President of Research and Innovation at CITY College (Head of AREC Europe), Ken Pan (Head of AREC China) and Angela Lu (CECC/CCIEE). This meeting provided the opportunity to review and forward plan for the AREC Hubs; and discuss potential collaboration opportunities. Discussion of topics of mutual interest resulted in agreement of win-win strategies. Afterwards our partners visited the New Era Development including CUBI hosted by Jerry Cheung (Sheffield Leading Businessman) and Richard Caborn (Former MP for Sheffield Central, and Former Minister of Sport).

On the final day, Professor Lenny Koh introduced our partners to the Vice President (Research) Professor David Petley at Firth Court, VP (Research) Office. Mutual strategic appreciation and high level dialogue took place between our China partners (CECC/CCIEE and DRTTA) and the Vice President, with warm interest in deepening our partnership between UK and China. This was followed by a tour of Factory 2050 hosted by Phil Yates and a tour of the AMRC Factory of the Future and AMRC Composites Centre hosted by Elijah Sargent. The AMRC Knowledge Transfer Centre was the venue for a Blockchain and Transport workshop hosted by Dr Victor Shi and a Research proposal was presented by Dr Michel Le Lerre. The visit closed with a Partnership, knowledge exchange and technology transfer, research and innovation, commercialisation (IP) meeting with our China partners hosted by Chris Baker and Ruth Hambleton at the University Research Office.

CCIEE
China Center for International Economic Exchanges

国研智库 国际研修院
DRTT WORLD ACADEMY

February 2019

ReTraCE: Realising the Transition towards the Circular Economy

The University of Sheffield AREC Research Centre will lead a €4 million research project and train a new cohort of thought leaders to drive the transition towards a more sustainable mode of production and consumption in Europe over the coming decades. This is part of the AREC Waste recycling and Circular Economy research theme.

Realising the Transition to the Circular Economy (ReTraCE) is a research project funded by Horizon 2020 EU's Marie Skłodowska-Curie Innovative Training Networks and will support the implementation of the European Commission's Circular Economy strategy.

A consortium of ten beneficiaries is led by the University of Sheffield and includes seven academic and three non-academic groups.

Professor Andrea Genovese, from the University of Sheffield's Management School and Principal Investigator of the ReTraCE initiative, said:

> "This project will directly facilitate the implementation of the recently adopted ambitious Circular Economy strategy of the European Commission, which is closely linked to Sustainable Development Goals – the blueprint to achieve a better and more sustainable future for all.
>
> Looking beyond the current take-make-dispose extractive industrial model, a circular economy is an alternative to a traditional linear economy. It aims to redefine growth, focusing on positive society-wide benefits, where products are kept in use for as long as possible, with value recovery and regeneration at the end of their useful life."

The multi-disciplinary project will draw upon research that will advance the current understanding of the circular economy from economic, environmental and social perspectives, providing policy insights and implications for practice.

The network will design and deliver world-class multidisciplinary training to 15 early stage researchers, offering them an extended and valuable program of international exchanges and secondments through a wide network of partner organisations – from public, private and third sector.

Call for applications

The project has a call for applications for 15 Early Stage Researcher positions funded by the EU H2020-MSCA-ITN-2018 scheme. Find out more about the project on their Twitter and Facebook pages.

ReTraCE

REALISING THE TRANSITION TOWARDS THE CIRCULAR ECONOMY

February 2019

UK scientists led by Sheffield University working with engineers to reduce food waste in developing countries

Scientists and engineers in the UK are working to use ideas from advanced space technology to improve the lives of farmers and reduce food waste in developing countries. This research forms part of the AREC research centre at the University of Sheffield within the Agritech and Food theme.

Due to a warmer climate and a lack of technology, expertise and infrastructure, developing countries can waste up to 40% of food, the majority being fresh produce. Farmers are unable to insulate and cool or refrigerate food after is harvested resulting in spoilage on the journey between the farm and the consumer.

Dr Sonal Choudhary at the University of Sheffield Management School is leading a team of researchers made up of both academia and industry including representatives from Sheffield University Management School (SUMS), Hull University (HUBS), STFC's RAL Space and commercial cryogenics firm Cryox. The team are working on utilising STFC's expertise in space science and cryogenics, thermal engineering and analysing large datasets to improve the efficiency of the cold food supply chain in India with the aim of reducing the amount of waste, both in terms of food and energy.

UK expertise in cryogenics, the science of extremely cold temperatures, and of thermal engineering could hold the key to bolstering the food chain by reducing the amount of loss from farm-to-fork and by doing so, helping farmers raise their income.

Dr Choudhary said: "There are a number of practical and logistical challenges for farmers in developing countries. Once they have harvested the fruit or vegetables, how can they keep it fresh before it reaches the consumer? They are often unable to afford refrigerated vehicles, and rely solely on traditional methods such as transporting the produce through open trucks, rickshaws, motorcycles and even bicycles. Given the ambient temperature of 40-45^{o}C in many parts of India, a good thermal insulation along with cryogenics technology could provide us with a viable option to reduce food loss from farm-to-fork and improve the cold chain efficiency."

Dr Bryan Shaughnessy, head of the Thermal Engineering Group at STFC RAL said: "We design systems to withstand the harsh extremes of temperature in space. By taking the technology and expertise we apply in developing instruments for use in space missions and instead looking at how to apply it in assisting in keeping food cooler in warm climates I believe we have an opportunity here to find fairly low cost solutions to what can be a very expensive problem."

The project has had funding from the STFC Food Network+, which brings together researchers from STFC and different disciplines in the agri-food sector with the aim of solving some of the world's greatest food sustainability challenges.

Find out more about the network and the other projects being funded here.

February 2019

AREC China: Unveiling ceremony for the Sino-British "One Belt, One Road" Advanced Resource Efficiency Research Centre

On December 20, 2018, the “One Belt, One Road” Capacity Cooperation Centre of the Zhongguancun Haixing Promotion Association (Capacity Cooperation Centre) and the Advanced Resource Efficiency Research Centre of the University of Sheffield (AREC) jointly established the Sino-British “Belt and Road” Advanced Resource Efficiency Research Centre; the unveiling ceremony was held at the Constellation Accelerator.

Pan Jian, Director of AREC China, Associate Dean of DRTT Research Institute, Yao Zhenlei, Director of Market Development Project of DRTT Research Institute, Yang Chengxiu, Secretary General of the Capacity Cooperation Centre, Deputy Secretary-General Meng Wei, Zhao Jianghe, Secretary-General of Zhongxingcun Haixing Strategic Emerging Industry Promotion Association, and Deputy Secretary-General Zhang Wei attended the unveiling ceremony.

The UK is the first Western power to apply for the “One Belt, One Road” Asian Infrastructure Investment Bank, and the second country to invest in the AIIB's special fund after China. In recent years, the Sino-British “Belt and Road” cooperation has been full of power, and has achieved “early harvest” in terms of policy communication, trade smoothness, infrastructure connectivity, capital finance, and personnel training. Since the end of 2017, the British government has appointed the “Belt and Road” special envoy to set up an expert council to announce the support of the £25 billion “Belt and Road” Asian project. In the future, the two countries will expand their cooperation in terms of scale and level together with a wider scope in the field of “Belt and Road”.

In this context, the establishment of the Sino-British “Belt and Road” Advanced Resource Efficiency Research Centre has far-reaching significance. The future centre will rely on the park space and industrial resources of the “One Belt, One Road” capacity cooperation centre of the Zhongguancun Haixing Promotion Association, and actively promote the joint innovation of Sino-British science and technology through activities such as research cooperation, international science and technology innovation forum, doctoral workstations, and international roadshows. The transformation of international scientific and technological achievements is committed to building the centre into a Sino-British cooperation centre for science and technology innovation and a platform for international high-end talent exchange.

University of Sheffield AREC Research Centre collaboration with world leading Imerys and Penn State University

AREC in conjunction with the wider University of Sheffield hosted a very successful visit with Imerys, a world leader in mineral-based specialities for Industry with headquarters in France.

Imerys delivers high value-added functional solutions to many sectors, from processing industries to building products and consumer goods. This partnership builds from the work between Prof Lenny Koh and Prof Ian Reaney with Penn State University. Imerys have signed the French policy/legislation meaning they need to reduce their C02 footprint, they will follow up with discussions regarding SCEnAT and how this tool can help. They are also interested in AREC's capabilities regarding circular economy and in the diversity of project work AREC has under various topics. This research collaboration will enable positive exchange both ways, AREC's global network sharing and Imerys existing projects with Penn State. Sheffield University is coordinating the partnership with involvement of team members across various faculties.

There are exciting opportunities for AREC USA working with Penn State and Imerys and there are talks happening around establishing a joint research project on plastic, bio-based materials and polymer LCA. There are opportunities to connect agriculture and bio energy researchers (including sharing of database) on joint LCA project. With Imerys as an industry partner, joint LCA collaborative research with a focus on green mining would have mutual interest and benefit. Other projects such as seed funding to pump prime collaborative LCA research are on the horizon. The toxicology footprint Nature paper has been shared with NSF, relevant industry and policy makers and the UK REF impact case study measurement has also been shared. Connecting social sciences (urban, transport, supply chain, humanitarian etc.) researchers in joint LCA projects has exciting opportunities for mutual benefits in resource efficiency and sustainability.

May 2019

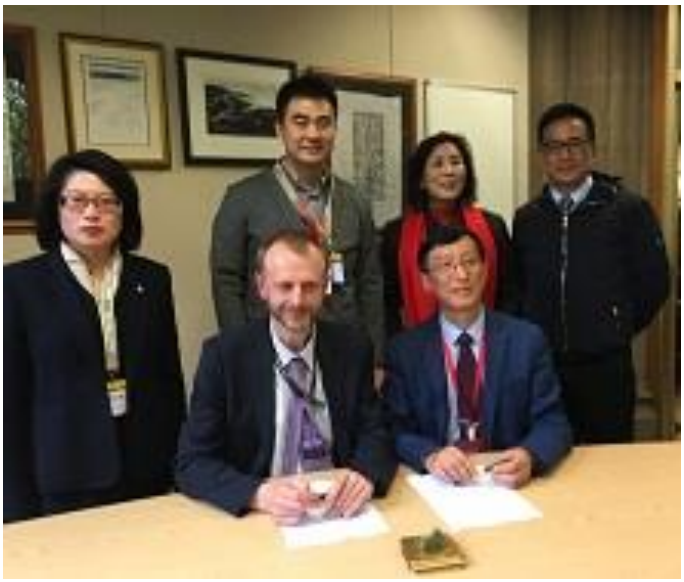
Innovating a new model of international cooperation: Shenzhen China and Sheffield UK

On May 9, 2019, The University of Sheffield hosted a prestigious incoming delegation from Shenzhen led by Shenzhen Municipal Commerce Bureau Director-General Wang Youming, China to Sheffield UK, coordinated by AREC.

This delegation includes Shenzhen Electronic Chamber of commerce and 21 entrepreneurial elites of business and industry including Shenzhen government departments. The aim of the visit was to comprehensively strengthen cooperation between Shenzhen and the UK, especially with The University of Sheffield in the fields of technological innovation and international trade, and to continuously expand cooperation in the fields of higher education and talent introduction.

Memorandum of Understanding (MOU) between CEC I-Valley and The University of Sheffield, and MOU between Shenzhen Electronic Chamber of Commerce and the Sheffield Chamber of Commerce and Industry were signed. The delegation toured The University of Sheffield's AMRC and Factory 2050.

The visit culminated with a drinks reception hosted by Vice President for Research and Innovation Professor Dave Petley at the Rotunda in Firth Court at The University of Sheffield. On behalf of the University, Professor Petley expressed good wishes and sincere welcome to the Shenzhen leaders and entrepreneurs. This visit was an excellent platform for opportunity and collaboration between the University of Sheffield and Shenzhen.



During the morning of 10th May 2019, the Vice Director of the Shenzhen Education Bureau Dr Wang Shui Fa hosted a roundtable meeting at China-Britain Business Council (CBBC) London Office coordinated by Nathalie Cachet-Gaujard, attended by various universities in the UK. Professor Koh represented The University of Sheffield in this roundtable meeting focussing on establishing a new type of PhD programme in Science and Technology Entrepreneurship between UK and China.

During the afternoon of 10th May, the Shenzhen Municipal People's Government led by the Mayor of Shenzhen Chen Rugui hosted the "Shenzhen & Hong Kong - London Economic and Trade Cooperation, Greater Bay Area, Build a Winning Future (London)" Conference at the Four Seasons hotel in London. More than 200 people attended this highly prestigious conference including speeches from leaders of both UK and China governments and industry.

May 2019

First International Conference on Drawdown

Project Drawdown is partnering with Penn State to hold the first international conference on Drawdown — Research to Action: The Science of Drawdown. "Drawdown" is the point at which concentrations of greenhouse gases in the atmosphere begin to steadily decline, ultimately reversing global warming. A rich database of solutions to reverse global warming was developed by Project Drawdown.

Leading scientific experts and researchers from around the world held a critical discussion about the most innovative and promising climate change solutions and upcoming research.

The conference steering committee comprised of leaders from U.S. and international universities and organizations, and hundreds of other experts with representation from over 50 U.S. universities, businesses, and governments participated.

The intention of the conference was to connect international partners and research institutions. The three-day conference focused on analysis and peer review of the portfolio of over 100 individual solutions, synergies and interactions were discussed and implementation pathways were evaluated including successful examples from around the world.

The Drawdown sectors and conference themes included:

Built Environment, Electricity Generation, Food, Land Use, Materials and Waste, Oceans, Transportation and Women and Girls.

Professor Lenny Koh represented the University of Sheffield in the session: *Materials and Waste—More with Less: Better Production, Reducing Consumption, and Using Waste to get to Drawdown*. The session discussed Drawdown solutions including several pathways to a more circular economy.

For detailed information please visit https://drawdown.psu.edu/

August 2019

IFAC MIM 2019 Conference in Berlin

Digital, Resilient and Sustainable Manufacturing 4.0 Digitalization, resilience, and sustainability shape current and future trends in manufacturing modelling, management, and control.

The aim of MIM 2019 is to bring together researchers and practitioners in industrial engineering, manufacturing, operations research, supply chain management, and computer science to present and discuss emerging topics in modern manufacturing modelling, management, and control. MIM'2019 will follow a rich tradition of previous IFAC conferences and symposia in Manufacturing and Logistics held in Germany. MIM'2019 will focus in particular on the most innovative methods proposed in the last few years in the context of digitalization, risk management, and resilience in production and logistics systems in the 21st century.

This year the Berlin School of Economics and Law hosted the 9th IFAC MIM conference which was attended by over 750 participants and was host to some outstanding scientific and social programs, with many world renowned Academic speakers and authors.

Professor Lenny Koh was a plenary speaker and her talk **What really matters today and in the future – From physical to digital to autonomous** covered some of the challenges and opportunities faced by society and industry, commented on the transformation of our world, and why resource sustainability and machine economy will take central stage in this transition.

Lenny's research contributes to advancing the understanding and resolution of complex supply chains using interdisciplinary approaches crossing supply chain management and information systems domains across industry. Her research is world leading and is recognised for its scientific novelty and has generated significant impacts for society, government and industry from manufacturing to services. This includes the pioneering of digital Cloud based tools (SCEnAT suites) that support the transformation of supply chains towards resource efficiency and sustainability; and infusing and digitising supply chain life cycle thinking across sectors, technologies and systems. Lenny has established strategic partnerships with industry leaders from automotive to digital sectors on supply chain sustainability and digital transformation, and works closely with the Transport Systems Catapult on intelligent mobility.

For detailed information please visit https://blog.hwr-berlin.de/mim2019/

September 2019

POMS Conference in Brighton

(POMS) is an international professional organization representing the interests of POM professionals from around the world.

The theme of conference was “Connecting the OM&SCM world in divided times”. Trade wars, austerity and political uncertainty fill our television and newspaper headlines. Yet, despite these divided times, we have ever-increasing opportunities to connect with each other by building networks and through operational and technological advancements (e.g. Internet of things, Blockchain).

Professor Lenny Koh was on the panel for Practise-based research: Lessons learned for external research funding and led a talk on The Research Funding Journey: Strategies to succeed. Further talks considered *The Research Funding Journey: Balancing the Multi-Objectives of Funding Agencies and Academic Research Panel.* Lenny contributed to this discussion with Professor Michael Bourlakis and Professor Nagesh Murthy (facilitated by Professor Samir Dani) and again highlighted the need for a strong and holistic application in which both the research opportunities and the business benefits are clearly illustrated.

This event also encompassed the ideology of the Circular Economy, the challenges and barriers to using Artificial Intelligence in supply chains, managing the supply chain in times of political disruption, labour issues and international trade disputes and how social media is affecting the market place in terms of new product design, forecasting demand and quality management among other considerations. The effects of Industry 4.0 technologies (additive manufacturing/3D printing, intelligent manufacturing, internet-of-things, big data etc.) were also discussed and how their input will affect production and the supply chain.

For detailed information please visit *https://www.poms2019.com/*

September/October 2019

ETHAC 2019
Thessaloniki, Greece

The 2019 European Triple Helix Congress on responsible innovation & entrepreneurship. The mission of ETHAC is to mobilise knowledge and innovation transfer to the global market by enabling international triple helix interactions where academics, innovators, industry, entrepreneurs, investors, governments and policy makers actively engage in innovation co-production and transfer.

ETHAC is organized by the Triple Helix Association - a non-for-profit, non-governmental association with scientific purpose and a global reach. Its main scope is to advance scientific knowledge and practical achievements related to all aspects of the triple helix interaction for fostering research, innovation, competitiveness and growth. ETHAC2019 pushes the frontiers of triple helix interactions in the most pressing worldwide challenges in terms of innovation development processes and its outcomes.

Professor Lenny Koh was a keynote speaker amongst others such as Professor Loet Leydesdorf, Professor Martin Jones and Dr. Dimitri Corpakis. Professor Lenny's talk on "Shaping world-wide resource sustainability policy and industry practice through cutting-edge research - USA, Europe & China" included the Energy Institutes research pillars, "Electrical Energy Storage, Nuclear, Wind, Circular Economy and Conventional Power along with sustainable development goals, policies, industry and framework. The focus of the talk featured the SCEnAT 4.0 suite which provides a range of resource sustainability prediction capabilities using Microsoft Azure Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning (DL) cognitive services.

For detailed information please visit https://www.triplehelixcongress.com/

Solving the e-waste challenge requires global action…

- **International team of experts have produced recommendations to reduce the harm to human health and the environment from current e-waste processing practices**
- **Hazardous e-waste such as old mobiles, computers and circuit boards is piling up at alarming rates – 45 million metric tonnes recorded in 2016.**
- **New report calls on government agencies and manufacturers to work together to tackle the e-waste crisis**

An international team of experts have highlighted the urgent need for global cooperation to reform the e-waste recycling industry and counteract the harm it poses to both human health and environment.

Old mobile phones, computers, and circuit boards are all examples of electronic waste or e-waste.
E-waste often contains toxic components and is a major problem on the world stage. Even more concerning is the alarming rate at which e-waste is growing with almost 45 million metric tonnes recorded in 2016.

Huge volumes of e-waste are shipped around the world illegally or sent for processing to countries with underdeveloped and unsafe recycling capabilities. These practices pose a significant risk to human health and the environment.

The collaborative study, which involves Professor Lenny Koh from the University of Sheffield's Management School and a team of researchers from the USA and China, is published in Nature Electronics.

The authors of the paper aim to transform today's rudimentary recycling practices so that they become advanced, safe, and a profitable part of the global circular economy – an economic model where we extract the maximum use from a produce before it is recycled entirely or valuable parts are salvaged for future use.

Professor Lenny Koh, who is the Director for the Centre of Energy, Environment and Sustainability, and Director of the Advanced Resource Efficiency Centre, said: "E-waste can be turned into 'gold' and can contribute to the circular economy if it is handled effectively, efficiently and sustainably, thereby avoiding negative impacts on health and the environment."

Advanced equipment used to manage e-waste recycling such as Apple's iPhone recycling robot 'Daisy' is expensive and unable to deal with the sheer volume of waste material.

Current preventative measures such as the United Nations' Basel Convention are unable to cope with the rapidly increasing quantity of hazardous waste.

However, the international team of experts which includes Professor Oladele Ogunseitan from the University of California, USA, and Professor Jinhui Li and Dr Abhishek Awasthi from Tsinghua University, China, have developed recommendations to help alleviate the global challenge.

The researchers are calling for international cooperation and engagement from the private sector to tackle the pressing issue urging the best available technologies to be shared internationally and scaled up to deal not only with the e-waste mountain, but also with the safety issues around labour practises in this nascent industry.

The study also highlights standards in the e-waste industry which need to be improved. Profit margins for recyclers can be so small that they resort to using unsafe and environmentally damaging practices to meet demand. The researchers flag the need for oversight from governmental agencies to advance e-waste collection and strengthen recycling infrastructure.

Furthermore, financial incentives for this industry should be introduced. The academics point to an example of good practice where Indian banks have provided capital to promote sustainable development in rural regions which supports particular industries.

The researchers argue that this model can be applied to the e-waste industry to establish self-help group parks or cooperatives under the umbrella of the environmental regulatory authority of a country. This strategy aims to professionalise the industry, develop workers' skills, and sure up safe labour practises across countries.

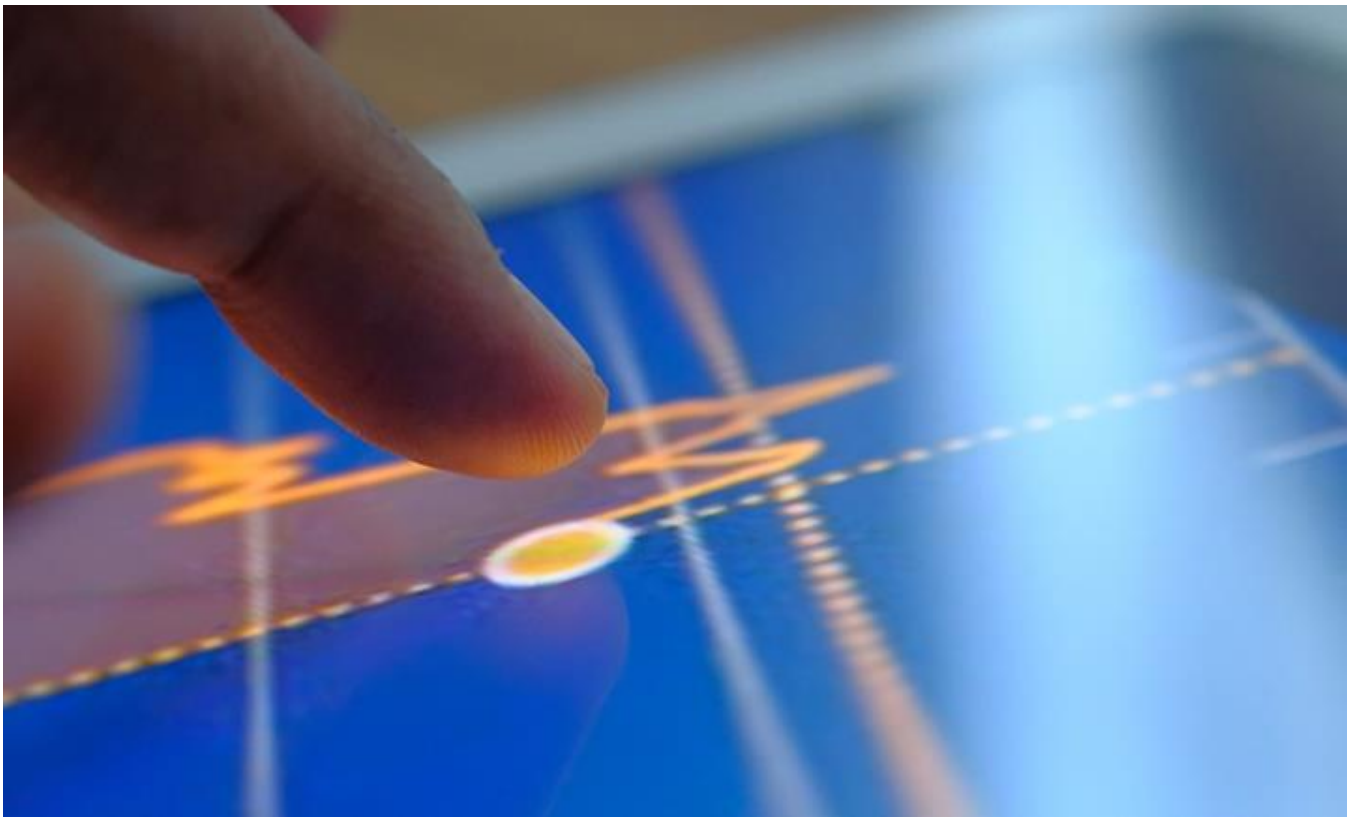
Professor Koh added: "Accessible best available technologies, sustainable standards for e-waste recycling, and financial incentives will pave the way forward for global actions in solving the e-waste challenge. Our research and recommendations shown in this paper can be used directly by governments and industry globally in designing e-waste recovery and circular economy models and policy."

The paper 'Circular economy and electronic waste' is published in Nature Electronics.

View the full paper

New view of the world could help create unlimited sustainable resources

- **Predictor tool developed by the University of Sheffield will help scientists forecast future impact of climate change, population growth and energy use**
- **The Supply Chain Environmental Analysis Tool (SCEnAT) 4.0 uses large scale databases including from the World Bank and NASA Satellite maps and embedded autonomous learning**
- **Policy makers and industry leaders can use the predictor to have a deeper understanding of the implications of investment decisions and policy**



A pioneering predictor tool developed by the University of Sheffield will give scientists an alternative way to visualise the world and help to forecast the impact of climate change, population growth and energy use.

The Supply Chain Environmental Analysis Tool (SCEnAT) 4.0 uses large scale databases – including from the World Bank and NASA Satellite maps – numerical, graphic and textual data with embedded autonomous learning.

The new tool will be able to predict the relationship between climate change, political economy, innovation, life expectancy, population growth and energy use, on sustainable development and resources. With the flexible design of SCEnAT 4.0, any sustainability questions and any resources can be built.

The University of Sheffield, in collaboration with Microsoft, has been working for the past eight years to solve the global challenge of depleting resources. The new tool has been pioneered through the University's Advanced Resource Efficiency Centre (AREC) by Professor Lenny Koh.

“We are very proud of the long standing relationship between the University of Sheffield AREC and Microsoft,” said Professor Koh, Director of the AREC.

“SCEnAT 4.0 is borne from this ongoing collaboration in the era of Industry 4.0; and the Cloud and AI economy. SCEnAT 4.0 AI capabilities fit strategically with the AI sector Deal announced by the UK Government.

“Globally, AI interests are on the rise especially in the USA, China and Europe, whilst the global revenues from the AI market is projected at circa 90 billion USD in 2025 in tune with the increasing global demand for more sustainable and resource efficient solutions. SCEnAT 4.0 framework and platform are well-positioned for such worldwide scale-up rapidly.”

SCEnAT 4.0 has evolved from the original SCEnAT Cloud based tool, powered by Microsoft Azure, which has helped companies reduce the environmental impact of their supply chains.

The collaboration between the University of Sheffield and Microsoft progressed the tool into SCEnAT+ and SCEnATi – funded by the EU – which has the addition of big data analytics and benchmarking capabilities along with Power BI integration, a Microsoft business analytics service.

Anthony Bitar, Cloud Solution Architect, Microsoft UK, said: “Policy makers and industry leaders can exploit the prediction experiencer from SCEnAT 4.0 to have a deeper understanding of the implications of policy and investment decisions.

“We are excited by how the combination of Microsoft’s Azure cloud and AI services are being used in the SCEnAT 4.0 platform to de-risk and visualise the relationship of economic, environmental and social impact from the way we produce and consume resources.”

For further information about SCEnAT please visit http://www.scenat.com/

Developing sustainable solutions for international supply chains

A new research partnership with Pennsylvania State University and the University of Sheffield aims to promote more sustainable supply chains to meet US policy standards.

Researchers from the Energy Institute at the University of Sheffield have now launched the USA branch of the Advanced Resource Efficiency Centre (AREC-USA) at Pennsylvania State University. This research centre will promote collaboration between industry and universities. It will offer easy to access platforms that will help meet the challenges of sustainability across supply chains.

Professor Lenny Koh, Director of AREC and Head of Communication, Partnership and Internationalisation for the Energy Institute explains “We developed AREC in Sheffield to address some of the world’s biggest challenges such as resource scarcity, efficiency and sustainability through our cutting-edge research and innovation bringing transformational change and positive global impact on society, industry and government. We hope that AREC USA will lead to deep and significant USA policy and USA supply chain impact; and global policy and global supply chain impact on energy, environment and economy.”

AREC-USA supports the development of sustainable supply chains by proposing new ways of reducing risk for partners in overcoming the challenges of resource availability. Small and Medium sized Enterprises (SMEs) will be able to collaborate with larger industrial partners and benefit from cutting edge academic research. This provides the mechanism for achieving US Government and policy targets in supporting an environment in which the millions of US-based SMEs can flourish with their supply chains in the US and internationally.

Collaboration between the institutions will contribute to raising awareness about the excellent work conducted at the University of Sheffield internationally. AREC-USA will build on the existing partnership with Microsoft to develop cutting edge digital technologies to transform supply chains. An example of this is the Supply Chain Environmental Analysis Tool (SCEnAT) which was developed by Sheffield researchers in partnership with Microsoft. This cloud based software can pinpoint the places in the supply chain where most carbon is produced so companies know where change is required.

Clive Randall, Director of the Materials Research Institute at Penn State, said "We are extremely pleased to welcome the Pennsylvania State University's partner, the Advanced Resource Efficiency Center (AREC-USA) with the University of Sheffield.

This will tremendously aid the consideration of major resources, ranging from advanced materials manufacturing, energy, mining, and agritech supply chains. Through this partnership, we aim to address and reengineer future research and business practice by integrating supply chain resource efficiency and sustainability into strategic decision making in government, industry and education."

AREC's central hub in Sheffield already provides industrial sustainable research in Europe and China. The USA programme brings together the Institute of Energy and Environment (IEE), Materials Research Institute (MRI), and Behrend's Plastics Engineering Laboratory, all of which have committed funds to accelerate this partnership. AREC-USA offers a cross-disciplinary team with combined experience of research and innovation on sustainability, materials, manufacturing, energy and resource efficiency over five decades.

The launch of AREC-USA coincides with the Drawdown Conference on 16-18 September. The conference invites leading scientific experts and researchers from around the world to take part in a critical discussion about the most innovative and promising climate change solutions and upcoming research. Professor Lenny Koh, from the University of Sheffield's Management School, AREC and Energy Institute, will attend the conference to present her research.

For further information about AREC please visit https://www.sheffield.ac.uk/arec

October 2019

AREC-USA and AREC UK explore research collective on resource recovery from waste

Dr Gamini Mendis from Pennsylvania State University, Advanced Resource Efficiency Center - USA was welcomed by Lenny Koh and AREC UK to the Energy Institute at the University of Sheffield where he held a Seminar on 'Talking Trash: Resource Recovery Opportunities from Municipal Solid Waste'.

Everything thrown into a rubbish bin is an opportunity. Generally, rubbish is landfilled, but there are many technologies which can be used to recover value from waste. From conventional techniques, like recycling and incineration, to technologies currently undergoing development, such as waste to biocrude/biofuel, these technologies can extract energy or valuable materials from waste. However, the lifecycle costs and impacts of many of these technologies are very uncertain, and analysis tools are needed to better identify opportunities for investment.

At AREC-USA, we are developing a life cycle analysis and cost tool to better quantify many of the uncertainties associated with waste-to-resource technologies. This talk will highlight capabilities of the tool and discuss opportunities in the waste-to-resource field.

Dr Gamini Mendis graduated with his Bachelor's Degree in Materials Engineering from Purdue University in 2012 and received his PhD in May 2017. Gamini was a National Science Foundation Integrative Graduate Education and Research Traineeship (NSF IGERT) fellow, and examined the complex interactions between materials, policy, people and the planet. During his PhD, he worked to understand structure-properties-processing relationships in multicomponent polymer systems and the interactions between materials and the environment. Gamini completed a post-doctoral research appointment in the Environmental and Ecological Engineering department at Purdue University studying critical materials, energy technologies, and smart and sustainable manufacturing. He is currently examining the life cycle impact of Waste-to-Resource technologies at Pennsylvania State University in conjunction with the Advanced Resource Efficiency Center - USA. AREC-USA Researchers from the Energy Institute have recently launched the USA branch of the Advanced Resource Efficiency Centre (AREC-USA) at Pennsylvania State University. This research centre will promote collaboration between industry and universities. It will offer easy to access platforms that will help meet the challenges of sustainability across supply chains.

For further information about the Energy Institute please visit https://www.sheffield.ac.uk/energy

Let's reduce food waste in schools!

Food waste is a big problem for the environment. And public places, like schools or hospitals, create a significant proportion of this waste. With this in mind, a group of Grantham Scholars – Jonas Cromwell, Gloria Mensah, Ye Jiang, and Eunice Oppon – went to Anne Grove Primary School. Their aim? To try help reduce food waste in schools.

This team of four from the Grantham Centre for Sustainable Futures are so concerned about the environmental impact of wasted food they decided to tackle the issue at grass roots level.

Working with local primary school children the team visited the school over a 4 week period. Their intention was to highlight the issue, educate the children and make an impact at a local level by reducing the volume of wasted food whilst simultaneously giving the children the opportunity to use the scientific skills of measuring, recording and evaluating an experiment in a real life scenario.

During the first week the children were taught to separate their waste into categories and measure and record the volumes in each. They were also encouraged to think about why so much food was wasted. In the second week, the children played informative games that revealed how far some foods have travelled before reaching their plate. The team also ran assemblies where the children learnt about where food comes from, why food is wasted and how to reduce the amount of wasted food. In the third week some children conducted surveys and analysed the results while others produced posters illustrating how food waste can be reduced. In the final week another waste food audit was completed showing the reduction in volume due to more conscious decision making by the children with their increased knowledge and understanding of the food life cycle.

The project was a great success with several positive outcomes:

- The key result of reducing food waste was achieved.
- Educationally, the children are now more aware of the issue of wasted food and making considered decisions.
- Practically, the children have benefitted by putting more advanced scientific skills into practise.
- The team have broadened their understanding of learning and teaching in primary schools and the importance of creating engaging activities and improved teaching materials to bring research to life.
- The team have contributed to the University's commitment to widening participation.
- Helping to inspire the next generation and promoting the benefits of higher education.

Congratulations to the whole team on a successful project.

The group has written a blog to explain how they worked with the children and staff on this important environmental is: http://grantham.seffield.ac.uk/reduce-food-waste-in-schools/

November 2019

New funding worth £1.2m from STFC to run the next phase of Food Network

Dr. Sonal Choudhary - *STFC Food Network+ Industry & Impact Lead Lecturer in Sustainable Management* has today revealed that the STFC Food Network+ (SFN) Extension (Phase 2) grant application worth £1.2M (£0.96M at 80%) has been successful.

This is fantastic news and demonstrates a great achievement for Sonal and her team whilst raising the profile of the University of Sheffield's research into food sustainability. The project will run for 4 years starting in February/March 2020 and depending on the network performance the project could qualify for further funding in its second or third year.

Sonal attended the STFC All Networks' Meeting in London yesterday where the news was announced and she is understandably thrilled with the success. This is the first STFC network grant in Sheffield as most of them are being led by Manchester. This is also the first project to be led by Social Sciences.

Sonal states, "*Our vision for the Phase 2 of SFN+ was very much appreciated yesterday by STFC and they have high hopes from this network as they are considering this to be one of their flagship programmes*."

This grant will also contribute towards the University of Sheffield's Flagship Programme on Food and will help to raise the profiles of SUMS, LSCM and the Institute for Sustainable Food.
Sonal is keen to show her appreciation to everyone involved with the application and is looking forward to working with her team on this project for at least the next 4 years.

November 2019

DoE ARPA–E Workshop Newark, New Jersey, USA

Professor Lenny Koh was invited to an 'invite only' ARPA-E workshop in Newark, New Jersey, USA in November.

The focus of the workshop was to develop a new framework to turn waste into resources underpinned by the LCA (Life Cycle Assessment) principle, converting solid waste into energy intensive materials.

This is strategically creating a waste-to-resource framework initiative, forging international partnerships between the UK and the US around energy innovation and collaboration involving Argonne, AREC USA and AREC UK.

It was attended by 80 participants representing a range of key players in related industries and policy making organisations in order to transform US strategies and policies in dealing with waste – especially in creating a waste-to-resource framework.

November 2019

Incoming Delegation from Penn State University (PSU) and AREC USA led by Chancellor Ford from Behrend Campus, PSU

Professor Ralph Ford (Chancellor), Professor Alicyn Rhoades, Amy Bridger and Professor Timothy Kurzweg all from Behrend Campus, Penn State University together with Mick Shaw (Vice President of Plastek Europe), Kathi Gillespie (Plastek USA), Juraj Ulik (Plastek UK), and Brenda Jackson (Plastek USA) were warmly welcomed by Professor Lenny Koh on behalf of The University of Sheffield.

The visit was an opportunity to forge further and deeper collaboration between the UK and USA in the areas of research and materials innovation.

There were a series of meetings and tours of our key facilities including AMRC, Factory 2050 and the Diamond, The University of Sheffield's prestigious research and learning facility.

November 2019

Advancing the scale-up of China research collaborations and partnerships

Over the last years, solid collaborations and partnerships have led to significant impact on policy and industry in China. Advanced through the scale-up of AREC China (Beijing and Shenzhen) coupled with wider global reach.

Stemmed from the strong foundation between AREC Global and UK and AREC China, Professor Lenny Koh recently visited Beijing and Nanjing, China to meet with AREC China (led by Ken Pan) and partners to foster scaling up of China research collaborations and partnerships. The objective was to further maximise the collaborative partnerships built from the already established significant impact to benefit global society and industry.

The meetings involved several organisations such as leading universities, industry and government think tanks including Tsinghua University, Nanjing University, CIIC International Human Resources Services Ltd, MCC, Great Environmental Group, Beijing Warmland Energy Services Co Ltd, Lotus Lake Capital, Beijing Capital Robotics Industry Innovation Centre, GHDDI (funded by Bill Gates), GHIC, Beijing Tsinghua Industrial Research & Development Institute and etc.

Global healthcare, energy revolution, Belt and Road automotive supply chains, SCEnAT suites and life cycle assessment, water and environmental technology, waste-to-resources, new materials, circular economy and recycling were amongst some of the areas of collaborative projects. A total of 22 projects have been created from these visits through multiple meetings and workshops with stakeholders, leading industry, universities, policy makers and think tanks in China.

Some of the outcomes from these include:

Tsinghua University (Beijing), DRTT, CCIEE and Transinfo
Building from the Memorandum of Understanding (MoU) between The University of Sheffield and Tsinghua University, China; the collaboration between UK, Europe, China and USA on automotive supply chain; and collaboration between Professor Lenny Koh with Tsinghua University on Blockchain and life cycle, proposals have been submitted to MOST and EU (Brussels). This involves partners from the UK, Europe, USA and China, with stakeholders from leading industries, policy makers, think tanks and universities.

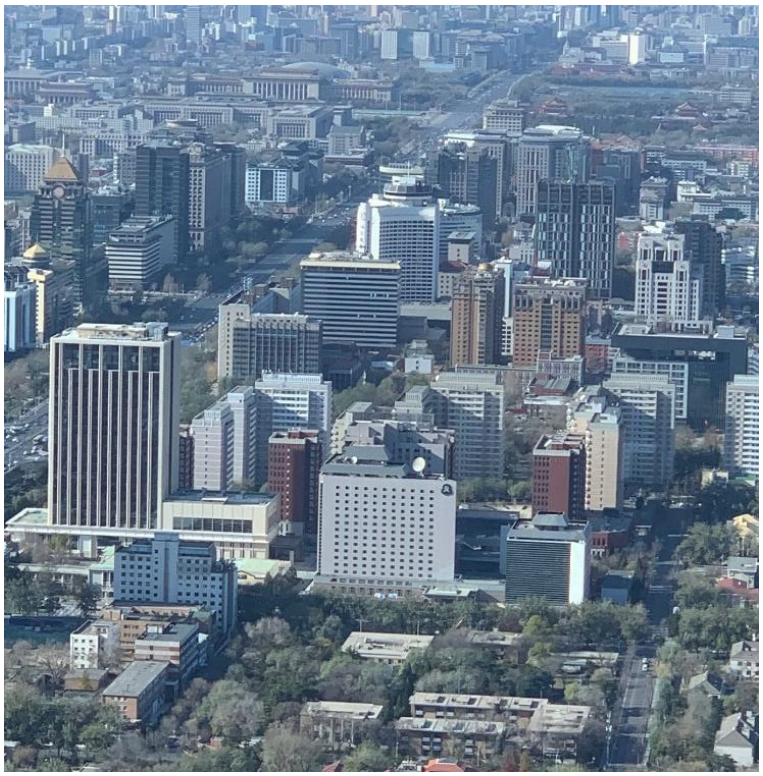
Tsinghua University is ranked #1 in China and Asia. DRTT and CCIEE are prestigious government think tanks and policies makers in China. Transinfo is China leading provider of big data on transport and logistics (freights and passengers) across multi-modality including road, air, rail and sea.

In addition, existing collaboration and partnership between AREC and Tsinghua includes environmental management, waste recycling and circular economy policies.

Beijing Tsinghua Industrial Research & Development Institute, Tsinghua Beijing Science Park
Aiming to advance the discussions between Beijing Tsinghua Industrial Research & Development Institute and Neuroscience Institute and Energy Institute at The University of Sheffield looking at transforming global healthcare and energy sustainability. Tour of key facilities have provided insights into the range of drug discovery, funding mechanism and partners involved, including the GHDDI funded by Bill Gates.

CIIC – International Human Resources Services Ltd
CIIC is a SASAC Directly Affiliated Central Enterprise. It is ranked #1 in Human Resources Providers in China and top 10 in Global Human Resources Providers. There are a total of 89 branches of CIIC in 76 Countries. CIIC is a Top 100 Services Enterprises.

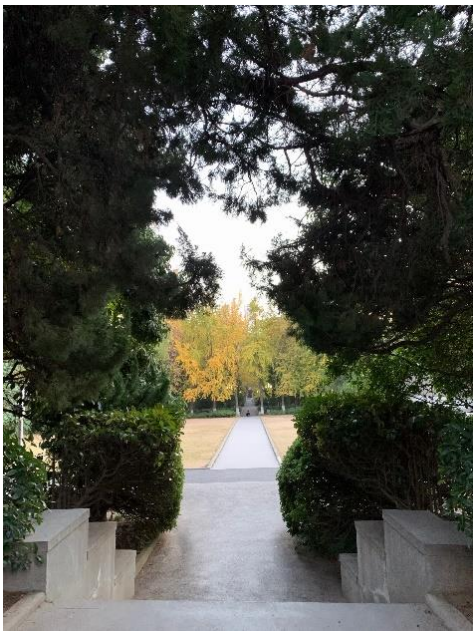
Focussing on energy (including advancing SCEnAT suites) and talent development, a MoU will be signed between AREC and CIIC to strengthen our partnership and collaboration in these domain. This initiative includes the establishment of energy centres in China and Sheffield (covering research, innovation and training); as well as career and employment route map and green lane for future talent.



China Second Metallurgical Group
China Second Metallurgical Group Co., Ltd., referred to as 2MCC, founded in 1956, is a national super construction enterprise and is a wholly-owned subsidiary of China Metallurgical Science and Industry Corporation(MCC), which is the world's largest and strongest metallurgical construction contractor and operation service provider, one of the state-recognized major resource enterprises, China's largest steel structure producer, one of the first 16 central SOEs with real estate development as its major business approved by the State-owned Assets Supervision and Administration Commission (SASAC) of the State Council, and the main force for China's infrastructure construction.

Five specific projects with 2MCC to stimulate potential collaboration between AREC and 2MCC which cover areas such as circular economy, sustainable innovation, greener materials, and etc. have been established.

Beijing Warmland Energy Services Co Ltd
Using SCEnAT suites in computing environmental innovation impact in particular their application and implementation in the China Beijing Olympic Stadium in preparation for the 2022 Olympic Games. This collaboration, SCEnAT suites and results will be showcased at the Olympic Initiative Zone.



Great Environmental Group
Largest in Henan province. Adopting water technology and circular technology innovation, and new methods for improving resource efficiency and recycling for China's industry environmental and business benefits. Focussing on translational dimensions of these innovation.

Nanjing University
Building from the strong partnership between The University of Sheffield and Nanjing University, an advanced collaboration will focus on recycling and waste-to-resources (industrial and municipal waste streams), and Energy Institute with support from municipal/province level. This collaboration is between AREC, Energy Institute and the Nanjing University Government Policy Department.

December 2019

Automotive logistics leaders unite to prepare for future challenges

Automotive LOGISTICS UK

04 December 2019
Jaguar Experience Castle Bromwich

JAGUAR

Automotive logistic leaders from across the industry attended the Jaguar Experience centre in Castle Bromwich on 4th December for the Automotive Logistics UK conference.

This industry-led conference was an important event for the future of the Automotive industry and was attended by a host of senior decision makers, influencers, innovators and practitioners along with vehicle manufacturers, tier suppliers, LSPs and technology providers from across the automotive logistics sector in the UK and Europe. The event was an incredible opportunity to knowledge share, build relationships and gain a valuable understanding to support future success in the new automotive era.

Experts from across the industry ran Think Tanks throughout the day with practical, interactive group discussions on topics such as:

Dealing with Disruption, Making the most of Data, Finished Vehicles: Raising standards, Many Happy Returns: Container and Packaging Management, Finished Vehicles: Testing Times, The EV Supply Chain, Next Generation Warehouse and The road ahead for UK automotive.

Professor Lenny Koh led the Think Tank for "#LogisticsForFuture: Cutting pollution in the supply chain" and presented the research and development that AREC UK have been involved in sustainability of automotive supply chain and logistics including SCEnAT Suites, transport and recycling, circular economy and Blockchain along with an insight into China's Automobile Industrial Park.

Following on from the think tank sessions was an exclusive tour of the Jaguar plant, an exciting opportunity to see first-hand the entire manufacturing process for the high performance F-Type, as well as gain an insight into how the plant is preparing to building the new, all-electric XJ starting next year.

EXAMPLES OF RECENT PUBLICATIONS

Life cycle assessment of functional materials and devices: Opportunities, challenges, and current and future trends
Lucy Smith, Taofeeq Ibn-Mohammed, Lenny Koh, Ian M. Reaney (2019)
Journal of the American Ceramic Society, Volume 102, Issue 12, December 2019, Pages 7037-7064

Analysing acculturation to sustainable food consumption behaviour in social media through the lens of information diffusion.
Sonal Choudhary, Rakesh Nayak, Sushma Kumaric, Homagni Choudhury (2019)
Technological Forecasting and Social Change, Volume 145, August 2019, Pages 481-492

Sustainable resource allocation for power generation: The role of big data in enabling inter industry architectural innovation
Konstantinos J.Chalvatzis, Hanif Malekpoor, Nishikant Mishra, Fiona Lettice, Sonal Choudhary (2019)
Technological Forecasting and Social Change, Volume 144, July 2019, Pages 381-393

The Role of Customer Awareness in Promoting Firm Sustainability and Sustainable Supply Chain Management.
Mengfeng Gong, Yuan Gao, Lenny Koh, Charles Sutcliffe, John Cullen (2019)
International Journal of Production Economics, Volume 217, November 2019, Pages 88-96

Comparative environmental profile assessments of commercial and novel material structures for solid oxide fuel cells.
Lucy Smith, Taofeeq Ibn-Mohammed, Fan Yang, Ian M.Reaney, Derek C.Sinclair, Lenny Koh (2019)
Applied Energy, Volume 235, 1 February 2019, Pages 1300-1313

Examining the relationship between energy poverty and measures of deprivation.
Robert Marchand, Andrea Genovese, Lenny Koh, Alan Brennan (2019)
Energy Policy, Volume 130, July 2019, Pages 206-217

A simple approach to modelling rural and urban district heating.
Ian Brocklebank, Stephen B.M. Beck, Peter Styring (2018)
Frontiers in Energy Research, *Original Research ARTICLE, Front. Energy Res., 15 October 2018*

AREC TEAM MEMBERS AND MANAGEMENT STRUCTURE

AREC has a well-established management structure that facilitates its continuing growth and success. The centre is led by Professor Lenny Koh from School of Management. In addition, the centre's work is structured around four core research themes which are directed by experts from different departments from the University of Sheffield. This includes:

Academics	
Name	**Position**
Professor Lenny Koh	Director of AREC UK and AREC Global
Professor Panos Ketikidis	Head of AREC Europe
Ken Pan	Head of AREC China
Professor Ian Reaney	Head of AREC USA
Professor Alicyn Rhoades	Head of AREC USA
Dr Erica Ballantyne	Lecturer in Operations and Supply Chain Management
Dr Andrew Brint	Lecturer in Operations Management
Richard Bruce	Business Engagement Lead for the Grantham Centre for Sustainable Futures and Lecturer in Supply Chain Accounting & Finance
Dr Chantal C Cantarelli	Lecturer in Operations Management
Dr Sonal Choudhary	Lecturer in Sustainable Management
Professor Federica Cucchiella	University of L'Aquila
Dr Andrea Genovese	Senior Lecturer in Logistics and Supply Chain Management
Professor Jonathan Linton	Operations Management and Decision Sciences
Dr Stuart Maguire	Lecturer in Information Systems Management
Dr Robert Marchand	Lecturer in Operations Management
Professor David Oglethorpe	Dean, Sheffield University Management School
Professor Ian Reaney	Professor in Ceramics
Dr Antonino Sgalambro	Lecturer in Operations Research
Professor Ian Shellard	Rolls-Royce appointed Honorary Visiting Professor
Professor Andrew Simpson	Associate Dean External Business Advancement, Sheffield University Management School
Dr Mike Simpson	Senior Lecturer in Business Management
Professor Elaine Toms	Chair in Information Innovation and Management
Advanced Materials & Manufacturing Leads	
Professor Mark Rainforth	Professor of Materials Science and Engineering, Director of Mercury Centre and Royce Institute Lead
Professor Neil Hopkins/Dr Christophe Pinna	Professor of Mechanical Engineering/Senior Lecturer in Mechanical Engineering
Professor Derek Sinclair	Professor in Materials Science and Engineering
Dr Sam Turner/Dr Stuart Dawson	Chief Technology Officer of AMRC
Energy & Nuclear Leads	
Professor Peter Styring	Director of UK CDU, Dept of Chemistry
Professor Neil Hyatt	Professor of Nuclear Materials
Professor Mike Tynan/Dr Andrew Storer	Chief Executive of Nuclear AMRC

Water Lead	
Professor Simon Tait	Professor of Water Engineering
Agritech & Food Leads	
Professor Jurriaan Ton	Professor & ERC research fellow - Department of Animal & Plant Sciences
Professor Peter Jackson	Chair of the Food Standards Agency's (FSA) Social Science Research Committee, Geography
Professor Duncan Cameron	Professor of Plant and Soil Biology, Royal Society University Research Fellow
Post-Doctoral Research Associates (PDRAs), Research and KE Fellows and PhD researchers	
Faisal H Abubakar	EPSRC e-futures DTC Doctoral Researcher (AREC researcher – energy, LCA and circular economy – supervised by Prof Lenny Koh and Dr Andrea Genovese)
Deepak Arunachalam	AREC Doctoral Researcher (AREC researcher – big data – supervised by Prof Elaine Toms)
Dolores Astudillo	EPSRC Energy Storage Doctoral Researcher (AREC researcher – energy storage and LCA – supervised by Prof Peter Hall and Prof Lenny Koh)
Andreas Bofinger	SEERC Doctoral Researcher (AREC researcher – green manufacturing – supervised by Prof John Cullen, Prof Lenny Koh and Prof Panos Ketikidis)
Dr Francesco Ciardiello	Research Associate (AREC PDRA – operational research – supervised by Prof Andrew Simpson)
Dr Seyed Ebrahimi	EPSRC JLR Simulife Research Associate (AREC PDRA – LCA and resource efficiency – supervised by Prof Lenny Koh, Dr Christophe Pinna, Prof David Wagg, Prof Constantinos Soutis and JLR)
Mengfeng Gong	Supply Chain Doctoral Researcher (AREC researcher – sustainable supply chain – supervised by Prof Lenny Koh and Prof Andrew Simpson)
Dr Liam Goucher	N8 KE Fellow (AREC research and KE fellow – agrifood LCA – supervised by Prof Lenny Koh, Prof Peter Horton and Prof Duncan Cameron)
Besart Hajrizi	SEERC Doctoral Researcher (AREC researcher – innovation model – supervised by Prof Panos Ketikidis and Prof Lenny Koh)
Dr Taofeeq Ibn-Mohammed	Research Associate - ESPRC - Management School (AREC PDRA – materials LCA – supervised by Prof Lenny Koh, Prof Ian Reaney and Prof Derek Sinclair)
Benjamin Lowe	Doctoral Researcher (AREC researcher – water sustainability – supervised by Prof David Oglethorpe and Dr Sonal Choudhary)
Stella Manoli	Mechanical Engineering Doctoral Researcher (AREC researcher – composite materials LCA – supervised by Prof Patrick Fairclough, Dr Chis Holland and Prof Lenny Koh)
Mauro Cruz Mercado	Food Doctoral Researcher (AREC researcher – food sustainability – supervised by Prof Peter Jackson)
Dr Jamal Miah	EPSRC R2REE Research Associate (AREC PDRA – road-to-rail energy storage LCA – supervised by Prof Lenny Koh and Prof David Stone)
Kamal Miah	EPSRC Materials DTC Doctoral Researcher (AREC researcher – manufacturing and sintering materials LCA – supervised by Dr Richard Thackeray and Prof Lenny Koh)
Ashish Momaya	Doctoral Researcher (AREC researcher – Blockchain technology – supervised by Prof Lenny Koh and Prof Jonathan Linton)
Dr Raymond Obayi	AREC Researcher (AREC PDRA – resource efficiency and knowledge management – supervised by Prof Lenny Koh and Prof David Oglethorpe)

Eunice Oppon	Leverhulme Trust LC3M and Grantham Centre for Sustainable Futures Scholar (AREC researcher – climate change LCA – supervised by Professor Lenny Koh and Prof David Beerling)
Dr Olga Siemers	Research Fellow, EU H2020 GOF4R (AREC research fellow – transport infrastructure policy – supervised by Prof Lenny Koh, Prof Elaine Toms and Dr Jonathan Paragreen)
Dr Victor Shi	AMRC Postdoctoral Researcher (AREC PDRA – servitisation – supervised by Prof Keith Ridgway)
Dr Lucy Smith	R2REE PDRA (AREC researcher – materials LCA and indicators – supervised by Prof Lenny Koh and Prof Ian Reaney)
Karthik Suresh	Research Assistant - Management School (AREC researcher – risk modelling – supervised by Prof Lenny Koh)
Hui Sun (Avril)	ESRC WR CDT Doctoral Researcher (AREC researcher – food supply chain sustainability – supervised by Prof Lenny Koh and Dr Sonal Choudhary)
Andrew Timmis	Post Doctoral Research Assistant (AREC researcher – materials composite LCA – supervised by Prof Lenny Koh and Prof Alma Hodzic)
Dr Abiye Tob-Ogu	Postdoctoral Research Associate (AREC PDRA – sustainable transportation – supervised by Dr Andrea Genovese and Dr Erica Ballantyne)
Dr Adrian Solomon	AREC PDRA – paper cup recycling – supervised by Prof Lenny Koh and Prof Peter Styring)
Richard Bruce	AREC researcher – open book accounting in food supply chain – supervised by Prof John Cullen and Prof Lenny Koh
Dr Rafael Mauricio Eufrassio Espinosa	AREC PDRA – Leverhulme Climate Change mitigation LCA – supervised by Prof Lenny Koh and Prof David Beerling
Business Development and Partnership	
Dr Mel Knight	Challenge Driven Support Manager – Research Services
Peter Caven	Challenge Driven Support Officer – Research Services
Jennifer Phaff	Challenge Driven Support Officer – Research Services
Dr Neil Lowrie	Business Development Manager
Dr Richard France	Senior Business Development Manager
Charles Wilby	Business Development Manager
Chris Baker	Partnership Manager
Lee Allman	Research Manager (AMRC/Engineering)
Dr Adrian Solomon	AREC Project Manager
Angela Booth	AREC Support Officer

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