Supported by the UrbanWINS project, funded by the
European Research and Innovation Program Horizon 2020

Scientific Meeting on
Circular Economy and Waste Management

26 JUNE 2018

Auditorium of the Dep. of Mechanical Engineering, University of Coimbra (UC)
Polo II Campus, Coimbra, Portugal

Chair: Fausto Freire (UC), **Co-chair**: Lia Vasconcelos (FCT NOVA)

Programme

08h30 Registration

09h00 Opening session
Fausto Freire (UC, Portugal) and Lia Vasconcelos (FCT NOVA, Portugal)
Carlos Henggeler Antunes (Energy for Sustainability Iniciative, UC, Portugal)
Martins Ferreira (Director Department of Mechanical Engineering, UC, Portugal)
Luís Menezes (Vice-Rector of UC, Portugal)

Research in waste management and circular economy
Paulo Ferrão (President of the Foundation for Science and Technology, Portugal)

09h45 Panel I

Industrial Ecology: Understanding the Circular Economy
Roland Clift (University of Surrey, UK)

Challenges and opportunities for action at urban level: lessons of the UrbanWINS project
Livia Mazzá (Ecosistemi, Italy)

The metabolism of Cities: a research proposition
Leonardo Rosado, Divia Encarnacion (Chalmers University, Sweden)

12h00 Lunch (served in the venue)

14h00 **Panel II**

Food waste within the bio-economy and the circular economy EU policies
Serenella Sala and Carla Caldeira (JRC-EC)

Waste management opportunities in an agro-industrial cooperative in Brazil
Cassiano Piekarski (UTFPR, Brazil)

LIFE PAYT: Tool to reduce waste in South Europe
Célia Dias-Ferreira (CERNAS, Portugal)

EU Project SCREEN - Synergic Circular Economy across European Regions
Margarida Franca (CCDRC, Portugal)

Collaborative methodology in complex management
Lia Vasconcelos (FCT NOVA)

15h40 **Coffee break**

16h00 **Flash talks**

A Circular Economy Envisioned for Historic Köszeg, Hungary and its Immediate Bioregion
Hillary Brown (City College of New York, USA)

Application of LCSA to Used Lubricant Oils Management in South Brazilian region
Malaquias Tsambe (Pedagogic University of Mozambique, Mozambique)

Management of Biomass Ash Waste from Energy Production in Building Materials
Tamíris Costa (University of Aveiro, Portugal)

A sustainable system for the valorization of fish canning wastewater through biopolymers production: the FISHPOL project
Almudena Hospido (Universidad de Santiago de Compostela, Spain)

Agriculture and its contribution to circular economy in the irrigation perimeter of the river Caía, Alentejo
Luís Alcino Conceição (Instituto Politécnico de Portalegre, Portugal)

Repair Café Porto: a situational analysis
Ana Coelho (Repair Café)

17h15 **Closing**
Lia Vasconcelos (FCT NOVA) and Fausto Freire (UC)

About the talks

Waste management and circular economy

Paulo Ferrão

Paulo Ferrão is the President of the Board of Directors of the *Fundação para a Ciência e a Tecnologia* (Foundation for Science and Technology, FCT). He had been the director of the MIT-Portugal programme since 2006, a strategic partnership set up between the Massachusetts Institute of Technology (MIT) and several Portuguese universities and research centres, supported and funded by FCT.

With a widely acknowledged international career, Paulo Ferrão is a member of the U.S. National Academies Roundtable on Science and Technology for Sustainability, of The National Academies of Sciences, Engineering, and Medicine, where he also sits on the Committees on Pathways to Urban Sustainability and on Sustainability Linkages in the Federal Government. His scientific interests are focused in the areas of energy and industrial ecology, in which he has carried out research into waste and urban systems management. In this context, Paulo Ferrão coordinated the working groups that established Portuguese plans for waste management: PNGR-*Plano Nacional de Gestão de Resíduos* and PERSU 2020-*Plano estratégico para os resíduos urbanos*.

Industrial Ecology: Understanding the Circular Economy

The idea of the "Circular Economy" is widely discussed as an approach to reducing resource consumption and environmental impacts while maintaining quality of life; for example, the European Union is currently developing an action plan on the circular economy. The circular economy is a version of the idea of a "Closed-loop Economy" which is at the heart of Industrial Ecology (IE). IE is an approach to examining the stocks and flows in the economy and how they affect human well-being and environmental health. While engineering (and chemical engineering in particular) is concerned with managing material and energy flows and transformations in pipes and plants, IE is concerned with the whole economy – at one level, IE amounts to "engineering outside the pipe". This seminar will introduce some current thinking based on applying simple engineering analysis to flows of materials into the economy and the stocks of goods and infrastructure within the economy. Focussing on flows, as in some approaches to the Circular Economy, can be misleading: use of the stock emerges as the key to providing a good quality of life in a resource-efficient economy. Ways of defining quality of stock are explored. The approach shows how engineering analysis can be combined with economics and the social sciences to make the elusive dream of a sustainable society more tangible.

Roland Clift

Emeritus Professor of Environmental Technology and former head of the Department of Chemical and Process Engineering and founding Director of the Centre for Environmental Strategy (CES - now Centre for Environment and Sustainability) at the University of Surrey; Visiting Professor at Chalmers University and the Universities of British Columbia and Coimbra; formerly Executive Director and President of the International Society for Industrial Ecology; past member of the Royal Commission on Environmental Pollution, the UK Ecolabelling Board, the Science Advisory Council of the Department of the Environment, Food and Rural Affairs and of the "Groupe des Sages" set up by the European Commission to advise on the application of LCA to ecolabelling. His research interests are in environmental system analysis, including Industrial Ecology, Life Cycle Assessment and Material Flow Accounting.

Challenges and opportunities for action at urban level: the lessons of the UrbanWINS project

The UrbanWINS project aims at contributing to the implementation of EU strategies for resource efficiency and circular economy by supporting decision makers and urban communities in the development of strategies for waste prevention and management. A network of scientists, researchers, public officials and decision-makers picked up the challenge to innovate the policy framework for urban waste strategies and to investigate with local stakeholders opportunities to design and implement pilot actions that can bring environmental benefits alongside economic and social ones.

Livia Mazzà

Livia Mazzà, MSc in Environmental Sustainability, has worked for more than 15 years as a consultant for public and private organization in the field of sustainable development with particular focus on green procurement and green supply chains, environmental accounting and sustainable local development. Currently employed by Fondazione Ecosistemi (Rome, Italy), she coordinates the implementation of EU and national projects, among which UrbanWINS.

The metabolism of cities: a research proposition

Cities are very complex systems that until recently have been very difficult to understand from a holistic perspective, in particular regarding resource use. Research has been mostly conducted either on specific sectors, or specific resources. A research field that deals with these questions is called Urban Metabolism, and the few studies made provide coarse and aggregated description of resource use in cities, indicating the need for further advancements in scientific knowledge. In this presentation, it will be showcased a research proposition for Urban Metabolism and how it contributes to unlocking knowledge to study cities in detail, and how this is useful for society. Emphasis will be put on the need to develop better analytical tools and models, that are, to the extent possible, universal in their nature.

Leonardo Rosado

Leonardo Rosado is an Assistant Professor at the Architecture and Civil Engineering department at Chalmers focusing on the Urban Metabolism field, in particular using a holistic approach to develop methods to study all resource flows of cities. Leonardo Rosado has developed a groundbreaking method to account for materials in urban areas – the Urban Metabolism Analyst. The main goal is to study cities to provide valuable information to stakeholders on different levels: circular economy, waste management, urban planning, industry and households.

Food waste within the bio-economy and the circular economy EU policies

European policies are advocating a transition toward bio-economy, an economy aiming at reducing the dependence from fossil-based resources, limiting greenhouse gas emissions, safeguarding food security and ensuring a sustainable economic growth. Besides, circular economy policies are aiming at closing loop of resources as much as possible. The application of circular economy principles to bioeconomy, namely the cascading use of bio-based waste, could represent a valuable contribution to bioeconomy performance optimisation. In this context, food waste has been gaining prominence as a potential feedstock for the production of an array of products such as food, chemical/materials and bioenergy/biofuel production in integrated bio-refineries and valorising all side streams. This presentation will focus on how the issue of food waste has been evolving and how strategies to address the problem are being developed at the European level.

Serenella Sala and Carla Caldeira

Serenella Sala and Carla Caldeira are researchers at the European Commission, Joint Research Center (JRC), Bio-economy unit. Serenella Sala, holding a PhD in Ecotoxicology, is an LCA expert, working since 2010 at the JRC developing integrated assessment methodologies to be applied to a wide array of topics, including on the evaluation of food waste generation and valorisation. Carla Caldeira holds a PhD in Sustainable Energy Systems (MIT-Portugal Program, University of Coimbra) and in the past years has developed research in LCA and the use of LCA within multi-objective problems.

Waste management in an agro-industrial cooperative in Brazil towards the circular economy

The objective is to present waste management in a large agro-industrial cooperative as a way for the circular economy in the southern region of Brazil. The different types of business and activities in the cooperative offer opportunities for sustainability for waste management. In this sense, waste management practices will be presented to promote circular economy and competitiveness, such as: biogas and biomethane generation from waste, georeferencing to identify clusters for bioenergy production, and mapping opportunities to circularity in the cooperative.

Cassiano Piekarski

Cassiano Moro Piekarski is PhD in Production Engineering in LCA theme. He is Professor at Federal University of Technology - Paraná, Brazil (UTFPR) since 2013. Over the past years, he has been working on Life Cycle Assessment (LCA), Industrial Sustainability, Sustainable Production Systems and Circular Economy.

LIFE PAYT: Tool to reduce waste in South Europe

Current municipal waste management practices in Portugal, Greece and Cyprus have failed to achieve high recycling rates and have difficulties in assuming EU waste environmental targets for 2020. Source segregation is low, with only 11% of waste being separately collected in Portugal, while 51% of municipal waste is still sent to landfill.
Citizens, commerce, services actively engaged in source segregation and recycling do not feel rewarded, because waste tariffs are calculated using the water consumed, leading to decreased commitment. The project LIFE PAYT, co-funded by the European Union is testing the implementation of PAYT (Pay-As-You-Throw) waste tariffs in Portugal, Greece and Cyprus. This communication aims to present what has been done so far within the project and to discuss how PAYT tariffs can contribute to increased recycling of packaging materials and to the circular economy.

Célia Dias Ferreira

Célia Dias Ferreira is the Head of the Research Group “Environment and Society” (CERNAS) of the Polytechnic Institute of Coimbra, Portugal, and a Researcher at the Dept. of Materials Engineering and Ceramics/CICECO (University of Aveiro). C Dias-Ferreira graduated in Environmental Engineering in 1996 and completed her PhD in 2005 on the treatment of hazardous waste. Dr C Dias-Ferreira has over 60 international peer-reviewed publications (h-index=13) and her current research interests include waste management and recycling. In 2016 she was honoured as one of the “100 Portuguese Woman in Science” whose work was most relevant to the progress of the Portuguese Science and Technology in the last decades.

EU Project SCREEN – Synergic Circular Economy across European Regions

SCREEN aims at defining a replicable systemic approach to a transition to the Circular Economy in the EU regions in the context of the Intelligent Specialization Strategy (RIS3) by identifying and implementing operational synergies between the H2020 - R & I (INVESTIGATION & INNOVATION) investments and the European Structural and Investment Funds, contributing to new future eco-innovative and horizontal business models in different value chains. It is a project funded by H2020 and includes a consortium of 18 partners from 17 regions (12 European countries). The project ends in October 2018 and is now at a crucial time with the establishment of the first results of this project. The definition of the financing mechanisms for projects in the circular economy, the definition of criteria for evaluating projects of this nature, the transregional synergies and the strategic sectors, and the identification of the barriers and constraints that must be overcome are underway.

Margarida Franca

Margarida Franca holds a PhD in Geography and has worked, since 2001, in the *Comissão de Coordenação e Desenvolvimento Regional do Centro*, CCDRC. Margarida Franca is working in the following projects, funded by the European H2020 programme: SCREEN- Synergic Circular Economy Across European Regions and InRoad In Road - Towards better Synchronisation of Priority Settings and Evaluation Mechanisms for Research Infrastructures Beyond National Relevance.

Collaborative methodology in complex management

Complex contexts of great uncertainty, as it is common in environmental management, require more and more an effective dialogue among the different expertise, and among these and the citizen lay knowledge, in the construction of collaborative joint solutions. A diversity of formats shaping these processes have been experimented more recently; however, a lot is still to explore. In general, what is called passive participation, with a more informative or consulting features (e.g., consultation or public auditions), is considerably consolidate. The same cannot be stated for what is called active participation – collaborative formats - with the effective involvement of the parts contributing and intervening directly in the decision making process.
The effective involvement and the active public participation of the citizens has become a growing requirement, namely in environmental management, having already conquered a substantial number of experts. This communication reflects on inclusive collaborative methodologies developed, the results attained and the lessons learned. This is of the utmost importance to sustain and strengthen decisions leading to sustainable contexts.

Lia Vasconcelos

Lia Vasconcelos, Professor at the FCT - New University of Lisbon and researcher of MARE (www.mare-centre.pt/pt) focus her research in innovative decision making and new forms of collaborative governance in public policy.
Founding member of wTeamUp - Participation and Empowerment (www.wteamup.com) an action-research group in collaborative processes. She has published various papers and is editor of several books, namely Sustainability in the 21st century – The Power of Dialogue (2015).
Coordinator of the MARGov Project and of the collaborative component of MARLISCO FP7 social awareness/co-responsibility towards marine litter recognized with the RRI (Research Responsible Innovation), she is responsible for the collaborative methodologies of the UrbanWINS (H2020) and OceanWise (Interreg Atlantic) projects.

Open session: flash-talks

A Circular Economy Envisioned for Historic Köszeg, Hungary and its Immediate Bioregion

Hillary Brown (City College of New York, USA)

How might we use systems thinking and ecologically-reflexive planning to examine how an historic town and bioregion—its cultural heritage coupled with existing and new industrial, commercial, and infrastructural services (energy, water, sanitation, waste)—can optimize its economy and environment, following the principles of a "circular economy? This alternative economic paradigm is envisioned as an ideal aspiration for the stagnant, post-Soviet bloc economy of Hungary's northwestern Pannonian region, with an agglomeration economy defined by clusters of small to medium-sized cities set in a region dominated by large-scale, industrialized agriculture. Vas county, in which Kőszeg sits, has lost population, associated with the degradation of the previous socialist economy and recent labor out-migration to Austria. This presentation will illustrate concepts for practical solutions to town and regional revitalization and resiliency.

Application of LCSA to Used Lubricant Oils Management in South Brazilian region

Malaquias Tsambe (Pedagogic University of Mozambique, Mozambique)

Malaquias Zildo António Tsambe [a], Cássio Florisbal de Almeida [b], Cássia Maria Lie Ugaya [c], Luiz Fernando de Abreu Cybis[b]

[a] UPM – Pedagogic University of Mozambique, Faculty of Natural Science and Mathematics, Chemistry Department, Av. do Trabalho, 2482, Maputo, Mozambique
[a] UFRGS - Federal University of Technology of Rio Grande do Sul, Post-Graduation Program in Hydric Resources and Environmental Sanitary, Av. Bento Gonçalves, 9500, Porto Alegre, Brazil
[b] UTFPR - Federal University of Technology - Paraná, Post-Graduation Program in Mechanical Engineering and Materials, Av. Sete de Setembro, Rebouças - Curitiba, 6681, Paraná, Brazil

Used Lubricant Oils (ULO) is a hazardous waste, result from lubricant oil uses in motorized equipment. This study aims to compare the sustainability of two ULO management system in Brazil: designated in the study by TTR scenario (which includes transportation phase, the transshipment and re-refining phase) other by TsTR scenario (without transshipment phase), to evaluate which scenario is social, economic and environmental more efficient. The study uses the Life Cycle Sustainability Assessment (LCSA) methodology. The sustainability index was obtained by data results aggregation of 8 environmental indicators, 5 economic indicators and 5 social indicators from the worker's stakeholders. The results show that the TsTR scenario presents best values for sustainability assessment than the TTR scenario. The TsTR scenario has the best social and economic performance than the TTR scenario, which has the best environmental performance. We found that the application of LCSA methodology in ULO management are very few, there is a need for further research in order to improve and evaluate the subjective analyze that characterize this methodology.

Management of Biomass Ash Waste from Energy Production in Building Materials

Tamíris Costa (University of Aveiro, Portugal)

Tamíris Pacheco da Costa, Paula Quinteiro, Luís Tarelho, Luís Arroja, Ana Cláudia Dias
Centre for Environmental and Marine Studies (CESAM), University of Aveiro

Since the emissions from biomass burning are considered carbon dioxide neutral, several new power plants were installed in the last years, making waste management an essential issue. Currently in Portugal, an annual production of 90,000 tons of ash is estimated, typically disposed in landfills (around 90%). A possibility for the ash valorization includes its incorporation in building materials, which is the object of this study. This study evaluated the environmental impacts of different ash management alternatives in cement mortar, concrete blocks and bitumen asphalt, through an attributional life cycle assessment. The results show that concrete production with ash presented the best performance in all impact categories under study, but the difference for the cement mortar is lower than 2%, indicating that this can also be an appropriate alternative. However, the avoided burdens in the asphalt production with ash were not enough to compensate for the impact caused by ash processing.

A sustainable system for the valorization of fish canning wastewater through biolymers production: the Fishpol project

Almudena Hospido (Universidad de Santiago de Compostela, Spain)

Viola Benedetti, Andrea Fra-Vázquez, Angeles Val del Río, Anuska Mosquera-Corral and Almudena Hospido
Group of Environmental Biotechnology. School of Engineering. Universidade de Santiago de Compostela

One of the challenges of the current European environmental policies related to waste management is to valorize them to produce value-added products. Aligning with this strategy, the project FISHPOL aims at the development of a sustainable system for treatment and valorization of fish canning wastewater through biopolymers production, upgrading the wastewater treatment plants (WWTPs) from waste treatment facilities to biorefineries, according to the principles of Circular Economy. Biopolymers are attracting growing interests as a sustainable alternative to conventional plastics, which production and disposal generate relevant environmental concerns. The environmental performance of the novel technology is evaluated through Life Cycle Assessment (LCA) in comparison with conventional WWT strategies applied to fish canning wastewater.

Acknowledgements: The authors belong to the Galician Competitive Research Group GRC2013-032 and the CRETUS strategic partnership (AGRUP2015/02), co-funded by FEDER (EU). Besides, the research presented here is supported by the projects FISHPOL (CTQ2014-55021-R) and TREASURE (CTQ2017-83225-C2-1-R).

Agriculture and its contribution to circular economy in the irrigation perimeter of the river Caía, Alentejo

Luís Alcino Conceição (Instituto Politécnico de Portalegre, Portugal)

Luís Alcino Conceição[1,2] , Francisco Mondragão-Rodrigues[1,2], Graça Pacheco de Carvalho[1], Rui Pulido Valente[1]
[1]Instituto Politécnico de Portalegre, Portugal
[2]ICAAM, Universidade de Évora, Portugal

According to the DGADR's statistics for 2014 due to the construction of the Alqueva Hydroelectric Power Plant, the largest river basin in Portuguese irrigation is Guadiana, with 30.6% of irrigated area. The irrigation perimeter of the river Caia represents the second largest area with 9093.1 ha or 6.86%. The main agricultural activities are olive groves, corn and other cereals, as well as the presence of intensive dairy farms, some of them with agro industrial units of milk processing into cheese and yoghurt. Although the intensive farm activity in Caia, there are many practices being implemented towards circular economy concept such us the adoption of conservation agriculture techniques associated with precision agriculture to reduce inputs, the reuse of animal and agro industrial wastes in crop fertilizers and inert compounds for animal stall beds and, the production of energy from biomass and renewable sources. Its impact and count analysis are being study under a pilot experiment of the project MechSmart Forages.

Repair Café Porto: a situational analysis

Ana Coelho

Repair Café Porto (RCP) through the lens of a SWOT method. Based on the event-RCP held for three hours on a Saturday every 2 months from June 17, 2017 until April 28, 2018 and new economics approach of circular economy. It is intended to examine the potentialities and challenges of RCP. RC are ‘workshops’ for people to bring consumer products in need of repair where they with volunteer fixers learn repair, maintain their broken/faulty products, or try product modification. It is a RCP-requirement that visitors who bring products participate in repairs undertaken. Regular repair stations include: Bike, Electrical and Electronic, Clothing and Jewellery. The SWOT (strengths, weaknesses, opportunities, threats) method is used to assess internal and external aspects of RCP. It is concluded that the success of RCP is dependent on financial support, maturity of repair notion, and alteration of consumers and producers’ attitude to see waste as a resource and extend the product’s life.

Scientific committee

Alexandra Ghenea (Ecoteca, Romania)
Ana Pires (FCT NOVA, Portugal)
Ana Silveira (FCT NOVA, Portugal)
António Francisco (UTFPR, Brazil)
Carla Caldeira (EC-JRC, Italy)
Carlos Henggeler Antunes (UC, Portugal)
Cassiano Piekarski (UTFPR, Brazil)
Fausto Freire (UC, Portugal)
Francesco Musco (IUAV, Italy)
Frederic Clarens (CTM, Spain)
Graça Martinho (FCT NOVA, Portugal)
José Carlos Ferreira (FCT NOVA, Portugal)
José Carlos Góis (UC, Portugal)
Leonardo Rosado (Chalmers University, Sweden)
Lia Vasconcelos (FCT NOVA, Portugal)
Lidia Lombardi (Università degli Studi Niccolò Cusano, Italy)
Livia Mazza (Ecossistemi, Italy)
Luís Dias (UC, Portugal)
Miguel Brandão (KTH, Sweden)
Paulo Ferrão (IST/UL, Portugal)
Rita Garcia (UC, Portugal)
Roland Clift (University of Surrey, UK)
Serenella Sala (EC-JRC, Italy)
Stelios Rozaki (BioEcon IUNG, Poland)
Vera Durão (CEIFAcoop, Portugal)

Organizing committee

Fausto Freire (UC)
Filipa Ferreira (FCT NOVA)
Flávia Silva (FCT NOVA)
Joana Bastos (UC)
Lia Vasconcelos (FCT NOVA)
Lívia Vieira (CEIFACoop)
Margarida Morais (CMLeiria)
Rita Garcia (UC)
Suhita Peters (CEIFAcoop)

Organization

Support

For more information http://www2.dem.uc.pt/CenterIndustrialEcology/UW-scientific-meeting.htm

The project has received funding from the European Union's Horizon 2020 research and innovation programme under grant Agreement No. 690047.

About the project: www.urbanwins.eu

Twitter, Facebook and Instagram: @UrbanWINS