

Conference Program
WasteLCA_3
Life Cycle Assessment for
Waste Management and Resource Optimization

June 5 -10, 2022
Grand Hotel San Michele, Cetraro (Calabria), ITALY

Conference Chairs:
Professors **Umberto Arena** and **Thomas Astrup**

Honorary Chair:
Professor **Morton Barlaz**



Engineering Conferences International
32 Broadway, Suite 314 - New York, NY 10004, USA
Phone: 1 - 212 - 514 - 6760
www.engconfintl.org – info@engconfintl.org

Conference Chairs

Professor Umberto Arena

Full professor of Waste Management and Industrial Pollution Control Engineering
University of Campania “Luigi Vanvitelli”, Italy

Professor Thomas Astrup

Full Professor of Environmental Engineering
Denmark Technical University, Denmark

Honorary Chair

Professor Morton Barlaz

Distinguished University Professor and Head Dept. of Civil, Construction and Environmental Engineering
North Carolina State University, USA

Scientific Advisory Committee (SAC)

Professor **Dezhen Chen** (Tongji University, China)

Professor **Roland Clift** (University of Surrey, UK)

Dr. **Anders Damgaard** (Technical University of Denmark)

Professor **Mario Grosso** (Politecnico of Milan, Italy)

Professor **Paulo Ferrao** (Instituto Superior Técnico, Portugal)

Professor **James W. Levis** (North Carolina State University, USA)

Professor **Lidia Lombardi** (University “Niccolò Cusano”, Italy)

Professor **Antonio Massarutto** (University of Udine, Italy)

Ms. **Susan Thorneloe** (Environmental Protection Agency, USA)

Dr. **Davide Tonini** (EC-Joint Research Centre, Spain)

Technical Organizing Committee (TOC)

Dr. **Filomena Ardolino** (University of Campania “Luigi Vanvitelli”, Italy), Head of the TOC

Dr. **Noemi Arena** (Arup, United Kingdom)

Dr. **Giovanni Francesco Cardamone** (University of Campania “Luigi Vanvitelli”, Italy)

Dr. **Concetta Lodato** (Technical University of Denmark)

Miss **Annarita Palladini** (University of Campania “Luigi Vanvitelli”, Italy)

Dr. **Francesco Parrillo** (University of Campania “Luigi Vanvitelli”, Italy)

Conference Sponsors

- **PRODEVAL EUROPE S.p.A.** (www.prodeval.com/en)



- **CONAI**, Italian Consortium for Packaging (www.conai.org)



IMPORTANT NOTES

- *All contributions have ten minutes for oral presentation (and five minutes for questions and discussion) and more time for further discussion at the poster session in the evening. This will allow intensive discussion of the technical materials presented.*
- *Speakers: Please have your presentation loaded onto the conference computer prior to the session start (preferably the day before), and please leave at least five minutes for questions and discussion.*
- *Posters: Please put your posters on the poster boards in the dedicated area in the morning of the day of your presentation and remove them at the end of the evening discussion session. **The template for the poster is free, but the size should be 84 cm (width) x 119 cm (height)**. Please, take into account that there is not the possibility to print posters at the conference.*
- *Audiotaping, videotaping and photography of presentations are prohibited.*
- *Please do not smoke at any conference functions.*
- *Turn your cellular telephones to vibrate or off during technical sessions.*
- *Lunches of Tuesday, Wednesday and Thursday are organized in the restaurant of the Hotel and in that of the Hotel private beach. Please give your choice at the registration desk during the coffee break.*
- *Coffee breaks are organized in the terrace of the Hotel while the afternoon refreshments in the Hotel lobby.*
- *A visit to the beautiful organic farm (44 hectares) of the Grand Hotel San Michele is scheduled on Wednesday afternoon. Guests/accompanying persons may also have the possibility for an excursion by bus to visit interesting sites along the Calabria Tyrrhenian coast.*
- ***COVID rules: Attendance at the conference is restricted to those fully vaccinated against Covid-19. Registration will not be considered complete until a proof of vaccination is uploaded via the registration portal and verified by ECI staff. Acceptable proof includes copies of a U.S. CDC vaccination card or a certificate/document issued by the relevant health agency in your country of residence along with a government issued photo ID, such as a driver's license or passport. If you have questions about these requirements, please email Kathy@engconfintl.org***

Sunday, June 5, 2022

16:30 – 18:30	Conference Check-in
17:00 – 18:00	Meeting of Scientific Advisory and Technical Organizing Committees
19:15 – 20:00	<i>Welcome Reception</i>
20:30 – 21:45	<i>Welcome Dinner (Restaurant of the of Grand Hotel Michele)</i>

Monday, June 6, 2022

07:30 – 08:30	<i>Breakfast (Terrace of Grand Hotel San Michele)</i>
08:30 – 09:00	Welcome and Conference Overview
09:00 – 09:45	PLENARY LECTURE (Chairman: <u>Prof. Umberto Arena</u>) Thomas Christensen (Dept. Env. and Res. Engineering., DTU, Denmark) Why do we still need LCA-modelling in waste management?

TOPIC 1: MUNICIPAL SOLID WASTE MANAGEMENT

	Chairman: <u>Prof. Umberto Arena</u> , University of Campania “Luigi Vanvitelli”
09:45 – 10:00	133_ Collection system's impact on environmental performance of the waste management system Kari Anne Lyng , NORSUS, Norway
10:00 – 10:15	170_ Life cycle assessment of multi-loop recycling: Opportunities and Challenges Gloria Moscatelli , Denmark Technical University, Lyngby, Denmark
10:15 – 10:30	145_ Evaluation of the Environmental Feasibility of HTC Applied to the Organic Fraction Mechanically Separated from MSW Lidia Lombardi , Niccolò Cusano University, Italy
10:30 – 11:15	<i>Coffee Break (Terrace of Grand Hotel Michele)</i>
	Chairman: <u>Thomas H. Christensen</u> , Denmark Technical University
11:15 – 11:30	124_ The environmental impact of wasting recoverable nutrients from treated sewage sludge for agricultural use: A Life cycle assessment for a circular economy Esra Aleisa , Kuwait University
11:30 – 11:45	129_ LCA-assisted conception of a digestate recovery by micro-algae production Jean-Romain Bautista Angeli , INRAE, France
11:45 – 12:00	153_ Life cycle environmental impact assessment of sludge treatment technologies based on uncertainty analysis Huimin Chang , Beijing Normal University, China
12:00 – 12:15	110_ Data quality of organic waste characteristics in life cycle assessment of waste management: a review Nomena Ravoahangy , Polytechnique Montréal, CIRAI, Canada
12:30 – 14:00	<i>Lunch (Restaurant of Grand Hotel San Michele)</i>
14:00 – 16:45	Free time /ad hoc sessions
16:45 – 17:15	<i>Afternoon Refreshments (Hotel lobby)</i>

TOPIC 2: PLASTICS WASTE CIRCULARITY

	Chairman: <u>Prof. Mario Grosso</u> , Milan Polytechnic
17:15 – 17:30	165_ Challenges of implementing new technologies in future waste management – example of chemical recycling Martyna Solis , Denmark Technical University, Lyngby, Denmark
17:30 – 17:45	160_ Technical and environmental performances of alternative thermochemical treatments for mixed plastics waste Filomena Ardolino , University of Campania, Italy
17:45 – 18:00	156_ Potential Circularity of Plastic in Europe – Dynamic MFA of PET, PE & PP Flows Marie K. Eriksen , Denmark Technical University, Lyngby, Denmark
18:00 – 18:15	121_ Analysis of plastic waste circularity through LCA Andres Font , Universidad de Alicante, Spain
18:15 – 18:30	132_ Analysing the environmental performance and improvement factors of plastic packaging recycling systems Pieter Callewaert , NORSUS, Norway
20:00 – 21:30	<i>Dinner (Restaurant of the Grand Hotel San Michele): Calabrian event</i>
21:30 – 22:30	Poster session with social hour

Tuesday, June 7, 2022

07:45 – 08:45	<i>Breakfast</i>
08:45 – 09:30	<p>PLENARY LECTURE (Chairman: <u>Prof. Thomas Astrup</u>)</p> <p>Antonio Massarutto (Dept. of Economic and Statistic Sciences, University of Udine, Italy)</p> <p>Economic evaluation of externalities in waste management LCC studies: state-of-art, perspective and open issues</p>

TOPIC 3: NEW ASSESSMENT TOOLS FOR WASTE AND RESOURCE MANAGEMENT AND PLANNING

	Chairman: <u>Prof. Thomas Astrup</u> , Denmark Technical University
9:30 – 09:45	<p>150_Improving the Representation of Solid Waste Management in the Ecoinvent Database</p> <p>Avraam Symeonidis, Ecoinvent, Switzerland</p>
09:45 – 10:00	<p>173_Indicators for selecting between alternatives in comparative LCA of waste management systems</p> <p>Valentina Bisinella, Denmark Technical University, Lyngby, Denmark</p>
10:00 – 10:15	<p>126_An LCA-based performance indicator for plastic packaging waste management systems</p> <p>Sarah Schmidt, University of Kassel, Germany</p>
10:15 – 10:30	<p>175_Supporting a circular economy strategy in South Tyrol, Italy: Integrated life-cycle energy and greenhouse gas analysis</p> <p>Antonello Durante, Eurac Research, Italy</p>
10:30 – 11:15	<i>Coffee Break (Terrace of Grand Hotel San Michele)</i>
	Chairman: <u>Prof. Anders Damgaard</u> , Denmark Technical University
11:15 – 11:30	<p>152_ Evaluation of the cross-media effects of new emission limit values for waste-to-energy plants via a combination of process modelling and life cycle assessment</p> <p>Alessandro Dal Pozzo, University of Bologna, Italy</p>
11:30 – 11:45	<p>164_ Measuring Recycling and Recycled Content Benefits in LCA - Implications for Policy Design</p> <p>Sofia Carvalho, 3drivers – Engineering, Innovation and Environment; Instituto Superior Técnico de Lisboa, Portugal</p>
11:45 – 12:00	<p>154_ Development of a regionalized recycling LCA collaborative tool</p> <p>Arianne Provost-Savard, Polytechnique Montréal, Canada</p>
12:00 – 12:15	<p>108_Environmental aspects of the implementation of MSWI fly ash treatment methods in the Czech Republic</p> <p>Monika Vitvarova, University of Chemistry and Technology Prague, Czech Republic</p>
12:30 – 14:00	<i>Lunch (Hotel private beach or restaurant of the Grand Hotel San Michele)</i>
14:00 – 17:00	Free time / <i>ad hoc</i> sessions
17:00 – 17:30	<i>Afternoon Refreshments (Hotel lobby)</i>

TOPIC 4: MSW MANAGEMENT PLANNING

	Chairman: <u>Prof. Giulia Costa</u> , University of Rome “Tor Vergata”
17:15 – 17:30	174_ Climate change impact of the development in household waste management in China Thomas H. Christensen , Denmark Technical University, Lyngby, Denmark
17:30 – 17:45	171_ System Level Life Cycle Assessment Models for EU and National Waste Management Josefine H. Sund , Denmark Technical University, Lyngby, Denmark
17:45 – 18:00	143_ The influence of energy output and substitution on the environmental impact of waste-to-energy operations Lizzie Boakes , KU Leuven, Belgium
18:00 – 18:15	144_ Environmental Sustainability of Municipal Waste Thermochemical Conversion Technologies Lidia Lombardi , Niccolò Cusano University, Italy
18:15 – 18:30	199_ LCA of the improvement potential for construction and demolition waste: The role of site specificity and quality Anders Damgaard , Denmark Technical University, Lyngby, Denmark
20:00 – 21:30	<i>Dinner (Restaurant of the Grand Hotel San Michele)</i>
21:30 – 22:30	Poster session with social hour

Wednesday, June 8, 2022

07:45 – 08:45	<i>Breakfast</i>
08:45 – 09:30	PLENARY LECTURE (Chairman: <u>Prof. Roland Clift</u>) Marzia Traverso (Inst. of Sustainability in Civil Engineering, RWTH Aachen University, Germany) Social Life Cycle Assessment of formal and informal recycling sector

TOPIC 5 SOCIAL AND SUSTAINABILITY LIFE CYCLE ASSESSMENT

	Chairman: <u>Prof. Giovanni De Feo</u> , University of Salerno
09:30 – 09:45	134_ Assessing social implications of circular economy by integrating circularity in S-LCA Anna Luthin , RWTH Aachen University, Germany
09:45 – 10:00	148_ A preliminary social assessment of innovative management options for mixed and hazardous plastics waste Filomena Ardolino , University of Campania, Italy
10:00 – 10:15	107_ LCT as Lever to Overcome Barriers in Areas Suffering from NIMBY Syndrome: The Case Study of Campania Region in Southern Italy Giovanni De Feo , University of Salerno, Italy
10:15 – 10:30	128_ An environmental, economic, and social evaluation of the production of animal feed from food waste: A Life Cycle Assessment Alla Alsaleh , Kuwait University, Kuwait
10:30-11:15	<i>Coffee Break (Terrace of Grand Hotel San Michele)</i>

TOPIC 6 RESOURCE OPTIMIZATION

	Chairman: <u>Prof. David Laner</u> , University of Kassel
11:15 – 11:30	158_ Prospective dynamic resource assessment of circular economy solutions: the case of batteries in the mining sector Harald Helander , Chalmers University of Technology, Sweden
11:30 – 11:45	167_ Insights from applying different assessment methods for metals resource use Maria Ljunggren Söderman , Chalmers University of Technology, Sweden
11:45 – 12:00	142_ Life Cycle Assessment of Alkali Activated Cement compared to Ordinary Portland Cement Anna Alfocea-Roig , University of Barcelona, Spain
12:00 – 12:15	109_ Repair for high-voltage electric motors: energy efficiency vs resource use? Adeline Jerome , Chalmers University of Technology, Sweden
13:00 – 14:30	<i>Lunch (Hotel private beach or restaurant of the Grand Hotel San Michele)</i>
15:00 – 19:00	<i>Visit to the San Michele organic farm with degustation of wine and local products</i>
20:00 – 21:15	<i>Dinner (Restaurant of the Grand Hotel San Michele): Pizza event</i>
21:15 – 22:30	Poster Session with Social Hour

Thursday, June 9, 2022

07:45 – 08:45	<i>Breakfast</i>
08:45 – 09:30	PLENARY LECTURE (Chairman: <u>Maria Ljunggren Söderman</u>) Roland Clift (British Columbia, Canada and University of Surrey, UK) Dynamics of Stocks and Flows in a Regenerative Economy

TOPIC 7 AGRICULTURAL, FOOD AND FORESTRY WASTE MANAGEMENT

	Chairman: Prof. Maria Ljunggren Söderman, Chalmers University of Tech.
09:30 – 09:45	111_LCA of food waste management in Italy, with a special focus on the effect of the bags used for the collection Mario Grosso , Milan Polytechnic, Italy
09:45 – 10:00	162_ Evaluating carbon balance of wood cascading – the need for accounting storage period and rate of carbon uptake Kranti Navare , KU Leuven, Belgium
10:00 – 10:15	139_Environmental and economic sustainability of agricultural waste collection and valorization Giuseppe Vignali , University of Parma, Italy
10:15 – 10:30	151_Forestry Waste in British Columbia - overcoming bad habits and perverse life cycle accounting Roland Clift , British Columbia, Canada and University of Surrey, UK
10:30-11:15	<i>Coffee Break (Terrace of Grand Hotel San Michele)</i>

TOPIC 8 BIOREFINERY SECTOR

	Chairman: Prof. <u>Esra Aleisa</u> , Kuwait University
11:15 – 11:30	172_Assessment of technologies and scenarios for biogas management in Denmark Anna Sofie Varling , Denmark Technical University, Lyngby, Denmark
11:30 – 11:45	178_BBcircle – Life Cycle Assessment for innovative biorefinery process evaluation Lidia Lombardi , Niccolò Cusano University, Italy
11:45 – 12:00	168_Environmental assessment of different integrated biorefinery scenarios using walnut shells as a source for lignin production Beatriz Santiago , CRETUS Institute, Spain
12:00 – 12:15	155_Environmental assessment framework for bio-based methane production via anaerobic digestion, gasification, and gas upgrading Concetta Lodato , Denmark Technical University, Lyngby, Denmark
12:15 – 12:30	141_ The Biofactory: Life Cycle Sustainability Assessment for Promoting Circular Economies in Wastewater Treatment Madeline Furness , University of Canterbury, United Kingdom

12:30 – 12:45	146_ Critical review on life cycle assessment of bio-based platform molecules: sustainability metrics of novel technologies Jorge Blanco , Rey Juan Carlos University, Spain
13:15 – 14:15	<i>Lunch (Hotel private beach or restaurant of the Hotel)</i>
14:30 – 17:00	Free time / <i>ad hoc</i> sessions

TOPIC 9 EMERGING TECHNOLOGIES

	Chairman: <u>Prof. Lidia Lombardi</u> , Niccolò Cusano University
17:15 – 17:30	157_ Life cycle analysis of different biochar production processes for simultaneous waste management and carbon capture credits Franco Berruti , ICFAR/Western University, Canada
17:30 – 17:45	149_ Advanced Thermochemical Conversion of Various Waste Feedstocks with CCS for Clean Hydrogen Production - a Life Cycle Assessment Suviti Chari , University College London, United Kingdom
17:45 – 18:00	117_ An alternative management scheme for plastics from construction & demolition waste Filomena Ardolino , University of Campania, Italy
18:00 – 18:15	180_ Life cycle impacts of WEEE plastics recycling within the PLAST2bCLEANED project Spela Ferjan , TNO, Netherlands
18:15 – 18:30	161_ LCA for emerging waste treatment technologies: theoretical approach and practical application Christina Tsouti , DRAXIS Environmental SA, Greece
20:00 – 21:15	<i>Gala Dinner (Restaurant of the Grand Hotel San Michele)</i>
21:15 – 22:30	Poster Session with Social Hour

Friday, June 10, 2022

08:00 – 09:00	<i>Breakfast on the terrace of Grand Hotel San Michele</i>
---------------	--

TOPIC 10 INDUSTRIAL WASTE

	Chairman: <u>Roland Clift</u> , University of Surrey
09:00 – 09:15	136_ Environmental and economic analysis to evaluate the valorization process of metallurgical waste and by-products Giovanna Sauve , KU Leuven, Belgium
09:15 – 09:30	127_ The environmental benefits of circular economy strategies in the nuclear industry: a Life Cycle Assessment study Andrea Paulillo , University College London, United Kingdom
09:30 – 09:45	116_ Economic and environmental assessment of lithium-ion battery recycling processes for electric vehicles Giovanni De Feo , University of Salerno, Italy
09:45 – 10:00	169_ Evaluating by LCA the environmental impact savings related to the use of waste incineration bottom ash in porcelain tiles manufacturing: The role of metals recovery Giulia Costa , University of Rome "Tor Vergata", Italy
10:00 – 10:15	125_ Critical choices in Waste LCA – A case study on the treatment of PAH-rich road debris David Laner , University of Kassel, Germany
10:15 – 10:30	131_ Prospective life cycle assessment for nickel slag valorization by mineral carbonation Eva Quéheille , Gustave Eiffel University, France
10:30 – 11:15	<i>Coffee Break (Terrace of Grand Hotel Michele)</i>
11:15 – 12:15	Poster Session
12:15 – 13:15	OVERALL DISCUSSION, FEEDBACK, WHAT IS NEXT?, CONCLUDING REMARKS AND CLOSING OF CONFERENCE
13:15 – 14:00	<i>Lunch at the restaurant of the Hotel and Departure</i>