

# SARDINIA2021

18th INTERNATIONAL SYMPOSIUM ON WASTE MANAGEMENT  
AND SUSTAINABLE LANDFILLING

HYBRID EVENT / 11-15 OCTOBER 2021 / FORTE VILLAGE, S.M. di PULA (IT)



**Organised by / Organizzato da:**

IWWG - International Waste Working Group



**With the scientific support of:**

**Con il supporto scientifico di:**



University of Padova, Italy



Fukuoka University, Japan



Hamburg University of Technology, Germany



Luleå University of Technology, Sweden

Tongji University, China



**Promoted by / Promosso da:**

GITISA - Italian Group of Sanitary-Environmental Engineering



IGS - International Geosynthetics Society



**Sardinia 2021 Partner Journal / Rivista partner:**

Detritus, Multidisciplinary Journal for Waste Resources and Residues



**Organising Secretariat / Segreteria Organizzativa:**

Eurowaste Srl, Padova, Italy

## FORTE VILLAGE MAP / MAPPA FORTE VILLAGE



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# PRESENTATION PRESENTAZIONE

The Sardinia Symposia are a biennial event organized by the International Waste Working Group (IWWG), with the scientific support of the Universities of Padova, Tongji, Fukuoka and the Technical Universities of Luleå and Hamburg.

The International Symposia Sardinia were established in 1987 in order to make ideas and experiences in the rapidly developing field of waste management and landfilling readily available to professional communities worldwide. Since then the Symposia have rapidly become the international reference forum where every two years planners, operators, public officials and scientists present their relevant experiences and discuss new concepts and technologies of waste management.

All new ideas and approaches applied worldwide in the last three decades were thoroughly debated and reviewed during the numerous sessions in the Symposia, some of them purposely organized in cooperation with the IWWG task groups.

The seventeenth Symposium was held in October 2019, in the traditional venue of the Forte Village Complex at S. Margherita di Pula (Cagliari), with an attendance of more than 700 delegates from 70 different countries.

The 2021 edition, for the first time, will be delivered in a hybrid format, combining an in-person conference experience with a virtual component.

The scientific programme of Sardinia 2021 – Hybrid Edition is structured in 4 parallel sessions for a total of 70 sessions and includes more than 270 presentations. Each session will feature presentations made by both on-site and online speakers.

*Il Sardinia è un Simposio internazionale, biennale, organizzato dall'IWWG - International Waste Working Group, con il supporto scientifico di cinque prestigiose Università: Padova, Luleå (Svezia), Amburgo (Germania), Fukuoka (Giappone) e Tongji (Cina).*

*I Simposi Sardinia sono stati istituiti nel 1987 con lo scopo di rendere facilmente disponibili e condivisibili le conoscenze e le esperienze nel campo della gestione dei rifiuti e dello scarico controllato. Da allora sono diventati uno dei principali forum di riferimento a livello mondiale per gli esperti del settore che ogni due anni si ritrovano in Sardegna per presentare e discutere nuove strategie e tecnologie in quella che è unanimemente riconosciuta come una delle vetrine più prestigiose per la ricerca nazionale e internazionale.*

*Nel corso delle edizioni i Simposi hanno testimoniato e contribuito allo sviluppo dei moderni concetti di gestione integrata e smaltimento sostenibile dei rifiuti: non c'è innovazione che negli ultimi venticinque anni non sia stata presentata e discussa durante le conferenze e i numerosi workshop dei Simposi, alcuni dei quali organizzati grazie alla proficua collaborazione con i membri dell'International Waste Working Group.*

*La diciassettesima edizione, tenutasi nell'Ottobre del 2019, nella tradizionale sede del Forte Village Resort di Santa Margherita di Pula (Cagliari) ha visto la partecipazione di oltre 700 delegati provenienti da oltre 70 paesi.*

*Quest'anno, per la prima volta, il Simposio si terrà in forma ibrida, con la possibilità di essere seguito da qualsiasi parte del mondo.*

*Il programma scientifico si articolerà in 4 sessioni parallele all'interno delle quali saranno presentati oltre 270 lavori selezionati dal Comitato Scientifico Esecutivo. In tutte le sessioni (70 in totale) sono previsti interventi sia in presenza che online.*

# SCIENTIFIC COMMITTEES COMITATI SCIENTIFICI

## SYMPOSIUM CHAIRS / *PRESIDENTI DEL SIMPOSIO*



**Prof. Raffaello COSSU**  
University of Padova (IT)



**Prof. Jurate KUMPIENE**  
Luleå University of  
Technology (SE)



**Prof. Rainer STEGMANN**  
Hamburg University of  
Technology (DE)

## Executive Scientific Committee / *Comitato Scientifico Esecutivo*

Raffaello COSSU, University of Padova (IT)

Pinjing HE, Tongji University (CN)

Jurate KUMPIENE, Luleå University of Technology (SE)

Yasushi MATSUFUJI, Fukuoka University (JP)

Rainer STEGMANN, Hamburg University of Technology (DE)

## Scientific Secretaries / *Segretari Scientifici*



**Robero RAGA**  
University of Padova (IT)



**Alberto PIVATO**  
University of Padova (IT)



# SCIENTIFIC COMMITTEES

## COMITATI SCIENTIFICI

### International Advisory Board / *Comitato Scientifico Internazionale*

- Muhammed ALAMGIR, Khulna University of Engineering & Technology (BD)
- Damià BARCELÓ, Institute of Environmental Assessment and Water Research (ES)
- Andreas BARTL, Vienna University of Technology (AT)
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- Daniele CAZZUFFI, CESI SpA (IT)
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- Martin KRANERT, University of Stuttgart (DE)
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- Nuno LAPA, Universidade NOVA de Lisboa (PT)
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- Claudio MAHLER, Federal University of Rio de Janeiro (BR)
- Andjelka MIHAJLOV, Environmental Ambassador for Sustainable Development, Serbia (RS)
- Mark MILKE, University of Canterbury (NZ)
- Aldo MUNTONI, University of Cagliari (IT)
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- Marco RITZKOWSKI, Hamburg University of Technology (DE)
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- Susan THORNELOE, US-EPA (US)
- Giuseppe TIPALDO, University of Turin (IT)
- Evangelos VOUDRIAS, Democritus University of Thrace (GR)
- Ian D. WILLIAMS, University of Southampton (UK)
- Jonathan WONG, Hong Kong Baptist University (HK)
- Dongbei YUE, Tsinghua University (CN)

# ORGANISING SECRETARIAT

## SEGRETERIA ORGANIZZATIVA



**Gioia BURGELLO**  
Symposium Manager  
*Euowaste Srl*



**Elena COSSU**  
General Manager  
*Euowaste Srl, Arcoplan*



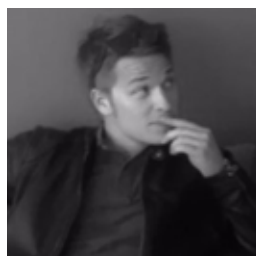
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**Angelica LONGHI**  
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**Rachele MALESANI**  
*University of Padova*



**Cristina RAGAZZI**  
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info@euowaste.it / www.euowaste.it / www.sardiniasymposium.it

# INSTRUCTIONS

# ISTRUZIONI

This edition of the Symposium will be held in a hybrid format: each session will feature presentations made by both on-site and online speakers.

*L'edizione di quest'anno si svolgerà in modalità ibrida: in ciascuna sessione sono previsti interventi di relatori in presenza e online.*

## Instructions for Chairs of Sessions

On arrival at the venue, Chairs of oral sessions and workshops must contact the Speakers' Room to collect the session materials: our staff will provide the curricula vitae of speakers, with the indication of in-person or virtual presentations, and inform of any last-minute changes in the programme.

Fifteen minutes prior to the start of the sessions, Chairs should report to the conference room where the session will take place, to meet the speakers.

Chairs are kindly requested to ensure that all speakers remain seated at the table throughout the entire session and that **the timetable is strictly adhered to**. This aspect is of extreme importance in order to allow delegates to schedule their attendance in the parallel sessions.

In each conference room there will be a computer connected via Zoom with online attendees. Therefore, each speaker and Chair are kindly requested to deliver their talk in front of this computer to be seen by the virtual audience.

Chairs are furthermore requested to check the chat of the Zoom meeting in case some questions arise from the attendees.

Our staff member will be always available in the room for any technical assistance.

## Istruzioni per i Presidenti di sessione

*Al loro arrivo, i Presidenti delle sessioni orali e dei workshop dovranno recarsi nella Sala Relatori, presso il centro congressi, per ritirare il materiale della loro sessione: il nostro staff consegnerà una cartellina contenente i curricula dei relatori (con indicazione delle presentazioni in persona e online), e informerà circa eventuali modifiche al programma della sessione che dovranno presiedere.*

*Quindici minuti prima dell'inizio delle rispettive sessioni, i Presidenti si presenteranno presso la sala dove si svolgerà la sessione per prendere contatto con i relatori.*

*I Presidenti di sessione sono inoltre pregati di adoperarsi affinché nessuno dei relatori abbandoni la sala prima della conclusione della sessione e **venga rispettata la tempistica prevista**. Quest'ultimo aspetto è di particolare importanza al fine di consentire ai partecipanti di seguire le relazioni di loro interesse in diverse sessioni parallele.*

*In ciascuna sala sarà presente un computer connesso via Zoom per la partecipazione dei delegati online. Pertanto, tutti i relatori e i presidenti di sessione dovranno tenere il loro intervento restando seduti di fronte al monitor per essere visibili anche alla platea collegata in remoto. I presidenti di sessione dovranno inoltre controllare la chat Zoom per rivolgere ai relatori eventuali domande poste dai partecipanti online.*

*Ciascuna sala sarà presidiata da un membro del nostro staff a disposizione per qualsiasi esigenza tecnica.*

# INSTRUCTIONS

# ISTRUZIONI

## Information for Speakers

Speakers should contact the Chair 15 minutes prior to the start of the session in which their paper is to be presented. The Chair will be available in the conference room where the session is to take place. Speakers should be present at the conference table from the beginning of the session and remain for the entire duration. During the presentation, commercial advertising should be avoided. Mention of affiliations or company name should be very discreet.

A member of our staff is on hand in the Speakers' Room for all requirements. Speakers who have not sent a copy of their PowerPoint presentation to the Organising Secretariat are kindly requested to contact the Speakers' Room in a timely manner, at the latest within the session prior to the one in which their own presentation is scheduled.

In each conference room there will be a computer connected via Zoom with online speakers and attendees. Therefore, each speaker and Chair are kindly requested to deliver their talk in front of this computer to be seen by the virtual audience. Our staff member will be always available in the room for any technical assistance.

If your allotted time runs out, do not under any circumstances hurry to finish the entire presentation but go straight to the conclusions. To this regard, it may be useful to prepare a slide illustrating the conclusions in a summarised version.

## Informazioni per i relatori

*I relatori dovranno contattare il Presidente della sessione durante la quale presenteranno la propria relazione almeno 15 minuti prima dell'inizio della stessa nella sala conferenze di riferimento. Gli autori dovranno essere presenti al tavolo della conferenza dall'inizio della sessione e rimanervi per tutta la durata della stessa. Nella presentazione va assolutamente evitata qualsiasi forma di pubblicità. La presenza di enti o ditte di appartenenza deve essere molto discreta.*

*Nella Sala Relatori sarà sempre presente un incaricato dell'organizzazione per fornire eventuale assistenza. Non sarà possibile utilizzare il computer della Sala Relatori per preparare le relazioni, ma solo per apportare piccole modifiche e per un controllo finale.*

*I relatori che non avessero inviato una copia della loro presentazione PowerPoint alla Segreteria Organizzativa prima del Simposio sono cortesemente pregati di recarsi nella Sala Relatori non oltre la sessione precedente a quella in cui devono presentare la propria relazione. In ciascuna sala sarà presente un computer connesso via Zoom per la partecipazione dei delegati online. Pertanto, tutti i relatori dovranno tenere il loro intervento restando seduti di fronte al monitor per essere visibili anche alla platea collegata in remoto. I presidenti di sessione dovranno inoltre controllare la chat Zoom per porre ai relatori eventuali domande poste dai partecipanti online.*

*Ciascuna sala sarà presidiata da un membro del nostro staff per qualsiasi esigenza tecnica. Durante la comunicazione orale, nel caso stia per terminare il tempo a disposizione, si prega di non accelerare per esporre il resto della relazione ma di passare direttamente alle conclusioni. A tal proposito, potrebbe rivelarsi utile preparare una slide che sintetizzi le conclusioni.*

# VIRTUAL PLATFORM & MOBILE APP

## PIATTAFORMA VIRTUALE E APP

The hybrid format of Sardinia 2021 will be delivered through our virtual platform and mobile app, powered by **Attendify**, that will allow both speakers and participants to join all conference sessions from wherever they are in the world and interact with on-site stage. The platform will be accessible from any device (mobiles, tablets and computers) and will keep you updated on any conference activities and news.

All delegates will be able to:

- view the agenda and explore sessions
- build your personal schedule
- watch all presentations in live streaming
- join live discussions and Q&A chats
- read speakers' profiles and download their conference papers
- network with other delegates via private message and group chats
- share your photos and posts on the social wall
- view exhibitors' info
- receive important updates and notifications about program and social events
- browse through all posters and watch the discussions by their authors
- re-watch every session after the end of the conference.

**The app will be our main tool to communicate with you!**

Please download it now and check it out!

*L'edizione ibrida del Sardinia 2021 sarà gestita attraverso la nostra piattaforma virtuale e la app ufficiale del Simposio, sviluppata da Attendify, per consentire ai relatori e ai partecipanti di seguire tutte le sessioni del Sardinia ovunque si trovino.*

*La piattaforma sarà disponibile per tutti i dispositivi (smartphone, tablet e computer) e vi terrà aggiornati su tutte le attività del Sardinia (programma scientifico, eventi serali, ultime notizie, etc). Attraverso la app e la piattaforma i delegati potranno:*

- vedere tutto il programma ed esplorare le sessioni
- creare il proprio programma personalizzato
- vedere le sessioni in diretta
- partecipare alle discussioni sia con collegamento audio video sia attraverso la chat
- leggere i profili e i cv degli speaker e scaricare i papers
- fare network con tutti i partecipanti con messaggi privati o chat di gruppo
- condividere foto e post sulla bacheca
- vedere i profili degli espositori, scaricare i materiali aziendali e prendere nuovi contatti
- ricevere aggiornamenti di programma e ultime notizie in tempo reale
- riguardare tutte le sessioni registrate dopo la fine del Simposio

**La App sarà il nostro strumento principale per comunicare con voi!**

*Si prega di scaricarla subito e di tenerla costantemente monitorata!*

## INSTRUCTIONS FOR DOWNLOAD

### Mobile app (for smartphones and tablets)

The mobile app is available in the App Store and Google Play Store. Follow this Steps:

1. Download the Attendify app
2. Sign up with your email address
3. Click on the event "Sardinia 2021 Symposium"
4. Click on "Join".

### Desktop version (for computers)

The virtual platform is accessible at: [https://ve.attendify.com/index/s1t5z4/s\\_s1t5z4/](https://ve.attendify.com/index/s1t5z4/s_s1t5z4/)

To enter the symposium, log in or create a new profile with your email address.

## ISTRUZIONI PER IL DOWNLOAD

### App (per smartphone e tablet)

La app è disponibile su App Store e Google Play Store:

1. Scarica l'app Attendify
2. Registrati con il tuo indirizzo email
3. Cliccare sull'evento "Sardinia Symposium 2021"
4. Cliccare su "Partecipa"

### Versione Computer (PC e notebook)

La versione per i computer è accessibile dal link: [https://ve.attendify.com/index/s1t5z4/s\\_s1t5z4/](https://ve.attendify.com/index/s1t5z4/s_s1t5z4/)

Per accedere al Sardinia 2021 si prega di effettuare il log in o creare un nuovo profilo con l'indirizzo email fornito in fase di registrazione al Simposio.

## MEMBERS' AREA / AREA RISERVATA

All accepted papers are available for download (PDF documents) from the website members' area (available upon login to registered participants only).

*Tutti i paper accettati sono disponibili per il download (file PDF) nell'area riservata del sito ufficiale del Simposio (accesso con login solo per i partecipanti).*

# SOCIAL PROGRAMME

## PROGRAMMA SOCIALE

As we all know, in recent times social interaction and activities had to be put aside. We see our Symposium as a chance to return to a more-or-less normal life, to pick up where we left off. Sardinia Symposium will be the perfect occasion to meet again after a long time, create new collaborations and friendships, share ideas and have a good time together! For further details please check the bulletin board in the congress foyer or contact the organising secretariat at the registration desk!

*Come tutti sappiamo, negli ultimi tempi abbiamo dovuto ridurre al minimo le interazioni sociali e le attività di gruppo. Noi vediamo il nostro Simposio come un'opportunità per tornare a una vita più o meno normale, per riprendere da dove ci siamo lasciati. Il Sardinia 2021 sarà l'occasione perfetta per ritrovarsi dopo tanto tempo, creare nuove collaborazioni e amicizie, condividere idee e divertirsi insieme!*

*Per ulteriori dettagli sui singoli eventi serali contattare la segreteria organizzativa al banco registrazioni o consultare la bacheca nel centro congressi*



### SUNDAY / 10 October / h. 19:30

#### SARDINIAN WELCOME COCKTAIL

Get the Symposium off to a great start and meet old and new friends and colleagues in a relaxing atmosphere by the pool



### MONDAY / 11 October / h. 21:30

#### FLUO PARTY ON THE BEACH

Join us in a dancing party on the beach and let's brighten up the night wearing colorful clothes and neon accessories!

**DRESS CODE:** your most colorful outfit!



### from MONDAY 11 to THURSDAY 14 / h. 19:30

#### RUN WITH US

Running session everyday at 19:30. Join our staff in a daily run around the Forte Village and on the beach to train the body and relax the mind in front of the magical Sardinian sunsets!



**TUESDAY / 12 October / h. 21:30**

### **GO KART TOURNAMENT: RALLY SARDINIA**

The Race will take place on a 500m professional circuit, equipped with a telemetry system. The Tournament consists of a technical briefing, qualifying session, a semi-final and a final session. Podium, prize ceremony with national anthem and prosecco at the end of the Race. **Limited seats! Book your place at the registration desk** (40€ + VAT 22%)



**WEDNESDAY / 13 October / h. 21:30**

### **ACTIVITIES FOR PHYSICAL & MENTAL WELL-BEING**

From sunset to midnight, an evening dedicated to activities for physical & mental well-being, involving all of you, not only as participants but also as trainers! Do you practise any disciplines or sports that you would like to teach to friends and colleagues? Please contact us at the registration desk!

#### **Confirmed activities:**

- Pilates class by Prof. Alexandre Cabral, *University of Sherbrooke (CA)*
- Running programme by Symposium Staff, *Eurowaste & University of Padova (IT)*
- Functional Training on the beach by Carlo Cossu, *University of Pretoria (ZA)*
- Padel class by Mattia Trapani, *Tennis Club Ambrosiano (IT)*



**THURSDAY / 14 October / h. 21:30**

### **"DIRTY DANCING" NIGHT**

Let's get on the dance floor and have fun together all night long with overwhelming Latin rhythms.

# REGISTRATION REGISTRAZIONE

## WHAT'S INCLUDED IN YOUR REGISTRATION / CHE COSA È INCLUSO NELLA VOSTRA REGISTRAZIONE

- Participation in Symposium sessions
- Sardinia 2021 - Symposium Guidebook
- Digital Symposium proceedings (USB pendrive and access to the members' area)
- Conference materials
- Coffee breaks
- Admission to the welcome cocktail
- Fluo Party and other social events
- Gala Dinner (supplement to evening meal)
- *Partecipazione alle sessioni del Simposio*
- *Programma stampato 'Sardinia 2021 - Symposium Guidebook*
- *Atti del convegno (chiavetta USB e accesso alla Members area)*
- *Materiale congressuale*
- *Coffee breaks*
- *Invito al cocktail di benvenuto*
- *Invito al Fluo Party e ad altri eventi serali*
- *Cena di Gala (come supplemento alla mezza pensione alberghiera)*

## REGISTRATION / REGISTRAZIONI

The Registration Desk will be open in the Conference Centre with the following schedule:

- Sunday October 10th from 16:00 - 19:00
- Monday October 11th from 8:30 - 9:00, 11:00 - 13:00 and 15:00 - 18:30
- Tuesday October 12th - Friday October 15th from 08.30 - 13.00 and from 15.00 - 18:30

*Il banco segreteria per la registrazione al Simposio sarà aperto presso la hall del Centro Congressi ai seguenti orari:*

- *domenica 10 Ottobre dalle 16.00 alle 19.00*
- *lunedì 11 Ottobre dalle 8:30 alle 9:00, 11:00 - 13:00 e 15:00 - 18:30*
- *da martedì 12 Ottobre a venerdì 15 Ottobre dalle 08.30 alle 13.00 e dalle 15.00 alle 18:30*

DAY 1 / MONDAY  
OCTOBER 11

# MONDAY OCTOBER 11 MORNING

## OPENING SESSION / CENTRAL HALL / 9:00-12:30

Chair: Raffaello Cossu (IT)

### WELCOME ADDRESSES / SALUTI DI BENVENUTO

- 9:15-10:20** Raffaello COSSU / University of Padova (IT)  
Jurate KUMPIENE / Luleå University of Technology (SE)  
Rainer STEGMANN / Hamburg University of Technology (DE)  
Evangelos GIDARAKOS / IWWG President, Technical University of Crete (GR)  
Gianni LAMPIS / Regional Councillor Dept. for Environmental Defence, Sardinia (IT)

### OPENING LECTURES / RELAZIONI DI APERTURA

*In accordance with a consolidated tradition, the Symposium will be opened by introductory lectures not strictly linked to sanitary landfilling. The 18th edition of the Sardinia Symposium will be opened by:*

- 10:20-10:50** Herta FLOR / Institute of Cognitive and Clinical Neuroscience,  
Central Institute of Mental Health, Mannheim, Heidelberg University (DE)

### ADAPTIVE AND MALADAPTIVE BRAIN PLASTICITY: THE ROLE OF WASTE REMOVAL

Neuroscientific evidence from the last three decades has convincingly shown that the brain develops and changes not only in childhood but is plastic into high age. Injury but also stimulation and learning, including social factors, thus modify the maps in brain areas involved in perception and movement as well as in centers dealing with emotion, motivation and cognition. Age-related maladaptive cortical changes can be influenced by adequate stimulation and training. This includes functional and structural changes as well as the development of new neuronal connections. Adequate environmental stimulation, including social interaction, seems to be especially important. This capability for improvement and plastic change also holds for injury-related deficits, such as those occurring in chronic pain. Removal of waste products is essential for the maintenance of high brain plasticity. Toxic waste that is produced by the brain and is not properly managed, has been implicated in dementia and Alzheimer's disease. For learning and memory processes to optimally function, the brain needs to resculpt its structural and functional connections and eliminate connections that are no longer beneficial. For these functions, sleep has a special role in that it eliminates no longer needed and enhances new connections. We will show examples of this brain-related waste removal and the significance for healthy aging.

- 10:50-11:20** Coffee break

- 11:20-12:00** Raffaello COSSU / University of Padova (IT)  
Rainer STEGMANN / Hamburg University of Technology (DE)

### WASTE PREVENTION AND SINKS IN CONTROLLING MATERIAL LOOPS IN SUSTAINABLE WASTE MANAGEMENT

Waste minimization means resources protection. Increasing population and standard of living require higher production rates and consequently higher more consumption of resources. Due to the limited availability of non-renewable resources, the use of fossil ma-

terials should be strongly restricted and avoided, products should be reused and waste recycled. But all the related processes should be designed, managed and controlled on a sound scientific basis, measuring the entity of avoided waste (i.e avoided use of no renewable resources) and keeping mass balance under control.

But considering physical laws whatever we do, increasing of entropy cannot be avoided and residues would be always produced. To avoid diffusion of contaminants from the different recycling steps and from the disposal of residual wastes final sinks for closing the material loops and safely storing contaminants should be provided. Such final sinks include landfills where several technical barriers and long- term supervision and maintenance will be implemented for respecting sustainable Final Storage Quality.

**12:00-12:30 Evangelos GIDARAKOS** /*Technical University of Crete (GR)*

### **COVID-19 AND ENVIRONMENTAL FOOTPRINT**

COVID-19 pandemic has been dominating our lives for almost 2 years. Being responsible for great changes imposed on our societies and unfortunately the death of millions of people worldwide, COVID19 has turned out to be a strong enemy. Lockdowns, isolation, restrictions, etc. are still some of the measures taken against it. Inevitably its impacts are not restricted on our health only; on the contrary they are spread among many different aspects of our lives, including the status of the environment we live in.

COVID-19 environmental footprint has been under research already from the first months of its appearance, leading to important conclusions, concerning recorded and expected consequences, as well as necessary actions/ measures by individuals, societies, companies and authorities.

# MONDAY OCTOBER 11

## AFTERNOON

### **SESSION A1 / CENTRAL HALL / 15:00-16:30**

#### **MINIMISATION AND RECYCLING**

*Chair: Andreas Bartl (AT)*

*R. Stegmann (DE)*

New concepts for waste minimisation

*M. Wiprächtiger, M. Rapp, M. Haupt, S. Hellweg (CH)*

Environmental assessment of waste prevention

*J. Lederer, A. Aldrian, A. Bartl, J. Fellner, D. Blasenbauer, L. Gritsch, W. Ipsmiller, P. Kählig, J. Mühl, S. Skutan (AT)*

Towards a recycling-based circular economy: a conceptual approach

*C. Roithner, O. Cencic, H. Rechberger (AT)*

Multiple application of statistical entropy: assessment of recycling process effectiveness as well as product-inherent recyclability

*M. van Praagh, L. Brander (SE)*

Obstacles and promoters for increased use of recycled materials - who takes the risk?

**16:30 - 17:00** Coffee break + Poster discussion

### **SESSION A2 / CENTRAL HALL / 17:00-18:30**

#### **STRATEGIC ISSUES IN CIRCULAR ECONOMY**

*Chair: Adriana Del Borghi (IT)*

*P.J. Shaw, I.D. Williams (UK)*

Destined for resource efficiency? A critical perspective of municipal waste destinations across the European Union, 1995 to 2019

*M. Rossetti, N. Lamanna, L. Zoia, A. Franzetti (IT)*

From a smoke-free policy to an end of waste proposal at the University of Milano-Bicocca

*R. Maletz, J. Sachse (DE)*

Evaluation of Waste-to-Energy technology in Germany

*B. Staley, S. Boxman, P. Hargreave (US)*

State of practice of organic waste management & collection in Canada

## **SESSION B1 / CENTRAL HALL 2 / 15:00-16:30**

### **HYDROTHERMAL TREATMENT OF ORGANIC WASTE**

*Chair: Anders Lagerkvist (SE)*

*L. Lombardi, F. Tuci, S. Fabrizi, B. Mendecka, M. Ślizc, M. Wilk (IT)*

Hydrothermal carbonization of the organic fraction mechanically separated from the residual MSW

*P. Evangelopoulos, R. Sott, L. Smuk (SE)*

Experimental investigation of hydrothermal liquefaction (HTL) as thermal treatment method for plastic packaging mixtures to achieve materials circularity

*J.K. Yankyera, N.S.A. Derkyi, S.K. Pelz, S. Paczkowski, K. Sarquah (GH)*

Techno-economic assessment of combined heat and power generation from hydrothermally carbonized biomass for an agro-process industry

*G. Cappai, A. Carucci, G. De Gioannis, G. Farru, S. Milia, A. Muntoni, G. Selenu (IT)*

Hydrothermal carbonization of agro-industrial waste

**16:30 - 17:00** Coffee break + Poster discussion

## **SESSION B2 / CENTRAL HALL 2 / 17:00-18:30**

### **PYROLYSIS OF SPECIFIC WASTE**

*Chair: Christoph Wünsch (DE)*

*G. Faussone (IT)*

Solid residues from the pyrolysis of marine litter: closing the mass balance of chemical recycling

*J. Ruiz, I. Fonts, M. Sancho, I. Perez, J. Ceamanos, J. Abrego, G. Gea (ES)*

Pyrolysis of two different kinds of proteins: collagen and soybean protein. Analysis of their contribution on the pyrolysis of rich protein animal wastes

*J. Fernández-Ferreras, N. Sánchez-Fernández, T. Llano, A. Coz (ES)*

Slow pyrolysis of coffee silverskin and spent coffee for its integral valorisation

*J. Fernández-Ferreras, C. Rueda (ES)*

Sewage sludge pyrolysis conditions assessment to maximize the liquid fraction for its valorisation

# MONDAY OCTOBER 11

## AFTERNOON

### SESSION C1 / PANORAMA HALL / 15:00-16:30

#### LANDFILL MANAGEMENT

*Chair: Evangelos Gidarakos (GR)*

*N.M. Proietti, A. Sarno (SE)*

Developing a digital platform to implement sustainable landfill management

*N. Sliusar, T. Filkin, Y. Mozzhegorova, R. Garifzyanov (RU)*

Integrated monitoring of waste landfills with unmanned aerial vehicles

*S. Holy, J. Fellner, D. Laner, M. Schuster (AT)*

Software tool for assessing the aftercare costs of landfills

*J. McQuilkin, N. Proietti (SE)*

GASTRAQ: Tracing and quantifying methane emissions from landfills and biogas plants using drones

*B. Staley, S. Bolyard (US)*

Sources of tritium in municipal solid waste landfills, Detection in leachate and environmental implications

**16:30 - 17:00** Coffee break + Poster discussion

### SESSION C2 / PANORAMA HALL / 17:00-18:30

#### LANDFILL MINING

*Chair: Raffaello Cossu (IT)*

*S. Jennings, P. Jain, R. Hixson (US)*

Landfill mining as a solution to contamination, a source of cover material, and a significant capacity for future waste disposal

*E. Wille, C. Isenborgs, L. Lamair, C. Neculau, R. De Rijdt, the RAWFILL Team (BE)*

Cedalion and Orion: A two-step decision support tool to allow smart ELFM project planning, prioritisation and sustainable interim use (RAWFILL project)

*M.A.G. Leme, C.M. Takeda, K.G. Silva, J.C.V. Silva, M.G. Miguel (BR)*

Gravimetric characterization of Brazilian municipal solid waste mined from landfill for assessment of reuse potential

*O. Johansson, M. Pettersson (SE)*

Environmental law issues in connection with the excavation of landfills

*A. Gatto, L. Traverso (IT)*

Landfill mining - Excavation & operation. A case study in Northern Italy

## **SESSION D1 / PANORAMA HALL 2 / 15:00-16:30**

### **RECOVERY OF RESOURCES FROM SEWAGE SLUDGE**

*Chair: Giorgia De Gioannis (IT)*

*L. Niero, T. Bauer, F. Morgan-Sagastume, M. Pelkonen, A. Lagerkvist (SE)*

System analysis of a two-stage anaerobic digestion of sewage sludge

*M. Bagheri, M. Öhman, E. Wetterlund (SE)*

Techno-economic analysis of phosphorus recovery scenarios from sewage sludge ash

*A. Mitzia, M. Vítková, S. Zarzsevszkij (CZ)*

Laboratory application of un/treated sewage sludge for soil remediation; focus on sewage sludge mineralogy

*P. Alberti (HU)*

Thermal disposal and utilization system

*M.H. Mishuk, M. Alamgir (BD)*

Suitable treatment option for FSM in an emergency human settlement in Rohingya Camp at Cox's Bazar of Bangladesh

**16:30 - 17:00** Coffee break + Poster discussion

## **SESSION D2 / PANORAMA HALL 2 / 17:00-18:30**

### **WORKSHOP: EDUCATION IN WASTE MANAGEMENT AND GLOBAL ENVIRONMENTAL ISSUES**

*Chairs: Rainer Stegmann (DE), Giovanni De Feo (IT)*

In order to reach sustainability in all sectors of our life – including waste minimization, emission reduction and new ecological approaches in economics, agriculture and city planning – it needs the conviction, support and activities of people regardless of their profession.

In order to reach this goal, adequate education is essential starting from kids in Kindergarten followed by young people in Schools and Universities independent of the subjects they are studying.

In this workshop we will present ideas and examples and invite the audience for discussion and input.

# MONDAY OCTOBER 11

## AFTERNOON

### ACTIVE LAB O1 + O2

**FOYER CONGRESS CENTER / 15:00-18:30**

#### **SAMPLING OF GRANULAR WASTE**

*Chairs: Alberto Pivato, Giovanni Beggio (IT)*

Data reliability, considered in terms of uncertainty and variability, is determined by the analytical methods and the performed sampling procedures. The influence of this latter increases with highly heterogeneous materials characterized by the presence of trace, “rare” elements (both considered resources or contaminants), as occurring in the field of waste management. Nevertheless, the theoretical principles behind representative sampling are still not well understood in the waste community, which often underestimates its influence on the reliability of the resulting data and consequent decisions.

A practical experience will be organized where participants will explore the following topics:

- Definition of the concepts of representativeness and uncertainty related with sampling;
- calculation of the size of a waste laboratory sample;
- assessment of the granulometric and physical characteristics of the waste under investigation;
- production of composite samples collected from a real heap;
- design of a sampling plan;
- data reporting.



DAY 2 / TUESDAY  
OCTOBER 12

# TUESDAY OCTOBER 12

## MORNING

### SESSION A3 / CENTRAL HALL / 9:00-10:30

#### RESIDUES FROM THERMAL TREATMENT

*Chair: Giovanna Cappai (IT)*

*M. Šyc, J. Hykš, T. Baloch, J. Valentin, E. Korotenko, B. Zach (CZ)*

Perspectives of bottom ash utilization in the Czech Republic

*K. Kremser, H. Schoen, S. Thallner, S. Spieß, M. Haberbauer, J. Kucera, G.M. Guebitz (AT)*

Recovery of valuable metals from waste incineration residues by iron- and sulfuroxidizing bacteria

*E. Korotenko, M. Šyc, L. Grič, T. Baloch, P. Drápela (CZ)*

Resource recovery potential of calcium-based APCr from MSWI

*H. Muñoz Sierra, M. Šyc, B. Zach, E. Korotenko, A. Shtukurova (CZ)*

The influence of working parameters for the up-concentration of metal aluminum from the fine fraction of incineration bottom ash by wet shaker table

*S. Ge, D. Chen (CN)*

MSW pyrolysis volatile reforming over char catalyst under high-temperature CO<sub>2</sub> atmosphere

**10:30 - 11:00** Coffee break

### SESSION A4 / CENTRAL HALL / 11:00-12:30

#### ENVIRONMENTAL ISSUES IN THERMAL TREATMENT

*Chair: Roman Maletz (DE)*

*D. Panepinto, M.C. Zanetti (IT)*

An overview of msw thermal treatment and the analysis of the Turin incineration plant

*J. Fellner, T. Schwarzböck (AT)*

Performance impairment of Waste to Energy plants due to insufficient mixing of the waste feed

*H. Zhou, L. Hong, D. Chen (CN)*

Influence of none-SCR De-NOx technology on dioxin emissions in a full scale MSW incinerator

*H. de Chefdebien, C. Priault, C. Coste, P. Darde, S. Durecu (FR)*

Mercury behaviour, monitoring and treatment in Energy Recovery Facilities - SVDU's study, ESSEVA

*A. Serras-Malillos, A. Peña, E. Acha, A. Lopez-Uriónabarrenechea, P. Serras, B.B. Perez-Martinez, B.M. Caballero (ES)*

Chemicals reclamation from waste composites: experimental validation of a CFD model

## SESSION B3 / CENTRAL HALL 2 / 9:00-10:30

### WASTE COLLECTION & CHARACTERISATION FOR RECYCLING

Chair: *Andreas Bartl (AT)*

*A. Degli Esposti, C. Magrini, A. Bonoli, S. Cavani (IT)*

Door-to-door paper waste collection: a case study of cost and ergonomics optimisation

*T. Althoff, R. Holzhauer, S. Schmuck (DE)*

Using CO<sub>2</sub> balancing for evaluating the efficiency of systems for citizen-oriented waste collection compared to classical waste collecting systems

*A. Verstegen, M.J. Bouzrouiti, A. Hensen, G. Moreau, J. Jansen, L. Weemaels, J. Van Caneghem (BE)*

Quantification of the packaging share in household hazardous waste by direct sampling: case study and methodology

*A. Verstegen, E. De Bruyn, F. Soers, R. Van Renne, B. Vanaenroyde, J. Van Caneghem (BE)*

Characterization of street bin waste with a focus on packaging: case study in a regional city in Belgium

*Y. Wang, K. L. Thyberg, E. Hewitt, D. J. Tonjes (US)*

New York City residential wastes: changes in composition and management, 1990- 2017

*M. Sharkey, D. Drage, S. Harrad, M. Coggins, H. Berresheim (IE)*

Persistent organic chemicals of concern in fabrics and foams from childcare articles

**10:30 - 11:00** Coffee break

## SESSION B4 / CENTRAL HALL 2 / 11:00-12:30

### WASTE BIOREFINERY

Chairs: *Aldo Muntoni (IT), Luca Alibardi (UK)*

*A. Oumarou Amadou, M. Cera, G. P. De Gaudenzi, G. De Gioannis, G. Marcheselli, A. Muntoni, A. Serpe, S. Trudu (IT)*

Bio-derived acids for Co-recovery from hard metal waste by solvometallurgy

*R. Malesani, A. Schievano, A. Pivato (IT)*

Thermal energy recovery from biowaste and organic residues implementing thermocompost technology in decentralised areas

*F. Asunis, G. De Gioannis, G. Francini, L. Lombardi, A. Muntoni, A. Poletti, R. Pomi, A. Rossi, D. Spiga (IT)*

Evaluation of the environmental sustainability of biorefinery applied to cheese whey

*T.F. Astrup, P.F. Albizzati, S.A. Bassi, C. Lodato (DK)*

Are waste biorefineries sustainable? Lessons learned and recommendations provided

# TUESDAY OCTOBER 12

## MORNING

### SESSION C3 / PANORAMA HALL / 9:00-10:30

#### LANDFILL LEACHATE QUALITY & TREATMENT

*Chair: Timo Heimovaara (NL)*

*C. Simongini, M. Pucetaite, S. Serranti, M. van Praagh, E. Hammer, G. Bonifazi (IT)*

Microplastics identification in landfill leachates by different spectroscopic techniques

*B. Staley (US)*

PFAS leachate treatment breaking down the bond barrier

*V. Grossule, R. Cossu, M.C. Lavagnolo, R. Raga (IT)*

Preparation of MSW artificial leachate for treatment studies

*V. Grossule, D. Fang, R. Cossu, M.C. Lavagnolo (IT)*

Leachate treatment by BSF larvae: an innovative feeding

*I. Zekker, E. Rikmann, K. Ohimai, J. Oja, S. Anslan, L. Ali Shah, M. Zahoor, T. Tenno (EE)*

The selective salinity and hydrazine parameters for the start-up of non anammox-specific biomass

**10:30 - 11:00** Coffee break

### SESSION C4 / PANORAMA HALL / 11:00-12:30

#### LEACHATE EMISSIONS FROM LANDFILLS

*Chair: Valentina Grossule (IT)*

*L. Wang, J. Gebert, T.J. Heimovaara (NL)*

Estimation of landfill emission potential with particle filtering

*T.J. Heimovaara, L. Wang, J. Gebert (NL)*

Quantification of the variation in emission potential under natural meteorological conditions

*S. Harrad, D. Drage, M. Sharkey, H. Berresheim (IE)*

Furthering understanding of emissions from landfilled waste containing POP-BFRs and PFASs (the FUEL project)

*O. Hirata, R. Yanase, K. Kawase, M. Takaoka, T. Kusakabe, F. Takahashi (JP)*

Long-term mercury behavior in mercury waste by a simulated landfill lysimeter - Mass balance of mercury dissolution and diffusion with different landfilled pattern and waste type

*T.S. Bisht, D. Kumar, B.J. Alappat (IN)*

Estimation of contamination potential of landfill leachate using revised Leachate Pollution Index (r-LPI)

## SESSION D3 / PANORAMA HALL 2 / 9:00-10:30

### WORKSHOP: RAWFILL - MATERIAL RECOVERY BY LANDFILL MINING

*Chairs / Presidenti: Claudia Neculau, Laura Lamair (BE)*

The RAWFILL project (Acronym for "Supporting a new circular economy for RAW materials recovered from landFILLs") aims at facilitating the implementation and the development of the landfill mining project in Europe... *Full appetizer available on the website or app*

#### Introductory lectures:

*C. Neculau, L. Lamair - SPAQUE (BE): RAWFILL Project – Overview of the project findings*

*E. Wille, C. Isenborgs - OVAM (BE): Stepwise Decision making (data management, ranking, categorizing)*

*C. Neculau, L. Lamair - SPAQUE (BE): Presentation of HADESS, the innovative landfill content characterization methodology*

*L. Lamair et al. (BE): Cost-benefit analysis of HADESS characterization methodology (RAW-FILL project)*

*C. Neculau et al. (BE): The Landfill Miner guide - For profitable landfill mining projects and interim use options identification - RAWFILL Project*

*C. Neculau et al. (BE): Lessons learned and recommendations for launching landfill mining project (results of the RAWFILL project)*

**10:30 - 11:00** Coffee break

## SESSION D4 / PANORAMA HALL 2 / 11:00-12:30

### WORKSHOP: SOCIO-ECONOMIC AND ENVIRONMENTAL ASPECTS OF FOOD WASTE MANAGEMENT

*Chair: Silvia Scherhauer (AT)*

The evaluation of socio-economic and environmental benefits (or gains) and efforts of implementing innovations for food waste prevention and reduction is critical for taking informed decisions. However, evaluation methods often face challenges when implemented in practice (...) Challenges shall be identified and discussed along practical examples which are being implemented in current EU funded projects such as the Horizon 2020 project LOWINFOOD and other innovation actions funded under the same call. Participants from around the world are invited to join the workshop and to share their experiences to accumulate knowledge on the evaluation of food waste prevention activities.

*Full appetizer available on the website or app.*

#### Introductory lectures:

*C. Cicatiello (IT): Rationale and practical implementation of measures against food waste*

*K. Lasaridi (GR): Establishing food waste baselines: challenges and options*

*C. Giordano (IT): Evaluation of the efficacy*

*N. Koseoglu (GB): Evaluation of socio-economic impacts*

*S. Scherhauer (AT): Evaluation of environmental impacts*

# TUESDAY OCTOBER 12

## AFTERNOON

### SESSION A5 / CENTRAL HALL / 15:00-16:30

#### FOOD WASTE CHARACTERISATION

*Chair: Lidia Lombardi (IT)*

*K. Watanabe, T. Okayama, H. Yamakawa (JP)*

Household characteristics and food waste generation - Waste sorting analysis and questionnaire survey

*E. Nie, P. He, H. Zhang, L. Shao, F. Lü (CN)*

Fate of municipal biowaste during transportation: variation of physio-chemical characteristics and consequences on biomethane potential

*W. Peng, H. Zhang, F. Lü, P. He (CN)*

Conversion of food waste and its digestate to nitrogen self-doped char and methanerich syngas via autogenic pressure carbonization

*A. Happenhofer, P. Beigl, C. Zafiu, E. Binner, R. Ottner (AT)*

Analysing biogenic waste composition - a novel standard for food waste, polymer and impurity assessment in Austria

*C. Giordano, L. Falasconi, F. Alboni, N. G. di Fiore, E. Carloni (IT)*

Monitoring household food waste in Italy: a diary study over 500 families

**16:30 - 17:00** Coffee break + Poster discussion

### SESSION A6 / CENTRAL HALL / 17:00-18:30

#### FOOD WASTE MANAGEMENT

*Chair: Claudia Giordano (IT)*

*T. Okayama, K. Watanabe, H. Yamakawa (JP)*

Why do householders throw away edible food? - Results of a questionnaire survey in Tokyo

*C. Li, L. Hao, F. Lü, L. Shao, P. He, H. Zhang (CN)*

Microbial community composition and key drivers in full-scale food waste anaerobic digesters

*B. Bello (MX)*

Environmental concern and food waste management: a case study on food waste in restaurants from Nuevo Leon, Mexico

*P.F. Albizzati, D. Tonini, T.F. Astrup (DK)*

Sustainability assessment of the food waste hierarchy: A European case study

## **SESSION B5 / CENTRAL HALL 2 / 15:00-16:30**

### **STRATEGIES & CASES IN WEEE MANAGEMENT**

*Chair: Giuseppe Bonifazi (IT)*

*T. Nigl, R. Pomberger (AT)*

Fire-hazardous waste materials – Risk analysis and assessment of portable and lithium-ion batteries in waste management systems

*M. Osmani, J. Pollard, J. Forde, C. Cole, S. Grubnic, J. Horne, P. Leroy (GB)*

Circular economy business model opportunities, challenges, and enablers in the electrical and electronic equipment sector: stakeholders' perspectives

*M. Pamperl, G. Obersteiner, E. Schmied (AT)*

Hibernation of disused electrical and electronic equipment in Austrian households – Analysis of motives for storage and potential for reuse

*P. Gonçalves (BR)*

Recycling of waste printed circuit boards: non-destructive characterization and mechanical processing operations

**16:30 - 17:00** Coffee break + Poster discussion

## **SESSION B6 / CENTRAL HALL 2 / 17:00-18:30**

### **CIRCULARITY IN WASTE ARCHITECTURE**

*Chair: Andreas Gassner (AT)*

*L. Pellegrini, L.C. Tagliabue, E. Seghezzi, G.M. Di Giuda (IT)*

Digital and green public procurement for construction and demolition waste management

*E. Labrozzi, S. Puleio (IT)*

Re-tile: an innovative infrastructure for the circular management of façade cladding materials

*A. Gassner, J. Lederer, J. Fellner (AT)*

The impact of urban traffic planning and thus implied modal choice and motorization rate on future resource consumption and construction and demolition waste generation

# TUESDAY OCTOBER 12

## AFTERNOON

### SESSION C5 / PANORAMA HALL / 15:00-16:30

#### LANDFILL GAS QUALITY & MANAGEMENT

*Chair: Alexandre Cabral (CA)*

*Z. Duan, P. Kjeldsen, C. Scheutz (DK)*

Trace gas composition in LFG at Danish landfills receiving low-organic waste

*C. Scheutz, Z. Duan, P. Kjeldsen (DK)*

Efficiencies of gas collection systems at Danish landfills

*G. M. Samim, L. Khaled, M. Marin-Gallego, M. Tazerout (FR)*

Pre-feasibility study of synthetic methane production via power-to-gas integration into landfill biogas

**16:30 - 17:00** Coffee break + Poster discussion

### SESSION C6 / PANORAMA HALL / 17:00-18:30

#### GAS EMISSIONS FROM LANDFILLS

*Chair: Marion Huber-Humer (AT)*

*B. Lotesoriere, C. Bax, L. Capelli (IT)*

Implementation of a "smart" multi-sensor system with variable thresholds for the continuous monitoring of emissions from a landfill

*A. Fraser-McDonald, C. Boardman, T. Gladding, S. Burnley, V. Gauci (GB)*

Greenhouse gas emissions from trees planted on closed landfill sites

*B.R. Nelson, R.G. Zytner, Z.L. Kanmacher, A. Yochim, R. Vaillancourt, B. Boss, Y. Dulac, A.R. Cabral (CA)*

Mitigating fugitive methane emissions from closed landfills: a pilot-scale field study

*K. Kissas, A. Ibrom, P. Kjeldsen, C. Scheutz (DK)*

Methane emission dynamics from an old Danish landfill

## SESSION D5 / PANORAMA HALL 2 / 15:00-16:30

### WORKSHOP: X-RAY FLUORESCENCE FOR RAPID WASTE CHARACTERISATION

*Chair: Florian Part (AT)*

This workshop provides an introduction to handheld/portable X-ray fluorescence (PXRF) instruments as a rapid and easy-to-handle tool for solid waste characterisation. PXRF allows determining the elemental composition of large sample sizes (in-situ) without any further sample preparation steps. In this way, PXRF systems can be used to monitor diverse and heterogeneous waste streams to be able to make quick decisions on their further treatment. For example, it can be decided – also on-site – within a few minutes, if the material is suitable for recycling in case it contains valuable components, or if the material has to undergo a specific treatment before disposal in case it contains hazardous substances. PXRF allows an on-site sample analysis, whereas conventional analytical instruments are located in laboratories, which means relatively few samples have to be transferred to a laboratory and need to be prepared prior to being analysed, for instance, via ICP-OES or GC-MS. This process is time-consuming and days pass before the results are available to make a final decision on how to adequately handle different materials. Using the example of sewage sludge ashes, our PXRF results showed acceptable accuracy for the elements Ca, Cu, Fe, P, Pb, Sn and Zn, while the results for other elements, such as Cr, K and Mg, showed larger deviations from ICP-OES data (...). In summary, PXRF is a promising method to be used on-site for screening waste streams to quickly detect both valuable substances or contaminants, such as Cu or Br. The scope of this workshop is to provide a short introduction to the basics of PXRF and information on limitations and analytical parameters regarding the accuracy of measured concentrations (...). Finally, a group discussion in form of a “world café” closes the workshop to allow an exchange of experiences between the groups and to specify the needs and challenges in using PXRF technology. *Full appetizer available on the website or app*

#### Introductory lectures:

*F. Part (AT): Workshop introduction*

*C. Zafiu (AT): Principles, limitations and available PXRF devices*

*S. Neubauer (AT): Application study on sewage sludge ashes*

*A. Jandric (AT): Application study on plastics*

**16:30 - 17:00** Coffee break + Poster discussion

## SESSION D6 / PANORAMA HALL 2 / 17:00-18:30

### WORKSHOP: LANDFILL AND OTHER ENVIRONMENTAL SITES MONITORING VIA EARTH OBSERVATION SATELLITE DATA

*Chairs / Presidenti: Yuri Ponzani, Donata Magrin (UK)*

Landfill gas emissions and leachate leaks at landfills – as well as at other environmental sites (ie Brownfields) - can give rise to regulatory and third-party liabilities for permit holders, landowners, and other potentially responsible parties if human health, properties, or

# TUESDAY OCTOBER 12

## AFTERNOON

the environment are damaged, along with business interruption and reputation. Extensive sources of information are available to assist landfill operators and other stakeholders, but they often provide a snapshot impression of risk at one moment of time, and more frequent in situ assessment and monitoring can be very expensive. The main purpose of the workshop is to present to landfill operators, public authorities, but also to the scientific community how space-based remote sensing data (Earth Observation satellite data) can be used for monitoring within and nearby landfill sites to spot changes that could be linked to gaseous (methane) and liquid (leachate) emissions. Space-based information and data gathered can help detect and monitor emissions from landfill sites in order to better manage their risks. The collected data can also enable the data users to verify the environmental conditions and monitor their dynamics over time. Participants are invited to join the workshop to share opinions, identify challenges and feedback gathering. Introductory lectures:

### Introductory lectures:

*Y. Ponzani (GB)*

Workshop introduction

*H. Boesch (GB)*

CH<sub>4</sub> model - Detecting occasional methane emissions from landfills with space-borne sensors (Madrid Landfill)

*M. Perry (GB)*

LST in Brownfields/Landfills - Detecting global land surface temperature data for climate science

*D. Magrin (GB)*

Methodological robustness and results of few pilot tests

DAY 3 / WEDNESDAY  
OCTOBER 13

# WEDNESDAY OCTOBER 13

## MORNING

### SESSION A7 / CENTRAL HALL / 9:00-10:30

#### TOOLS FOR SUSTAINABLE LANDFILLING

*Chair: Raffaello Cossu (IT)*

*Q. Luo, V. Grossule, M.C. Lavagnolo (IT)*

Washing of residual waste in the framework of the sustainable landfill

*M. Ritzkowski (DE)*

Landfill aeration - An important contribution towards landfill sustainability

*H. Lammen, C.R. Cruz Osorio, H. Scharff, R.N.J. Comans (NL)*

Sustainable landfill management: leachate development in two aerated landfills

*C.R. Cruz Osorio, H. Lammen, H. Oonk (NL)*

Sustainable landfill management: carbon removal in two aerated landfills

*F. van Raffe, R. Jin, H. Lammen, J.J. Dijkstra, R.N.J. Comans (NL)*

Sustainable landfill management in the Netherlands: application of geochemical modelling to characterise solid waste prior to (an)aerobic stabilization

**10:30 - 11:00** Coffee break

### SESSION A8 / CENTRAL HALL / 11:00-12:30

#### EFFECTS OF AERATION ON LANDFILL EMISSIONS

*Chair: Marco Ritzkowski (DE)*

*M. Nag, T. Shimaoka, T. Komiya (JP)*

Effect of aeration mode and leachate recirculation scheme on MSW stabilization and nitrous oxide production in aerobic and aerobic-anaerobic landfill method

*N. Meza, H. Lammen, C. Cruz, T.J. Heimovaara, J. Gebert (NL)*

Spatial variability of gas composition in landfill under *in situ* aeration

*J. Gebert, T. de Jong, T. Rees-White, R. Beaven, H. Lammen (NL)*

Spatial variability of leachate tables, leachate composition and hydraulic conductivity in a landfill stabilized by *in situ* aeration

*N. Fricko, C. Brandstätter, J. Fellner (AT)*

Carbon and nitrogen metabolism in aerobic, anaerobic-aerobic and anaerobic landfills

## **SESSION B7 / CENTRAL HALL 2 / 9:00-10:30**

### **MANAGEMENT OF CONSTRUCTION AND DEMOLITION WASTE**

*Chair: Giulia Costa (IT)*

*J. Lederer, A. Gassner, F. Kleemann, J. Fellner (AT)*

*Circular economy of mineral construction materials and demolition waste: a case study from Vienna*

*A. Yu, I. Wong, K. Mok (HK)*

*Strategies for minimizing and managing refurbishment and renovation waste*

*G. Bonifazi, G. Capobianco, S. Serranti, S. Malinconico, F. Paglietti (IT)*

*Asbestos detection in construction and demolition waste adopting different classification approaches based on short wave infrared hyperspectral imaging*

*M. Castro-Díaz, M. Osmani, S. Cavalaro, P. Needham, J. Thompson, S. Elliott, B. Parker, T. Lovato, D. Jalland (GB)*

*A methodologic approach based on hydrocyclone separation and acid leaching to purify gypsum from refurbishment plasterboard waste*

*N. Han Hoang, T. Ishigaki, T. Watari M. Yamada, K. Kawamoto (JP)*

*Building demolition in Vietnam: current state and possibility for selective dismantling*

**10:30 - 11:00** Coffee break

## **SESSION B8 / CENTRAL HALL 2 / 11:00-12:30**

### **RECYCLING OF WASTE IN BUILDING MATERIALS**

*Chair: Jakob Lederer (AT)*

*S.A. Viczek, A. Aldrian, R. Pomberger, R. Sarc (AT)*

*Recycling of waste materials in the cement industry and implications for its role in a circular economy*

*A. Ešťokova, R. Figmig, N. Galanova (SK)*

*Waste incorporation in building materials to improve their performance under acid rain attack*

*N. Stevulova, J. Junak, J. Strigac, E. Terpakova (SK)*

*Mechanical properties of hydraulic road binder using ground granulated blast furnace slag and additional component of cement bypass dust*

*D. Blasenbauer, J. Fellner, S. Skutan, J. Lederer (AT)*

*Wet treatment of construction and demolition waste in industrial scale – Analysis of an innovative recovery facility*

# WEDNESDAY OCTOBER 13

## MORNING

### SESSION C7 / PANORAMA HALL / 9:00-10:30

#### ANAEROBIC DIGESTION STRATEGIES

*Chair: Aldo Muntoni (IT)*

*M.K. Manu, J.W.C. Wong (HK)*

Anaerobic digestate management: challenges and opportunities

*L. Laguillaumie, Y. Raftafi, E. Paul, E. Mengelle, S. Dubos, M. Bounouba, D. Delagnes C. Dumas (FR)*

Orientation of biogas recovery towards the production of methane or organic acids in anaerobic mixed cultures

*M. Mainardis, F. Magnolo, C. Ferrara C. Vance. G. Misson , G. De Feo, D. Goi (IT)*

Resource and energy recovery from seagrass: a life cycle-assessment approach

*N. Leno, A.S.Ajayan, K.C.M. Thampatti (IN)*

Carbon recalcitrance of a rapid thermochemical digestate fertilizer from degradable solid waste for climate change mitigation in the tropics

**10:30 - 11:00** Coffee break

### SESSION C8 / PANORAMA HALL / 11:00-12:30

#### ANAEROBIC DIGESTION: PROCESSES AND TECHNOLOGY

*Chair: Giovanni de Feo (IT)*

*A. Ezieke, A. Serrano-Moral, W. Clarke, D. Villa-Gomez (AU)*

Effect of Feeding Mode on Anaerobic Digestion of Fruit Waste

*L. Digan, E. Mengelle, S. Dubos, M. Bounouba, C. Pagès, G. Santa-Catalina, E. Trably, H. Roux de Balmann, S. Galier, E. Paul, C. Dumas (FR)*

Influence of exogenous inoculation on acidogenic fermentation of the solid waste in various pH conditions

*L. Luo, Y. Xu, J.W.C. Wong (CN)*

Exogenous additives for regulation of acidogenic fermentation of food waste in a two-phase anaerobic digestion system

*A. Randazzo, A. Folino, F. Tatàno, F. Tassi, S. de Rosa, A. Gambioli (IT)*

Volatile organic compounds (VOCs) from green waste anaerobic digestion: degradation proceeding and sources assessment

## **SESSION D7 / PANORAMA HALL 2 / 9:00-10:30**

### **WORKSHOP: SORTING PROCESSES IN WASTE MANAGEMENT**

*Chair: Giuseppe Bonifazi (IT)*

#### **Introductory lectures:**

*K. Friedrich, G. Koinig, R. Pomberger, D. Vollprecht (AT)*

Statistical modelling of sensor-based sorting processes

*L. Kandlbauer, M. Enengel, R. Pomberger, R. Sarc (AT)*

Statistical simulation tool for sorting processes in waste management

*V. Poli, G. De Togni, M.C. Lavagnolo (IT)*

Characterisation of separate collection fractions in view of materials sorting

**10:30 - 11:00** Coffee break

## **SESSION D8 / PANORAMA HALL 2 / 11:00-12:30**

### **WORKSHOP: BIOPLASTICS IN WASTE MANAGEMENT: SOLUTION OR NEW PROBLEM**

*Chair: Christian Zafiu (AT)*

This workshop will address the topics covering i) an overview on plastic pollution in the environment – especially in and along rivers and the relative contribution of bioplastic. ii) A comprehensive introduction into bioplastics and present main features of the test procedures that are used to investigate the content of biogenic carbon and the properties of degradability. iii) We will report on own results from laboratory-based investigations and field tests on degradability of different materials (e.g. plastic bags for collection of bio-wastes). iv) We will report and discuss the influence of micro- and bioplastics on soil physics and organisms. v) Based on the presented topics, we'll organize discussion groups to exchange opinions and experience with plastic pollution and bioplastics.

#### **Introductory lectures:**

*G. Obersteiner (AT)*

Littering - (Bio)Plastics in the environment

*E. Binner (AT)*

Definition of bioplastics, test proceedings for testing biodegradability, do we like biodegradable plastics in composting plants

*C. Zafiu (AT)*

Laboratory and field studies on biodegradability of bioplastics

*C. Zafiu (AT)*

Influence of microplastics on the soil and soil organisms

# WEDNESDAY OCTOBER 13

## AFTERNOON

### SESSION A9 / CENTRAL HALL / 15:00-16:30

#### BIOENERGY FROM WASTE AND BIOMASS

*Chair: Giovanni Beggio (IT)*

*E. Rossi, I. Pecorini, R. Iannelli (IT)*

Multilinear regression model for biogas production prediction from dry anaerobic digestion of OFMSW

*M. Muradin, J. Kulczycka, G. de Clercq, R. Verhe (PL)*

Enzymatic conversion of organic municipal solid waste into biofuels: environmental impact of BioRen project

*A. Folino, A. Randazzo, F. Tassi, F. Tatàno, S. de Rosa, A. Gambioli (IT)*

Lab-scale evaluation of bioenergy from green waste through anaerobic digestion: substrate, biogas, and digestate characterisation

*A. Dell'Era, M. Pasquali, A. Polettini, R. Pomi, A. Rossi, T. Zonfa (IT)*

Insight into the integration of dark fermentation with electrochemical methods for H<sub>2</sub> and electricity production

**16:30 - 17:00** Coffee break + Poster discussion

### SESSION A10 / CENTRAL HALL / 17:00-18:30

#### STRATEGIES FOR PLASTICS RECYCLING

*Chair: Giovanni De Feo (IT)*

*M. Lisiecki, A. Damgaard, T. F. Astrup (DK)*

Plastic circularity: Systematic evaluation of circular economy initiatives

*M. Klotz, M. Haupt, S. Hellweg (CH)*

Are we designing plastic recycling systems that allow for primary material substitution?

*A. Damgaard, M.K. Eriksen, C. Lodato, A.E. Daugaard, T.F. Astrup (DK)*

Chemical versus mechanical recycling of plastics – What is a fair comparison?

*F. Ardolino, U. Arena (IT)*

Alternative treatments for challenging waste plastics: environmental performances in a life cycle perspective

## **SESSION B9 / CENTRAL HALL 2 / 15:00-16:30**

### **CHARACTERISATION OF PLASTICS**

*Chair: Giuseppe Bonifazi (IT)*

*H. Wiesinger, M. Klotz, Z. Wang, S. Hellweg (CH)*

A comprehensive overview of plastic monomers, additives and processing aids

*G. Bonifazi, G. Capobianco, P. Cucuzza, S. Serranti, A. Uzzo (IT)*

Recycling-oriented characterization of PET waste stream by SWIR hyperspectral imaging and variable selection methods

*S. Harrad, D. Drage, M. Abdallah, M. Sharkey, H. Berresheim (GB)*

XRF screening of plastic waste for compliance with low POP concentration limits in Ireland

*M. Sharkey, D. Drage, S. Harrad, M. Coggins, H. Berresheim (IE)*

Further development of XRF screening methodologies for the quantification of bromine- and phosphorous-based flame retardants in plastic waste

*N. Mhaddolkar, G. Koinig, D. Vollprecht (AT)*

Analysing suitability of existing NIR sorting technology for capturing recyclable bioplastics

**16:30 - 17:00** Coffee break + Poster discussion

## **SESSION B10 / CENTRAL HALL 2 / 17:00-18:30**

### **HEALTHCARE WASTE DURING COVID-19 PANDEMIC**

*Chair: Evangelos Gidaracos (GR)*

*N. Fraeyman, E. Van Braeckel, B. Verhasselt, P. De Waegemaeker, S. Mahnik, M. Hoffmann, P. Gemmel, K. Eeckloo, E. Mortier (BE)*

Solid medical waste in times of corona: increased volume but no increased biohazard risk

*K. Brugger (AT)*

Hospital waste: a detachable worldwide problem - waste management concepts for more safety and life quality using the example of Laos in South-East Asia

*V. Spadi, M. Boccarossa, A. Folino, L. Lombardi, F. Tatàno, P. Sirini (IT)*

Environmental assessment of different residual municipal waste managements in the Marche Region (Central Italy) before and during the COVID19 pandemic

*M. Castellote, E. Jiménez-Relinque, M. Grande, F.J. Rubiano, A. Castillo (ES)*

Getting rid of face mask wastes: circular economy in pandemic times by adding them to cementitious materials

# WEDNESDAY OCTOBER 13

## AFTERNOON

### SESSION C9 / PANORAMA HALL / 15:30-17:10

#### LANDFILL COVER SYSTEMS

*Chair: Charlotte Scheutz (DK)*

*M. Zarotti, S. Guglielmi, V. Tagarelli (IT)*

A novel green technology for a safe and eco-friendly long-term slope landfill aftercare

*K. Berger, V. Dunger (DE)*

Water balance of landfill cover systems under the impact of predicted climate change

*F. Tassi, A. Randazzo, B. Raco, P. G. Bicocchi, De Pascale, S. Venturi (IT)*

Flux measurements of volatile organic compounds (VOCs) from cover soils in municipal waste landfills: theoretical vs. empirical approaches

*T. Kahale, O. Ouedraogo, L. Des Alliers, J. Roger, A.R. Cabral (CA)*

Impact of contaminated soils used as final cover material

*M. Zhu, R. Joshi, G. Dortland (NL)*

Improving ESG at landfill sites by means of closing with engineered turf capping technology

**16:30 - 17:00** Coffee break + Poster discussion

### SESSION C10 / PANORAMA HALL / 17:00-18:30

#### METHANE OXIDATION

*Chair: Julia Gebert (NL)*

*Y. Dulac, B.R. Nelson, R.G. Zytner, A. Yochim, R. Vaillancourt, B. Boss, A.R. Cabral (CA)*

Determination of a critical design parameter for a passive methane oxidation biosystem

*S. Yi, A. Heijbroek, J. Gebert (NL)*

The effects of biochar on physical properties and methane oxidation capacity of cover soils from two Dutch landfills

*R. Gregory, K O'Regan (GB)*

Adapting the biowindow approach for two landfills in the aftercare phase

*Z. Duan, P.O.R. Hansen, C. Scheutz, P. Kjeldsen (DK)*

Mitigation of methane and trace gases through a large-scale biofilter system at Glatved landfill, Denmark

## **SESSION D9 / PANORAMA HALL 2 / 15:30-17:10**

### **WORKSHOP: MANAGEMENT OF C&D WASTE**

*Chairs: Oumaya Marzouk (FR), Issam Srour (LB), Gaetano Di Mino (IT)*

In developed countries, there is a growing interest and understanding of the social, environmental, and economic impact of C&D waste management. This is leading to a growth in the recycling market alleviating the pressure on landfills. In contrast, developing & lower-income countries (DLIC) fall behind in terms of recycling and, generally, in implementing effective C&D waste management practices. Large amounts of waste are sent to landfills and, in some countries, even larger amounts are dumped illegally in environmentally sensitive areas (e.g., riverbeds, hillsides). As the management of C&D waste is a multidimensional issue that incorporates political, institutional, social, environmental, and economic aspects, practitioners and researchers in DLICs should focus on these different aspects to design and implement a sustainable management system. Therefore, the objective of the first part of this workshop is to discuss and share findings on: Good C&D waste management practices and feedback / Political instrument / C&D supply chain and logistics / Economic aspects / Sustainable development approach / Adapted technological transfer / C&D waste management standards and tools. The C&D waste, considered as a resource for road construction, is the second issue of this workshop. The valorization of these secondary materials strictly depends on the demand of stakeholders such as companies and road authorities for new infrastructures and for the maintenance of existing ones. Therefore, with the aim of implementing circular economic models in the road construction sector, it is needed to know the potential market of this material within the road construction sector of DLICs. The goals of the second part are: The relation supply demand of aggregates in road construction / The production of C&D waste over historical series / The expected production of C&D waste over the next 5 years / Boundaries and limits for recycling of C&D waste in road construction sector.

**16:30 - 17:00** Coffee break + Poster discussion

## **SESSION D10 / PANORAMA HALL 2 / 17:00-18:30**

### **WORKSHOP: HYDROTHERMAL TREATMENT**

*Chair: Anders Lagerkvist (SE)*

HTT has a great potential for treatment of organic wastes: Why is it not used more often? Different aspects of this issue will be discussed by a panel of researchers.

# WEDNESDAY OCTOBER 13

## AFTERNOON

### ACTIVE LAB 03+ 04

**FOYER CONGRESS CENTER / 15:00-18:30**

#### **DIRECT TEST METHODS FOR HAZARDOUS WASTE CLASSIFICATION**

*Organised by: LabAnalysis (IT)*

*Managed by: Lorenzo Maggi and Erica Tediosi, LabAnalysis (IT)*

*Supported by: Giovanni Beggio, University of Padova (IT)*

##### Aquatic ecotoxicity

- What an ecotoxicological test is
- Preparation of test solutions (dissolution of wastes in water)
- Fish acute toxicity test: selection of fish, fish exposure, toxicity determination
- Daphnia magna acute toxicity test: description of Daphnia magna, Daphnia exposure, toxicity determination
- Algal growth inhibition test: algae characteristics, algal exposure and growth, determination of growth inhibition
- Daphnia magna reproduction test: description of the test, determination of reproduction and inhibition evaluation

##### In vitro toxicology

- What an in vitro test is
- Dermal irritation and dermal corrosion: description of tissues, exposure and determination of toxicity



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DAY 4 / THURSDAY  
OCTOBER 14

# THURSDAY OCTOBER 14

## MORNING

### SESSION A11 / CENTRAL HALL / 9:00-10:30

#### OCCURRENCE OF MICRO- AND MACRO-PLASTICS IN THE ENVIRONMENT

*Chair: Margherita Ferrante (IT)*

*J. Mayerhofer, G. Obersteiner, S. Lenz (AT)*

Macro-plastic sources, types and flows in the Danube river

*A. Marrone, M.F. La Russa, L. Randazzo, D. La Russa, E. Cellini, D. Pellegrino (IT)*

Microplastics distribution in the center of Mediterranean and evaluation of local "hot spots"

*S. Lenz, J. Mayerhofer G. Obersteiner (AT)*

Evaluation and assessment of different microplastic measurement methods in Danube river basin

*T. Mani, T. Gutsa, M. Khan, L. Lebreton, C. Trois (ZA)*

CAPTURE – Climate Change Adaptation amid Plastic Waste Transport in the Umgeni River Environment

*T. Schwarzboeck, S. Spacek, H. Rechberger (AT)*

Monitoring the mass of microplastics using a simple thermoanalytical method

*M. Ferrante (IT)*

Environmental pollution by unmanaged plastic wastes and effects on food web and human health

**10:30 - 11:00** Coffee break

### SESSION A12 / CENTRAL HALL / 11:00-12:30

#### POST-USE BEHAVIOUR OF PLASTICS

*Chair: Claire Dumas (FR)*

*S. Serranti, L. Fiore, G. Bonifazi, R. Horimoto, H. Takeuchi, S. Kashiwada (IT)*

Characterization of plastic litter along sandy beaches by hyperspectral imaging coupled with chemometrics

*A. Białowiec, P. Żak (PL)*

Biodegradability of bioplastics under anaerobic conditions: biogas production kinetics

*G. De Gioannis, M. Falzarano, A. Muntoni, A. Polettini, R. Pomi, A. Rossi, D. Spiga (IT)*

Anaerobic digestion of biodegradable plastics: analysis in terms of process conditions and overall performance

*T. Vasconcelos, B. Silva, C.A. Bernardo (PT)*

Comparing the environmental performance of plastic (PET) and glass water bottles using the Life Cycle Assessment methodology

## **SESSION B11 / CENTRAL HALL 2 / 9:00-10:30**

### **MINIMISATION & RECYCLING OF FOOD WASTE PACKAGING**

*Chair: Anna Happenhofer (AT)*

*R. Stefanini, G. Vignali (IT)*

Innovation in food polymeric packaging recycling: a comparative assessment of recent alternatives

*G. Obersteiner, M. Cociancig, S. Luck, J. Mayerhofer (AT)*

Impact of optimised packaging on the food waste prevention potential at consumer level

*G. Borghesi, A. Ronzano, R. Stefanini, G. Vignali (IT)*

High Pressure Processing: a solution to reduce the food waste. A Life Cycle Assessment study

*E. Schmied, S. Lenz, M. Pamperl, G. Obersteiner (AT)*

What happens to empty beverage cans in five European countries?

**10:30 - 11:00** Coffee break

## **SESSION B12 / CENTRAL HALL 2 / 11:00-12:30**

### **USEFUL APPLICATION OF DIFFERENT REDISUAL MATERIALS**

*Chair: Sabine Dworak (AT)*

*N. Sutthasil, H. Ishimori, T. Ishigaki, M. Yamada (JP)*

The determination of adhesive properties of the organic waste

*K. Opwis, T. Mayer-Gall, J.S. Gutmann (DE)*

Functional textiles for the adsorption, enrichment and recovery of resources and pollutants

*H. Kitamura, T. Ishigaki, H. Ishimori, M. Yamada (JP)*

Metal immobilization behaviour of microbially induced carbonate precipitation by ureolytic bacteria isolated from waste landfill

*S. Zueva, I. Pugacheva, I. De Michelis, N.M. Ippolito, F. Vegliò (RU)*

Recycling of aluminum-containing waste and its reuse in wastewater treatment

# THURSDAY OCTOBER 14 MORNING

## **SESSION C11 / PANORAMA HALL / 9:00-10:30**

### **GEOTECHNICAL ISSUES IN LANDFILLING**

*Chair: Daniele Cazzuffi (IT)*

*D. Cazzuffi, P. Recalcati, L.S. Calvarano, S. Marelli (IT)*

A review of direct shear and inclined plane tests results for different interfaces in landfill capping

*L. Kurta, N. Kaniski, N. Hrnčić, I. Petrovic, B. Kavur, E. Serdarevic, R. Savi (HR)*

Shear strength of biodried municipal solid waste

*Q. Napoleoni, M. Ramundo (IT)*

Study of the mechanical behaviour of Municipal Solid Waste using Triaxial tests

*N. Kaniski, B. Gavez, N. Hrnčić, I. Petrovic (HR)*

Basic geotechnical parameters of biodried waste from winter and summer period

*H. Mulleneers, D. Zegers (NL)*

New developments in research and installation techniques of Trisoplast, the innovative polymer-enhanced mineral barrier

**10:30 - 11:00** Coffee break

## **SESSION C12 / PANORAMA HALL / 11:00-12:30**

### **HYDRAULIC ISSUES IN LANDFILLING**

*Chair: Klaus Berger (DE)*

*K. Ishii, M. Sato, S. Ochiai (JP)*

Prediction of leachate generation from a landfill site using the long short-term memory model

*K. Berger (DE)*

On the new Hydrologic Evaluation of Landfill Performance (HELP) model version 4 for the water balance simulation of landfill cover systems

*Z. Ren, J. Chavez Olalla, L. Wang, S. Kedzia Kowalska, T. Kanen, T.J. Heimovaara (NL)*

Visualizing distribution of water in a landfill using electrical resistivity tomography

*S. Schmuck, M. Seyedpour, R. Widmann, T. Ricken (DE)*

depSIM: numerical 3D simulation of water flows in the landfill body and in the transition area to the grown soil

## **SESSION D11 / PANORAMA HALL 2 / 9:00-10:40**

### **WORKSHOP: IMPLEMENTATION OF CIRCULAR ECONOMY IN CONSTRUCTION**

*Chair: Mohamed Osmani (UK)*

The construction industry plays a leading role in improving the quality of the built environment, but its activities also impact on the wider environment in several ways, including waste production. For example, Construction and demolition activities in the European Union are responsible for generating 850 million tons of construction and demolition waste (CDW) per year, accounting for 35% of the total waste generation. Diverting CDW from landfill has a global political profile today unrivalled in recent historical times. Indeed, the last two decades saw a combined plethora of global, European and national waste related legislation, policies, strategies and guidance documents to curb CDW production and increase recycling rates. Similarly, an everincreasing international research on CDW has been conducted ranging from 'soft' mapping and management, and reduction tools and methodologies to 'hard' treatment and recycling technologies. (...). What are the barriers that impede circularity uptake in construction? What are the enablers and incentives that could drive circular economy implementation in construction? As such, the workshop will identify and appraise circular economy systematic enablers in construction and highlight examples of circularity methods, tools, and case studies from research and industry projects. *Full appetizer available on the website or app*

**10:30 - 11:00** Coffee break

## **SESSION D12 / PANORAMA HALL 2 / 11:00-12:30**

### **WORKSHOP: DATA MANAGEMENT AND DIGITALIZATION OF LANDFILLS**

*Chairs: Nicolas Marino Proietti (IS), Alessandro Sarno (SE)*

#### **Agenda:**

- Presentation of different type of data for a landfill site (type of acquisition, methods, etc.) by Nicolas Proietti from ReSource International ehf., Senior consultant
- Workshop session: in groups participants will define the type of data they can think of related to landfills, what are the data used for, how is it reported:
  - List up all data available according to you on a landfill
  - Determine data types and regroup your items into each type
  - Stakeholder analysis – which groups are linked to what data?
  - Results gathering from different groups and conclusions
- Digitalization of landfill: presentation on data acquisition and digitalization (UAV, modelling, databases, BIG DATA, etc.) by Nicolas Proietti from ReSource International ehf., Senior consultant
- Workshop session in groups: Digitalization implemented on landfills
  - Define the steps in digitalization of landfills;
  - What problems are stopping landfill to go into a digital form?
  - Results gathering from different groups and conclusions

# THURSDAY OCTOBER 14

## AFTERNOON

### SESSION A13 / CENTRAL HALL / 15:00-16:30

#### CARBON CAPTURE IN THERMAL TREATMENT PLANTS

*Chair: Giulia Costa (IT)*

*V. Bisinella, T. Hulgaard, C. Riber, A. Damgaard, T.H. Christensen (DK)*

Introducing carbon capture and storage (CCS) in waste incineration

*B. Zach, M. Šyc, P. Izák (CZ)*

Limitations of membrane separation of CO<sub>2</sub> at a waste-to-energy plant based on experimental investigation

*T.H. Christensen, V. Bisinella (DK)*

Scenarios for introduction of carbon capture and utilization (CCU) in waste incineration

*I. Fonts, M. Abián, N. Gil-Lalaguna, J. Ábrego, J.-L. Sánchez, H.-H. Carstensen (ES)*

Investigation of the CO<sub>2</sub> adsorption capacity of chars produced by pyrolysis of macrocomponents of digested manure and their blends

**16:30 - 17:00** Coffee break + Poster discussion

### SESSION A14 / CENTRAL HALL / 17:00-18:30

#### CLIMATE CHANGE AND WASTE MANAGEMENT

*Chair: Thomas Christensen (DK)*

*S. Scherhauser, G. Obersteiner (AT)*

Food waste and its impacts on climate change

*A.M. Fredenslund, E. Gudmundsson, J.M. Falk, C. Scheutz (DK)*

Danish national effort to minimise methane emission from biogas plants – Lessons learned

*M. van Praagh (SE)*

Municipal Solid Wastes' untapped energy and GHG saving potential – A closer look at the Scania region, Sweden

*C. Wünsch, A. Tsybina (DE)*

Climate change mitigation potential of the Russian municipal solid waste sector

*L. Landen, A. Grochowska (SE)*

Biochar from garden waste – A local carbon negative circular loop

## **SESSION B13 / CENTRAL HALL 2 / 15:00-16:30**

### **RECYCLING OF TEXTILE WASTE**

*Chair: Charlotte Scheuz (DK)*

*A. Bartl, W. Ipsmiller (AT)*

Textile waste: Where is the journey heading?

*A. Shtukaturova, M. Šyc, B. Zach, M. Pavlas, R. Šomplák (CZ)*

Textile waste streams: A case study of the Czech Republic

*W. Ipsmiller, A. Bartl (AT)*

Textile waste: An inventory of available and emerging recycling technologies

*P. Kählig, W. Ipsmiller, A. Bartl (AT)*

Investigating possibilities for the recycling of PET / cellulose mixed textile waste

**16:30 - 17:00** Coffee break + Poster discussion

## **SESSION B14 / CENTRAL HALL 2 / 17:40-19:20**

### **RECYCLING OF INDUSTRIAL WASTE**

*Chair: Jurate Kumpiene (SE)*

*S. Dworak, J. Fellner (AT)*

Potential and challenges of steel scrap recycling – A detailed analysis of the European scrap arisings and its quality

*E. Appleby, P.J. Shaw (UK)*

Packaging and residue wastes in the cosmetics sector: the case of nail varnish

*S. Kalambura, S. Paixo, J. Santos, M. Girao, S. Pedro (HR)*

Green optics – Educational and sustainable development project

*G. Costa, F. Marafioti, L. Acampora, A. Falsetti, I. Verginelli, F. Lombardi, C. Mensi (IT)*

Analysis of the leaching behaviour of mineral fractions from waste incineration bottom ash treatment in view of utilization

*G. Costa, F. Lombardi, L. Maggi, C. Mensi, S. Messinetti, E. Tediosi, I. Verginelli (IT)*

A risk-based methodology for evaluating the utilisation potential of mineral fractions from waste incineration bottom ash treatment based on leaching and ecotoxicological tests

# THURSDAY OCTOBER 14

## AFTERNOON

### **SESSION C13 / PANORAMA HALL / 15:00-16:30**

#### **COMPOSTING: CHALLENGES AND OPPORTUNITIES**

*Chair: Giovanni Beggio (IT)*

*V. Pallier, O. Toundou, K. Tozo, G. Feuillade-Cathalifaud (FR)*

Impact of wastes compost on the growth and the yield of cultures of Zea mays L.: field experiments under two water regimes

*S. Bronco, S. Doni, C. Forte, L. Trivelli (IT)*

Beyond the landfill 4.0: Vermicomposting of the wet fraction from mechanical treatment of municipal solid waste and of anaerobic digestate

*A. Grasserova, N.I. Navarro Pacheco, J. Semerad, A. Hanc, T. Cajthaml (CZ)*

Vermiremediation of micropollutants from sewage sludge

*T. Cajthaml, K. Šírová, Černá T., K. Michalíková (CZ)*

Composting of sewage sludge from WWTPs contaminated by micropollutants

*L. Luskar, J. Polanšek, B. Čeh (SI)*

On-site composting of hop biomass with biobased polymeric twine

**16:30 - 17:00** Coffee break + Poster discussion

### **SESSION C14 / PANORAMA HALL / 17:00-18:30**

#### **COMPOSTING: CASES AND APPLICATION IN AGRICULTURE**

*Chair: L. Luskar (SI)*

*K. Sobieraj, K. Giez, S. Stegenta-Dąbrowska, K. Pawęska, A. Białowiec (PL)*

Assessment of vegan composts applicability

*V.Z. Bogataj, P. Fajs, R. Hurdin, G. Vilmorin, V. Martinez-Nogues (SI)*

Cascading utilization of hop waste biomass for new products in the horticultural sector

*A. Filippi, G. Cecchini, F. Cammillozzi, E. Miletto (IT)*

The Acea Smart Comp project

## **SESSION D13 / PANORAMA HALL 2 / 15:00-16:30**

### **WORKSHOP: GEOSYNTHETICS FOR DRAINAGE AND FILTRATION IN LANDFILL BARRIER SYSTEMS**

*Chair: Daniele Cazzuffi (IT)*

The workshop will present the state-of-the-art for the application of drainage geosynthetics in landfill barrier systems. The development of their use for drainage and filtration functions will be illustrated, including the drainage of rainwater on capping applications, biogas management, use of drainage geosynthetics in leachate collection layers and as part of double lining systems. Recent developments will be presented: new products with enhanced friction resistance, structures with enhanced resistance to creep or geotextile intrusion. *Full appetizer available on website and app*

#### **Introductory lectures:**

*E. Blond (CA):* Designing geocomposites drains in leachate collection layers and double lining systems

*P. Rimoldi (IT):* Designing geocomposites drains for hydraulic capacity: current codes and standards

*P. Recalcati (IT):* Designing geocomposites drains for veneer stability

*M.C. Mandaglio, S. Bilardi, N. Moraci (IT):* Relevance of soil geotextile filter long term behaviour on the design of environmental and civil works

*C. Tarnowski (DE):* Use of geocomposite drains for leachate recirculation in bioreactors

**16:30 - 17:00** Coffee break + Poster discussion

## **SESSION D14 / PANORAMA HALL 2 / 17:00-18:30**

### **WORKSHOP: PERFORMANCE OF METHANE OXIDATION SYSTEMS**

*Chairs: Julia Gebert (NL), Marion Huber-Humer (AT)*

The main purpose of the proposed workshop is therefore to discuss options and approaches for monitoring and controlling the performance of full-scale engineered methane oxidation systems. Three to four short pitches will be given by invited speakers who will share concrete aspects and experiences with performance control and monitoring of large/full-scale methane oxidation systems. As main outcome it is intended to provide a list of currently applied monitoring methods and approaches including framework conditions for application and key points of success and concern, that can be incorporated in guiding documents to be composed by TG CLEAR.

#### **Introductory lectures:**

*C. Geck, J. Streese-Kleeberg, J. Gebert (NL):* Experiences with 5 years of monitoring full scale biowindows in Hamburg, Germany

*A. Cabral, A. Abedini (CA):* Monitoring of CH<sub>4</sub> oxidation systems in Canada

*M. Huber-Humer (AT):* Monitoring of biocovers - chamber versus laser/open-path based approaches

*C. Scheutz, P. Kjeldsen (DK):* Monitoring of full scale Danish biocovers

# THURSDAY OCTOBER 14

## AFTERNOON

### ACTIVE LAB 05 + 06

**FOYER CONGRESS CENTER / 15:30-18:30**

#### **SAMPLING AND ANALYSIS OF MICROPLASTICS IN SEA WATER AND ON THE BEACH**

*Managed by: Claire Gwinnett, Staffordshire University (UK)*

*Supported by: George Varghese, NIT - National Institute of Technology, Calicut (IN)*

Have you ever wondered how scientists sample and analyse microplastic pollution? Come and join the Microplast Active Lab and get hands-on experience in sampling and analysing microplastic pollution!

#### **Programme overview**

Plastic pollution is a global problem and acknowledged to be one of our major environmental challenges. Poor waste management has led to plastic pollution being found in all compartments of our environment, including our aquatic, atmospheric and terrestrial systems. Microplastics (polymers smaller than 5mm in size) have been found in even the remotest locations including the Arctic, the deep sea and on Everest. Understanding the abundance and type of microplastics in our different environments is important for risk assessments and the development of mitigation activities.

In this 4-hour active lab, we will sample both sediment and water from key locations along the Forte Village Resort beach using protocols developed to reduce contamination during sampling. You will then transport your samples back to the "lab" and learn how to recover any microplastics using filtering and density separation methods. Once recovered, you will conduct simple analysis whilst learning about additional techniques that may be employed to fully characterise samples and help identify source.

Interpretation of the results will provide us estimates of microplastic pollution in the local environment and help us understand possible waste management initiatives that could be employed.



DAY 5 / FRIDAY  
OCTOBER 15

# FRIDAY OCTOBER 15

## MORNING

### SESSION A15 / CENTRAL HALL / 9:00-10:30

#### EDUCATION AND PUBLIC PERCEPTION IN WASTE MANAGEMENT

*Chair: Rainer Stegmann (DE)*

*G. Calderari, K.Cipri, C. Cucuzzella (IT)*

How GREENUS Project responds to the Education needs in Waste Management in Asia

*G. De Feo (IT)*

Waste management education with the Greenopoli project: from schools to television

*O. Janikowska, J. Kulczycka, G. De Clercq (PL)*

Deliberative democracy as the education tool for sustainable municipal waste management

*E.M. Mukhtar, I.D. Williams, P.J. Shaw (GB)*

Out of sight, out of mind: fundamental factors in waste management systems and their visibility

*C. Maiorana, E. Elamè, M.C. Lavagnolo (IT)*

Waste Management education projects in Cameroon: results and challenges in 10 years

**10:30 - 11:00** Coffee break

### SESSION A16 / CENTRAL HALL / 11:00-12:30

#### POLICIES IN WASTE MANAGEMENT

*Chair: Anders Damgaard (DK)*

*C. Cord'Homme (FR)*

Benchmarking in European countries of waste disposal tax and its efficient impact on waste management

*L. Lombardi (IT)*

Environmental comparison of residual municipal solid waste treatments

*I. Filosa, L. Lombardi, C. Lubello, A. Fazio, A. Oliveri, D. Scamardella (IT)*

Environmental assessment of the new MSW collection plan implementation in the city of Florence

*A. Singhal, S. Goel, B.K. Dubey (FI)*

Application of Google Earth in solid waste management: for developing waste management plan and studying waste dumpsites

## **SESSION B15 / CENTRAL HALL 2 / 9:00-10:30**

### **RECOVERY OF RESOURCES FROM WASTE IN DEVELOPING COUNTRIES**

*Chair: Richard David Lee (AT)*

*K. Sarquah, E. Antwi, U. Bassey, M. Hartmann, S. Narra, M. Nelles (DE)*

Review of Refuse-Derived Fuel potential in Ghana for sustainable energy integration

*J. Cristobal, J. Kannengiesser, M. Margallo, R. Aldaco, L. Schebek, A. Irabien (ES)*

Waste-related clean development mechanism projects on small island developing states: opportunities and barriers

*C. Weekes, E. Mijts, J. Van Caneghem (AW)*

Sustainable strategies for materials and energy recovery from municipal solid waste in small island states: a case study of Aruba

*S. Kalambura, D. Kalambura, S. Serti (HR)*

Maldives waste management system and future circular economy plans

**10:30 - 11:00** Coffee break

## **SESSION B16 / CENTRAL HALL 2 / 11:00-12:30**

### **WASTE MANAGEMENT IN DEVELOPING COUNTRIES: PROBLEMS AND SOLUTIONS**

*Chair: Maria Cristina Lavagnolo (IT)*

*R.D. Lee (AT)*

Potential applications of publicly available remote sensing data to solid waste management in developing countries

*S. Dworak, R.D. Lee, J. Fellner, C. Centeno, E. Galvan (AT)*

WaPla – A user-friendly software for waste management planning in developing countries

*M.C. Lavagnolo, D. Mittner, P. Fonkou, L.G. Touko Hamani, E. Elamè (IT)*

Sustainable and circular solutions for waste management at Yaoundé, Cameroon

*A.K.M. Morita, C. Ibelli-Bianco, J.A.A. Anache, J.V. Coutinho, N.S. Pelinson, J. Nobrega, L.M.P. Rosalem, C.M.C. Leite, L.M. Niviadonski, C. Manastella, E. Wendland (UY)*

Environmental threat by dumpsites and non-sanitary landfills in Brazil

# FRIDAY OCTOBER 4

## MORNING

### SESSION C15 / PANORAMA HALL / 9:00-10:30

#### REMEDIATION OF CONTAMINATED SOIL

*Chair: Jurate Kumpiene (SE)*

*K. Haarstad (NO)*

The occurrence of the water- and fireproofing fluoro alkyl (PFAS) substances in samples from a Norwegian waste handling facility and its surroundings

*A. Franzetti, T. Stella, G. Cerutti, A. Tofalos, F. Formicola, S. Citterio, E. Casati, A. Francioli (IT)*

Biological treatment of hydrocarbons contaminated soil by phytoremediation and biopiles at pilot-scale

*A. Checa-Fernandez, A. Santos, M. Subirán, A. Romero, C.M. Dominguez (ES)*

Exploring the use of surfactants for soil washing and subsequent persulfate-based oxidation treatments

*A. Santos, A. Checa-Fernandez, C.M. Dominguez, D. Lorenzo, R. García-Cervilla (ES)*

Enhancement in the remediation of soil and groundwater polluted with lindane wastes by alkali addition

*L. Priya, G.K. Varghese (IN)*

Determination of Remediability Score for remediation liability allocation among polluters

**10:30 - 11:00** Coffee break

### SESSION C16 / PANORAMA HALL / 11:00-12:30

#### WASTE & AUTOMOBILES

*Chair: Maria Chiara Zanetti (IT)*

*I.D. Williams, B. Moore, R.B. Cook, N. Symonds, J.O. Bello (GB)*

Construction and operation of a bespoke test system to investigate and analyze automotive tyre wear debris

*A. Parchomenko, J. Gillabel, Y. Dams, T. Goelen, K.C. Vrancken (BE)*

Recycling of electric vehicle batteries in Flanders – A resource effectiveness perspective

*I.D. Williams, E. Lewis, I. McCarthy, R.B. Cook, J. Murray, S. Rennison (GB)*

The potential of tyre and brake wear to contribute to non-exhaust airborne particulate matter

*N. Generowicz, J. Kulczycka (PL)*

Recovery of PGMs from catalysts as a good example of sustainable waste management in Poland

## **SESSION D15 / PANORAMA HALL 2 / 9:00-10:30**

### **WORKSHOP: WASTE AND HEALTH**

*Chair: Raffaello Cossu (IT)*

#### **Introductory lecture:**

*R. Cossu, M. Ferrante (IT)*

The Italian Committee for Waste and Health: Report on two years activity

**10:30 - 11:00** Coffee break

## **SESSION D16 / PANORAMA HALL 2 / 11:00-12:30**

### **WORKSHOP: TEXTILES IN CIRCULAR ECONOMY**

*Chairs: Andreas Bartl, Wolfgang Ipsmiller (AT)*

Textiles and textile waste have recently gained great importance. Due to a new EU directive, textiles are counted as municipal waste and from 2025 at the latest, municipalities will have to organize a separate collection of end-of-life textiles. Therefore, a significantly larger amount of collected end-of-life textiles can be expected in the near future. While reuse is to be welcomed in principle, it is already reaching its limits. Within the EU, second-hand clothing is only marketable to a very limited extent, so that the majority is exported, primarily to developing countries. This market is also already saturated and the local textile industry is coming under increasing pressure, so that some African countries have already imposed import bans. It is therefore clear that in the coming years, an increasing volume of end-of-life textiles will have to be reused or recycled in the EU. Separate collection of end-of-life textiles is only moderately developed in a few EU countries. The mandatory collection from 2025 must shift the costs (which will be higher than today) from the general public to the causer (e.g., extended producer responsibility - EPR). The fees of such a system must not only fund the collection itself but also the costs for re-use (including repair activities) and recycling. (...)

The fees must also fund research and development of new recycling technologies, which will then exhibit economic and environmental benefits. However, not only the symptoms should be tackled, but also their causes. Finally, the volume of textiles put to the market must be reduced and the fast fashion business model must be replaced by a more sustainable one. *Full appetizer available on website and app*

#### **Introductory lectures:**

*P. Kählig, W. Ipsmiller, A. Bartl (AT)*

To improve automatic sorting and recycling of waste textiles

*E. Boschmeier, A. Bartl, W. Ipsmiller (AT)*

Introduction to System Circularity and Innovative Recycling of Textiles (SCIRT)

*A. Shtukaturova, M. Šyc, B. Zach, M. Pavlas, R. Šomplák (CZ)*

Textile waste treatment in the Czech Republic

# FRIDAY OCTOBER 4

## MORNING

*P.J. Shaw (UK)*

The clothing and textile sector: waste and resources perspectives

*M. Šyc, A. Shtukaturova, B. Zach, M. Pavlas, R. Šomplák (CZ)*

Socio-economic issues of textile waste treatment in the Czech Republic

*W. Ipsmiller, E. Ipsmiller, A. Bartl (AT)*

Dead white men's clothes: Is apparel re-use the best solution?

# POSTER SESSIONS

## SESSIONI POSTER

Poster presentations will be accessible to Symposium delegates at all times in the conference foyer. Poster discussion will take place in the presence of authors in the afternoon from Monday to Thursday from 16:30 to 17:00.

Posters (pdf files) are also available on the virtual platform and Symposium App.

*Le presentazioni poster saranno sempre accessibili ai partecipanti al Simposio. La discussione dei poster avverrà alla presenza degli autori dal lunedì, al giovedì pomeriggio dalle 16:30 alle 17:00.*

*I Poster sono inoltre disponibili in pdf sulla piattaforma virtuale e sulla app ufficiale del Simposio.*

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### **P01 / G. Borowski (PL)**

Using of adhesives and binders for waste agglomeration

### **P02 / G.V. Landeros G., G. Dominguez C., M.D. Hudson, P.J. Shaw, I.D. Williams (GB)**

Microplastic waste and wastewater treatment plants - A review

### **P03 / A. Dzionek, D. Wojcieszńska, U. Guzik (PL)**

Xanthan gum in wastewater purification: a promising carrier for immobilization

### **P04 / A. Carucci, G. De Gioannis, A. Muntoni, D. Spiga, E. Tamburini, R. Lussu, R. Iannelli, S. Di Gregorio, I. Pecorini, A. La Camera, F. Pilato, P. Bottis, A. Cordas, C. Mancosus, P. Signoriles, C. Detotto, C. Idda, D. Prunetti, J. Bassu, V. Statzu, M. Soi (IT)**

GRRinPORT – Sustainable management of waste and wastewater in ports

### **P05 / D. Biondi, N. Subirà Berini, F. Corridori (IT)**

Post gestione primi approcci alle disposizioni del D.lgs 121/2020

### **P06 / P. Prawisudha, H.S. Ahmad, A.S. Nugroho (ID)**

Hydrothermal-pyrolysis system as a sustainable communal-scale treatment for mixed Municipal Solid Waste

### **P07 / B. Seo, M. Lee, B.G. Park, J.Y. Kim, J. Chung (KR)**

Applicability and environmental benefits of alternative resource recovery processes by substituting conventional leaching

### **P08 / J. Čespiva, M. Jadlovec, J. Výtisk, T. Ochodek, S. Honus, K. Borovec (CZ)**

Products of solid recovered fuel gasification in unique pilot-scale unit

### **P09 / M. Jadlovec, J. Čespiva, J. Výtisk, S. Honus, T. Ochodek, K. Borovec (CZ)**

Utilisation of solid recovered fuel ash as sorbent for mercury capture

### **P10 / M.A. Habib (EG)**

Adding value to lampante oil: high quality leather fatliquoring agent via the low- grade oil sulfonation

**P11** / *R.S. Jasna, A. Sekar, G.K. Varghese (IN)*

The air quality profile during COVID-19 lockdown as a forensic tool for air pollution source identification

**P12** / *A. Marrone, D. La Russa, E. Brunelli, G. Santovito, D. Pellegrino (IT)*

Antarctica as a global sensor of transboundary pollution: metals biomonitoring in a twelve-year period

**P13** / *P. Innemanová, A. Grasserová, T. Cajthaml (CZ)*

Pilot scale vermicomposting of dewatered sewage sludge from a medium-size WWTP

**P14** / *A. Del Borghi, L. Moreschi, S. De Angeli, M. Gallo (IT)*

Waste to aggregate: an application of circular economy to aquaculture evaluated through a life-cycle approach

**P15** / *I. Pecorini, E. Rossi, S. Di Gregorio, S. Becarelli, R. Iannelli (IT)*

Comparison of wet and dry anaerobic digestion of OFMSW with a focus on microbial characteristics

**P16** / *V. Innocenzi, S. Zueva, V. Corradini, I. De Michelis, F. Ferella, F. Vegliò (RU)*

A case study on the wastewater treatment in the semiconductor industry

**P17** / *G. Feuillade-Cathalifaud, K.N. Segbeaya, E.K. Koledzi, V. Pallier, G. Baba (FR)*

Modeling the evolution of the pollution of the Kara River by the Municipal Solid Waste from Kara City (Togo)

**P18** / *H.-H. Carstensen, J. Ruiz, I. Fonts, N. Gil-Lalaguna, J. Ceamanos, M.B. Murillo, G. Gea (ES)*

CO<sub>2</sub> adsorption on char from rich-protein animal wastes and pure proteins. A comparative study

EXHIBITORS,  
ORGANIZERS &  
MEDIA PARTNERS

ESPOSITORI,  
ORGANIZZATORI  
E MEDIA PARTNER

# EXHIBITORS ESPOSITORI

Our companies exhibition will be held in the Foyer of the Congress Center and will be accessible to Symposium delegates at all times from Monday to Friday.

Please find below a list of exhibitors.

Additional contents (brochure, promotional materials, photo, etc. ) and exhibitors details are available on the website and app.

*L'esposizione commerciale sarà allestita nel foyer del Centro Congressi e sarà accessibile in qualsiasi momento dal lunedì al venerdì.*

*Si elencano di seguito gli espositori presenti.*

*Contenuti aggiuntivi (quali brochure in pdf, materiali promozionali, foto, video, etc.) e contatti dei referenti di ciascuna azienda, sono disponibili sulla app e sul sito web.*

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## ACMO SRL

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z.i. ,31056 Roncade (TV), Italy  
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MILAN / +39 02 33300110  
info@acmospa.com  
www.acmosrl.com



AC.MO Srl designs and manufactures hydraulic equipments for water distribution, water transmission, irrigation and water treatment.

The Company supports and develops all the technologies that combine to make efficient and safe systems for the management of the root element of our ecosystem, water.

All equipment is designed to ensure minimal energy consumption, both directly through the use of smart actuators with low consumption and indirectly through the development of products designed to get less and less water loss and thus contribute to an actual reduction in consumption pumping stations and distribution networks.

Since 2018 ACMO is part of the AVK group, becoming the official distributor of AVK products on the Italian market. Furthermore, will serve as the competence centre for the AVK Group in Smart water solutions, thus adding digital solutions and intelligence to a long row of AVK products that are vital for a sustainable water distribution network.

## STUDIO ARCOPLAN WASTE ARCHITECTURE PLATFORM

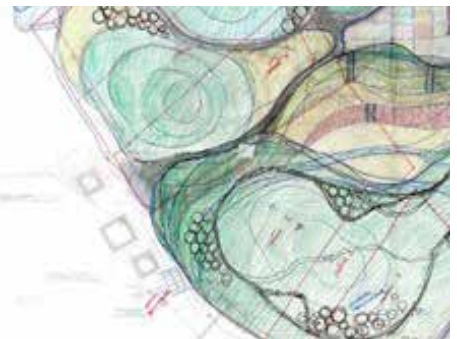
Via Beato Pellegrino 23  
35137 Padova, Italy  
Tel. +39 3203630505  
studio@arcoplan.it  
www.arcoplan.it  
www.wastearchitecture.com



Arcoplan is an architectural and engineering consultancy, located in Padova, active in the fields of architecture, landscape, environment, engineering and technical architecture. Founded in 2009 by Anna Artuso, architect, and Elena Cossu, civil engineer, Arcoplan has developed specific expertise in architectural aspects connected to Waste Management interventions aimed at the development of the concept of Waste Architecture. Since 2009 they have developed studies and projects for the functional requalification of old and new landfill sites, remediation of degraded land, buildings for waste pretreatment, composting plants and transfer stations, urban models of sustainable management of waste collection, and reuse centres.

Arcoplan also strives to disseminate the above topics by collaborating to the organization of scientific conferences connected to the research activities carried out by the University of Padova in the field of environmental engineering.

Arcoplan has recently given rise to **Waste Architecture Platform**, a complex project conceived as a container of initiatives devoted to environmental architecture in connection with interventions concerning the collection, disposal and management of waste. Waste Architecture is a new and relatively unexplored conceptual and design topic which promises to give rise to a lively debate between environmental professionals, and architecture and urban design experts.



# EXHIBITORS ESPOSITORI

## BPC INSTRUMENTS AB

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Contact person: Mihaela Nistor, PhD

[mn@bioprocesscontrol.com](mailto:mn@bioprocesscontrol.com)

[bioprocesscontrol.com](http://bioprocesscontrol.com)



BPC Instruments AB (former Bioprocess Control AB) is a Swedish-based technology company that develops and sells automated, analytical instruments that allow for more efficient, reliable, and higher quality research and analysis in a wide range of industries (e.g., biogas production, biodegradability of bioplastics and other polymers, wastewater treatment, animal nutrition, bioethanol production, biohydrogen production, etc). The result is significant reductions in time and labour and more efficient use of manpower resources. Product portfolio:

- Gas Endeavour (GE)
- Automatic Methane Potential Test System (AMPTS II)
- BioReactor Simulator (BRS)
- BPC Go

Based on our recent statistics, BPC Instruments AB has over a thousand customers from nearly 500 organizations in 70 countries, covering both academic research institutes and industrial players in biogas sector. Currently, there are about 800 scientific publications based on data generated by our smart instruments and more are added each month.

A selection of scientific articles, in which our smart analytical instrument was used, are listed at our website: [bioprocesscontrol.com/scientificreferences](http://bioprocesscontrol.com/scientificreferences)

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## CESARO MAC IMPORT SRL

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[www.cesaromacimport.com](http://www.cesaromacimport.com)

[www.tigerdeapack.com](http://www.tigerdeapack.com)



Cesaro Mac Import opera dal 1985 come rivenditore a e assistenza di macchine industriali e dal 1994 è dealer ufficiale per l'Italia di Doppstadt, Sennebogen, marchi leader mondiali nella produzione di macchine per il trattamento dei rifiuti e della movimentazione dei materiali.

L'azienda oggi il più grande ed importante costruttore di impianti di compostaggio in Italia, e di impianti integrati di digestione anaerobica e compostaggio grazie ai suoi marchi brevettati Il Girasole tunnel Composting e Tiger Depack.

## CISA PUBLISHER

Via Beato Pellegrino, 23  
35137 Padova (Italy)  
Tel +39 049 8726986  
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www.cisapublisher.com



Cisa Publisher is an imprint of Eurowaste Srl. Cisa Publisher represents the Eurowaste section dealing with transfer to the media (books, reports, textbooks, CD, etc) of the wealth of information accumulated throughout activities performed by the University of Padova (in particular in the field of waste management and contaminated site remediation) and by IWWG and member scientists.

### CATALOGUE:

#### **Detritus - Multidisciplinary Journal for Waste Resources and Residues**

##### **Latest Book:**

R. Cossu, V. Grossule M.C. Lavagnolo (2020)

La discarica sostenibile: Ruolo nell'Economia Circolare e proposte normative

##### **IWWG Monograph series:**

- Sustainable Landfilling
- Management and Landfilling of Solid Wastes in Developing Countries
- Landfill Aeration

##### **Other Monographs:**

- Urban Mining: A global cycle approach to resource recovery from solid waste

##### **Conference Proceedings:**

- Venice International Symposium on Energy from Biomass and Waste
- Sardinia International Waste Management and Landfill Symposium
- SUM - Symposium on Urban mining and Circular Economy

Publications are available at the registration desk and may be ordered online from the website [www.cisapublisher.com](http://www.cisapublisher.com).

# EXHIBITORS ESPOSITORI

## COSMO GROUP

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30033 Noale, VE, Italy  
Tel. +39 041 5801616  
info@cosmogruppo.it  
www.cosmogruppo.it



Cosmo Group was established sixty years ago and today is a leader in the sector of major infrastructure projects and waste management. It employs about 150 employees and operates through five companies of the group: Cosmo Scavi srl, Cosmo Tecnologie ambientali srl, Cosmo Energia, CSR srl (Chemistry and geotechnical laboratory), Hexa Green.

In its customer portfolio Cosmo Group counts public bodies and private companies, renowned customers for whom it has created important projects such as the Mestre highway section, Venice Marco Polo Airport, the third lane of the A4 Venice-Trieste highway, the logistics platform in the Port of Trieste, the "All'Angelo" hospital in Mestre.

The plant, located in via Mestrina, consists of 160,000 square meters of technological systems for the treatment, disposal and recovery of special and industrial waste with an average recovery rate of 60%. The production cycles take place in the covered area where, thanks to the most advanced technologies, each cycle is optimized, ensuring maximum safety.

In recent years, Cosmo Group has distinguished itself for the strong input given to the dissemination of clean and sustainable technologies. It has installed a photovoltaic system in its plant in Noale that generates a maximum power of 840 kWp and covers about 35% of internal needs. Clean energy, such as that produced by the biomass plant, another 995 kw entirely given to the power grid.

Thanks to an Environmental Management system, Cosmo Group evaluates and monitors each activity and internal process, rationalizing the service delivery and management phases, in accordance with the regulations. Since 2014 it has adopted the model 231: an External Supervisory Body that monitors that the work of the companies complies with the stated principles. Endowed with all the latest certifications, Cosmo Group pursues the safety and quality objectives through an all-female team.

In more recent years, Cosmo Group has launched several projects concerning the corporate social responsibility.

## GEOS Environment

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Fax +39.0823883214  
info@geosgroup.it  
www.geosgroup.it



Founded in 1987 as an environmental protection services firm, Geos Environment S.r.l. has been continually adapting to the copious changes of this important sector, occurred in the society over the past 25 years; specifically to the more stringent legal and social requirements that have nowadays become the fundamental milestones of our future environmental behaviour.

Today, the Company is a truly European operator with excellent human capital, technological capabilities and business references; it states itself as a benchmark in this field, due its capacity to meet clients' needs and develop customized, open-ended solutions to the problems they encounter in the areas of waste management optimizing.

Geos Environment Ltd. has the resources and expertise to deal with all of the environmental concerns of Local Authorities and Industrial Companies offering a range of services designed to protect the environment and make our clients much more competitive and self-assured within their areas of influence.

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## HERAMBIENTE Spa

Viale Carlo Berti Pichat nr. 2/4  
40127 Bologna, Italy  
Tel. +39.051287111  
www.herambiente.it



HERAmbiente is Italy's leading company in the construction and operation of waste treatment plants, material and energy recovery, and waste disposal.

Founded in 2009 as part of Hera Group, the company is currently 25% owned by international funds Eiser and APG. HERAmbiente offers customised environmental services to companies through a dedicated commercial structure. Sustainability, environmental protection and investment in technological innovation ensure safe and effective solutions which are subject to transparent certification procedures.

- 6.4 million tonnes/year of waste treated
- 4.6 million tonnes/year of special waste treated
- 91 waste disposal plants including 10 waste-to-energy plants
- 974 GWh of electricity generated/year
- 122 GWh of thermal energy produced/year
- 240 GWh of thermal energy produced/year

# EXHIBITORS ESPOSITORI

## IWWG International Waste Working Group

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The International Waste Working Group, founded in 2002 and registered as a no-profit organisation, serves as a forum for the scientific and professional community. The IWWG aims to provide an intellectual platform to encourage and support integrated and sustainable waste management and to promote practical scientific development in the field.

The group was conceived to provide a “home” for professionals and researchers, and give us a voice to be able to beneficially influence waste management and research.

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## LAB ANALYSIS

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LabAnalysis was founded in 1976, by Luigino and Isella, with only one employee. Our foundation in Italy marked the beginning of an incredible journey in the analytical field by delivering testing for compliance with directives and consulting services to the Pharma and Environment industries.

We've learned to help customers across the entire business lifecycle, starting from test results interpretation to delivering multi-disciplinary, quick problem-solving expertise. In the early 2000, Lorenzo and Stefano, joined their parents. To assure a legacy of continuity and success, they embraced the values and survival strategies. Consequently, enabling progress and enhancing our team performance, our role have steadily grown also in Health & Security, Food and GLP sector.

Today, LabAnalysis has a proven track record of long last business partnerships. With an extensive national network of accredited laboratories, our highly trained experts guarantee the reliability and precision of results through an uniform approach to quality procedures.

## RESOURCE GROUP

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ReSource Group invents and delivers appropriate engineering solutions to complex environmental problems. We work in operations, consulting, design, monitoring and R&D in a diverse portfolio of projects related to the circular economy, management of waste and water, pollution, and energy generation. Our projects span much of Western and Northern Europe and we have bases in Scandinavia, Switzerland and Iceland.

The last years, the group developed several large projects in digitalization of the waste management field. After the development of new monitoring technics including the use of UAV on landfills, the company has designed and start commercialization of a digital platform for efficient landfill operation. In addition, it successfully managed the deployment over large areas of smart bin systems for improved waste collection. The group builds up growth on its people's passion for innovation and their common interest in building a more sustainable future.

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## VOW ASA / ETIA

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[www.vowasa.com](http://www.vowasa.com) (Corporate website)

[www.biogreen-energy.com](http://www.biogreen-energy.com) (Product website) / [etia-group.com](http://etia-group.com)



Vow delivers world leading solutions that support industry decarbonization and convert waste into value, to make the world a cleaner and better place. With our subsidiary ETIA, we have long been a leader in delivering thermal processes that change unwanted residues into quality products, green commodities, and climate friendly energy.

Since 2003, ETIA delivers Biogreen® technology: a robust, reliable, and continuous pyrolysis process. Our system is uniquely designed to be powered by electricity, which enables fossil-free energy use, ensures efficient and stable conversion, and guarantees precise control of operating parameters. These features make Biogreen® a perfect tool to navigate the treatment conditions according to the feedstock and market demand and achieve the desired market quality of final products. Thanks to its flexibility, reliability and many implementations worldwide, our system has become first choice of customers looking for proven and industrial technology, which guarantees continuous production and highest quality standards. Biogreen® applications on biomass and sludge are strongly CO<sub>2</sub> negative solution that allows significant emission avoidance – a potential which is highly sought after by companies around the world looking for innovative ways to stay competitive in the changing climate.

# ORGANIZERS ORGANIZZATORI

## IWWG - INTERNATIONAL WASTE WORKING GROUP

Find out more about the IWWG activities and its regional brands and become a member. The International Waste Working Group, founded in 2002 and registered as a no-profit organisation, serves as a forum for the scientific and professional community. The IWWG aims to provide an intellectual platform to encourage and support integrated and sustainable waste management and to promote practical scientific development in the field.

The group was conceived to provide a "home" for professionals and researchers, and give us a voice to be able to beneficially influence waste management and research.

The benefits of IWWG membership are the following:

- Subscription to IWWG official Journal Waste Management at a special discount price, both print subscription or print+electronic subscription. (electronic subscription includes access to back numbers from 1995).
- Access to the members area on the website
- Access to previous editions of IWWG conferences proceedings (Index)
- Access to the IWWG members discussion forum on the website
- Free download of LeachXS - Lite from the members area on the website
- Discount on IWWG Training Course Registration
- Discount on IWWG Seminar Registration
- Discount on the entrance fee of IWWG international waste management symposia (official IWWG conferences)
- Discount on IWWG publications (e.g. textbooks)
- Discount on Elsevier publications
- Participation in all activities of IWWG including task groups

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# ORGANIZERS ORGANIZZATORI

## EUROWASTE Srl

Concept and planning of conferences / seminars / courses

Eurowaste Srl was founded to manage communication and educational tools in connection with research activities performed in the field of environmental engineering by the University of Padova. Over time it has become a service agency that works in national and international context in the scientific events organization.

Its activities is addressed to the entire Scientific Community in order to support it in conceiving and organising congress, symposia, meetings, workshops and all kind of events. For the past 25 years Eurowaste has been organising International Symposia registering the participation of up to 1000 delegates from dozens of different countries worldwide.

### SERVICES:

Concept development and preparation of time schedule / Design of event logo and graphics / Design and printing of the conference materials / Editing, photocomposition and layout of texts / Event promotion and dissemination / Multilingual organising secretariat / Venue sourcing among the most prestigious locations / Budget management and sourcing of suppliers / Hotel and catering arrangements / Commercial exhibition: contacts with exhibitors, design and production of exhibition areas / Sponsorship programmes and sponsorship acquisition / Social programme and technical tours / On site management, conference secretariat and assistance during the event / Set up of conference halls and exhibition areas / Design of official event website / Proceedings (Gathering and editing of papers and scientific materials, revision and printing / Graphics and product design (book, CD or other support) / Printing and distribution

*Eurowaste Srl nasce per gestire gli strumenti di comunicazione e divulgazione scientifica connessi alle attività di ricerca svolte dell'Università di Padova nel campo dell'ingegneria ambientale. Nel tempo è diventata un'agenzia di servizi che opera a livello nazionale ed internazionale nel settore dell'organizzazione di eventi di carattere scientifico.*

*Da oltre 25 anni Eurowaste organizza simposi internazionali che in alcune edizioni hanno visto la partecipazione di oltre 1000 delegati provenienti da tutto il mondo.*

*La sua attività si rivolge a tutta la Comunità Scientifica supportandola nell'ideazione, progettazione e realizzazione di congressi, simposi, meeting, workshop ed eventi di ogni genere.*

### SERVIZI:

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# PARTNER JOURNAL

## RIVISTA PARTNER

### DETRITUS / MULTIDISCIPLINARY JOURNAL FOR WASTE RESOURCES AND RESIDUES

Detritus, Multidisciplinary Journal for Waste Resources and Residues is an official journal of IWWG, International Waste Working Group, published by Cisa Publisher. The journal is aimed at extending the "waste" concept by opening up the field to other waste-related disciplines (e.g. earth science, applied microbiology, environmental science, architecture, art, law, etc.) welcoming strategic, review and opinion papers.

Detritus is a double open journal: **FREE ACCESS** for readers and **FREE SUBMISSION** for authors in order to promote the transfer of scientific knowledge with no economical constraints. Detritus is **indexed in SCOPUS / Emerging Sources Citation Index (ESCI)**, Clarivate Analytics, Web of Science / DOAJ - Directory of Open Access Journal / Google Scholar.

*Detritus, Multidisciplinary Journal for Waste Resources and Residues è una rivista ufficiale dell'IWWG International Waste Working Group, pubblicata da Cisa Publisher. La rivista ha lo scopo di estendere il concetto di "rifiuto" aprendo il campo ad altre discipline ad esso correlate (medicina, scienze della terra, microbiologia applicata, scienze ambientali, architettura, arte, leggi, ecc.) accogliendo lavori scientifici strategici, di revisione e di opinione. Detritus è una rivista rivoluzionaria per il settore: doppiamente open access! Al fine di promuovere il trasferimento delle conoscenze scientifiche senza alcuna barriera economica, sarà gratuito sia l'accesso per i lettori sia l'invio lavori per gli autori.*

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