

organised by

iwwg
international waste working group

venue

Scuola Grande di San
Giovanni Evangelista
Venice . Italy
15-18 October 2018



7TH INTERNATIONAL SYMPOSIUM ON
ENERGY FROM BIOMASS AND WASTE

VENICE 2018

Follow Us on our
Social Networks!



SYMPOSIUM GUIDEBOOK

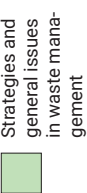
Daily programme / Useful info / Technical tours
Social events / Poster session / Media partners
Companies / Notebook

GUIDEBOOK

Useful info • Daily programme
Technical Tours • Social Events •
Companies • Organisers & Media
Partners • Notebook

SYMPOSIUM STRUCTURE

OPENING SESSION					
Monday October 15th morning	A1 / Characterization and pretreatment of biomass in sustainable energy production	B1 / Modelling of thermal treatment processes	C1 / Energy and wastewater	D1 / Workshop: Public opinion & education	E1 / Bioenergia da rifiuti
	A2 / Anaerobic digestion of MSW organic fraction	B2 / Thermal gasification of biomass I	C2 / Energy from sewage sludge	D2 / Strategies in recovering renewable energy from waste	E2 / Energia nella gestione dei rifiuti e valutazioni strategiche
	A3 / Co-digestion of different substrates	B3 / Thermal gasification of biomass II	C3 / Workshop: Energy from microalgae biomass	D3 / Waste to energy strategies: Case studies	E3 / Gestione delle emissioni gassose da impianti di recupero energetico, da biomasse e da rifiuti
Tuesday October 16th morning	A4 / Control of anaerobic digestion reactors	B4 / Pyrolysis and gasification	C4 / Energy from animal waste management	D4 / Workshop: Bio-based plastics	E4 / Companies forum
	A5 / Biogas production from organic waste	B5 / Pyrolysis of specific organic waste	C5 / Workshop: Energy from waste in leather industry	D5 / Waste management in DC's	E5 / Companies forum
	A6 / Biomass to energy in DC's	B6 / Hydrothermal carbonization	C6 / Energy from food waste management	D6 / Workshop: Combustion residues	E6 / Waste and health
Tuesday October 16th afternoon	A7 / Biomethane production	B7 / Hydrothermal liquefaction and other thermo-chemical conversion processes	C7 / Workshop: Microbial fuel cells in WTE strategies	D7 / Waste management strategies in DC's: Case studies	E7 / Control of contaminants in waste management and health protection
	A8 / Biodiesel and bioethanol from biomass	B8 / Combustion emissions	C8 / Energy from agricultural waste	D8 / Recycling of waste into construction	E8 / Biorefinery for different waste stream
	A9 / Anaerobic digestion of sewage sludge	B9 / RDF - Refused derived fuel	C9 / Energy from landfills	D9 / Environmental and life cycle assessment	E9 / Workshop: Biorefinery - Opportunities and perspectives
Wednesday October 17th morning	CLOSING SESSION 'SYMPOSIUM MEETS SOCIETY' HEALTH ISSUES IN WASTE TO ENERGY: What bothers people, what is true?				
Wednesday October 17th afternoon					
Thursday October 18th	TECHNICAL TOURS				





Organised by / Organizzato da:

IWWG - International Waste Working Group

With the scientific support of / Con il supporto scientifico di:

University of Padova (IT)

Hamburg University of Technology (DE)

Hokkaido University (JP)

Tsinghua University (CN)

University of Queensland (AU)

University of Rostock (DE)

University of Trento (IT) Economic Development

Promoted by / Promosso da:

ENEA - Italian National Agency for new Technologies, Energy and Sustainable Economic Development (IT)

FOIV - Federazione Ordini Ingegneri Veneto

KYOTO CLUB (IT)

GITISA - Italian Group of Sanitary Environmental Engineering (IT)

IWMSA - Institute of Waste Management of Southern Africa (ZA)

WELCOME LETTER

LETTERA DI BENVENUTO

Dear Delegate,

First of all a very warm welcome to Venice. This programme of the Seventh International Symposium on Energy from Biomass and Waste shall guide you through a full week of presentations. However, we would like to take this opportunity to remind all participants of a number of key issues and provide a list of exciting Social Events that will take place throughout the week.

Coffee Breaks

Coffee breaks will be served twice per day to all registered participants in Sala delle Colonne (ground floor).

Evening Social Events

After a long days' work it's time to relax. Places are still available for the following events (further details to be found on page 13-14 of the Symposium Guidebook). If you have not done so yet, please book your place at the registration desk.

Monday 15th October - Treasure Hunt in Venice (h. 20.30/23.30)

Discover the most beautiful sites and interesting secrets of Venice with a fun and informative treasure hunt. The cost of the event is included in the registration fee for Symposium participants.

Tuesday 16th October - Galleon dinner cruise & Dancing night (h. 19.30/00.30)

Price: € 70,00 + VAT 22%

A fascinating excursion with a delicious dinner on board a characteristic Venetian Galleon around Venice and its beautiful lagoon. Musical entertainment will be arranged during the night.

Wednesday 17th October h. 17.00 - Farewell Cocktail and Jazz Concert

Remember to join the Farewell Cocktail Party (Sala delle Colonne, ground floor) to celebrate with us the closure of the conference. Smooth jazz melodies, played by the University of Padova jazz band, will accompany the evening.

Technical Tours

Four guided technical tours of real scale plants have been arranged for Thursday 18th October. Places are limited and have been assigned on a first-come first-served basis. Participants who have not yet booked their place but would like to attend the technical tours should contact a staffmember at the Registration Desk as soon as possible.

We hope you enjoy the Symposium!

The Organising Secretariat

CONTENTS

SOMMARIO

PRESENTATION & SYMPOSIUM STRUCTURE <i>PRESENTAZIONE E STRUTTURA DEL SIMPOSIO</i>	6-7
SCIENTIFIC COMMITTEES & ORGANISING SECRETARIAT <i>COMITATI SCIENTIFICI E SEGRETERIA ORGANIZZATIVA</i>	8-9
INSTRUCTIONS FOR SESSION CHAIRS & SPEAKERS <i>ISTRUZIONI PER PRESIDENTI DI SESSIONE E RELATORI</i>	10-11
USEFUL INFO <i>INFORMAZIONI UTILI</i>	12
SOCIAL EVENTS <i>EVENTI SOCIALI</i>	13-14
ORAL SESSIONS <i>SESSIONI ORALI</i>	15-46
Monday / <i>Lunedì</i>	15-24
Tuesday / <i>Martedì</i>	25-36
Wednesday / <i>Mercoledì</i>	37-46
KICK OFF MEETING (Italians only) <i>PRIMA RIUNIONE CIRS - Comitato Interdisciplinare Rifiuti e Salute</i>	43-44
TECHNICAL TOURS <i>VISITE TECNICHE</i>	47-49
POSTER SESSIONS <i>SESSIONI POSTER</i>	51-54
COMPANIES <i>AZIENDE</i>	55-59
ORGANISERS <i>ORGANIZZATORI</i>	60-63
DETRITUS <i>DETRITUS</i>	64-65
MEDIA PARTNERS <i>MEDIA PARTNER</i>	66-67

PRESENTATION

PRESENTAZIONE

The production of energy from alternative sources and its impact on climate change are among the main strategic tools implicated in the sustainable development of our society. Numerous types of biomass and wastes contribute towards the production of energy and reduction in the use of fossil fuels by means of biological, chemical and thermal processes. Existing biomass and waste to energy technologies are currently undergoing rapid development. Despite growing interest in the use of these technologies, in many countries their implementation remains limited.

Advances in the application of technologies for energy recovery from biomass and waste will represent central debate topics of the sixth edition of the Venice Symposia. The following sub-topics will also be discussed: combustion, anaerobic digestion, biomass to energy, alternative thermal treatments, strategies and policies, other waste-to-energy options. Particular attention will be paid to the characteristics of combustible products generable from different approaches: SRF, biochar, biodiesel and other products suitable for a decentralized exploitation of the energy content of waste and biomass.

The Symposium is organized by the International Waste Working Group (IWWG) with the scientific support of the Universities of Padova, Hokkaido, Queensland, Rostock, Trento, Tsinghua and Hamburg University of Technology.

La produzione di energia da fonti alternative ed il suo impatto sui cambiamenti climatici sono tra i principali strumenti strategici implicati nello sviluppo sostenibile della nostra società. Numerose tipologie di biomasse e rifiuti contribuiscono, a seguito di processi biologici, chimici e termici, alla produzione di energia e alla riduzione dell'utilizzo di combustibili fossili. Le tecnologie esistenti per la generazione di energia da biomasse e rifiuti sono oggi in rapido sviluppo ma nonostante l'interesse crescente nell'utilizzo di tali tecnologie, in molti paesi la loro implementazione è ancora limitata.

Il tema centrale della sesta edizione del Simposio saranno le innovazioni introdotte nell'applicazione delle tecnologie per il recupero di energia da biomasse e rifiuti. Verranno dettagliatamente discussi i seguenti argomenti: combustione, digestione anaerobica, energia da biomassa, trattamenti termici alternativi, legislazione e strategie politiche, energia da rifiuti. Particolare attenzione sarà inoltre posta sulle caratteristiche dei prodotti combustibili generabili da diversi processi quali SRF, biochar, biodiesel e tutti gli altri prodotti che permettono un utilizzo decentralizzato del contenuto energetico di biomassa e rifiuti.

L'evento è organizzato dall'International Waste Working Group (IWWG) con il supporto scientifico delle Università di Padova, Hokkaido, Queensland, Rostock, Trento, Tsinghua e Amburgo.

SYMPOSIUM STRUCTURE

STRUTTURA SIMPOSIO

The Symposium is structured in oral sessions, a poster session and technical tours. Oral presentations are organized in five parallel tracks, for a total of 47 oral sessions during which about 200 presentations will be delivered.

Poster papers will be presented in an appropriate session, which will always be accessible to Symposium delegates, and discussed on Monday, Tuesday and Wednesday afternoon.

Papers were selected according to quality by the Symposium Executive Programme Committee and an International Committee from over 290 offers of papers from 60 different countries.

Il Simposio è strutturato in sessioni orali parallele, una sessione poster e visite tecniche guidate. Le presentazioni orali sono organizzate in cinque sessioni parallele durante le quali verranno discussi più di 200 lavori.

Le presentazioni poster saranno invece esposte in una sessione appropriata sempre accessibile ai partecipanti del Simposio e saranno discusse nei pomeriggi di lunedì, martedì e mercoledì.

I lavori selezionati sono stati scelti in base alla qualità scientifica dalla Commissione Esecutiva di Programma e da una Commissione Internazionale fra oltre 290 abstracts arrivati da 60 diversi paesi.

COMMITTEES

COMITATI

Executive Programme Committee / Comitato Esecutivo di Programma

Raffaello COSSU, University of Padova (IT)

Marco RAGAZZI, University of Trento (IT)

Alberto PIVATO, University of Padova (IT)

Symposium Chairmen / Presidenti del Simposio

William P. CLARKE, University of Queensland (AU)

Raffaello COSSU, University of Padova (IT)

Jianguo LIU, Tsinghua University (CN)

Toshihiko MATSUTO, University of Hokkaido (JP)

Michael NELLES, University of Rostock (DE)

Rainer STEGMANN, Hamburg University of Technology (DE)

Scientific Secretaries / Segretari Scientifici

Marco RAGAZZI, University of Trento (IT)

Alberto PIVATO, University of Padova (IT)

International Advisory Board / Comitato Scientifico Internazionale

- Muhammed ALAMGIR, Khulna University of Engineering & Technology (BD)
- Luca ALIBARDI, Cranfield University (GB)
- Umberto ARENA, Second University of Naples (IT)
- Jo-shu CHANG, National Cheng Kung University (TW)
- Dezhen CHEN, Tongji University (CN)
- Christophe CORD'HOMME, CNIM Group (FR)
- Martin FAULSTICH, Technical University of Munich (DE)
- Evangelos GIDARAKOS, Technical University of Crete (GR)
- Michele GIUGLIANO, Technical University of Milan (IT)
- Martin KRANERT, University of Stuttgart (DE)
- Maria Cristina LAVAGNOLO, University of Padova (IT)
- Fan LU, Tongji University (CN)
- Elena Cristina RADA, Insubria University (IT)
- Marco RAGAZZI, University of Trento (IT)
- Hans van der SLOOT, Netherlands Energy Research Foundation (NL)
- Vincenzo TORRETTA, University of Insubria (IT)

SECRETARIAT SEGRETERIA

ORGANISING SECRETARIAT / SEGRETERIA ORGANIZZATIVA

Gioia Burgello
Francesca Fava
Francesca Girotto
Adelia Presutti
Mattia Trapani
Eurowaste Srl, Padova (IT)

Anna Artuso
Elena Cossu
Arcoplan, Padova (IT)

GENERAL SECRETARIAT / SEGRETERIA GENERALE

Eurowaste Srl, Via Beato Pellegrino, 23 - 35137 Padova, Italy
Tel +39.049.8726986 / Fax: +39.049.8726987 / email: info@eurowaste.it

SCIENTIFIC SECRETARIAT / SEGRETERIA SCIENTIFICA

Marco RAGAZZI, University of Trento (IT)
marco.ragazzi@ing.unitn.it

Alberto PIVATO, University of Padova (IT)
alberto.pivato@unipd.it

Elena Cristina RADA, University of Trento (IT)
elena.rada@unitn.it

INSTRUCTIONS

ISTRUZIONI

INSTRUCTIONS FOR SESSION CHAIRS & SPEAKERS / ISTRUZIONI PER PRE- SIDENTI DI SESSIONE E RELATORI

Instructions for Chairs of Sessions

On arrival at the Symposium venue chairmen of oral sessions and workshops are kindly requested to contact the Speakers' Room where curricula vitae of speakers will be provided and any last-minute changes in the programme of the session to be chaired will be notified.

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

Chairmen are furthermore 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.

Istruzioni per i Presidenti di sessione

I Presidenti delle sessioni orali e workshop sono gentilmente pregati di contattare la Sala Relatori al loro arrivo presso la sede del Simposio affinché vengano forniti loro i curricula vitae dei relatori e vengano comunicate 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 svolge 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 affinché 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.

Information for Speakers

Speakers should contact the chairman 15 minutes before the beginning of the session in which their paper is to be presented. The chairman will be available in the conference hall 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.

The time available for each presentation is approximately 15 minutes. Chairmen will ensure that times are strictly adhered to. During the presentation commercial advertising should be avoided. Mention of affiliations or company name should be very discreet.

A duty member in the Speakers' Room will be on hand for all requirements. A PC will be available for speakers use and priority will be given in line with session timetable. The computer in the speakers' room may not be used to prepare the presentation, but only to make last-minute changes or a final check.

Speakers who have not forwarded a copy of their PowerPoint presentation to the Organising Secretariat prior to the conference are kindly requested to con-

tact the Speakers' Room at the latest by the session prior to that in which their presentation is scheduled (should this be scheduled in a morning session, the deadline for contacting the Speakers' Room is the evening of the day before). Speakers should ensure their presentations are delivered to the pertinent conference staff in a timely manner. No additional time will be provided for late arrival presentations.

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 of use to prepare a slide illustrating the conclusions in a synthesized version. The poster session will be held in the main entrance hall.

On arrival in the Poster Hall, all authors should check the exact position assigned to their poster. The Staff at the Registration Desk will be pleased to provide assistance and fixing materials.

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.

Il tempo a disposizione per ciascuna presentazione è di circa 15 minuti. Il Presidente di sessione provvederà affinché tale limite sia strettamente osservato. Nella presentazione va assolutamente evitata qualsiasi forma di pubblicità. La presenza del vostro ente o ditta di appartenenza deve essere molto discreta.

Nella Sala Relatori sarà sempre presente un incaricato dell'organizzazione per fornire eventuale assistenza. Un computer sarà a disposizione dei relatori con precedenza che rispetta gli orari della sessione di presentazione. 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 hanno inviato una copia della propria 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 (se si tratta di una sessione in programma per la mattina, il termine ultimo per contattare la Sala Relatori sarà la sera prima). I relatori dovranno assicurarsi che la loro presentazione sia consegnata allo staff di riferimento secondo le tempistiche indicate in quanto non sarà possibile garantire tempo supplementare agli autori le cui presentazioni non saranno pervenute per tempo. Durante la comunicazione orale, nel caso stia per terminare il tempo a disposizione, si consiglia di non accelerare per esporre il resto della relazione ma passare direttamente alle conclusioni. A tal proposito, potrebbe rivelarsi utile preparare una slide che sintetizzi le conclusioni.

La sessione poster si terrà nell'atrio dell'ingresso principale.

Gli autori sono pregati di controllare l'esatta ubicazione assegnata al proprio poster sulla mappa a disposizione nella Sala Poster. Lo staff al banco registrazioni sarà a disposizione in caso di necessità.

USEFUL INFORMATION

INFORMAZIONI UTILI

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

- Participation in Symposium sessions
- Symposium Proceedings
- Conference materials
- Coffee breaks
- Social events: Treasure Hunt in Venice (Monday) / Farewell Cocktail Party and Unipd Big Band Concert (Wednesday)
- Guided technical tours (book your place at the registration desk)
- Wi-Fi Internet access (Password not required)
- *Partecipazione alle sessioni del Simposio*
- *Atti del Convegno*
- *Materiale congressuale*
- *Coffee break*
- *Eventi sociali: caccia al tesoro a Venezia (lunedì) / Cocktail di chiusura con concerto jazz della Band dell'Università di Padova*
- *Visite tecniche guidate (prenotate il vostro posto presso il banco registrazioni)*
- *Accesso Internet Wi-Fi (Password non richiesta)*

REGISTRATION / REGISTRAZIONI

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

- Monday October 15th: 08:30 - 09:00, 10:40 - 18:00
- Tuesday October 16th: 08:30 - 18:00
- Wednesday October 17th: 08:30 - 18:00

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

- *Lunedì 15 Ottobre: 08:30 - 09:00, 10:40 - 18:00*
- *Martedì 16 Ottobre: 08:30 - 18:00*
- *Mercoledì 17 Ottobre: 08:30 - 18:00*

SOCIAL EVENTS

EVENTI SOCIALI

After eight hours of Symposium attendance it is time to enjoy the company of colleagues and friends, to relax and enjoy the entertainment. Details of social events organized are illustrated below.

Dopo una giornata di intenso lavoro congressuale è tempo di godere della compagnia di colleghi ed amici rilassandosi con un po' di svago. Come di seguito riportato numerosi sono gli eventi serali in programma.

Monday 15th	Treasure Hunt in Venice <i>Caccia al Tesoro a Venezia</i>
Tuesday 16th	Galleon Dinner Cruise and dancing night <i>Cena, crociera e serata danzante su Galeone Veneziano</i>
Wednesday 17th	Farewell Cocktail Party and Jazz Concert

Monday 15th October / Lunedì 15 Ottobre

20:30 - 23:30 Treasure Hunt in Venice / Caccia al Tesoro a Venezia

Meeting point: Symposium Venue

Duration: approx. 3 hours

Let's discover the secrets of the Venetian calli, campielli and fondamenta with an amazing treasure hunt!

An unconventional way to learn how to wander around this fabulous labyrinth without getting lost. Through a series of fun riddles we will lead you into the fascinating world of Marco Polo, revealing funny stories and legends, and together we will discover hidden gems, amazing monuments and breathtaking sites. Starting out from the conference venue each clue will lead you to the next destination. Will you solve them all?

If you like treasure hunts this will be a memorable experience to remember in the years to come. You will love it!

Places are limited and will be assigned on a first-come first-served basis. Therefore early booking is strongly recommended to be guaranteed a place. Please book your place at your arrival.

Una caccia al tesoro tra calli, fondamenta e campielli è sicuramente un modo divertente, e al contempo non convenzionale, per scoprire le tantissime meraviglie che Venezia ha da offrire.

Nascoste negli angoli della città troveremo insieme le tracce di un misterioso oggetto portato in laguna da Marco Polo di ritorno dal suo viaggio Cina: un manufatto dotato di poteri magici che è rimasto celato nella città da secoli.

A partire dalla sede del convegno ogni indizio sarà l'occasione per scoprire aneddoti e leggende legati alla storia veneziana. Riusciranno i nostri eroi a risolvere tutti gli enigmi e arrivare a destinazione?

I posti sono limitati e verranno assegnati strettamente in ordine di prenotazione. Pertanto consigliamo di iscriversi all'evento all'arrivo, presso il banco registrazioni.

SOCIAL EVENTS

EVENTI SOCIALI

Tuesday 16th October / Martedì 16 Ottobre

19:30 - 00:30 Galleon Dinner Cruise and dancing night / Cena, Crociera e serata danzante sul Galeone Veneziano

Meeting point: Symposium Venue h. 19:00

Duration: approx. 5 hours

Price: 70 € + VAT 22% per person

Step aboard a typical Venetian Galleon with us and enjoy an unforgettable evening in the seductive atmosphere of the Venetian lagoon.

As the last rays of the sun disappear on the horizon, the Galleon will slowly start moving off towards the northern part of the lagoon with its mysterious canals. You will be served delicious seasonal delicacies whilst sailing past the green islands of Le Vignole, Sant'Erasmo and San Francesco del Deserto.

The island of Burano with its brightly colored houses will come into view, followed by its neighbors Torcello and Mazzorbo. You will then sail past the island of Murano, well-known throughout the world for the delicate masterpieces created by its glassmakers. Sailing around the Arsenale, the Galleon will reach the small islands of Santa Maria delle Grazie and San Giorgio.

The Galleon will then head towards Venice and, while sailing the Canal of the Giudecca, you will be welcomed back by a breathtaking view of Saint Mark's basin and the historical palaces and hotels of the ancient city.

Musical entertainment will be arranged during the night.

As places are limited, we advise you to book as early as possible by filling in the online form.

Thursday 17th October / Mercoledì 17 Ottobre

17:00 Farewell Cocktail Party and Unipd Big Band Concert

To celebrate the closure of the conference, all delegates are warmly invited to join us for an evening of friendship and merriment in the beautiful setting of San Giovanni Evangelista.

Local wines and tasty appetizers (cicchetti) will be served as our way to say thank you to those who attended the conference. Smooth jazz melodies, played by the University of Padova jazz band, will accompany the evening.

The Unipd Big Band is part of the Concentus Musicus Patavinus: the musical studies and research center, at the University of Padova. It begun its activities in 2013 and all its members are part of the University of Padova, both current and former students, professors and technicians.

The Big Band's repertoire is based on original arrangements and tunes, some penned by its members (Alessandro Fedrigo, Ludovico Rinco and Alessandro Arcuri), other kindly given by famed contemporary jazz musicians such as saxophonist Ettore Martin and Michele Polga, guitarist Daniele Santimone and Nicola Privato, and pianist and bandleader Marcello Tonolo.

Alongside these original composition, the Big Band has in its repertoire, some classic arrangements by Count Basie and Duke Ellington. The conductor is the bassist and composer from Treviso, Alessandro Fedrigo.

MONDAY OCTOBER 15
MORNING

MONDAY OCTOBER 15

MORNING

OPENING SESSION / SALONE SAN GIOVANNI / 9:00-10:40

Chair / Presidente: Raffaello Cossu (IT)

WELCOME ADDRESSES / SALUTI DI BENVENUTO

9:00-10:00 Raffaello Cossu, University of Padova (IT)
Rainer Stegmann, Hamburg University of Technology (DE)
William P. Clarke, University of Queensland (AU)
Jianguo Liu, Tsinghua University (CN)
Toshihiko Matsuto, University of Hokkaido (JP)
Marco Ragazzi, University of Trento (IT)

OPENING LECTURES / RELAZIONI DI APERTURA

10:00-10:20 *M. Nelles (DE)*
Biogenic waste and residues in the energy system of the future

10:20-10:40 *M. Spyraiki, Member of European Parliament*

10:40-11:10 Coffee Break

SESSION A1 / SALONE SAN GIOVANNI / 11:10-12:50

CHARACTERISATION AND PRETREATMENT OF BIOMASS IN SUSTAINABLE ENERGY PRODUCTION

Chair / Presidente: J. Liu (CN)

E.G. Forbes, C.R. Johnston, H. Chen, J. Relf, J. Archer (UK)
Characterisation of biomass wastes for utilisation as sustainable energy sources

J. Kannengiesser, C. Kuhn, D. Stanojkovski, J. Jager, L. Schebek (DE)
Generation of bio-based products from OMSW by using a solid-liquid separation and an anaerobic treatment

A. Franca, C.M. Santos, L.S. Oliveira (BR)
Comparative evaluation of thermogravimetry-based methods for determination of ignition and burnout temperatures of biomasses aiming at solid fuel production

E.J. Bambokela, E. Muzenda, E.E. Agbenyeku, G. Danha (ZA)
Anaerobic co-digestion using animal wastes and organic fraction of municipal solid wastes (OFMSWS)

I. Pecorini, F. Baldi, E. Albini, G. Galoppi, G. Ferrara, R. Iannelli (IT)
Biochemical hydrogen potential test of the organic fraction of municipal solid waste in pilot scale reactors

SESSION B1 / ORATORIO DELLA CROCE / 11:10-12:50

MODELLING OF THERMAL TREATMENT PROCESSES

Chair / Presidente: D. Chen (CN)

F. Viganò (IT)

Modelling the combustion of any solid waste

T. Wenga, W. Ma, G. Chen (CN)

Experimental and kinetic modelling of KCl, H₂O vapour, and SO₂ on corrosion of Fe during simulated municipal solid waste combustion

K. Kishida, Y. Tanaka (JP)

Stable and complete combustion of medical waste by the vertical combustor

T.M. Ismail, E. Monteiro, A. Ramos, M. Abd El-Salam, P.S.D. Brito, A. Rouboa (EG)

Effect of plasma power and carrier gas on MSW plasma fixed bed gasifier using an Euler- Euler model

G. Groleau, F. Tanguay-Rioux, L. Spreutels, M. Heroux, R. Legros (CA)

Development of a MSW gasification model for flexible integration into a MFA-LCA framework

SESSION C1 / SALA STENDARDO / 11:10-12:50

ENERGY AND WASTEWATER

Chair / Presidente: A. Lagerkvist (SE)

A. Geißler (DE)

Development of a process engineering concept for the fermentation of nitrogen-containing substrates in the form of a high-performance hybrid reactor as a methane stage

F. Di Maria, M. Lasagni (IT)

Improving the global sustainability of the total recovery waste treatment plant of Arezzo

I. Eickhoff, N. Engler, M. Nelles (DE)

Development of an innovative process to digest press water from mixed household waste

N. Khandan (US)

Algal system for wastewater treatment and resource recovery

MONDAY OCTOBER 15

MORNING

SESSION D1 / SALA DELL'ALBERGO / 11:10-12:50

WORKSHOP: PUBLIC OPINION & EDUCATION

Chair / Presidente: R. Stegmann (DE)

In this workshop new ways to improve public acceptance and participation in waste management will be discussed. As a main tool the tailor-made education of the public and in Universities shall be fostered by means of innovative approaches. We will also discuss concrete ways for better education in developing countries.

Introductory lectures:

J. Slavik, K. Rybova, M. Dolejs (CZ)

Public involvement in the biowaste separation at source and its limits based on spatial conditions

R. Stegmann, W. Lu (DE)

Introducing social aspects in waste management education

M.C. Lavagnolo (IT)

Education in Waste management: a case study at Yaoundè, Cameroon

J. Palma-Oliveira, S. Zemba, C. Branquinho, B. Trump (PT)

Waste Treatment and health impact Analysis-Participatory science and community control as tools

SESSION E1 / SALA DEL GUARANA / 11:10-12:50 ITALIAN SESSION

BIOENERGIA DA RIFIUTI

Chair / Presidente: M. Lasagni (IT)

S. Romano, M. Viccaro, M. Cozzi, D. Caniani, I. Mancini, S. Masi (IT)

Dal mercato dei crediti di carbonio alla bioenergia: un'ipotesi della gestione forestale attiva

V. Negro, D. Mainero (IT)

Strategie per la stabilizzazione del biogas in un impianto di trattamento dei rifiuti industriali all'interno del progetto bioroburplus

S. Masi, P. Salatino (IT)

Presentazione del progetto PON Ricerca "Biofeerstok": integrazione delle filiere e delle tecnologie nel settore dei biocombustibili.

L. Ceccherini, M. Lasagni, L. Lombardi (IT)

Digestione anaerobica: scelta della tecnologia per un caso di studio italiano

C. J. Busato, R. Pellay, P. Barbierato, P. Pavan (IT)

Reattore anaerobico a membrana: produzione di biometano da pollina ed effluente ad elevata qualità

MONDAY OCTOBER 15
AFTERNOON

MONDAY OCTOBER 15

AFTERNOON

SESSION A2 / SALONE SAN GIOVANNI / 14:10-15:50

ANAEROBIC DIGESTION OF MSW ORGANIC FRACTION

Chair / Presidente: G. Bonifazi (IT)

A. Zentner, C. Dornack (DE)

Conversion of a mechanical biological treatment operating of residual waste to anaerobic digestion of organic fraction of municipal solid waste

L. Ceccherini, M. Lasagni, L. Lombardi (IT)

Anaerobic digestion: technology selection for an italian study case

E. Sobon-Mühlenbrock, M. Schlienz, M. Greger (LU)

Mesophilic and thermophilic anaerobic digestion of model kitchen waste with variation of fat content

R.G. Gregory, P.B. Mistry, R. Vogel (UK)

Key technical issues for managing anaerobic digestion of food waste

15:50 - 16:20 Coffee break and poster discussion

SESSION A3 / SALONE SAN GIOVANNI / 16:20-18:00

CO-DIGESTION OF DIFFERENT SUBSTRATES

Chair / Presidente: A. Zentner (DE)

I. Pecorini, E. Albin, F. Baldi, R. Iannelli (IT)

Performance of two-stage anaerobic co-digestion process: A pilot scale study

M.Y. Peña, A. Durán-Moreno (MX)

Anaerobic co-digestion of the organic fraction municipal solid waste: integrated management and energy conversion of beef cattle waste

K. Tsigkou, P. Tsafrakidou, A. Kopsahelis, D. Zagklis, C. Zafiri, M. Kornaros (GR)

Used disposable nappies and expired food products valorization through one- & two-stage anaerobic co-digestion

I. Zdanevitch, J. Lencauchez, C. Pineau, L. Andre (FR)

Roadside grass valorization in anaerobic digestion ("carmen" project)

SESSION B2 / ORATORIO DELLA CROCE / 14:10-15:50

THERMAL GASIFICATION OF BIOMASS I

Chair / Presidente: M. Nelles (DE)

M. Materazzi, R. Taylor (UK)

Integrated thermochemical process for production of low-molecular weight biofuels from municipal solid waste (MSW)

J. Haydary, J. Husar, P. Šuhaj (SK)

Catalytic tar cracking in biomass and waste gasification

G. Ducom, M. Gautier, M. Pietraccini, R. Gourdon (FR)

Comparison of 3 olive oil residues for fuelling a gasifier

D. Kardaś, J. Kluska, P. Kazimierski, M. Ochnio (PL)

Integrated experimental investigation and numerical modeling of hardwood gasification in updraft reactor

I. Gökalp, O. Kaya, S. Keçecioglu, D. Boden (FR)

A techno-economic feasibility analysis of the gasification of used tires for energy generation in Turkey

15:50 - 16:20 Coffee break and poster discussion

SESSION B3 / ORATORIO DELLA CROCE / 16:20-18:00

THERMAL GASIFICATION OF BIOMASS II

Chair / Presidente: L. Lombardi (IT)

M. Dudyński (PL)

Novel oxygen-steam gasification process for high quality gas from biomass

J. Mizuguchi, M. Kaneko, H. Takahashi (JP)

A novel tar-free gasification system for biomass power generation by means of thermally activated semi-conductors (TASC)

N. Inoue, Y. Maeda, T. Tada, K. Kawamoto (JP)

Gasification and catalytic reforming of woody biomass for improvement of gas yield and control of H₂/CO ratio

T. Dahou, F. Defoort, S. Thiéry, M. Grateau, M. Campargue, S. Bennici, M. Jeguirim, C. Dupont (FR)

Influence of the starting pyrolysis char on steam gasification kinetics

MONDAY OCTOBER 15

AFTERNOON

SESSION C2 / SALA STENDARDO / 14:10-15:50

ENERGY FROM SEWAGE SLUDGE

Chair / Presidente:

A. Ben Hassen Trabelsi, R. Zayoud, K. Zaafouri (TN)

Conversion of sewage sludge into energy feedstocks via pyrolysis process: optimization and modeling of biofuels production using response surface methodology

D. Castello, M.S. Haider, L.A. Rosendahl (DK)

Drop-in fuels from biomass and waste: upgrading of hydrothermal biocrudes from wood, algae and sewage sludge

T. Seljak, A. Žnidarčič, T. Katrašnik (SI)

Innovative approach to development of small-scale sludge incineration plants

S. Miryahyaei, M. Othman, N. Eshtiaghi (AU)

Effect of rheological properties of sludge on anaerobic digestion

15:50 - 16:20 Coffee break and poster discussion

SESSION C3 / SALA STENDARDO / 16:20-18:00

WORKSHOP: ENERGY FROM MICROALGAE BIOMASS

Chair / Presidente: A. Bertucco (IT)

Introductory lectures:

H. Ermis, M. Altinbas (TR)

Effect of anaerobic liquid digestate on fatty acid composition of microalgae

J.-C. Frigon, C. Roy, S.R. Guiot (CA)

Systematic approach for the pretreatment of microalgal biomass in order to maximise the solubilization of organic solids and subsequent methane yield

M.A. Wahab, G. Griffiths (UK)

Biomethane production from seaweeds and recycling of their liquid digestate as culture media to grow *Chlorella Sorokiniana* under mixotrophic conditions

SESSION D2 / SALA DELL'ALBERGO / 14:10-15:50

STRATEGIES IN RECOVERING RENEWABLE ENERGY FROM WASTE

Chair / Presidente: D. Yue (CN)

E.J. Bambokela, E. Muzenda, M. Belaid (BW)

Impact of artificial intelligence in the renewable energy sphere

N. Eickhoff, A. Wohlleben, S. Ford (DE)

Synergies of combining a modern thermal waste treatment and organic dry digestion

C. Cord'Homme (FR)

Tools to divide by 3 greenhouse gas emissions from waste sector

D. Wang, J. He, Y. T. Tang, D. Higgitt (CN)

The EU Landfill Directive drove the transition of sustainable municipal solid waste management in Nottingham City, UK

15:50 - 16:20 Coffee break and poster discussion

SESSION D3 / SALA DELL'ALBERGO / 16:20-18:00

WASTE TO ENERGY STRATEGIES: CASE STUDIES

Chair / Presidente: M. Ritzkowski (DE)

T. Lolos, C. Tsompanidis, E. Ieremiadi, K. Oikonomou (GR)

Comparison of different MBT plant efficiencies in terms of resources recovery energy efficiency and mitigation to climate change - Case studies from various EU co-financed projects

C. Camolesi Guimarães, L.S. Macedo, A.M. Barbosa, C.Z.T. Rebelo, F.P. Manéo, C.E. Teixeira (BR)

Source separation strategies of household waste: challenges regarding popular acceptance and participation in a pilot program in Bertioga, São Paulo, Brazil

T.M. Ismail, K. Koutera, Y. Kobayashi, K. Yoshikawa (EG)

Assessment of new technology for clean combustion and its impact on waste and health

D. Suarez, P. Graziani (IT)

Feasibility design study of a mechanical biological treatment plant (MBT) using solid residues in the city of Loja (Ecuador)

D. Pfeiffer, N. Szarka, D. Thrän (DE)

Perspectives for the application of biogenic residues and organic wastes for energy use

MONDAY OCTOBER 15

AFTERNOON

SESSION E2 / SALA DEL GUARANA / 14:10-15:50 / ITALIAN SESSION ENERGIA NELLA GESTIONE DEI RIFIUTI E VALUTAZIONI STRATEGICHE

Chair / Presidente: G. Cappai (IT)

F. Vigano (IT)

Come descrivere la combustione di qualsiasi mix di rifiuti solidi

S. Brivio, N. Kahale, L. Lombardi (IT)

Analisi del ciclo di vita di sistemi di rimozione dei gas acidi a secco in impianti di termovalorizzazione dei rifiuti urbani

F. Di Maria, M. Lasagni (IT)

Incremento della sostenibilit  dell'impianto a recupero totale di trattamento rifiuti di Arezzo

M. Gallo, V. Marotta, L. Moreschi, A. Del Borghi (IT)

Sostenibilit  nel settore marittimo: valutazione delle prestazioni di diverse modalit  di gestione dei rifiuti

S. Dalzero (IT)

  ci  che chiamiamo progresso. Rifiuti, destino di tutte le merci

15:50 - 16:20 Coffee break and Poster discussion

SESSION E3 / SALA DEL GUARANA / 16:20-18:00 / ITALIAN SESSION GESTIONE DELLE EMISSIONI GASSOSE DA IMPIANTI DI RECUPERO ENERGETICO, DA BIOMASSE E DA RIFIUTI

Chair / Presidente: A. Pivato (IT)

A. Mantovani (IT)

Prevenzione e controllo delle emissioni in atmosfera negli impianti di incenerimento

A. Pivato (IT)

Criteri di dimensionamento di biofiltri

G. Cappai (IT)

Stoccaggio minerale della CO₂ mediante carbonatazione accelerata di ceneri da impianti a biomasse

M. Ragazzi (IT)

Incidenza locale delle emissioni da impianti di trattamento dei rifiuti: ambiente e salute

TUESDAY OCTOBER 16
MORNING

TUESDAY OCTOBER 16

MORNING

SESSION A4 / SALA SAN GIOVANNI / 09:00-10:40

CONTROL OF ANAEROBIC DIGESTION REACTORS

Chair / Presidente: W. Clarke (AU)

N. Abdel Karim Aramouni, M.N. Ahmad, W. Kwapinski, J. Zeaiter (LB)

Carbon formation mitigation in dry reforming of methane

C.E. Gomez Camacho, L. Mangialardi, B. Ruggeri (IT)

Shear stress as phylogenetic control of microbial population dynamics in a dark fermentation (DF) systems

A. Nsair, S. Önen, K. Kuchta (DE)

Optimization of the stirring system for large scale biogas plant

E.J. Bambokela, E. Muzenda (ZA)

Assessing the chemiabsorptive potency of sodium hydroxide in anaerobic digestion under mesophilic conditions

10:40 - 11:10 Coffee break

SESSION A5 / SALA SAN GIOVANNI / 11:10-12:50

BIOGAS PRODUCTION FROM ORGANIC WASTE

Chair / Presidente: J. Liu (CN)

C.E. Gomez Camacho, M. Persico, I. Mangialardi, B. Ruggeri (IT)

Energetic performance of semi-pilot two-step anaerobic digester (TSAD) of organic market waste (OMW) operated in continuous-mode

L. Janke, S. Weinrich, A.F. Leite, H. Sträuber, M. Nikolausz, M. Nelles, W. Stinner (DE)

Year-round biogas production in sugarcane biorefineries: process stability, optimization and performance of a two-stage reactor system

C. Wangnai, C. Poonthawee (TH)

Biogas production from palm oil mill effluent using an anaerobic hybrid reactor: from laboratory-scale study to industrial-scale implementation

M. Tcha-Thom, G. Feuillade-Cathalifaud, V. Pallier, G. Baba, E.K. Koledzi (FR)

An integrated approach for valorization of pineapple waste into biogas

T. Haupt, T. Waetzel, E. Kraft (DE)

Reduction of uncontrolled struvite and carbonate formation in biogas plants

SESSION B4 / ORATORIO DELLA CROCE / 09:00-10:40

PYROLYSIS AND GASIFICATION

Chair / Presidente: M. Ragazzi (IT)

J. Musil, E. Hroncová, J. Ladomerský (SK)

Review of problematic legislative threshold values for quality of secondary fuels from waste produced by pyrolysis and gasification technologies and proposal for their change

P. Rentocchini, C. Valentini, M. Compagnino (IT)

Exhausted tires: material and energy recovery through pyrolysis

A.A. Rodriguez Gamboa, L.R. Santos, A.M.A. Rocha, J.A. Carvalho Jr. (BR)

Potential utilization of tyre pyrolytic oil produced in Brazil as alternative fuel

S. Inoue, T. Nakagawa (JP)

High efficiency utilization system of by-product gas from steelworks

N. Wang, D. Chen (CN)

Energy recovery efficiencies from MSW pyrolysis and char reforming process: influence of miscellaneous parameters

10:40 - 11:10 Coffee break

SESSION B5 / ORATORIO DELLA CROCE / 11:10-12:50

PYROLYSIS OF SPECIFIC ORGANIC WASTE

Chair / Presidente: U. Arena (IT)

F. Di Renzo, I.Z. Awan, S. Albonetti, F. Cavani (FR)

Evaluation of the reduction of hydrogen burden in bio-oil production by hydrogen-transfer pre-treatment of lignin

G. Xu, D. Chen, Y. Feng, X. Dai (CN)

High quality products from sewage sludge pyrolysis-reforming process in a continuous reactor: effect of pyrolysis temperature

G. Kolb, H. Pennemann, J. Schürer, C. Schindler (DE)

The BIOGO process: Conversion of wood residue derived pyrolysis oil and bio-gas to synthetic gasoline operated in a mini-plant in a modular containerised environment

H. Zhao, D. Chen, L. Yin, X. Dai (CN)

Pyrolysis characteristics of typical oil sludges and target products determining

L. Fryda, R. Visser, J. Schmidt (NL)

Environmental impact assessment of combined biochar & bioenergy production

TUESDAY OCTOBER 16

MORNING

SESSION C4 / SALA STENDARDO / 09:00-10:40

ENERGY FROM ANIMAL WASTE MANAGEMENT

Chair / Presidente: M.C. Zanetti (IT)

I. Moukazis, F.-M. Peller, E. Gidakos (GR)

Valorization of slaughterhouse by-products via saponification process

C. Mribet, J. Wu, H. Chen, B. Jiang, Y.-Y. Li (JP)

Operation of COD removal of a full scale slaughterhouse wastewater treatment plant using a combination of UASB and Activated Sludge process

S. Nilsson Påledal, E. Wasell, M. Gustavsson (SE)

Dry and wet digestion of dewatered manure - Biogas production in laboratory scale

B. Schumacher, J. Pröter, J. Liebetrau (DE)

Pre-treatment of cattle manure with pressure swing conditioning and its effects on biogas production

10:40 - 11:10 Coffee break

SESSION C5 / SALA STENDARDO / 11:10-12:50

WORKSHOP: ENERGY FROM WASTE IN LEATHER INDUSTRY

Chair / Presidente: R. Rafieenia (IT)

Using low value substrates such as waste materials can reduce the price of end products while facilitate waste utilization. The leather making industry produces considerable amounts of solid waste (animal fats, skin, and sludge from wastewater treatment plants) and wastewater. The biodegradable wastes could be considered as potential substrates for biogas production through anaerobic digestion, biodiesel production or combustion.

In the present workshop, we have for presentations. The first talk will be an introductory lecture about possible processes for energy recovery from leather industry wastes. The second presentation will be focused on the effect of high salinity on microbial performance during leather pickling wastewater. The next talk will be about biogas production from solid waste (collagen based) substrates. Finally, the last talk will be about co-combustion of leather tannery waste and hardwood pellets.

Introductory lectures:

R. Rafieenia (IT)

Energy from waste in leather industry - A review

J. Cassidy, C.S.S. Oliveira, B. Oliveira, C. Henriques, M.A.M. Reis (PT)

High salinity effect on the methanogenic microbial performance treating leather pickling wastewater

C. Scaraffuni Gomes, J.-U. Repke, M. Meyer (DE)

Diauxia during biogas production from collagen-based substrates

J. Kluska, T. Turzyński, D. Kardaś (PL)

Experimental tests of co-combustion of pelletized leather tannery wastes and hardwood pellets

SESSION D4 / SALA DELL'ALBERGO / 09:00-10:40

WORKSHOP: BIO-BASED PLASTICS

Chair / Presidente: F. Girotto (IT)

Bio-based plastics are made in whole or partially from renewable biological resources. When the starting feedstock is not a virgin one, the process becomes even more sustainable.

In the view of a bio-refinery process, valorisation of putrescible organics via acidogenic fermentation enables the recovery of biological metabolites to be used for bio-plastic production.

In addition to this, issues related to their possible re-use, recycling and disposal will be presented and different management pathways will be shown during the Workshop.

Introductory lectures:

F. Girotto (IT)

Bio-based plastics: a review

J. Bauer, C. Westphalen, W. Bidlingmaier (DE)

Bio-based plastics in the post-consumer-recycling stream

M. Labbert, T. Baloun, P. Clemenz, J.I. Schoenherr (DE)

Sorting of conventional, fiber-reinforced, and biodegradable plastics

10:40 - 11:10 Coffee break

SESSION D5 / SALA DELL'ALBERGO / 11:10-12:50

WASTE MANAGEMENT IN DEVELOPING COUNTRIES

Chair / Presidente: M.C. Lavagnolo (IT)

R. Kahhat, K. Ziegler-Rodriguez, M. Margallo, R. Aldaco, A. Irabien, I. Vazquez-Rowe (PE)

Waste to energy potential in Latin America

V. Di Bella, N. Fulbrook-Kagwe (UK)

Innovative approaches for the management of industrial and commercial waste in developing countries

E. Morton, S.R. Hobbs (US)

Sustainable waste management strategies for Sittee River, Belize

A. Ben Hassen Trabelsi, K. Zaafour (TN)

Solid waste management strategy in Tunisia: trends and opportunities for bio-fuels production

M.R. Sarder, M. Alamgir (BD)

Strength, weakness, opportunity and threat analysis of solid waste management at Kuet campus

TUESDAY OCTOBER 16

MORNING

SESSION E4 / SALA DEL GUARANA / 09:00-10:40

COMPANIES FORUM I

Chair / *Presidente*: R. Cossu (IT)

The latest bioenergy innovations and markets trends will be discussed during a forum specifically conceived for companies and firms operating in the field of energy from biomass and waste.

The forum will be freely accessible to all delegates and visitors of the conference, thus representing the perfect chance for companies to gain visibility, meet new potential clients and present products to a seated public.

Confirmed companies:

S. Andersson (SE) / Babcock & Wilcox Vølund AB
ADIOX for dioxin removal from flue gases

P. Lindgren (SE) / Babcock & Wilcox Vølund AB
Flue gas condensation for enhanced energy recovery from WtE

M. Meyer (DE) / FILK
FILK - leather research and byproduct management

10:40 - 11:10 Coffee break

SESSION E5 / SALA DEL GUARANA / 11:10-12:50

COMPANIES FORUM II

Chair / *Presidente*: R. Cossu (IT)

In Session E5 the discussion started in the previous session E4 will be continued with exhibitors and supporters.

Confirmed companies:

Y. Tanaka (JP) / Plantec Inc. Singapore Branch
Medical waste incineration in Dubai & Singapore utilizing the vertical combustor invented by Plantec in Japan

M. Nistor (SE) / Bioprocess Control
Smart analytical instruments for biogas labs

M. Dudynski (PL) / Modern Technologies and Filtration Sp.zo.o
Waste disposal in Poland. Doing business with MTF

TUESDAY OCTOBER 16
AFTERNOON

TUESDAY OCTOBER 16

AFTERNOON

SESSION A6 / SALA SAN GIOVANNI / 14:10-15:50

BIOMASS TO ENERGY IN DEVELOPING COUNTRIES

Chair / Presidente: M. Alamgir (BD)

A.I. Bufoni, C. Picolli, P. Delvizio, A.C. De Sousa Ferreira, P. Novis (BR)

The energy potential of Brazilian agricultural biomass waste

M.I. Quispe Trinidad, R. Navia, R. Kahhat (PE)

Technical, economic and environmental viability for energy recovery from rice husk in Peru

F.A. Aisien, E.T. Aisien (NG)

Energy from cassava peels

S. Ilyas, R.R. Srivastava (PK)

Energy and emissions: a growth plight for developing countries

15:50 - 16:20 Coffee break and poster discussion

SESSION A7 / SALA SAN GIOVANNI / 16:20-18:00

BIOMETHANE PRODUCTION

Chair / Presidente: B. Ruggeri (IT)

J. Heerenklage, R. Raga, F. Moretta, D. Rechtenbach, I. Atamaniuk, A. Alassali, K. Kuchta (DE)

Development of a method to produce standardised and storable inocula for biomethane potential tests

J. Zabranska, D. Pokorna, Z. Varga (CZ)

Biomethane from biogas by biological carbon dioxide reduction with external hydrogen

C.J. Busato, R. Pellay, P. Barbierato, P. Pavan (IT)

Anaerobic membrane reactor: biomethane from chicken manure and high quality effluent

E.J. Bambokela, E. Muzenda, E.E. Agbenyeku, G. Danha (ZA)

Potential utilization of liquified biogas (LBG) in Africa - A review

C. Castellana, M. Ravina, D. Panepinto, M. Zanetti (IT)

MCBioCH₄: a computational model for biogas and biomethane evaluation

SESSION B6 / ORATORIO DELLA CROCE / 14:10-15:50

HYDROTHERMAL CARBONIZATION

Chair / Presidente: A. Pivato (IT)

N.D. Berge, J.R.V. Flora, L. Li (US)

Energy recovery from organic wastes using hydrothermal carbonization

D. Sangare, A. Missaoui, S. Bostyn, V. Belandria, M. Moscossa-Santillan, I. Gökalp (FR)

Optimization of agave salmiana bagasse conversion by hydrothermal carbonization (HTC)

N. Koutsogeorgas, I. Moukazis, F.-M. Peller, E. Gidarakos (GR)

Hydrothermal carbonization of brewer's spent grains

W.A. Campbell, R.W. Evitts, A. Collier (CA)

Comparing severity of continuous torrefaction for five biomass with a wide range of bulk density and particle size

15:50 - 16:20 Coffee break and poster discussion

SESSION B7 / ORATORIO DELLA CROCE / 16:20-18:00

HYDROTHERMAL LIQUEFACTION AND OTHER THERMOCHEMICAL CONVERSION PROCESSES

Chair / Presidente: W. Campbell (CA)

M. Calado, N. Mac Dowell, C.J. Tighe (UK)

Stochastic techno-economic analysis of liquid fuel production from fast hydrolysis of woody biomass in near-critical water

M. Grilc, G.C. Faussone, B. Likozar (SI)

Lignocellulosic biomass liquefaction and isolation of inorganics: the BIAR process

H. Azaizeh, S. Abdelhadi, G. Rytwo, C.G. Dosoretz (IL)

Production of biochar from olive mill solid wastes for removal of heavy metals from industrial wastewater

Y. Tang, N. Ren, M. Li, T. Shen (CN)

Effect of minerals on temperature-dependent properties of sewage sludge biochar

TUESDAY OCTOBER 16

AFTERNOON

SESSION C6 / SALA STENDARDO / 14:10-15:50

ENERGY FROM FOOD WASTE MANAGEMENT

Chair / Presidente: M. Nelles (DE)

D. Panepinto, V. Riggio, G. Campo, A. Cerutti, M.C. Zanetti (IT)

Environmental and energetic evaluation of different solutions for by-products valorization

R. Rajagopal, B. Goyette (CA)

High-solid anaerobic co-digestion of food waste and dairy manure: a pilot scale study at low temperature conditions

I. Efthymiopoulos, P. Hellier, N. Ladommatos, A. Eveleigh, B. Mills-Lamptey (UK)

Effect of temperature and pressure on the efficiency of solvent extraction of lipids from spent coffee grounds

D.-J. Kim, H. Shin, Y.M. Kim (KR)

Phosphates adsorption/desorption characteristics of metal impregnated bio-char from the pyrolysis of coffee waste

O. Aboelazayem, M. Gadalla, B. Saha (UK)

Systematic multivariate optimisation of biodiesel synthesis from high acid value waste cooking oil: a response surface methodology approach

15:50 - 16:20 Coffee break and poster discussion

SESSION C7 / SALA STENDARDO / 16:20-18:00

WORKSHOP: MICROBIAL FUEL CELLS IN WASTE TO ENERGY STRATEGIES

Chair / Presidente: V. Di Noto (IT)

Introductory lecture:

E. Chirwa, B. Needham-Clark, N. Bezuidenhout (ZA)

Performance analysis for self-regenerating anoxic and methogenic anode microbial fuel cells

G. Cerminara, R. Raga, A. Schievano, A. Pivato, (IT)

Integration of MFC technology with lab-scale landfill bioreactors for organic matter removal: test configuration and preliminary results.

SESSION D6 / SALA DELL'ALBERGO / 14:10-15:50

WORKSHOP: COMBUSTION RESIDUES

Chair / Presidente: A. Poletti (IT)

Introductory lectures:

A. Poletti (IT)

Combustion residues: introductory paper

F. Huber, H. Herzel, C. Adam, O. Mallow, D. Blasenbauer, J. Fellner (AT)

A novel approach for the decontamination of MSWI fly ash using existing waste incineration plants

K. Ohenoja, M. Illikainen (FI)

Fly ashes from fluidized bed combustion of biomass and wastes as a construction material: effect of CaO additions

15:50 - 16:20 Coffee break and poster discussion

SESSION D7 / SALA DELL'ALBERGO / 16:20-18:00

WASTE MANAGEMENT STRATEGIES IN DEVELOPING COUNTRIES: CASE STUDIES

Chair / Presidente: F. Aisien (NG)

A. Campitelli, J. Kannengießer, C. Kuhn, L. Schebek (DE)

Implementation of an innovative biotechnology to produce bio-based products out of bio-waste: case Study Morocco and Côte d'Ivoire

M.B. Torres Cordero, A.B. Carvajal, P. Soto, L. Villalba, P. Graziani, D. Suarez (IT)

Solid waste characterization in Ecuador and the approach for its recovery and harnessing

J. Waewsak, P. Nutongkaew, P. Kiddee, C. Kongruang, C. Tranchant, Y. Gagnon (TH)

Sustainability of waste-to-energy (WtE) power generation from municipal solid waste in the Nakhon Si Thammarat province, Southern Thailand

G.Rondina Pupo da Silveira, N.S. Carriel, E.G. Correa, D.M. Polonio (BR)

Socio-environmental responsibility: the experience of an interdisciplinary debate as an educational strategy in a Brazilian higher education institution

TUESDAY OCTOBER 16

AFTERNOON

SESSION E6 / SALA DEL GUARANA / 14:10-15:50

WASTE AND HEALTH

Chair / *Presidente*: I. Zdanevitch (FR)

A. Maalouf, F. Sisani, F. Di Mari, M. Lasagni, M. El-Fadel (IT)

Increasing material and energy recovery from waste facilities: human health and ecosystem implications

T. Gladding, S. Tyrrel (UK)

Bioaerosols and waste management: an occupational and environmental issue?

O. Schlosser (FR)

Bioaerosols from MSW and C&IW management activities and health: knowledge and gaps

D. Traversi, E. Anedda, G. Gilli (IT)

Airborne microbiome diversity in the atmospheric environment of bioenergy plants

15:50 - 16:20 Coffee break and poster discussion

SESSION E7 / SALA DEL GUARANA / 16:20-18:00

CONTROL OF CONTAMINANTS IN WASTE MANAGEMENT AND HEALTH PROTECTION

Chair / *Presidente*: T. Astrup (DK)

W.P. Clarke (AU)

Managing emerging contaminants in a circular economy

A. Cambiaghi, G. Lonati (IT)

The actual contribution of WTE plants emissions to air quality: a case study from Northern Italy

Y. Jang, H. Kim, Y. Jang, Y. Kwon, H. Park (KR)

Flow analysis of brominated flame retardants in automobile shredded residues in Korea

I. Zdanevitch (FR)

Bio-waste from household collected separately and small scale composting: health risk issues

WEDNESDAY OCTOBER 17
MORNING

WEDNESDAY OCTOBER 17

MORNING

SESSION A8 / SALA SAN GIOVANNI / 09:00-10:40

BIODIESEL AND BIOETHANOL FROM BIOMASS

Chair / Presidente: A. Ben Hassen-Trabelsi (TN)

I. Idowu, M.O. Pedrola, S. Wylie, P. Kot, D. Phipps, A. Shaw (UK)

Improving biodiesel yield of animal waste fats by combination of a pretreatment technique and microwave technology

D. Papargyriou, E. Broumidis, M. De Vere-Tucker, S. Gavrielides, A.D. Bonaccorso, P. Hilditch, J.T.S. Irvine (UK)

Investigation of heterogeneous catalysts for biodiesel production from fish waste oil

Y. Yerima, F.A. Aisien (NG)

Studies on the degradation of raphia palm frond for bio-ethanol production using *Trichoderma Reisi*

K. Zaafouri, T. Jabri, M. Hamdi (TN)

Valorization of industrial waste of baker's yeast (IWB) into 2nd generation ethanol fuel

P. Rocha, A. Franca, L. Oliveira (BR)

Sulfonated activated carbon from corn cobs as heterogeneous catalysts for biodiesel production using microwave-assisted transesterification

10:40 - 11:10 Coffee break

SESSION A9 / SALA SAN GIOVANNI / 11:10-12:50

ANAEROBIC DIGESTION OF SEWAGE SLUDGE

Chair / Presidente: A. Chiumenti (IT)

J. Ruiz-Martinez, R. Li, Y. Zhao, M. Ji (CN)

Wet-high solids anaerobic digestion of dewatered sewage sludge: some steps towards better understanding the process

V. Bobade, J.C. Baudez, G. Evans, N. Eshtiaghi (AU)

Impact of gas injection on flow and physicochemical properties of municipal sewage sludge

E-M. Ekstrand, B.H. Svensson, A. Björn (SE)

Viscosity dynamics during anaerobic digestion of pulp and paper mill fibre sludge - The dependency on extracellular polymeric substances and soluble microbial products

M. Zietsman, S. Erasmus, S. Berner, J. Bezuidenhout, C. Bezuidenhout (ZA)

Assessment of selected pathogens and their removal during anaerobic digestion of faecal sludge

SESSION B8 / ORATORIO DELLA CROCE / 09:00-10:40

COMBUSTION EMISSIONS

Chair / Presidente: A. Poletti (IT)

H. De Chefdebien (FR)

The meaningful silences of the WI BREF BAT conclusions

S. Andersson, P. Lindgren (SE)

Flue gas cleaning requirements following from the new draft WI BREF

M. Aleya, N. Akbary (DE)

Intelligent combustion and emissions monitoring system (ccem-system) for low pollutants and high efficiency in biomass combustion plants

S. Andersson, M.D. Paz, J. Phother, T. Jonsson (SE)

High temperature corrosion and dioxin abatement using sulfur recirculation in a waste-to-energy plant

P. Davison (UK)

A global perspective on changing public attitudes towards energy from waste and how to encourage public support

10:40 - 11:10 Coffee break

SESSION B9 / ORATORIO DELLA CROCE / 11:10-12:50

RDF - REFUSED DERIVED FUEL

Chair / Presidente: E.C. Rada (IT)

S. De Gisi, F. Sciommarella, L. Tagliente, M. Notarnicola (IT)

Reducing agglomeration phenomena in a SRF-fired fluidized bed waste-to-energy plant through the use of dolomite: a full scale investigation

C. Bernardes Jr. (BR)

Characterization of mined domestic waste in Brazil focused on its use as RDF

T.M. Ismail, K. Yoshikawa, H. Sherif, M. Salah, S. Saeed (EG)

Assessment of thermal treatment for windrow drying process of refused derived fuel (RDF): A case study

H. Rechberger, T. Schwarzböck, P. Aschenbrenner, S. Szidat, J. Fellner (AT)

How to reliably determine the climate relevance of refuse derived fuels

WEDNESDAY OCTOBER 17

MORNING

SESSION C8 / SALA STENDARDO / 09:00-10:40

ENERGY FROM AGRICULTURAL WASTE

Chair / Presidente: S. Masi (IT)

C.E. Gómez Camacho, K. Pellicer Alborch, A. Bockisch, P. Neubauer, S. Junne, B. Ruggeri (IT)

Monitoring the impact of pH regulation in dark fermentation of agricultural waste: effects on product distribution and cell viability

T. Schliermann, I. Hartmann, H. Beidaghy Dizaji, T. Zeng, D. Schneider, S. Wassersleben, D. Enkeb, T. Jobst, A. Lange, F. Roelofs, A. Fellner, P. Schneider (DE)

High quality biogenic silica from combined energetic and material utilization of agricultural residues

M.D. Barbosa Watanabe, E.R. Morais, T.F. Cardoso, A. Bonomi (BR)

Techno-economics of renewable electricity from sugarcane straw in retrofit projects in Brazil

M.A. Wahab, F. Habouzit, N. Bernet, N. Jedidi, R. Escudie (UK)

Development of a new anaerobic reactor concept for the simultaneous treatment of high strength effluents and lignocellulosic waste

10:40 - 11:10 Coffee break

SESSION C9 / SALA STENDARDO / 11:10-12:50

ENERGY FROM LANDFILLS

Chair / Presidente: R. Raga (IT)

M. Zhang, Z. Ni, J. Liu (CN)

Experimental study of MSW degradation in an "aerobic-anaerobic-aerobic" three-stage landfilling bioreactor

S. Schmuck, A. Thom, T. Ricken, R. Widmann (DE)

DepSIM: Numerical 3D-simulation of gas and water streams in landfills

E.J. Bambokela, E. Muzenda, M. Belaid (ZA)

Simulation of a biogas upgrading plant connected to the carbon, capture and storage (CCS) system

R. Ahmed, A.S. Kataria, Md.J.B. Alam, Md.S. Hossain (US)

Energy potential of landfill mined solid waste

SESSION D8 / SALA DELL'ALBERGO / 09:00-10:40

RECYCLING OF WASTE INTO CONSTRUCTION

Chair / Presidente: E. Gidakos (GR)

M. Martín-Morales, M. López-Alonso, M.J. Martínez-Echevarría, J. Rodríguez-Montero, M. Zamorano (ES)

Valorization of fine olive stone in masonry mortars

M. Martín-Morales, D. Eliche-Quesada, L. Pérez Villarejo, M. Zamorano Toro (ES)

Ecofriendly clay bricks incorporating almond shell

J. Torres Agredo, D. Giraldo Alzate, C.M. Coral Huertas, F. Álvarez Hincapié, S. Gallego Restrepo (CO)

Use of a secondary lead smelting slag as an addition to clay bricks and its impacts on air quality and living organisms

A.A.G. Pimenta, C. Rodrigues Teles, G.L. Vieira, P.J.M. Pires (BR)

Reuse of tires and steel slag for application on retaining walls: literature review and case study

10:40 - 11:10 Coffee break

SESSION D9 / SALA DELL'ALBERGO / 11:10-12:50

ENVIRONMENTAL AND LIFE CYCLE ASSESSMENT

Chair / Presidente: T. Matsuto (JP)

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

Environmental performances of alternative strategies for biomethane production

S.J. Burnley (UK)

A life cycle assessment of energy from waste and recycling in a post-carbon future

S. Brivio, N. Kahale, L. Lombardi (IT)

Life cycle assessment of dry flue gas treatment in WtE plants

D.C. Rosenfeld, H. Bohm, J. Lindorfer, M. Lehner (AT)

Greenhouse gas reduction in an integrated steel work by implementing a Power-to-Gas and biomass gasification system: a feasibility and techno-economic study

WEDNESDAY OCTOBER 17

MORNING

SESSION E8 / SALA DEL GUARANA / 09:00-10:40

BIOREFINERY FOR DIFFERENT WASTE STREAM

Chair / Presidente: R. Pomi (IT)

F. Asunis, M.R. Boni, G. De Gioannis, M. Isipato, A. Muntoni, A. Poletti, R. Pomi, A. Rossi, D. Spiga (IT)

Dark fermentation of sheep cheese whey: biochemicals and biofuels production as a function of fermentation time and pH

R. Alayoubi, N. Mehmood, E. Husson, A. Kouzayha, M. Tabcheh, C. Sarazin, I. Gosselin (FR)
Mild ionic liquid pretreatment of lignocellulosic biomasses for enhanced second generation bioethanol yields

P. Kaewkannetra, P. Muanruksa (TH)

Combination of fatty acids extraction and enzymatic esterification for biodiesel production using sludge palm oil as a low-cost substrate

K. Malik (IN)

Bio-ethanol production from waste potato by using *Saccharomyces Cerevisiae*

J. Hancsok, O. Visnyei, A. Holló, L. Leveles (HU)

Alternative Diesel Fuels with High Hydrogen Content in their Molecular Structures

10:40 - 11:10 Coffee break

SESSION E9 / SALA DEL GUARANA / 11:10-12:50

WORKSHOP: BIOREFINERY - OPPORTUNITIES AND PERSPECTIVES

Chair / Presidente: A. Muntoni (IT)

The progressive implementation of the circular economy concepts, the population growth and associated concerns in terms of availability of non-renewable resources, the will of many countries to diversify their strategic sources and to free themselves from the supply of materials and energy resources from areas politically and socially unstable, the fight against climate change, the need to favor delocalization of production systems and promote regional and rural development, the improvement of the knowledge of the factors that govern biological processes, entail that the context of biowaste management currently looks at more ambitious and articulated targets which find the most appropriate and complete synthesis in the concept of waste biorefinery.

Introductory lectures:

A. Muntoni (IT): Waste biorefinery: opportunities and perspectives

M. Mittelbach (AT)

Recent developments and challenges of biodiesel from waste oils and fats

T.F. Astrup (DK)

Process-oriented life cycle assessment modeling of waste biorefinery technologies: an outlook

W. Clarke (AU)

Industrial H₂S production using municipal solid waste as a carbon source

**CIRS - COMITATO
INTERDISCIPLINARE
RIFIUTI E SALUTE
KICK OFF MEETING**

MERCOLEDÌ 17 OTTOBRE

MATTINA

KICK OFF MEETING / 10:00-13:00

CIRS - COMITATO INTERDISCIPLINARE RIFIUTI E SALUTE

Chair / Presidente: Raffaello Cossu

E' indubbio che quella della salute è oggi la principale preoccupazione per le popolazioni interessate dalla costruzione e gestione delle installazioni per la gestione dei rifiuti solidi e la comunità scientifica, colpevolmente, ha fatto poco per cercare di portare chiarezza su questi argomenti, lasciandoli troppo allo sbando di dibattiti improvvisati, alla manipolazione di interesse di parte e alle speculazioni politiche e mediatiche.

Proprio per ovviare a questa carenza di informazione scientifica corretta, non tendenziosa, non portatrice di interessi, che nasce l'esigenza condivisa da diversi e qualificati esponenti della comunità scientifica in Italia, di un **Forum su Rifiuti e salute**, interdisciplinare, circoscritto agli aspetti squisitamente tecnici e scientifici, aperto a tutti gli esperti qualificati nei rispettivi campi disciplinari e professionali (Ingegneri, Biologi, Chimici, Igienisti, Epidemiologi, Avvocati, Oncologi, ecc.), che si muova in accordo e in collaborazione con gli organismi istituzionali (Ministero dell'Ambiente, Ministero della Sanità, Istituto Superiore della sanità, ISPRA, ENEA, ASL, CNRecc.).

Obiettivo finale sarà quello di produrre un documento condiviso che per differenti tipologie di rifiuto solido e tecnologie di gestione dei rifiuti faccia il punto sullo stato delle conoscenze nel settore così da costituire una base di razionale riferimento per la popolazione.

Il Forum, che si chiamerà **CIRS (Comitato Interdisciplinare Rifiuti e Salute)**, è promosso dal Tavolo di Roma (think-tank sui rifiuti che unisce uomini politici di diverso orientamento politico, ingegneri ambientali, medici, giornalisti, magistrati, ambientalisti) e prenderà avvio in occasione del Simposio, il giorno 17 ottobre, h.10:00, con un "kick-off meeting" dove si metteranno le basi metodologiche e programmatiche del lavoro da fare.

Il successivo incontro si svolgerà in una Sala convegni del Parlamento, per lanciare ufficialmente l'iniziativa e sancire il rapporto di collaborazione con le istituzioni del paese e l'interesse sociale nazionale dell'iniziativa stessa.

Il Comitato è aperto a tutte le persone che vantano esperienze concrete sulla tematica.

WEDNESDAY OCTOBER 17
AFTERNOON

WEDNESDAY OCTOBER 17

AFTERNOON

CLOSING SESSION / SALONE SAN GIOVANNI / 14:30-16:40

SYMPOSIUM MEETS SOCIETY / HEALTH ISSUES IN WASTE TO ENERGY: WHAT BOTHERS PEOPLE, WHAT IS TRUE?

Chair / *Presidente*: Rainer Stegmann (DE)

Exposure to hazardous waste can affect human health, children being more vulnerable to these pollutants. In fact, direct exposure can lead to diseases through chemical exposure as the release of chemical waste into the environment leads to chemical poisoning. Many studies have been carried out in various parts of the world to establish a connection between health and hazardous waste.

A modern waste management is addressed to solve the health issues associated to an improper and informal waste management. But release of emissions from waste circulation, treatment and disposal, especially in connection obsolete technologies, are rising concern for possible health impacts.

The available scientific evidence on the waste related health effects is not conclusive, but suggests the possible occurrence of serious adverse effects particularly when toxic waste are involved.

Due to these uncertainties the communication is unfortunately left so far to informal organizations and groups, which spread disinformation and fake news, creating dangerous prejudices and scaremongering.

This Round Table will try to focus on some questions: What is the state of art with the scientific research? How to better involve the scientific community in communicating to the public opinion? How to cooperate among the different disciplines involved in the waste and health issues ?

Confirmed speakers:

Raffaello Cossu, University of Padova (PD)

William Clarke, University of Queensland (AU)

Paolo Russo, Italian Parliament (IT)

Isabelle Zdanevitch, INERIS (FR)

Olivier Schlosser - SUEZ Environnement (FR)

Janguo Liu, Tsinghua University (CN)

THURSDAY OCTOBER 18
TECHNICAL TOURS

THURSDAY OCTOBER 18

TECHNICAL TOURS

Four guided technical tours of real scale plants operating in the production of energy from biomass and waste both by means of thermal and biological processes have been arranged for Thursday 18th October.

Coaches will be provided by the Organizers. All details on departure and expected return times are available at the registration desk.

Places are limited and will be assigned on a first-come first-served basis. Book your place at the registration desk on your arrival.

Nella giornata di Giovedì 18 Ottobre sono previste quattro visite tecniche ad i seguenti impianti di produzione di energia da biomasse e rifiuti attraverso processi termici e biologici.

I bus saranno forniti dagli organizzatori. Maggiori dettagli su orari di andata e ritorno disponibili al banco registrazioni.

I posti sono limitati e saranno assegnati strettamente in ordine di prenotazione. I partecipanti che volessero prenotare il proprio posto per la visita guidata sono pregati di contattare la Segreteria Organizzativa al loro arrivo.



Bio Treatment plant in
Camposampiero
(approx. 1hr from Venice)

*Impianto di trattamento
biologico di Camposampiero
(a circa 1 ora da Venezia)*

BIO TREATMENT PLANT, CAMPOSAMPIERO / ETRA

The plant of Camposampiero, active since 2005, combines a biological wastewater and a solid waste (food waste, zootechnical wastewater, sewage sludge) treatment plant for the production of energy from renewable sources. Food waste entering the plant undergoes specific pre-treatments, which depend on the waste source, and it is subsequently digested anaerobically, in order to produce biogas and digested sludge. Starting from the produced biogas, electric and thermal energy is generated through co-generators and boilers. In particular, the plant treats about 49,000 tons/year of waste, producing more than 3 million kWh/year of electric energy and more than 5 million kWh/year of thermal energy.



Anaerobic Digestion plant
in Bassano del Grappa
(approx. 1h 30 mins from
Venice)

*Impianto di digestione
anaerobica di Bassano
del Grappa (a circa 1 ora e
mezza da Venezia)*

ANAEROBIC DIGESTION PLANT, BASSANO / ETRA

The treatment plant in Bassano, active since 2003, processes food waste and residual non-recyclable waste derived from separate collection in the Vicenza 5 basin, with a total amount of about 70.000 tons/year. In particular, food waste undergoes mechanical pre-treatment and anaerobic digestion. The biogas produced within the three digesters is used for the production of electric energy, enabling the plant to self-sustain its energy expenses and to sell the excess energy generated. The digested sludge is composted in order to allow the production of high quality compost. The non-recyclable waste treatment line consists of different physical-biological processes units, aimed at the production of RDF/SRF and biostabilized material to be used as landfill cover.



Fusina thermal power plant
(approx. 50 mins from
Venice)

*Impianto termoelettrico
'Andrea palladio' di Fusina
(circa 50 min da Venezia)*

FUSINA THERMAL POWER PLANT 'ANDREA PALLADIO' / ENEL

The thermal power station Andrea Palladio, owned by ENEL, is a multi-fuel power plant with a total installed capacity of 1240MW.

The production plant is composed of five sections propelled by coal, natural gas or fuel oil. The biggest two can also be powered by waste. After extensive testing approved by the Region of Veneto and the Province and City of Venice, the plant is now able to make safe use of 70,000 metric tons of RDF (equivalent to the waste generated by 300,000 people). The facility has also a sixth group, a gas turbine combined cycle which is the first industrial-size turbine powered by hydrogen in the world. The gas is recovered as a by-product from the chemical processing and propels the group for an electrical power of 12 MW gross. The exhaust gases of this group can be recovered in a special boiler, increasing the overall performance.



Brescia Waste to Energy
Plant (2 hours from Venice)

*Termovalorizzatore di
Brescia (circa 2 ore da
Venezia)*

BRESCIA WASTE-TO-ENERGY PLANT / A2A

The waste-to-energy plant is located in the south of Brescia, near other production plants belonging to the same company and connected to the city's district heating network.

The waste-to-energy plant significantly contributes to the energy demand of the city of Brescia. In fact, in addition to the production of electricity, it recovers the generated heat and conveys it, through a district heating network of over 630 km, to the individual users' homes. The plant is composed of 3 interdependent combustion units fed by unsorted urban waste and non-hazardous special waste.



POSTER SESSIONS
SESSIONI POSTER

POSTER SESSIONS

SESSIONI POSTER

Poster presentations will be accessible to Symposium delegates at all times. Poster discussion will take place in the presence of authors on Monday, Tuesday and Wednesday afternoon from 15:50 to 16:20.

Le presentazioni poster saranno sempre accessibili ai partecipanti al Simposio. La discussione dei poster avverrà alla presenza degli autori lunedì, martedì e mercoledì pomeriggio dalle 15:50 alle 16:20.

01 / W. Brenner, N. Adamovic (AT)

Standardization Promoting a Circular Economy for PV Waste - The H2020 Project CABRISS

02 / S. Ilyas, R.R. Srivastava (PK)

Microbial reclamation of energy critical elements from spent lithium ion batteries

03 / A. Biagioli, E. Ciccardini, M. Fantini (IT)

Domestic landfill leachate treatment by membrane filtration technologies new development

04 / M.A. Gaya de Figueiredo, L. Ventura Baia, J. Pereira de Sá Leitão, W. de Souza Carvalho (BR)

Wood powder as a slow release matrix of urea

05 / M.L. Mogotsi, H.D. Vivian, A. Motha, E.C.J.G. Emery (ZA)

Waste/flagship programme - The diversion of municipal solid waste away from landfills in six south african municipalities

06 / T. Schmitz, I.C. Tessaro, N.R. Marcilio (BR)

Zeolites production from rice husk biomass

07 / S. Austgulen Grinde, J. Lund Iversen, N. Lømmen (NO)

Modelling wet organic waste gasification for hydrogen production in Western Norway

08 / R.A. Pollo, G.Rondina Pupo da Silveira, L.G. Cardoso, B.S.X. De Barros (BR)

Agricultural-energy production and its impact on the environment

09 / G.Rondina Pupo da Silveira, S. Campos, R.A. Pollo, F.L. Ribeiro (BR)

Geomatics techniques applied in physical characteristics and conservationist in the watershed in the Brazil, using the environmental legislation

10 / M. Ravina, D. Panepinto, J. Mejia Estrada, S. Toscano, P. Salizzoni, M.C. Zanetti (IT)

Integrated system for monitoring of odour emissions from wastewater treatment plants

11 / F. Marchelli, C. Moliner, B. Bosio, E. Arato (IT)

CFD mixing simulations of rice straw and sand in a spouted bed reactor

12 / B.R. Gyawali, J. Sandifer, O. Sariyildiz (US)

Evaluating variations in above-ground biomass accumulation and carbon ba-

lance impacts on reforested reclaimed coal mine sites: A case study in eastern Kentucky from 1980 to 2010

13 / J. B. S. Hamm, A. Ambrosi, A. K. Fellenberg, L. D. Pollo, I. C. Tessaro, N. R. Marcilio (Br)

Preparation and characterization of supported carbon membranes from poly(ether imide)

14 / V. Negro, D. Mainero (IT)

Strategies for the optimisation of an industrial anaerobic digestion process

15 / C. Hartung, C. Zollfrank, V. Dandikas, T. Eickenscheidt, H. Heuwinkel (DE)

Biomass from paludiculture as substrate for biogas formation

16 / M.A. Wahab, D.J. Nowakowski, G. Griffiths (UK)

Fast pyrolysis of different brown seaweeds and analysis of their valuable chemical products

17 / I.T. Spagnol, R.A. Teixeira, C. Rodrigues Teles, G.L. Vieira (BR)

Evaluation of leaching contaminants in concrete with incorporation of the iron ore reject generated in mariana disaster - Minas Gerais / Brazil

18 / R.A. Teixeira, C. Rodrigues Teles, G.L. Vieira (BR)

Evaluation of leaching contaminants in concrete with incorporation of residue of the gas densulfurization process (FGD)

19 / H. Schneider, P. Hubner, L.K.M. Quines, N.R. Marcílio (BR)

Use of coal fly ash for zeolite production aiming the adsorption of dyes

20 / A.M. Barbosa, C. Camolesi Guimarães, C.P. Cavallieri (BR)

Analysis of remote sensing images and aerial photographs for the identification and study of evolution of inadequate waste disposal sites

21 / L.S. Macedo, C. Camolesi Guimarães, A.M. Barbosa (BR)

The main challenges for closing dumpsites in Brazil

22 / F. Güler, F. Özçelik (TR)

Determination of xylanase activity of indigenous bacillus species isolated from food and agricultural wastes

23 / F. Güler, I. Semerci (TR)

Utilization of protic ionic liquids for levulinic acid production from biomass

24 / M.J. Salar Garcia, A. de Ramon Fernandez, C. Santoro, J. Greenman, I. Ieropoulos (UK)

Optimization of ceramic-type microbial fuel cell fed with urine by varying different operating parameters

25 / H. Berriche, D. Thomas, A-L. Hantson (BE)

Optimisation of anaerobic co-digestion of microalgae residue and spent coffee grounds

26 / A.I. Nanko Wetie (CM)

The management of municipal waste in the cities of Bafoussam, Bangangté and Bangou by Hysacam: state and prospective

27 / *V. Jesus, R. Serpa, M. Alves, I. Ribeiro (PT)*
FOGDIGEST - Activation of an IASB pilot plant

28 / *L. Guerrero, J. C. Rubio, A. Barahona, S. Montalvo, C. Huiliñir (CL)*
Removal of ammoniacal nitrogen through simultaneous nitrification and autotrophic denitrification using elemental sulfur and zeolite in a batch reactor

29 / *L. Benassi, C. Alias, D. Feretti, U. Gelatti, G. Piovani, S. Sorlini, I. Zerbini (IT)*
Ecotoxicity and genotoxicity of steel slags: preliminary results

30 / *T.D. Arsenie, L. Nemes, D. Bulgariu, I.S. Badesc, L. Bulgariu (RO)*
Alternative use of biomass waste from biofuels production as biosorbent for Pb(II) removal from aqueous effluents

31 / *H.f. Du, D.j. Cheng, L. He, W. Mcfarland, D. Mcfarland, G.c Wu, Y. Zhang (Cn)*
The distributed gasification of biomass for power generation and its economic impact on China's micro-grid application

32 / *K. Feng, H. Li, C. Zheng (CN)*
Optimizing methane production of food waste by shifting fermentation types of acidogenesis phase during two-phase anaerobic digestion

33 / *L. Doeland (NL)*
At Home in an Unhomely World – On Living With Waste

34 / *L. Garcia (CO)*
Sustainable solutions for climatized buidings, instead of alternatives that suppose a waste of energy

35 / *M. Ragazzi, E.C. Rada, G. Castagna, G.P. Ghelardi, V. Torretta (IT)*
Biomethane from landfills: a case study

36 / *M. Schiavon, T. Ravanelli, M. Ragazzi, E.C. Rada, N. Ferronato, V. Torretta (IT)*
Critical aspects of a green ranking for the assessment of the environmental sustainability of universities: focus on waste management and disposal

36 / *M. Schiavon, T. Ravanelli, M. Ragazzi, E.C. Rada, N. Ferronato, V. Torretta (IT)*
Critical aspects of a green ranking for the assessment of the environmental sustainability of universities: focus on waste management and disposal

37 / *D. V. Best, D. Kammen (US)*
Assessing a Greenhouse Gas Baseline and Carbon Balance for Arid Lands: Laikipia County, Kenya

**COMPANIES,
ORGANISERS &
MEDIA PARTNERS**

**AZIENDE,
ORGANIZZATORI &
MEDIA PARTNER**

COMPANIES

AZIENDE

A2A GROUP

A2A Group is the largest Italian multiutility, leader in the energy, environment, heating network and smart city sectors. Within local areas, we are an integrated company capable of generating and distributing value, with a constant focus on sustainability, respect and listening to people's needs. Every day, we bring light, heat, water and efficiency into people's homes, we offer essential services and are committed to designing the towns and cities of tomorrow with innovative technology.

A2A Ambiente is part of the A2A Group - Italian multi-utility company with over 100 years of presence on the territory - and is a leader in Italy in the environmental services sector and in recovery of materials and energy through the valorization of waste, with plants equipped with the most innovative technologies. The main data of A2A Ambiente are the following:

- 5 million ton of overall managed waste
- 3,6 million served people
- Waste treatment assets: 8 WtE plants that include also three high efficiency cogeneration units serving district heating in Bergamo, Brescia and Milano, 16 material selection/recovery plants, 8 MBT plants and 3 treatment platforms for industrial waste
- 1.800 GWh/year electric energy
- 1.400 GWh/year thermal energy

From urban street cleansing to integrated waste management, up to recovery of materials and energy, for A2A Ambiente the path is from the end to the beginning with a vision towards circular economy.

A2A Ambiente is therefore leader in the entire waste management value chain up to the transformation into new materials towards production and consumption cycles. A2A Ambiente applies the best technologies and gives the utmost attention to environmental performance.

The 2018-2022 industrial plan includes significant development actions and significant investments to strengthen the assets dedicated to material recovery, increasing the positioning of A2A Ambiente in most of the fundamental nodes of waste circular economy.

A2A Ambiente operates locally through 16 subsidiaries and 8 investee companies with a structure that guarantees the separation of companies operating in urban collection/street cleansing services from those that are active in waste treatment activities, in compliance with current regulations.

Contacts / Contatti:

A2A AMBIENTE Spa
Via Lamarmora 230
25124 Brescia (Italy)
Tel +39 03035531
Fax +39 0303553204
email: a2a.ambiente@pec.a2a.eu



BIOPROCESS CONTROL

Bioprocess Control is a technology provider in the area of advanced instrumentation and control technologies for research and commercial applications in the biogas industry.

The company brings to market more than 16 years industry leading research and development in the area of instrumentation, control and automation of anaerobic digestion processes.

Bioprocess Control offers a portfolio of smart instruments in the area of substrate analysis and process simulation, which allows the company to offer technology solutions that can both stabilise and unleash the true potential of a biogas plant.

While conducting biogas research, having reliable and accurate data is fundamental. Whether you are working at a university, public or private research laboratory, you can rely on Bioprocess Control's instruments to provide extremely accurate and precise testing of biomethane, biogas, and biohydrogen potential, specific methanogenic activity, biodegradability study, as well as simulations of continuous biodegradation processes.

Contacts / *Contatti*:

BIOPROCESS CONTROL

AB Scheelevägen 22

223 63 Lund, Sweden

Tel. +46.(0)46163950

Fax +46.(0)46163959

email: info@bioprocesscontrol.com

website: www.bioprocesscontrol.com



COMPANIES

AZIENDE

GEOS ENVIRONMENT SRL

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 our 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.

Among the leading National and European operators Geos Environment is capable to provide a complete range of waste management services, covering the entire waste cycle: urban cleaning services, soil and site remediation, collection, sorting, transfer, treatment and recycling-recovery. As priorities the Company is committed to modelling and intensifying its integrated municipal and industrial waste management services, lengthening its lead in waste treatment technology and continuing the industrialization of processes in order to recycle more and more resources. Geos Environment Ltd. is therefore committed to the following goals: reducing the pollutant load of waste in order to mitigate the environmental impact of rising waste production besides, pushing forward with recycling and recovery as prerequisites of its future growth. As global regulations prioritize environmental protection the full value of its mission becomes clear.

Contacts / *Contatti*:
GEOS ENVIRONMENT
via Monti 8, 20123 Milano (Italy)
Tel. +39.0823872028
Fax +39.0823883214
email: info@geosgroup.it
website: www.geosgroup.it



GREGORY Environmental Consulting

Gregory Environmental Consulting Ltd (GECL) is an independent UK based consultancy with the technical knowledge and international experience to offer sound environmental solutions and pragmatic commercial advice to the following sectors: waste and resource management, renewable energy, late-life landfill management and redevelopment.

GECL has a client focussed philosophy, and continues to build on its founder's international reputation based on trust and long-lasting professional relationships.

Project teams can be built as required from an extensive network of associates, to serve your needs across the whole project cycle, or embedded in your own team to deliver specific projects: site selection and planning / feasibility, technology review, design / environmental assessment and permitting / operation and compliance / due diligence, acquisition and divestiture / decommissioning, and site redevelopment.

Contacts / *Contatti*

GREGORY ENVIRONMENTAL CONSULTING
4A Middle Lane, Nether Broughton
Leicestershire LE14 3HD (UK)
tel. +44.7943060467
email: info@gregoryenvironmental.com
website: www.gregoryenvironmental.com



ORGANIZERS

ORGANIZZATORI

EUROWASTE Srl

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.

Since 2005 Eurowaste has set up a collaboration with IWWG-International Waste Working Group, established in 2002, following a world-wide demand, to serve as a forum for the scientific and professional community.

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.

Dal 2005 Eurowaste collabora stabilmente con l'IWWG, un'associazione senza fini di lucro nata nel 2002 con l'obiettivo di costituire un forum internazionale di discussione scientifica sulle tematiche connesse alla gestione dei rifiuti solidi.

Contacts / Contatti:

EUROWASTE SRL

via Beato Pellegrino 23

35137 Padova (Italy)

Tel +39 049 8726986

e-mail: info@eurowaste.it

website: www.eurowaste.it



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

For further information please contact:

Marco Ritzkowski

c/o Hamburg University of Technology

Harburger Schlossstr. 36 20179 Hamburg, Germany

tel. +49 040 428 78 20 53 / fax +49 040 428 78 23 75

info@iwwg.eu / www.iwwg.eu



ORGANIZERS

ORGANIZZATORI

STUDIO ARCOPLAN / WASTE ARCHITECTURE PLATFORM

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.

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.

Arcoplan è uno studio che si occupa di progettazione architettonica, paesaggistica ed urbana. Nato nel 2009 dalla collaborazione tra Anna Artuso, architetto, e Elena Cossu, ingegnere civile, lo studio Arcoplan ha maturato una specifica competenza nell'ambito della progettazione architettonica e paesaggistica rivolta alle grandi opere per l'ingegneria ambientale con l'obiettivo di sviluppare il filone della Waste Architecture, l'Architettura per i rifiuti.

Arcoplan svolge attività di progettazione, consulenza e studio con un'articolata esperienza in riqualificazioni funzionali di discariche, piani di ripristino ambientale, reintegrazione di aree degradate, centri del riuso, integrazione dei sistemi di raccolta pneumatica dei rifiuti nel tessuto urbano e architettura degli edifici per la preselezione dei rifiuti e impianti di compostaggio.

Arcoplan si occupa inoltre della divulgazione di queste tematiche collaborando all'organizzazione di convegni scientifici connessi alle attività di ricerca svolte dell'Università di Padova nel campo dell'ingegneria ambientale.

*Nel 2015 lo studio ha ideato **Waste Architecture Platform**, un progetto articolato concepito come un contenitore di varie iniziative che coinvolgono esperti di ambiente, architettura, pianificazione, progettazione urbana e territoriale nell'ambito di seminari, tavoli di lavoro, workshop di progettazione, pubblicazioni etc.*

Contacts / Contatti:

ARCOPLAN / Studio Associato
di Ingegneria e Architettura
Via Beato Pellegrino 23
35137 Padova (Italy)
Tel. +39 3203630505
e-mail: studio@arcoplan.it
website: www.arcoplan.it
website: www.wastearchitecture.com



CISA PUBLISHER

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:

IWWG Monograph series:

- Participation in all activities of IWWG including task groups
- 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

Publications are available at the registration desk and may be ordered online from the website www.cisapublisher.com.

Contacts / Contatti:

CISA PUBLISHER - EUROWASTE SRL
Via Beato Pellegrino, 23
35137 Padova (Italy)
Tel +39 049 8726986
e-mail: info@cisapublisher.com
website: www.cisapublisher.com



DETRITUS

DETRITUS

DETRITUS / MULTIDISCIPLINARY JOURNAL FOR WASTE RESOURCES AND RESIDUES

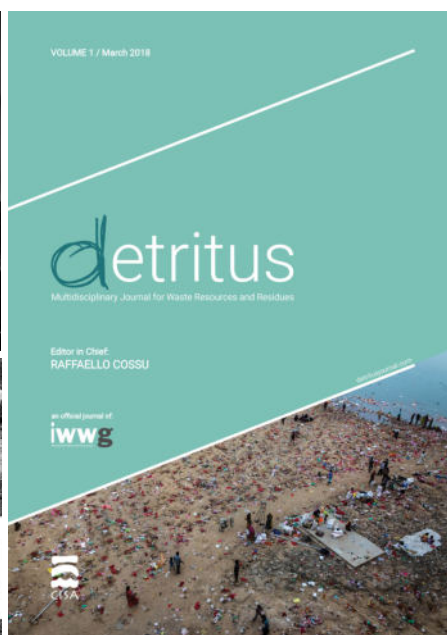
Detritus, Multidisciplinary Journal for Waste Resources and Residues is a new official journal of IWWG, International Waste Working Group, published by Cisa Publisher. The journal is aimed at extending the "waste" concept by opening up the field to other waste-related disciplines (e.g. earth science, 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, Multidisciplinary Journal for Waste Resources and Residues è una nuova 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.



double open!



Ready to submit your paper to Detritus? The journal contents are available on:

www.detritusjournal.com

SUBSCRIBE TO PRINTED VERSION

Detritus is a self financed journal, free for readers (online) and free for authors. Please subscribe to the printed version and invite others to subscribe! The first three issues of the journal are available at the registration desk and may be ordered online from the official website www.detritusjournal.com



Individual Volume

- 30 €
(colour printing)

Annual subscription (4 volumes)

- Corporate bodies
(Companies, Universities)
1000 € + VAT 22% (2 copies x 4 vol)
- Regular: 100 €
- IWWG Members: 90 €

ABBONATI ALLA VERSIONE CARTACEA

Detritus è una rivista autofinanziata, gratuita per i lettori (versione online) e gratuita per gli autori. Sostieni Detritus abbonandoti alla versione cartacea e invita anche i tuoi colleghi a farlo!

Numero singolo: 30 € (stampa a colori)

Abbonamento annuale (4 numeri): 100 €

Membri IWWG: 90 €

Abbonamento per Università e Aziende: (4 numeri x 2 copie): 1000 €

I primi tre numeri di Detritus sono disponibili presso il banco registrazioni e possono essere acquistati online sul sito ufficiale della rivista www.detritusjournal.com

Editor in Chief: Raffaello Cossu

Published by: Cisa Publisher

An official journal of: IWWG

Contacts / Contatti:

DETRITUS EDITORIAL OFFICE

Via Beato Pellegrino 23, 35137 Padova, Italy

tel: +39 049 8726986 / email: editorialoffice@detritusjournal.com

For advertising or other commercial opportunities please contact the Administration Office at info@cisapublisher.com

detritus

MEDIA PARTNERS

MEDIA PARTNER