

MEMORANDUM OF UNDERSTANDING

By and Between

M.S. Ramaiah University of Applied Sciences,

And

**WTER India, a Sister Organization of Global WTER Council (GWC), an
International Organization founded by the
Earth Engineering Center, Columbia University**

Regarding hosting of WTER Council Activities in India

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MEMORANDUM OF UNDERSTANDING

This Memorandum of Understanding ("MOU") is made on this the 23rd day of May 2017 by and between

- 1) M.S. Ramaiah University of Applied Sciences, having its registered office at University House, Gnanagangothri Campus, New BEL Road, MSR Nagar, Bangalore – 560054, (hereinafter referred to as "MSRUAS")

and

- 2) Global WTER Council having its registered office at 500 West 120th St. New York NY 10027, U.S.A (hereinafter referred to as "GWC")

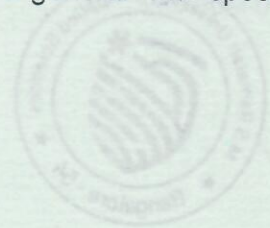
and

- 3) Waste to Energy Research and Technology Council – India (hereinafter referred to as "WTER-India") is co-founded by the National Environmental Engineering Research Institute (NEERI) and the Earth Engineering Center (EEC) of Columbia University and having its registered office at 402, 4th floor, Lotus Plaza CHS Ltd, Opp. MTNL office, Corner of Gohkale Road, Naupada, Thane (West)- 400602. WTER-India will function as India's window to the world on the entire spectrum of solid waste management issues.

Each of MSRUAS, GWC and WTER- India shall, individually, be referred to as Party and shall, collectively, hereinafter be referred to as the "Parties" to this Agreement.

WHEREAS

- A) WTER-India was founded to address the rising interest, increasing investments, and the dire necessity of sustainable solid waste management in India. It aims to create a niche for the budding solid waste management sector in India and worldwide. It intends to act as a swiveling point to funnel important decisions related to solid waste management in India in the right direction. WTER, India in MSRUAS will be the latest addition to the Global WTER Council (GWC) which is already operating in the U.S., Canada, Greece, China, Germany, Japan, Brazil, France, U.K., Italy, and Mexico
- B) GWC has special interest, knowledge and expertise in identifying the most suitable means for managing various solid waste research and disseminating this information by means of publications, the worldwide web, and at technical meetings
- C) MSRUAS has special interest, knowledge and expertise in the area of materials processing, waste management, materials and energy recovery from used products, and its applications, specifically research, technology transfer, education and training.
- D) MSRUAS has agreed to align with the activities of WTER India in general with special focus in southern part of India in particular;



WHEREAS

The Parties are desirous of pursuing and promoting joint research and development activities of mutual interest in various aspects of sustainable waste management in India in accordance with their respective needs and objectives and shall, by joint agreement, determine the areas and subject of such collaboration, on the basis of this MOU which sets out the general understanding of the Parties' collaboration in research and development.

1. AREAS OF COOPERATION

1.1 The Parties agree to cooperate on research activities in the following areas in accordance with their respective needs and objectives:

- (a) Joint research projects in the area of sustainable waste management;
- (b) Collaborative programs of academic and research nature with Industries, universities, Institution and colleges;
- (c) Advise and contribute to syllabi making on Waste Management for University academic programs;
- (d) Visits by staff and students for discussions and research on research projects;
- (e) Joint conferences, workshops and training programs for staff and students' skills development;
- (f) Dissemination of information relating to sustainable waste management

1.2 MSRUAS further agrees to allow the use of MSRUAS' logo on the WTERT-India web page (existing website i.e www.wtert.in) that links various academic, industrial, and governmental research groups who are concerned with advancing the goals of sustainable waste management in India, and elsewhere, with providing information in the area of management of solid wastes to the public and policymakers, as detailed in **Appendix 1** to this MOU ("Charter of Global WTERT Council").

2. ARRANGEMENTS AND FUNDING

2.1 To implement the collaborative Activities envisaged under this MOU, representatives of the Parties may meet periodically to discuss and formulate specific and definitive programmes of cooperation ("Projects"), including their financing for each Project and possible collaboration with other parties, provided that neither of the Parties shall have the power to bind the other Party without such other's consent, in writing, thereto.

2.2 Each Party may nominate a representative to act as a coordinator to help drive, initiate and coordinate the Projects. The coordinators from each Party may meet as and when necessary to review progress of the implementation of the agreed Projects, define new areas and programmes of cooperation as well as to discuss matters related to this MOU. The coordinator from MSRUAS in the first instance shall be Dr. B.S. Dayananda. The coordinator from GWC in the first instance shall be Mr. Ranjith Annepu, who is a Senior

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Research Associate at the Earth Engineering Center of Columbia University and instrumental in the development of WTER-India.

- 2.3 The financial arrangement relating to each Project will be in accordance with the specific definitive agreements to be entered into between the Parties ("Project Agreements").
- 2.4 The funding shall be raised through Projects and consultancy mode and any other activities like Workshops, Exhibitions, Training programmes etc.

(g) COORDINATION COMMITTEE

A Coordination Committee shall be formed to lead, initiate and coordinate the Activities. The Coordination Committee shall consist of:

- (a) Prof. A. D. Sawant, WTER India
- (b) Dr. Sunil Kumar, CSIR-NEERI
- (c) Dr. B.S. Dayananda (MSRUAS) or his nominee
- (d) Mr. Ranjith Annepu or his nominee
- (e) Other members to be invited as required

The Coordination Committee shall:

- (a) Review the progress of the identified activities (at least once a year);
- (b) Consider new research proposals for joint collaboration;
- (c) Define cooperation areas and programs

3. PUBLICATIONS, INTELLECTUAL PROPERTY, INVENTIONS AND INNOVATIONS

- 3.1 The Parties agree that in general all publications under the MOU shall be authored or co-authored by the relevant faculty, staff or research fellow(s) of the respective Parties.
- 3.2 Specific terms on the ownership, protection and management of any intellectual property rights, inventions and innovations arising from joint research activities between the Parties ("Research IP") shall be included in the relevant Project Agreement for each Project.

a. The Parties agree that the outlined principles below will generally apply to Research IP, subject to the specific terms and conditions in the relevant Project Agreement, which terms and conditions shall prevail:

- i. Any background intellectual property belonging to or in the control of a Party, which the Party may introduce or disclose to the other Party for the purposes of a Project ("Background IP") shall remain the property of the Party introducing and/or disclosing the same. Each Party shall only use the other Party's Background IP for the purposes of the Project for which the Background IP was introduced or intended.
- ii. All Research IP created or developed solely by the employees, students or agents of a Party shall be solely owned by such Party.
- iii. All Research IP created or developed jointly by employees, students or agents of both Parties shall be jointly owned ("Joint IP"). The



Parties shall jointly agree on the management and protection of such Joint IP, including the sharing of any expenses related thereto of such Joint IP.

4. CONFIDENTIALITY

- 4.1 Each Party agrees to use any Confidential Information (as defined below) of the other Party disclosed under this MOU solely for the purposes of this MOU. "Confidential Information" means any device, graphics, written information, or information in any other tangible form that is disclosed by the disclosing Party to the receiving Party for the purposes of this MOU, that is marked at the time of disclosure as being "Confidential" or "Proprietary" or words of similar import. Information disclosed orally or visually and identified at the time as "Confidential" shall be considered "Confidential Information" if it is designated "Confidential," concurrent with the oral or visual disclosure.
- 4.2 Neither of the Parties shall, without the prior written consent of the other Party, disclose any "Confidential Information" relating to this MOU to any third party.
- 4.3 Each Party agrees to make Confidential Information available only to those employees and students who require access to it in the performance of this MOU, and to inform them of the confidential nature of such information and their obligation to protect such confidentiality. Each Party shall exert reasonable efforts, no less than the protection given its own confidential information, to maintain such information in confidence.
- 4.4 Each Party agrees that the obligations of confidentiality contained herein shall not attach to information that :
- (a) is or was already known to the receiving Party at the time of disclosure to it as evidenced by written records; or
 - (b) is at the time of disclosure to the receiving Party or thereafter becomes public knowledge through no fault or omission of the receiving Party; or
 - (c) is lawfully obtained by the receiving Party from a third party who is not under any confidentiality obligation to the disclosing Party; or
 - (d) is required to be disclosed by court rule or governmental law or regulation, provided that the receiving Party gives the disclosing Party prompt notice of any such requirement and cooperates with the disclosing Party in attempting to limit such disclosure.
- 4.5 The obligation of confidentiality hereunder shall carry on in force for a period of five (5) years from the termination or expiry of this MOU.
- 4.6 Nothing in this MOU constitutes or implies any representation, warranty or undertaking by the disclosing Party of the accuracy or completeness of the information or materials provided as part of its involvement hereunder.

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5. AMENDMENTS

5.1 This MOU may be amended and supplemented, in writing, at any time as decided and agreed by mutual written consent of the Parties.

6. TERM OF MOU

6.1 This MOU shall commence on the date first written above and shall remain in force for a period of three (3) years. Either of the Parties may terminate this MOU by giving two (2) months written notification of its desire to terminate to the other Party. The termination of this MOU shall not affect the implementation of the Projects established under it prior to such termination. This MOU can be extended by mutual written agreement of both Parties on such terms and conditions as they agree upon.

7. NON-BINDING NATURE OF THIS MOU

7.1 Save for clause 5 on "Confidentiality" and clause 1.2 on the formation of WTERT-India at MSRUIAS which shall be legally binding, despite the statements and obligations expressed herein, this MOU is a non-binding expression of the current intentions of the Parties, and neither Party will incur nor be bound by any legal obligation or expense hereunder to the other Party until and unless definitive agreements have been negotiated, approved by the necessary management levels of each Party and executed and delivered by authorized representatives of both Parties **IN WITNESS WHEREOF** the Parties have caused this MOU to be executed on the date first above written.

SIGNED by
For and on behalf of
M.S. Ramaiah University of Applied Sciences

Name: Prof. S.R. Shankapal
Title: Vice Chancellor
M.S. Ramaiah University of Applied Sciences
University House, New BEL Road
MSR Nagar, Bangalore – 560 054

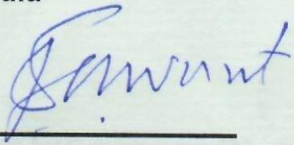
Vice Chancellor

M.S. Ramaiah University of Applied Sciences
Bangalore - 560 054.

Name: Mr. N.C. Shekar
Title: Registrar & CFO
M.S. Ramaiah University of Applied Sciences
University House, New BEL Road
MSR Nagar, Bangalore – 560 054



SIGNED by
For and on behalf of
WTERT- India



Name: Prof. A. D. Sawant
Title: WTERT-India
402, 4th floor
Lotus Plaza CHS Ltd.
Opp. MTNL Office, Corner of Gokhale Road
Naupada, Thane (West) -400602

SIGNED by
For and on behalf of
Global WTERT Council, Inc.

Name: Dr. A.C. (Thanos) Bourtsalas
Title: Manager, GWC, Inc.
500 West 120th St. New York, NY 10027, U.S.

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CHARTER OF THE GLOBAL WTERT COUNCIL (OCTOBER 2016)

Introduction

Since 1997, the Earth Engineering Center (EEC) of Columbia University has conducted research on the generation and disposition of used materials and products in the U.S. and globally. Economic development has resulted in the annual generation of billions of tons of used materials which represent a considerable resource but, when not managed properly, constitute a major environmental problem both in developed and developing nations. The goal of EEC was to identify and help develop the most suitable means for managing various solid wastes research, and disseminate this information by means of publications, the web, and technical meetings. EEC is also collaborating with *BioCycle* journal in carrying out a bi-annual survey of generation and disposition of MSW in the U.S. that is now being used by U.S. EPA in computing greenhouse emissions from waste management.

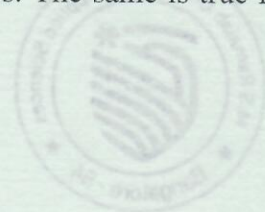
This research has engaged many M.S. and Ph.D. students on all aspects of waste management. Since 2000, EEC has produced nearly fifty theses and published nearly one hundred technical papers. In 2002, EEC co-founded, with the U.S. Energy Recovery Council (ERC; www.wte.org), the Waste-to-Energy Research and Technology Council (WTERT), which is by now the foremost U.S. research organization on the recovery of materials and energy from solid wastes.

In the course of its studies, EEC established that one billion tons of MSW are landfilled each year, landfilling will continue to be used in the foreseeable future, and nearly 80% of the world's landfills are not equipped to protect surface and ground waters from contamination. Therefore, in 2008 EEC proposed the expanded Hierarchy of Waste Management that differentiates between traditional and sanitary landfills.

In recent years, sister organizations to the WTERT in the U.S. have been created in several other nations such as Brazil, China, France, Greece, and India. In the interest of the common goal of these organizations, of advancing sustainable waste management, it became necessary, at the end of 2011, to create a U.S. non-profit organization named the Global WTERT Council (GWC) and establish a GWC "Charter" that was agreed upon by the existing national members at that time. The GWC Charter is used to explain the operations of the Council to other regions of the world who may wish to become members; and also, to existing and prospective industrial and government sponsors.

The Name of the WTERT Council

The principal tool for disseminating information by the U.S. and other existing members of WTERT has been the internet. The web addresses used (www.wtert.org, www.wtert.eu, www.wtert.gr, etc.) all include the acronym WTERT and this has the advantage that when one types WTERT in Google or other search engine, automatically one links to WTERT organizations in different countries. Thus, WTERT has become a valuable brand name and can be very helpful to people seeking information on waste management in a particular country (e.g. Greece) by using the acronym WTERT and then the name of the country or letters representing it (e.g. "gr"). It is therefore necessary for member nations to register and use the "wtert" web address (e.g. www.wtert.gr) as well as whatever other name and web address they wish. For example, the sister organization in Greece chose the name "SYNERGIA" so one can find their web either by going to www.wtert.gr or by using the SYNERGIA address. The same is true for our sister organization, MatER, in Italy (www.wtert.it).



In summary, each national, or regional, member should choose whatever word or words are most suitable to express the mission of their organization in their national language; and also use the second name "WTERT-Greece", "WTERT-Brazil", etc. to express the fact that they are also a member of the Global WTERT Council.

Mission of WTERT Council

The mission of GWC members is to identify the best available technologies for the treatment of various waste materials, conduct additional academic research as required, and disseminate this information by means of publications, the various GWC web pages, and periodic meetings. In particular, GWC members strive to increase the global recovery of materials and energy from used solids, by means of recycling, composting, waste-to-energy, and sanitary landfilling with LFG utilization. The guiding principle is that responsible management of wastes must be based on science and best available technology at a particular location and not what seems to be inexpensive now but can be very costly in the future.

Figure 1 shows the general rule of the accepted "hierarchy of waste management". And by now it has been translated and published in eight languages. However, GWC members understand that for practical or economic reasons it is not possible to follow this hierarchy at all times and at all locations. For example, waste-to-energy requires a much larger initial investment than sanitary landfilling and therefore may not be attainable at a certain stage of economic development of a community.

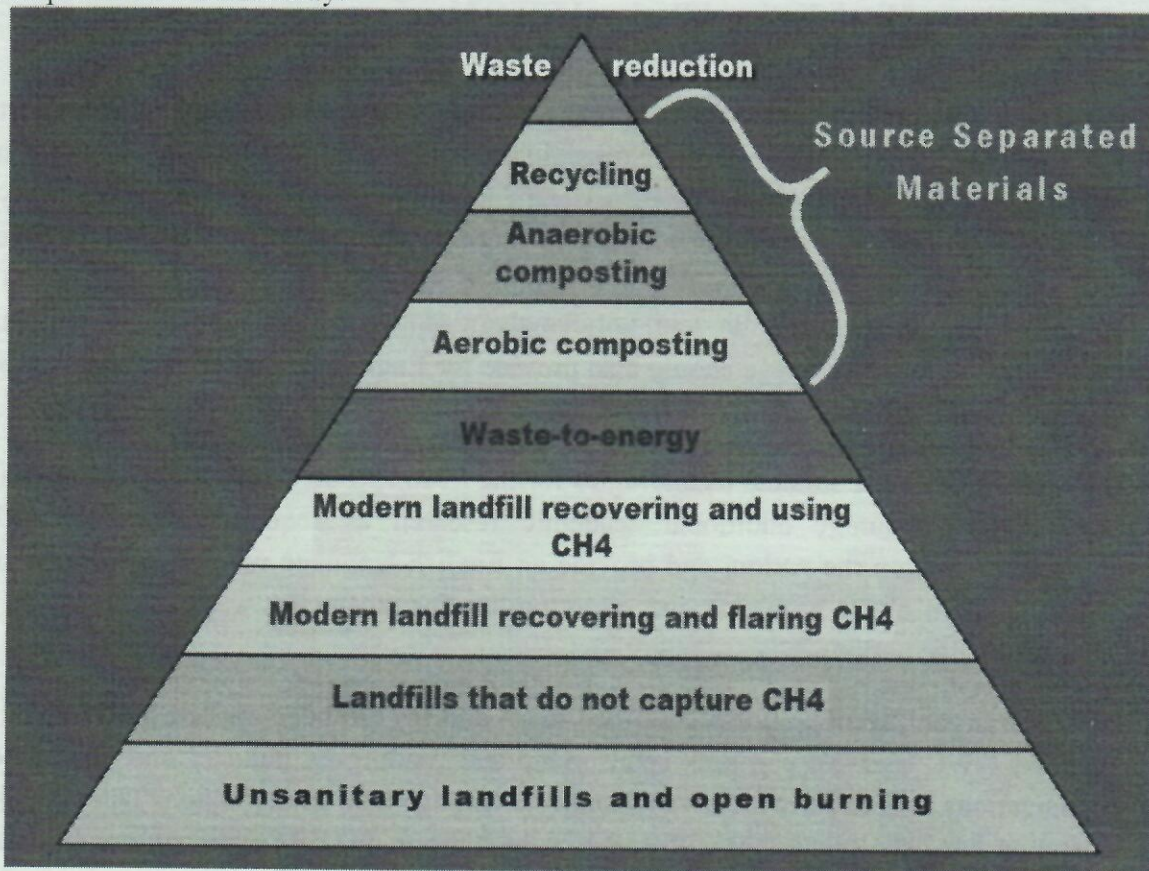


Figure 1: The GWC hierarchy of waste management

Scope of Operations of Global WTERT Council

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The Global WTERT Council consists of representatives designated by each national or regional member organization. These representatives form the governing board of the Council. The Chair of the governing board of the Council will be elected by majority vote of all members for a tenure period of five years. The Council will review and vote on the GWC Charter and subsequent actions affecting the operations and Charter of the Council. Most communications will be by e-mail or telephone conference. However, occasional meetings of the Council will be called, preferably to be held in conjunction with an international meeting on waste management. GWC members realize that waste management solutions vary from region to region. It is hoped that through the new and powerful tool of the internet, we can collectively create a global platform for sharing of experience, expertise and information that will advance the goals of

sustainable waste management world-wide. GWC has also provided and will provide start up funding for new regional members. For example, this is how WTERT-India was founded. By now GWC India is one of the most active GWC members and is incorporated as non-profit organization in India.

Scope of Operations of Each National/Regional GWC Members

The objectives of each GWC national/regional member is:

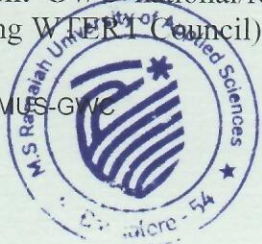
1. To develop and maintain a GWC web page that describes the mission and scope of the organization and links as many as possible academic and industrial research groups working on various aspects of waste management, within the nation. Preferably, this web page will be hosted at a major university that is conducting research on resource recovery from wastes. Most of the material in this web page will be in the national language so as to inform the general public and policymakers as well as academia and industry. However, the front web page should also provide for English language translation of part of the content, as discussed in (2) below.
2. To identify the most suitable technologies for the treatment of various waste materials in the nation, encourage additional academic research as required, disseminate this information within the nation, and provide an English language window for the outside world to learn about problems and opportunities for advancing waste management in their respective nation.
3. Once the organization platform described in (a) and (b) has been created, the national or regional GWC member can seek sponsorship and funding by industry and government organizations concerned with advancing waste management in the nation. This model of operation has been successful with some of the existing WTERT national members who are willing to advise and assist new members.

Global WTERT Council, Inc.

For financial and tax reasons, in December 2011, GWC was registered as a non-profit corporation in the State of New York and the U.S

Current GWC national/regional members and contact information (in chronological order of joining WTERT Council)

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GWC-US (www.WTERT.org)

Earth Engineering Center, Columbia University
500 West 120th St., New York, NY 10027, U.S.A.
Prof. N.J. Themelis <njt1@columbia.edu>, Dr. A.C. Bourtsalas
<ab3129@caa.columbia.edu>
Prof. Marco J. Castaldi, City College of New York (CCNY)
<mcastaldi@che.cuny.cuny.edu>

GWC-Greece (www.WTERT.gr) SYNERGIA

Prof. Konstantinos (Kostas) Aravossis, National Technical University of Athens (NTUA)
www.wtert.gr
<arvis@mail.ntua.gr>

GWC-China

a) Institute of Thermal Power Engineering (ITPE), Zhejiang University, Hangzhou,
China

wtert.zju.edu.cn/cn/index.asp
Prof. Qunxing Huang <hqx@zju.edu.cn>

b) Earth Engineering Center-CQUST (www.WTERT.cn)

Waste-to-Energy Department
Chongqing University of Science and Technology (CQUST)
Dr. Songtao Kong <kst@tom.com>

WTERT-Germany (www.WTERT.eu) WtERT

Waste to Energy Research Technology Germany GmbH (WtERT)
Werner Bauer <werner.bauer@ia-gmbh.de>

WTERT-Brazil (www.wtert.br) Name: CONGENERES

University of Brazil, Rio de Janeiro (UFRJ)
Dr. Sergio Guerreiro Ribeiro <sergiog@rjnet.com.br>

WTERT-U.K. (www.wtert.uk)

Department of Civil and Environmental Engineering
Imperial College, London, U.K.
Prof. Chris Cheeseman c.cheeseman@imperial.ac.uk
Department of Civil Engineering, Leeds University
Dr. Costas Velis <c.velis@leeds.ac.uk>

WTERT-Italy (www.wtert.it); (www.mater.polimi.it/mater)

MatER (Materials and energy recovery)
Department of Energy - School of Industrial Engineering - Politecnico di Milano
Campus Piacenza, Piacenza, Italy
Prof. Stefano Consonni <stefano.consonni@polimi.it>
Prof. Mario Grosso <mario.grosso@polimi.it>

WTERT-India (www.wtert.in)

National Environmental Engineering Research Institute (NEERI)
Dr. Sreenivasa Rao <ksrao@wtert.in>; Dr. Sunil Kumar s_kumar@neeri.res.in; Mr.
Ranjith Annepu rka2109@columbia.edu

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WTERT-Chile (web site under development)

Universidad del Desarrollo, Santiago, Chile

Prof. Alex Godoy < alexgodoy@ingenieros.udd.cl >

WTERT-Singapore (under development)

Nanyang Technological University (NTU), Prof. Jing-Yuan Wang

WTERT-Colombia Under development

WTERT-Colombia Under development



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