

BEEM2018 특별심포지움

제6회 가축매몰지 국제심포지움

가축매몰지 최적 환경관리기법

2018년 6월 12일

강원도 홍천 대명리조트

주최: 가축매몰지환경관리연구단

**후원:**

한국환경산업기술원

대한상하수도학회

(주)다산컨설턴트

(주)벽산엔지니어링

(주)부강테크

Special Symposium of BEEM2018

**6<sup>th</sup> International Symposium on Carcass Burial Site**

**Best Management Strategy for  
Environmental Management of Carcass Burial Site**

June 12<sup>th</sup>, 2018

Dae-Myung Resort, Hongcheon, Gangwon Province, Korea

Organized by: **SAFE Research Center** for  
Environmental Management of Burial Sites

Supported by:

Korean Institute of Environmental Technology and Industry

Korean Society of Water and Wastewater

Dasan Engineering Co. *Ltd.*

Byuksan Engineering Co. *Ltd.*

BKT Co. *Ltd.*

## 심포지움 개요

가축매몰지는 대부분 구제역, AI 와 같은 동물질병 확산방지를 목적으로 조성되지만 자돈폐사, 홍수 및 흑서와 같은 자연재난이 발생하는 경우에도 사축 수용을 위하여 조성된다. 그러나 사축을 처분하기 위한 지침은 다양한 형태로 발생하는 재난에 효율적으로 적용되지 않는 경우가 빈번하다. 바이러스 통제를 목적으로 살처분된 사축은 처분과정뿐 아니라 부패과정에서도 유해물질이 발생할 수 있으므로 사축은 기존의 기술과 규정으로는 제대로 관리할 수 없는 새로운 형태의 오염 물질로 간주되어야 한다.

대량으로 발생하는 사축을 처분하는 우리나라의 질병통제 방법과 관련하여 환경적인 측면에서 불확실한 요소가 매우 많다. 특히 가축매몰지 주변 토양과 지하수 환경관리 및 사축처분을 위한 지침개발에 있어 질병원인, 질병확산과정, 예방방법, 감염동물 관리방법, 건강에 대한 영향을 이해하는 것이 중요하며 위험이 확산될 가능성이 있는 경우 취약요소를 사전에 식별하고 대응해야한다. 가축매몰지의 예방적 위해성 관리는 자연환경, 생태, 재산 및 인간 건강에 대한 자연적 또는 인위적 위험을 줄이거나 감소시키기 위하여 위험요인의 지속가능성에 대응할 필요가 있다. 국민경제에 막대한 피해를 줄 수 있는 위험을 예방하고 통제하기 위해 국가적인 대응이 필요하며 국민이 안전하게 느낄 수 있는 안전관리시스템을 수립해야 한다.

가축매몰지 환경관리기술을 개발하는 SAFE 연구센터는 2012 년부터 매년 국내외 가축매몰지관련 환경기술을 집대성하기 위한 국제심포지움을 개최하고 있다. 지난 5 회에 이르는 심포지움을 통하여 국가별 질병대응사례, 지하수, 토양, 위해성, 오염정화 등 매몰지와 관련된 주제를 심층 고찰한 바 있다.

1<sup>st</sup> Symposium, *Environmental Management of Post-Epidemic Carcass Burial Sites*, 2012/9/17, BEXCO, Busan

2<sup>nd</sup> Symposium, *Groundwater Protection for Watershed Management*, 2013/9/19, DCC, Daejeon

3<sup>rd</sup> Symposium, *Environmental Management of Post-Epidemic Carcass Burial Sites*, 2014/6/9, ICC, Jeju

4<sup>th</sup> Symposium, *Risk Assessment and Management of Contaminated Sites*, 2015/8/25, Hannam University, Daejeon

5<sup>th</sup> Symposium, *Soil and Groundwater Remediation of Carcass Burial Site*, 2016/10/19, Kangwon National University, Chuncheon

지난 심포지움에서 발표된 다수 논문은 2016 년 SAFE 연구센터에서 발간한 특별호(*Sustainability*, SCIE/SSCI indexed, MDPI, “Environmental Management of Post-Epidemic Mass Carcasses Burial Sites”, Guest Editor: Geonha Kim, Chaeyoung Lee, Yongsik Ok, Daniel Tsang, Zeng-wei Hseu, Meththika Vithanage)에 수록된 바 있다.

제 6 차 심포지움에서는 지속 가능한 가축매몰지 환경관리기술, 기법 및 관련정책 개발의 방향, 특히 대량발생 사축의 악영향을 최소화하기위한 최신기술과 현장 적용 전략을 다룰 예정이다. 심포지움 발표논문은 SAFE 연구센터가 발간하는 두권의 가축매몰지 특별호 (*Process Safety and Environmental Protection*, Elsevier, SCI indexed, IF=2.9)와 *Environmental Research* (Elsevier, IF=3.8)에 게재될 예정이다.

## BEEM2018 컨퍼런스 일정

Abstract Submission Deadline: January 31, 2018

Abstract Acceptance Notification: February 28, 2018

Early Registration Deadline: March 31, 2018

## ABSTRACT

Animal mortalities are caused by various forms of diseases such as foot-and-mouth disease, bird flu, *brucellosis*, *tuberculosis*, and other catastrophes such as floods and heatwaves. During an outbreak, depopulation is a primary protocol to mitigate the virus spreading in many countries. Although many countries have prepared guidelines for dealing with such catastrophic incidents, the manuals or protocols emphasize the prevention of viruses only, and thus environmental consequences are often ignored. A variety of hazards and risks are associated with the disposal and management of carcasses during the livestock disease outbreak.

From the viewpoint of environment conservation, carcasses are intrinsically infectious wastes which massive discharged by the disaster. Animal carcasses thus should be regarded as the new forms of pollutants that cannot be managed properly with existing technologies and regulations. There is a need to consider what we may contribute to the national response to infectious animal diseases regarding scientific and technological knowledge. It is important to understand the causes of the disease, how it spreads, how to prevent it, how to manage infected animals, how harmful it is to the human health.

If risks are likely to spread, it is necessary to identify and respond to those in advance. The proactive risk management of infectious animal diseases refers to all activities taken focusing on the persistence and ubiquitous nature of risk, to reduce or eliminate natural or anthropogenic risks to the natural environment, ecology, properties, and human health.

We have to establish right response system considering risks what possibly exist, not limited to the magnitude of disasters what has occurred in an infectious animal disease in the past. The extent of prevention and control of risks that can cause massive damage to society and economies is impossible with the efforts of an individual or an organization.

We raise the question of how enough we prepared against possible risks. As we have suffered from the outbreak of foot-and-mouth disease in 2010, we have been able to find out how much knowledge our society has accumulated about risks. We have raised a lot of questions about how many unknown paths are available and who can judge how dangerous the risks are. It is necessary to check whether our society has a safety management system that makes people feel 'safe' about these problems. A comprehensive search and risk management framework for animal husbandry and food management needs to be established at the national level.

In the 6th symposium organized by SAFE Research Center for Environmental Management of Burial Sites, we are to discuss the direction of sustainable technology and policy developments. This symposium should discuss cutting-edge technology and site deployment strategies to minimize the adverse impacts of mass carcasses. The following questions will be asked to draw conclusions and agreements by participants;

- Do the current carcasses management tactics respond to future diseases?
- What are the most available technologies and what are the practical applications in the field?

A short symposium will not be able to cover everything, but it would be successful if it could be discussed that national scale of administrative and scientific approaches that deployable.

Invited speakers in this symposium are those who experienced in the formulation of a contingency plan for carcass disposal at the national level both in administrative and scientific perspectives with consideration of ecosystem evaluation including ecotoxicological risk assessments, energy conversion of carcasses, and advanced technological application in the construction of carcass burial sites. Additional oral/poster presentation sessions on

relevant technologies and policies will also be carried out. Selected papers presented at this symposium will be published in the special journal issue after review.

Participants will visit the Test Bed for the carcass management operated by SAFE Research Center for the field trip.

## **Important Dates of BEEM2018 Conference**

**Abstract Submission Deadline:** January 31, 2018

**Abstract Acceptance Notification:** February 28, 2018

**Early Registration Deadline:** March 31, 2018

## **Chair**

**Geon-Ha Kim**, Ph.D., Professor  
Department of Civil and Environmental Engineering  
Hannam University, KOREA

## **Co-Chairs**

**Phil Longhurst**, Ph.D., Professor  
School of Water, Energy, and Environment (SWEE)  
Cranfield University, UK

**Lori P. Miller**, P.E., Senior Staff Officer  
Animal and Plant Health Inspection Service  
United States Department of Agriculture, USA

**Hyun-Woo Kim**, Ph.D., Professor  
Department of Environmental Engineering  
Chonbuk National University, KOREA

## **Invited Speakers**

**Jason Weeks**, Ph.D., Professor  
Joint Nature Conservation Committee  
Department for Environment, Food & Rural Affairs, UK

**Gary A. Flory**, Agricultural Program Manager  
Virginia Department of Environmental Quality, USA

**Saikat Chowdhury**, Ph.D., Professor  
Department of Soil Science  
Sher-e-Bangla Agricultural University, Bangladesh

**Phil Longhurst**, Ph.D., Professor  
School of Water, Energy, and Environment (SWEE)  
Cranfield University, UK

**Lori P. Miller**, P.E., Senior Staff Officer  
Animal and Plant Health Inspection Service  
United States Department of Agriculture, USA

**Hyun-Woo Kim**, Ph.D., Professor  
Department of Environmental Engineering  
Chonbuk National University, KOREA

## **Advisory Panel (alphabetical order)**

**Nanthi Bolan**, Ph.D., Professor  
Global Centre for Environmental Remediation (GCER)  
The University of Newcastle, Australia

**Sang-II Hwang**, Ph.D., Chief Research Fellow  
Korea Environment Institute, Korea

**Hyenmi Chung**, Director General  
Division of Environmental Infrastructure  
National Institute of Environmental Research

**Kye-Hoon Kim**, Ph.D., Professor  
Department of Environmental Horticulture  
The University of Seoul, Korea

**Sung-Eun Lee**, Ph.D., Professor  
Department of Agricultural Chemistry  
Kyungbuk National University, Korea

**Kyung-Min Kim**, Ph.D., Researcher  
National Assembly Research Service

**Yong-Sik Ok**, Ph.D., Professor  
Korea Biochar Research Center  
Kangwon National University, Korea

**Jörg Rinklebe**, Ph.D., Professor  
School of Architecture and Civil Engineering  
University of Wuppertal, Germany

**Daniel Tsang**, Ph.D., Professor  
Department of Civil and Environmental Engineering  
The Hong Kong Polytechnic University, Hong Kong

## **Journal Special Issue**

Papers presented at the symposium are possibly published on the issues in:

- *Process Safety and Environmental Protection* (Elsevier, IF=2.9, **Appendix A**)
- *Environmental Research* (Elsevier, IF=3.8, **Appendix B**)

## **Field Trip**

SAFE Research Center TEST BED (**Appendix C**)

June 13<sup>th</sup> (Wednesday)

## Symposium Time Schedule

Time	Agenda	Chair
12:30 – 13:00	Registration	
13:00 – 13:10	Welcome Remark, Convener	
Session I Management 13:10 – 14:40 (90 min)	Invited 1 (25 min), Jason Weeks A review of emerging chemical risks potentially impacting on the environment of South Korea	Gary Flory, Hyunwoo Kim
	Invited 2 (25 min) Phil Longhurst Decision framework to inform disposal options for animal carcass disposal: Case study in the Republic of Korea	
	Invited 3 (25 min) Saikat Chowdhury Assessing the effect of carbon and nitrogen discharge from livestock mortalities on nitrogen dynamics in soil	
	Presentation 1 (15 min) Hyunkoo Kim Probabilistic assessment of potential leachate leakage from livestock mortality burial pits; a supervised classification approach using a Gaussian mixture model (GMM) fitted to a groundwater quality	
Break 14:40 – 14:50 (10 min)		
Session II Treatment 14:50 – 16:10 (80 min)	Invited 4 (25 min), Gary Flory Evolution of Composting from a Novelty to a Leading Carcass Disposal Method and the Role of Aboveground Burial during Future Animal Disease Outbreaks	Phil Longhurst, Saikat Chowdhury
	Invited 5 (25 min), Hyunwoo Kim Combining biodiesel and biogas production to treat rendered lipid of the carcass for eco-friendly termination of burial sites	
	Presentation 2 (15 min), Seonghoon Kim A pilot scale stabilization of previously burial-treated infected carcass wastes with a novel sequential ex-situ bio-augmented composting	
	Presentation 3 (15 min), Changyoon Jeong Dynamics of nitrous oxide, methane, and carbon dioxide from poultry carcass composting under different burial condition	

## Appendix A. Special Issue of *Process Safety and Environmental Protection*



### f. Special Issue Title

Environmental Management of Mass Carcasses, *Process Safety and Environmental Protection* (<https://www.journals.elsevier.com/process-safety-and-environmental-protection>)

## 2. Scope of the Special Issue

Outbreaks of foot-and-mouth-disease have severe implications for animal farming. Taiwan, the UK, China and Korea have all suffered significant economic losses from this highly infectious virus. The Korean outbreak of foot-and-mouth disease in the winter of 2010 resulted in the burial of over three million pigs and cows to prevent an epidemic. At present, concerns over the possible leakage of leachate discharged from the decomposing carcasses of infected animals, as well as the contamination of soil and groundwater resources, are mounting.

Livestock culling is a primary protocol used in many countries to mitigate the spread of the virus during animal disease outbreaks. Korea is unique in limiting the deployment of this protocol mainly due to conflicts between stakeholders. Government agencies, livestock breeding farmers, and non-government organizations all influence every step of the decision-making process and even technology development. Avoiding widespread livestock culling is of interest to many countries, however ensuring an assemblage of technologies to cope with a national disaster can hamper this challenge. There is worldwide interest in disaster prevention, and the goal of carcass management is to achieve biosecurity and promote better public health.

Various types of hazards and risks are associated with carcass management during an animal disease outbreak. Maximizing biosecurity during an outbreak is one of the primary reasons for mass carcass disposal. Burial is a common disposal practice and used in the UK and Korea during disease outbreaks due to simplicity and implementation, particularly where livestock farms are densely populated. However, the biosecurity of carcass disposal is often overlooked, again mainly due to stakeholders' critical demands. This challenge often leads to other risks to public health and the environment. Understanding the use of antibiotic agents, which are typical hazards, should not be overlooked when assessing the potential threats of mass carcasses to public health. Medicines injected to livestock to prevent early mortality may remain in the environment because of the mass depopulation of livestock. This practice represents a critical environmental and health issue to consider when strategies are developed to secure public safety. Some burial sites in Korea are being used for crops without compliance to guidelines and thus, they a potential threat to public health. Furthermore, Korea is the only country that allows the relocation of depopulated carcasses shortly after burial when the groundwater quality maybe vulnerable or has yet to be assessed in terms of its effect on public health.

This journal issue studies state-of-the-art technologies and strategies developed to minimize the adverse impacts of burial sites. The topics included are ecosystem evaluation including; ecotoxicological risk assessments, energy conversion of carcasses, advanced technological application in the construction of carcass burial sites, including new types of membranes, and policy issues related to securing and monitoring carcass burial sites.

The papers selected for this special issue will be subject to review procedure with the aim of rapidly disseminating the research results on developments, and applications widely to the research and practitioner community.

*Key Words:* Biosecurity enhancement of burial managements, Environmental risk management of burial sites, Enhancement of carcasses decomposition, Assessment of soil and groundwater quality in the vicinity of burial sites, Remediation of leachate-contaminated groundwater and soil, and policy issues relating to securing and monitoring the burial sites.

### **3. Submission Deadline**

August 31<sup>th</sup>, 2018

### **4. Guest Editors:**

*Name:* Geonha Kim, Ph.D. (Lead Guest Editor)

*Affiliation:* Professor, Department of Civil and Environmental Engineering, Hannam University, Ojungdong, Daedukku, Daejeon, 306-791, Korea

*Email:* kimgh@hnu.kr

*Link:* <http://www.fmdsafe.re.kr>

*Interests:* water quality management, diffuse pollution abatement, groundwater remediation, environmental site assessment

*Name:* Phil Longhurst, Ph.D., Professor

*Affiliation:* School of Water, Energy, and Environment (SWEE), Cranfield University, UK

*Name:* Nanthi Bolan, Ph.D., Professor

*Affiliation:* Global Centre for Environmental Remediation (GCER), The University of Newcastle, Australia

*Name:* Seung-Eun Lee, Ph.D., Professor

*Affiliation:* Division of Environmental Life Sciences, Kyungpook National University, Korea

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*Name:* TSANG, Yiu Fa, Ph.D., Professor

*Affiliation:* Department of Science and Engineering, Education University of Hong Kong

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## **CALL FOR PAPERS**

*Special Issue* – Environmental Management of Mass Carcasses

Manuscript submission deadline: August 31<sup>th</sup>, 2018

This special issue of *Process Safety and Environmental Protection*, with a theme of ‘Environmental Management of Mass Carcasses’, aims to report the latest research developments related to mass carcasses management. This issue will fulfil the knowledge gaps in the current lack of updated and comprehensive information about (1) the technologies, policies and regulations concerning the mass carcasses due to disease outbreaks and natural disasters; and (2) environmental management of hazardous wastes and emerging toxic substances using various forms of technologies.

## Appendix B. Special Issue in *Environmental Research*



### 1. Special Issue Title

**Endocrine Disruptors and Alternative Materials in Environment**, *Environmental Research* (<https://www.journals.elsevier.com/environmental-research>)

### 2. Scope of the Special Issue

Endocrine disruptors (EDs) represent the chemicals that can mimic the endocrine function of human and various animal species. As such, EDs are realized as one of the most significant health concerns in our planet. Besides the classical target for EDs, the emerging unexpected functional targets and associated mechanisms (e.g., hormone sensitive cancers, neuronal diseases, and the next generation effect of EDs for human and wildlife animal health) have been highlighted.

Recently, materials that can replace the conventional plasticizers have been developed. Nonetheless, endocrine activity, as well as the toxicity of these alternative chemicals, are yet relatively poorly understood at *in vivo* and *in vitro* levels. For instance, animal disease outbreak is one of the primary occasions through which various forms of EDs (e.g., antibiotics, pesticides, and disinfectants) are introduced into the environments without proper regulations. Carcasses burial is a widely adopted disposal practice during animal disease outbreak mainly due to its simplicity and swiftness for implementation. Likewise, overdose injection of medicals, intended to prevent early mortality of animals, may remain in the environment due to the mass depopulation of livestock. Assessment of risks posed by EDs and other substances should thus be taken as an indispensable step for the proper countermeasures.

In light of the significance of EDs and related issues, the following topics are to be dealt intensively in this special issue:

- effects of EDs on wildlife animals
- EDs and hormone sensitive cancer
- EDs on neurological disorder
- effects of EDs on animals including human
- endocrine disruption by emerging POPs
- next generation effect of EDs
- phytochemicals with endocrine activity
- molecular biomarkers for endocrine disruption
- genetically engineered organism for a biosensor for EDs
- molecular and cellular action mechanisms of EDs
- sensor technology to detect EDs
- monitoring of EDs and their metabolites in the environmental media and animal bodies
- development of alternative chemicals for EDs
- toxicity and endocrine disruption by emerging persistent organic chemicals
- the state of the art technologies to minimize adverse impacts of burials
- assessment of leachate originating from carcass management practices
- risk assessment of carcass management for the better practice selection
- monitoring of trace organics in multi-sphere near burials.

### **3. Submission Deadline**

June 30<sup>th</sup>, 2018

### **4. Guest Editors:**

*Name:* Myungchan Gye, Ph.D. (Lead Guest Editor)

*Affiliation:* Professor, Department of Biology, HanYang University, Korea

*Email:* mcgye @hanyang.ac.kr

*Name:* Cemyung Ko, Ph.D.

*Affiliation:* Professor, Department of Veterinary Medicine, The University of Urbana-Champaign, USA

*Email:* jayko@illinois.edu

*Name:* Geonha Kim, Ph.D.

*Affiliation:* Professor, Department of Civil and Environmental Engineering, Hannam University, Ojungdong, Daedukku, Daejeon, 306-791, Korea

*Email:* kimgh@hnu.kr

*Link:* <http://www.fmdsafe.re.kr>

*Interests:* water quality management, diffuse pollution abatement, groundwater remediation, environmental site assessment

*Name:* Nanthi Bolan, Ph.D., Professor

*Affiliation:* Global Centre for Environmental Remediation (GCER), The University of Newcastle, Australia

## Appendix C. SAFE Research Center TEST BED



Fig. 1. Bird-eye view of the test bed for the SAFE research center. The test bed is an area of 6,500 square meters, situated on the finished sanitary landfill site minimizing public concern.

SAFE Research Centre (“SAFE” hereafter) is a government funded research group to develop techniques for the environmental management of carcass burial site. SAFE is the acronym of four different technology forms being developed: Safety-enhancement, Action-oriented, Flexible-management, and Eco-friendly technology. The total research grant is 13 billion KRW equivalent to 12 million USD with research period from April 2012 to March 2017.

SAFE Research Centre established a test bed to evaluate field applicability of developed technologies by SAFE for the field deployment at Seolsung-myun, Icheon City, where most dense livestock breeding farms located in Korea. The test bed was built on the stabilized sanitary landfill site to minimize public concern over the facility.

Facility objectives can be summarized as the following:

- 1) Commercialization of technologies developed by SAFE Research Centre. The test bed is equipped with various auxiliary processes including odor control, pretreatment, post-treatment to simulate field condition, to attain actual design capability for field deployment.

2) Connected treatment of waste remains in an existing environmental infrastructure. Any conventional contaminants are to be terminated at the existing environmental infrastructures: sanitary landfill, wastewater plant, incinerator, night soil waste plant. SAFE regard carcasses as a new form of disaster waste which existing environmental infrastructure cannot accommodate, and test bed itself is a prototype of required facility for the management of carcasses.

3) Platform to integrate related technologies. Key technologies being developed by SAFE have different performances and operating costs. For better design, these key technologies can be assembled in series.

This test bed was designed to prove key technologies developed by SAFE for the field deployment possibilities. Thus this facility possesses capabilities raw materials and treated materials. All facilities are contained to control airborne matters to minimize any risks associated with carcasses. Three different treatment trains are aerobic bio-reduction, high-pressure rendering, and Phyto-barrier treatment of soil.

This research facility has several elements which can be categorized into four different groups. It reflects SAFE research center technology map. We can store 1000 m<sup>3</sup> of carcasses wastes. Each process is evaluated separately, and serial processing is possible as a system. Maximum 500 m<sup>3</sup>/month treatment capacity. Remains after treatment delivered to the environmental infrastructures such as incinerators. Most important aspect of this facility is that air-born virus is controlled.

## CHAIRS

### **Geonha Kim, Ph.D. Professor,**

Department of Civil and Environmental Engineering,  
Hannam University, Ojungdong, Daedukku,  
306-791, Republic of Korea.  
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E-mail: kimgh@hnu.kr



### **Education**

Ph.D. Department of Civil and Environmental Engineering, Texas A&M University  
M.S. Department of Civil and Environmental Engineering, Korea University  
B.S. Department of Civil and Environmental Engineering, Korea University

### **Research Area**

- Integrated watershed management
- Water quality monitoring
- Environmental geotechnical engineering
- Remediation of soil and groundwater

Dr. Geonha Kim earned his Ph.D. degree from Texas A&M University in environmental, geotechnical engineering field with the topic of “multidimensional finite element modeling of electrokinetic remediation.” His wide knowledge in environmental engineering, geoenvironmental engineering, and water resources engineering enables him successfully carrying out interdisciplinary researches.

His field of research is mainly legislative and abatement technique aspects of water quality management. He has contributed an implementation of Total Maximum Daily Load law in Korea by carrying out various research projects and publishing papers. He is now leading a research group studying about “environmental management of carcasses burial sites” funded by Korean Ministry of Environment. This research group is responsible for developing field deployable technologies for securing any threat imposed by burial sites. He is serving for the government as various roles including a member of regulatory reform committee and a member of performance evaluation committee. He was awarded several honors including Excellent Paper Award from Korean Society of Water Quality in 2007, Prime Minister’s commendation in 2011, President’s commendation in 2015, and National Assembly’s commendation in 2015.

**Phillip Longhurst, Ph.D.**, Professor  
Chair in Environment and Energy  
Technology, School of Water, Energy &  
Environment, Cranfield University,  
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### **CURRENT ORGANISATION AND ROLE**

Phil has research expertise in; energy from waste; waste strategy & material flow; amenity impact reduction and benchmarking performance; process emissions assessment, and regulatory control. He has developed a team of 10x academic, research, technical and support staff, and approximately 30x doctoral research and 30x M-level students completing postgraduate study on energy technology, resource management, risk, and regulation. The Centre for Bioenergy and Resource Management has 85% of core income generated from research and consultancy contracts with close working relationships with government and industry; particularly the waste and resource sectors.

### **QUALIFICATIONS**

Ph.D. Innovation & Technology Assessment (1996), Cranfield University  
BEd (Hons) 1st. Design & Technology (1988), Sheffield Hallam University

### **PROFESSIONAL MEMBERSHIP**

DFES Qualified Teacher (Ref. No. 8930678x)

### **POSTS HELD**

2016 to date Professor of Environment and Energy Technology  
2014 to 2016 Reader in Environmental Technology, Acting Head of Centre – BRM (2015)  
2010 to 2014 DHoC, Institute for Energy & Resource Technology [IERT], SAS.  
2006 to 2010 Head - Centre for Resource Management and Efficiency, School of Applied Sciences.  
2003 to date Senior Lecturer in Waste Strategy: Leading research within Cranfield on mass-flow analysis, environmental impact assessment for waste process selection and risk assessment for developing material markets.  
2000 – 2003 Lecturer, School of Water Sciences, Cranfield University: Course Director, leading EIA, waste processing, and establishing the Integrated Waste Management Centre  
1996 – 2000 Lecturer, International Ecotechnology Research Centre in SIMS  
1995 - 1996 Research Fellow, IERC in the School of Industrial & Manufacturing Sciences.  
1993 - 1995 Research Officer, International Ecotechnology Research Centre, Cranfield University.  
Centre for integrated modeling of ecological, economic and technological systems

**Lori P. Miller, PE**

Senior Staff Officer/Environmental Engineer  
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Lori P. Miller, PE is a licensed professional engineer with over 30 years of experience managing a variety of projects and programs aimed at reducing environmental impacts from industrial, military, and government activities. She oversees research and development activities so the findings can inform policy.

**CURRENT ORGANIZATION AND ROLE**

Ms. Miller currently serves as Senior Staff Officer/Environmental Engineer for the United States Department of Agriculture, Animal and Plant Health Inspection Service at their headquarters in Riverdale, Maryland, USA. In her current role, Ms. Miller focuses on planning and preparedness for animal health emergency response, specifically related to management of infected carcasses and biosecurity. Much of her work involves coordinating multi-agency partnerships to identify research gaps; then managing projects to fill the gaps. Recent projects include development of a non-freezing portable vehicle wash tunnel; evaluation of disposal capacities in major livestock production regions of the US; risk assessments for carcass management methods, risk assessment for transporting infected carcasses, risk assessment for landfill leachate from infected poultry, development of carcass management option decision tool and training modules, and evaluation of emergency rendering for outbreak response.

**QUALIFICATIONS**

BS Civil Engineering (1988) University of Maryland  
Chi Epsilon Civil Engineering Honor Society (1988) University of Maryland

**PROFESSIONAL MEMBERSHIP**

Professional Engineer, Maryland License 20229

**POSTS HELD**

2008 to date Senior Staff Officer/Environmental Engineer USDA APHIS  
2012 to 2014 Program Manager, US Department of Homeland Security  
2005 to 2008 Environmental Protection Program Manager, USDA APHIS  
2001 to 2005 Senior Remedial Project Manager, USDA ARS  
1998 to 2001 Environmental Coordinator, University of Maryland  
1989 to 1998 Project Manager, Dames and Moore Environmental Consultant  
1985 – 1989 Environmental Coordinator, Fusion Systems Corporation

**Hyun-Woo KIM, Ph.D., Professor**

Department of Environmental Engineering  
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### **Education**

**Ph.D.**, Dept. of Civil and Environmental Engineering,  
Korea Advanced Institute of Science and Technology  
(KAIST), **Title:** “Bioenergy Production by Anaerobic Co-digestion of Sewage Sludge and  
Food Waste Using Temperature-Phased Anaerobic Sequencing Batch Reactor System.”

**M.S.**, Dept. of Civil and Environmental Engineering, KAIST

**B.S.**, Dept. of Civil Engineering (Major), Dept. of Mechanical Engineering (Minor), KAIST

### **Research Interests**

Dr. Hyun-Woo Kim earned his Ph.D. from KAIST, Korea and obtained intensive research experiences from the Biodesign Institute at Arizona State University, U.S.A. as a Research Scientist. He currently works at the Department of Environmental Engineering, Chonbuk National University as an assistant professor. As a principal investigator, he has been running the “Environmental Biotechnology and Biosystem Laboratory” based on the various research funds from Korea governments. His research backgrounds and intellectual commitments have inspired him with a number of novel research interests: (1) Environmental biotechnology for wastewater/waste engineering; (2) Pollutant treatment and resource recovery; (3) Membrane-assisted photobioreactor technology for microalgae to biodiesel; (4) Non-thermal plasma process for the removal of toxic substances, POPs, and PPCPs; (5) Low Impact Development for the reduction of non-point pollution source. With those interests, Dr. Kim has focused on finding a new solution using leading-edge environmental engineering systems to solve major social and environmental concerns with renewable, sustainable, and carbon neutral frameworks.

Dr. Kim has served as an active reviewer for a numerous SCI journals to shares his expertise with the world societies. And he is a vice-director of general affairs in Korea Society of Waste Management, a conference committee/editorial board member of Korean Society of Environmental Engineering, a lifetime member of Korean Society of Water & Wastewater and Korean society of Environmental Technology.

## SPEAKERS

**Jason Weeks, Ph.D., Professor**

*Head of Business Development & Marketing*

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December 2015–Present Associate IEH Consulting (United Kingdom) Environmental risk consulting, training. Ecological risk.

November 2013–December 2015 Professor of Environmental Risk Analysis Institute of Environment, Health, Risk and Futures, Cranfield University (United Kingdom) Main activities and responsibilities include all aspects of environmental risk analysis (including hazard characterisation, exposure prediction, risk assessment, risk perception and risk communication) and management and environmental regulation and governance. Horizon scanning and scenario analysis and associated risks and opportunities. Environmental risk assessment of veterinary pharmaceuticals.

2004–2013 Aquatic Veterinary Pharmaceutical Programme Director Cefas, Weymouth (United Kingdom) Aquatic Animal Health and Hygiene Business Development Manager (Cefas) and Member of the Cefas Senior Management Team. Extensive experience of SE Asian aquaculture industry including fish and shellfish. Directly responsible for the commercial programme within Cefas focussing on development of aquatic veterinary medicines for fish and shellfish and fish vaccine development. Extensive experience of disease challenge studies, GLP and veterinary pharmaceutical drug safety and efficacy testing.

1993–2004 Chief Scientist WRc-NSF WRc plc. Medmenham (United Kingdom) Responsible for the Ecological Risk Services component of the WRc-NSF consultancy business. Established a soil ecotoxicological capability within the company. Direct line responsibility and management of 45 senior and principal scientists (and 50 other analysts and support staff). Long-term strategic fiscal and human-resource planning/deliverance of a science business plan. Also managed key and complex research projects, programmes and consortia. Developed commercial applications and exploitation of novel and embryonic research initiatives as products through commercial development routes. Responsible for the derivation and propagation of the business unit themes in the areas of chemical risk assessment, microbial auditing and risk assessment, the National Centre for Environmental Toxicology and the Environmental Monitoring and Assessment business units. Member of the executive management board of WRc.

EDUCATION AND TRAINING 1987–1990 PhD University of London (United Kingdom)  
Marine science - ecotoxicology

**Gary A. Flory**

Agricultural Program Manager

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Gary Flory is the Agricultural & Stormwater Program Manager for the Valley Regional Office of the Virginia Department of Environmental Quality. In this role, Gary provides leadership on numerous issues surrounding the nexus of agriculture, the environment, and public health. A passionate problem solver, he is regularly selected to execute new and potentially controversial regulatory programs including stormwater management, biosolids land application, agricultural permitting and compliance, and the Total Maximum Daily Loads (TMDLs) program.

Gary also founded G.A. Flory Consulting, a global consulting firm, to help clients with a range of services including animal disease and natural disaster response, agricultural emergency planning, emergency response training and public speaking. Gary was deployed to the Midwest on five separate occasions in support of USDA's efforts to control Highly Pathogenic Avian Influenza outbreaks and was a lead author of USDA's recently released *Mortality Composting Protocol for Avian Influenza Infected Flocks*. Gary has published numerous articles including recent articles on the weaponization of emerging infectious diseases, biosurveillance, and counter-agroterrorism for the journal *Chemical, Biological and Nuclear Warfare*. He shares his expertise at conferences around the country and as far away as Malaysia and Azerbaijan. Gary also serves on the Editorial and Scientific Advisory Boards of some scientific journals.

Gary participates in a variety of working groups including the Chesapeake Bay Program's Agricultural Workgroup, Virginia Poultry Disease Taskforce, Animal Health Quadrilateral Meeting of the Emergency Management Task Group & Disposal, Destruction & Disinfection Network, BioWatch Extended Veterinary Network, and the Virginia Catastrophic Livestock Mortality Taskforce

## **Saikat Chowdhury, Ph.D.,**

Associate Professor  
Department of Soil Science  
Sher-e-Bangla Agricultural University  
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### **Education:**

PhD in Environmental Remediation and Public Health, UniSA, Australia  
MS in Soil Science, Sher-e-Bangla Agricultural University, Bangladesh  
BSc in Agriculture, Sher-e-Bangla Agricultural University, Bangladesh

### **Research Interest:**

Soil and groundwater remediation  
Development of disposal technology for better management of contaminants  
Greenhouse gas emission and mitigation  
Soil nutrient management and carbon sequestration

Dr Chowdhury completed his PhD on Environmental Remediation and Public health under the prestigious University President Scholarship (UPS) of UniSA, AU. He also received the competitive CSIRO Top Up Scholarship in association with UPS. During his PhD program (August, 2010 – December, 2013), Dr Chowdhury did work in the area of soil organic carbon and nutrient cycling with an emphasis on quantifying the mechanisms of decomposition and stabilization of soil carbon, and carbon flow within soil-plant systems.

After completing his PhD, Dr Chowdhury has served under the job title ‘Postdoctoral Researcher’ within SAFE Research Centre, Hannam University, Daejeon, South Korea. Dr. Chowdhury joined the centre to undertake research on ‘Risk assessment and management of carcass burial in relation to soil and groundwater quality’ as part of a project entitled ‘Environmental Management of Burial Sites (GAIA Project)’ funded by Ministry of Environment, South Korea. During his postdoctoral program (January, 2015 – December, 2016.), Dr Chowdhury played a considerable role to develop a low-cost, eco-friendly, efficient technology to minimize the soil and groundwater pollution by leachate produced from different landfills or mass carcass burials.

Currently Dr Chowdhury is serving as a faculty of Soil Science Department, Sher-e-Bangla Agricultural University where he is involved in several tasks including a member of departmental academic and advisory committee and a member of performance evaluation committee of MS and PhD programs.