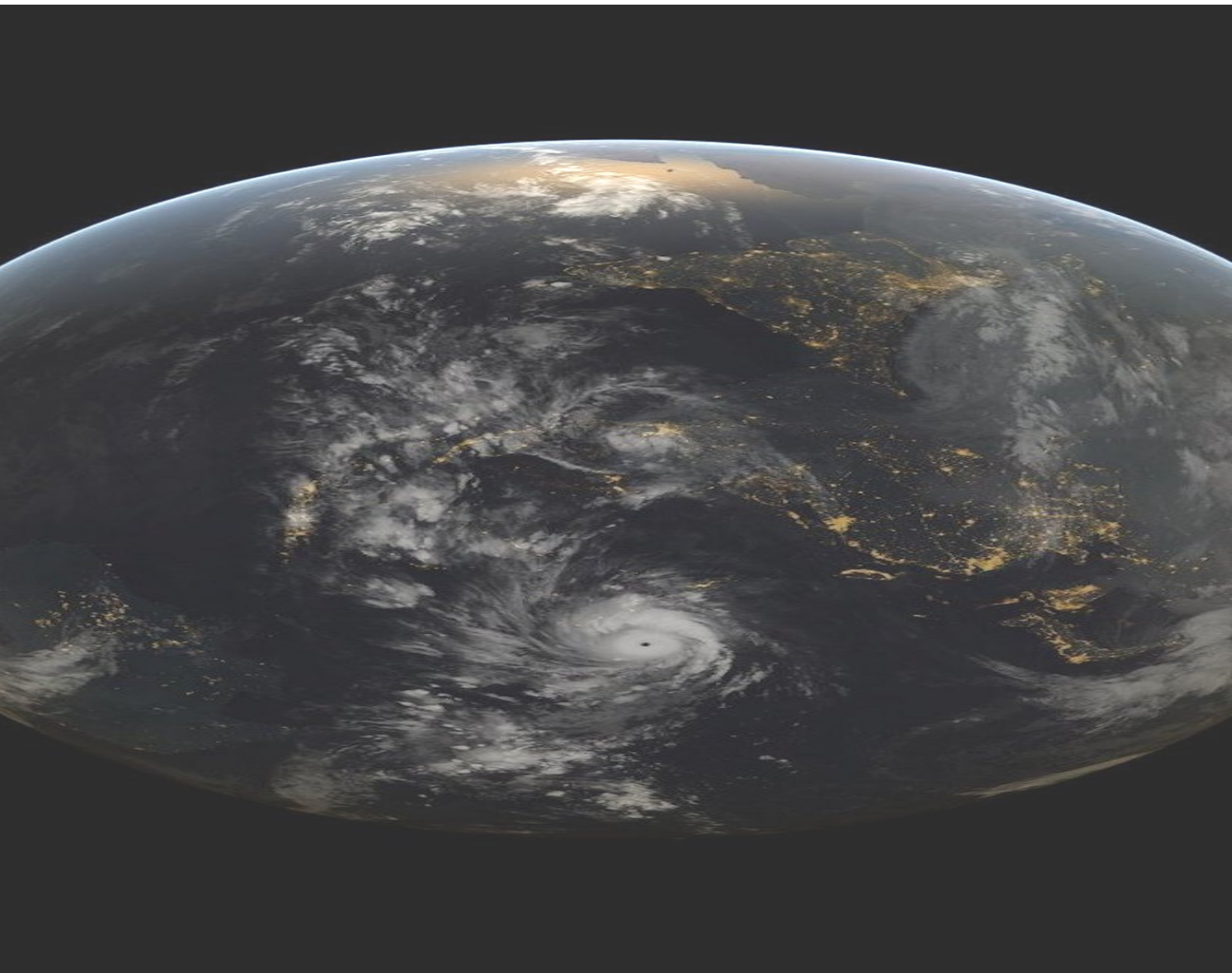


# **E&HI**

# **Environment & Health International**

**Magazine of the International Federation of Environmental Health**

Volume 14 Issue 1 December 2013



ISSN 1683-3805

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Front Cover Photo: A digital composite of Typhoon Haiyan approaching the Philippines. Made using images captured geostationary satellites of the Japanese Meteorological agency. Image courtesy of Barcroft Media.

## **About IFEH**

### **INTERNATIONAL FEDERATION OF ENVIRONMENTAL HEALTH**

The Federation works to disseminate knowledge concerning environmental health and promote co-operation between countries where environmental health issues are trans-boundary. It promotes the interchange of people working in this sector and the exchange of Member's publications of a scientific and technical nature.

Amongst other things, the Federation seeks to provide means of exchanging information and experience on environmental health, to hold Congresses and meetings to discuss subjects relevant to environmental health science and administration, to represent the interests of environmental health to state agencies, national governments and international organisations and to promote field studies of environmental health control.

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# IFEH President Perspectives



*By Peter Davey, President IFEH.*

## Preamble

*This Perspective for the period 2012 to 2013 outlines the big and small ideas/concepts/platforms/policies/programs and memberships we promote and implement and the Events we plan and facilitate - international conferences/training/BOD Board of Directors, Council and Regional Group meetings/World EH Day activities and of course, the people/practitioners/academics/students and sponsors involved and working in our global organisation for the improvement of environmental health practice worldwide...and of course we strive to work in partnership to pursue our goals with government and the non-government sectors, industry and communities for improved quality of life.*

## Perspectives

On behalf of the IFEH Council and Board of Directors including our Regional Group Chairs, the Secretary and the Treasurer, I would like to congratulate our Council and our many Associations and their professional environment and health officers/practitioners, our members who are private consultants, our Sponsors, the Universities/academics and students and our many partners on another successful year. All our initiatives are well documented on the IFEH website; we must thank our President Elect Henning Hansen for the quality of the Website, our Secretary Rod House and our long-serving Treasurer Stephen Cooper for both your efforts to maintain our Company requirements so efficiently. Thanks to all Board of Directors for your inputs this period. Special thanks to Graham Dukes CEO of CIEH for hosting the IFEH Company arrangements.

Remember what we are primarily concerned with is 'Caring for the Environment in the interest of World Health' as stated in the motto of the Federation. Please view the Strategic Plan published on the website. The Federation allows full membership from only the 'Peak EH Professional Body' from each Member Country. Each full member has at least 1 seat on the Council. Other EH groups within that Country can apply for Associate Member status. IFEH works to disseminate knowledge concerning environmental health and promote co-operation between countries where environmental health issues are transboundary. It promotes the interchange of people working in this sector and the exchange of Member's publications of a scientific and technical nature. Amongst other things, the Federation seeks to provide means of exchanging information and experience on environmental health, to hold Congresses and meetings to discuss subjects relevant to

environmental health science and administration, to represent the interests of environmental health to state agencies, national governments and international organisations and to promote twinning for students and practitioners.

IFEH has adopted and published 10 Policy Statements for use by Members. Statements 6 and 7 on Water and Sanitation and Environmental Health and more recently Statements 8, 9 and 10 are declarations detailing our 'cutting-edge' position/advice on Sustainability Indicators (Contact: Henning Hansen), Climate Change (Contact Henning Hansen) and the latest Health Equity (Contact Peter Archer and Peter Wade) and thanks all for these timely policies.

The Board of Directors elaborated on the benefits of being a member of the IFEH in a recent document which targets all membership categories. But looking back we have significantly increased our membership and sponsorships in all categories, I can report we are a growing global organisation. We have 42 full national member organisations, 6 Associate and affiliate members, 23 Academic Associate Members, 40+ individual members, Sponsors, and 5 supportive IFEH Regional Groups.

The Regional Groups of IFEH include Africa, The Americas, Europe (EFEH), Asia & the Pacific and the Middle East. The Regional Groups are so important to our progress and I must thank all Regional Chairs for their hard work giving advice as Directors on the IFEH Board.

Another highlight as President was to participate in the 3rd All African Congress in late 2012 in Durban (thanks to the African Regional Group SAIEH and Jerry Chaka and Selva Mudaly); I must say the passion of EHOs across this Region continues to show the way forward and motivates all of us. Mel Knight Americas Regional Chair has extended our reach to Jamaica and we have new membership from Mexico. Steve Cooper has worked with Croatia as one of our new members. The IFEH Europe Group - EFEH with leadership from the Regional Chair (and President Elect Henning Hansen) has recently been approved by IMPEL with 'observer member status'; a strategic outcome for IFEH. Our President Elect has presented at several OCED Congresses on sustainability indicators and to promote IFEH objectives. IFEH is in communication with W.H.O. in several of their Regional Offices; W.H.O. representatives spoke highly of our organisations actions and outcomes in Vilnius last year at the 12 IFEH World Congress. Members interested in links to W.H.O. could contact Dr Joshi Pranav our AP Regional Chair. Rasheed Ahmed, Middle East Regional Chair has expanded our influence in this area through enhancing our engagement in local conferences.

What an informative high level 12th IFEH World EH Congress attended in Vilnius in 2010; I must thank all involved (President Victoria and Conference Convenor Andrius); the Conference Proceedings have been published.

Congratulations to all our Members and Students around the Globe for your significant levels of input into activities focusing on the promotion and implementation of Environmental Health in connection with World Environmental Health Day (WEHD) - 26 September 2013; so many purposeful activities were implemented worldwide; too many to elaborate on, but I must congratulate Indonesia for all their efforts to kick-start this initiative in Bali in 2011, particularly our students from 6 Universities; students have planned and formed an International Student Special Interest Group which will interact within IFEH to

our advantage. This 'WEHD MOVEMENT' has grown exponentially and these activities bind us together as a diverse EH community both locally and globally.

For the first time IFEH in 2012 offered International CDC (Centre for Diseases Control DC Atlanta) Accredited Short Course Training in Environmental Health and Disaster Management; with significant partnerships between IFEH/NEHA and CDC Atlanta and our Council Members. This initiative has been expanded to other regions/countries and to local communities/cities; we will increase our number of accredited trainers (thanks Martin Kalis, Tim Hatch and Ben Ryan) in the short-term and in our planning hope to offer more 2 day and more 5 day Courses. I facilitated 4 Disaster Training Courses with Griffith University and Aspen Medical as sponsors - before Brisbane 2 day Course and Bali 5 day courses. (2012 /13 in Brisbane and Kuching - thanks to Griffith University and MEHA) and more 5 day Courses in (2013 Bali and Townsville, thanks to EHSAL and EHA). Coming up Courses 2014 in Europe starting in Denmark; we hope in several languages in the medium term and then on-line in the long-term.

IFEH is developing a database of trained members, we are forming partnerships with key agencies and will engage with these agencies to respond to future disasters and act as experts in disaster risk reduction and the important recovery process. An IFEH statement of support to the People of the Philippines in their time of disaster and adversity has been announced, our colleagues in the IFEH Asia and Pacific Region are on-standby to help in the recovery, other EHOs are engaging through their respective employers; but please support the community fund raising efforts across the globe to support this global humanitarian response. I am planning to travel to the Philippines in 2014/15 to meet with the W.H.O. Regional Office and local cities to meet EHOs on the ground and facilitate memberships to IFEH.

IFEH has expanded our sponsorship base. The Federation has received financial support in the form of a Bursary from Hedgerow Software Ltd of Canada. The Federation wishes to thank and recognize Hedgerow Software for their generous support in the creation and establishment of this Bursary; the agreed purpose of this funding is to support members from developing countries to attend IFEH Council Meetings and International Congress. Many thanks to our new sponsors and I must acknowledge Robert Bradbury our Immediate Past President for facilitating this partnership. Rob is also preparing a paper to explore other types/levels of sponsorship for IFEH, sponsorship is so important to our activities.

IFEH acknowledged and thanked Mr Bernard Forteaths' contribution as the long-time Editor of our Newsletter. If you are interested in taking on this role please contact IFEH Secretary.

The Roy Emerson Award was established in Scotland at our Council Meeting in May this year (thanks to REHIS for hosting this meeting) to honour one of our founding fathers. Students who are affiliated with IFEH Member Countries or our Academic Association members are INVITED annually to submit a 2000-2500 Word Essay and accompanying power-point presentation on this year's theme: "The Climate Change Challenge"... engaging the Environmental Health Practitioner. The winner this year will be funded by IFEH to receive the prestigious Award in Las Vegas, USA and to present the Award Winning Essay as a Conference Presentation at the joint 13th IFEH World Congress/NEHA AEC Event from 7-10 July 2014 in Las Vegas.

I'm looking forward to 2014; I invite you all to attend our important global event when for the first time NEHA is hosting our IFEH World EH Congress. I travelled to Washington DC this year with Janet Russell President and Peter Wright of CIEH to attend the 77th Annual NEHA Event and IFEH set up a Trade Display. Based on the success of this Conference and the warmth shown by NEHAs' President/Board/CEO and all participants (acknowledgments to the work of President Alicia Collins and CEO Nelson Fabian) the 2014 Event will be the EH highlight for the year ahead.

I am really excited that many of our IFEH Members will register for the 2014 International Federation of Environmental Health (IFEH) and the National Environmental Health Association (NEHA) presents the 13th EH World Congress in partnership with the 78th Annual Educational Conference (AEC) & Exhibition July 7-10, 2014 in Las Vegas, Nevada, USA.

Simultaneous training and educational sessions will be offered at the conference covering over 20 different environmental health topics. The Congress offers two different types of learning environments at the AEC –

Lecture and Learning Labs. Detailed information about the congress is posted on our site and at [neha2014aec.org](http://neha2014aec.org). The Conference will also have on-line sessions if you can't attend. IFEH will also host its Annual IFEH Council and Regional Group meetings, the IFEH AGM and the IFEH International Faculty Forum for academics and students from 5 to 10 July 2014 during this event.

As you can see it's been a busy period so in closing 'best wishes to you and your family' for the upcoming holiday season and/or New Year...If you still have your diaries open make a note that in 2015 IFEH will facilitate an International Faculty Forum and Student Conference in Portugal around the 26 September for WEHD with Cumbria University and the Portuguese Society of Environmental Health. In 2016 we'll all be invited to Africa when Malawi will host the 14th IFEH World EH Congress (many thanks to Malawi EH Association Members and Dr Tony Grimason).

The prestigious Eric Foskett Award will be presented for the 8th time in Las Vegas next year. The award is presented at IFEH World Congresses. It is to be awarded to either an individual or an organisation. Recipients must have made a notable contribution to the work of the Federation by helping it to fulfil its aims and objectives.

The IFEH congratulates CIPHI, The Canadian Institute of Public Health Inspectors as it has turned 100 years. This is truly a historic milestone in Canadian Public and Environmental Health.

The IFEH welcomes our two latest full national members from Nigeria and Slovenia.

## In Summary

Finally, I must thank all involved in our common mission; I believe we are a 'global policy setting' organisation representing and acting with our country professional bodies. IFEH must engage our profession in this function, but we are evaluated highly by our members when we are also a 'doing' organisation. I support more global training in the future; I think we should also add a further organisational objective/focus and over time provide humanitarian responses/action. We need to facilitate the engagement of not just 40,000 EHO's but many of other 20,000 EHO's worldwide.

I have learnt that to expand this global organisation we need to review our structure, creating opportunities for a range of income streams and seek more industry sponsorship; and I get a real sense that our expanding global membership want mobility of employment', so a form of International Accreditation is a worthy agenda item to still be debated fully.

In my opinion the friends we meet on this journey make the effort and time spent most enjoyable. If not before I'll see you all in Las Vegas...

I close by encouraging and thanking Kathryn Young from our Irish Association our new Editor and I ask all members to publish their cutting edge projects and programs and evidence -based research in this flagship International EH Magazine.



**Dr Peter Davey. PhD. FEHA.**

**President IFEH.**

***Acknowledgments to IFEH BOD – Mr Henning Hansen, Mr Rod House, Mr Steve Cooper, Mr Jerry Chaka, Mr Mel Knight, Dr Joshi Pranav, Mr Rasheed Ahmed***

### **References**

**IFEH Official Website [www.ifeh.org](http://www.ifeh.org)**

**IFEH Council Minutes published on [www.ifeh.org](http://www.ifeh.org)**

**IFEH BOD Minutes 2012-2013**



# International Federation of Environmental Health Hedgerow Bursary



At the International Federation of Environmental Health Council (IFEH) meeting in Vilnius, Lithuania in May 2012, Dr. Anthony Grimason, Malawi Environmental Health Association representative, proposed that the Board of Directors approach the top ten member countries within the IFEH to provide the financial support for the development of travelling scholarships to encourage member participation from developing countries for attendance at World Congresses and Council meetings.

As the outgoing President of the Federation, I agreed to look into the matter on behalf of the Board. What struck me foremost at the time of the proposal was that many of our associations were struggling with maintaining their organisational membership after the economic downturn of 2008, whereby numerous environmental health practitioners had been displaced and many were still searching for employment, and therefore, we as an organization may thus be hard pressed to bring this concept to fruition. I believed the Federation offers a unique and dynamic opportunity to partner with the private sector in the creation of a bursary such as this that would enhance and improve the quality of global environmental health through economic action. This potential with the private sector may prove to be a better opportunity for funding than seeking internal financial support from an already weakened membership base.

During that 2012 World Congress in Vilnius, discussions commenced with Hedgerow Software Ltd, a Canadian company that was an Exhibitor at the Congress as a possible proponent of the bursary. Hedgerow Software Ltd has always been a strong supporter and proponent of environmental health and the company is an award-winning provider of software solutions and services to agencies responsible for environmental health regulation and the protection of public health in Canada. Created in 1995, and headquartered in Calgary, Alberta, Hedgerow Software Ltd has well over 1,000 users of its 'Hedgehog system' in more than 40 different organizations across Canada and the Territories.

During that initial conversation, an undertaking was given by Hedgerow ownership to further support environmental health within the IFEH community. We agreed to continue discussions after the Congress and the Board would develop the terms of reference for the bursary including the purpose, rationale, application process, accountability framework and funding requirements for the creation of the bursary and present this to Hedgerow for their consideration.

Dialogue with Hedgerow Software Ltd continued throughout the year and culminated at the 2013 Council Meeting in Renfrew, Scotland, when the Federation was presented with a cheque and on-going annual commitment for \$10,000CDN and thus the Hedgerow Bursary was formally created.

The general purpose of the bursary is to assist Member Association delegates to attend Council Meetings and of course World Congresses. As a condition of the bursary, monies are not to be used for travel to or from Regional meetings. The Bursary is to support attendance at Council meetings and therefore no more than 75% of the funding up to a maximum of \$2,000 should be provided. Initially, the Board agreed to commit to approving up to 4 applications per year, thus leaving some monies for contingencies such as a late attendance which is deemed necessary and in the best interests of organisational governance within the Federation. Bursary support is for travel costs and where applicable registration costs or delegate fees. However, it does not include accommodation costs or incidentals.

A Bursary Committee consisting of the Board of Directors including the Regional Chairs has been created and will review all applications received. The Regional Chair of an area where an application originates from will declare an interest and while allowed to speak in support of the application, they will not have a say or vote in the approval process for that application.

Primary assistance will be given to those member countries that fall into the area where IFEH subscription band limits their payment to £40.00 because of their Gross Domestic Product (GDP). These are mainly African countries, although other countries are included as well. If there are no applications in a particular year from those 'emerging' countries, then consideration might with discretion and the consideration of a case being made, the Board may agree to an application from a "developed" country member. Consideration shall also be given to countries where the member country is not classified as 'emerging' as their national economies may be vibrant; however the Member Association is not cash rich and cannot afford expensive travel costs. The Faculty Forum are Associate Members of the Federation, not full members and are not be eligible for funding through this medium. Member associations are required to have at least two (2) years membership in the Federation before they can make a funding application.

The Board recognizes the need for an accountability framework for accounting purposes and for reporting bursary funding allocation to the Council and the funding proponent. The bursary funds will be allocated a separate budget line and the Honorary Treasurer will update the budget and report to the Council at the Annual General Meeting and will then update the bursary sponsor of the name of the organisation(s) receiving the bursary, the amount of the bursary provided and the account balance.

Cost estimates for bursary funding requests shall be provided well in advance of the planned event where bursary support is sought. Applications must be submitted to the Honorary Secretary at least one hundred and twenty (120) days before the date of the Council meeting. Applications received after this date will not be considered. Upon approval from the Board, final payment will be made based on actual costs incurred. Accordingly, proper receipts must be submitted. In order to assist those granted a bursary,

monetary advances may be considered by the Board. Any monies not accounted for must be returned by the nominee to the Board.

More information is available on the Federation's website under 'Hedgerow Bursary'. Please visit the website at [www.ifeh.org](http://www.ifeh.org) for further information and complete details on the conditions of the bursary and how to apply for funding.

International Federation of Environmental Health President Dr. Peter Davey the Board of Directors would like to thank and recognize Neil Grinwis and John Dodson, Principals of Hedgerow Software Ltd for their generous support, on-going commitment and dedication to global environmental health through this bursary. Their financial support to members from developing countries for attendance at IFEH Council meetings will greatly assist in fostering a better understanding and a path forward on emerging global environmental health issues and concerns.

**Robert W Bradbury,  
Honorary Vice President,  
International Federation of Environmental Health**

# Editorial



Greetings from Dublin, Ireland and yes that is the Spire in the backdrop of my picture which is an iconic sculptural piece located in the centre of O Connell Street, Dublin. For anyone who has not visited Ireland and indeed Dublin I urge you to visit and you will be rewarded with an intellectual and cultural experience.

I am delighted to present this edition of the IFEH magazine and I hope that you will enjoy the articles submitted. I also would encourage members to submit articles for publication as it is necessary to produce evidence based research that will inform Environmental Health Policy. Dublin Institute of Technology has recently established an Environmental Health Science Institute (EHSI) with this objective in mind and plans are underway for a new DIT campus at a centre location in Dublin. I feel that the time is right for Governments to incorporate research outcomes into their decision making process particularly if an economic benefit can be demonstrated. With the world experiencing a global recession and indeed Ireland making progress in navigating itself out of its banking crises Governments must take note of anything that can save money.

I must acknowledge the suffering experienced as a result of typhoon Haiyan in the Philippines and this surely must amongst other disasters be a demonstration that the world is indeed a finite resource that is certainly in need of protection. The typhoon has been described as one of the strongest ever seen before on the planet in modern age. The image on the front cover is a view of the hurricane from outer space on course for the Philippines and shows the absolute force in causing the devastating effects we have all witnessed. Caring for the Environment and Health is the strategic policy/ vision of the IFEH and EH. This is sometimes difficult to achieve but with co-operation from our global organisation this must surely raise our voice in promoting our common mission of a global policy setting organisation that our President Peter Davey has referred to in his introduction.

Indeed an article by Peter Davey and Ben Ryan present a timely response to Environmental Health Disaster management and a number of successful courses have been run and more are planned for the future. Is Fearr cos Na Leigheas is the Irish for Prevention is better than Cure which has been the Irish EHA mission statement for years. See Martin Fitzpatrick's and Marie Ryan's contribution on the rationale behind Ireland's Association name change

The recognition and accreditation of an international curriculum has been debated by member associations and an article by John O Connor may stimulate the debate and action in an important area to enhance progress in the Internationalisation of the Degree in EH.

The juxtaposition between the needs of developing countries vs. developed countries is demonstrated in this edition when we see the challenges facing a country such as Uganda in the provision of clean water. This contrasts with the needs faced by EH in other countries in dealing with such risks as the use of nanotechnology by the Food Industry. This is an emerging risk that is perhaps more pertinent to developed economies but demonstrates that vigilance is necessary with regard to the protection of EH.

I hope you enjoy this edition of the IFEH magazine and may I wish you and your families seasons greetings and extend a sincere note of sympathy to all families who lost loved ones in the Philippines disaster. *Ar dheis De` go raibh a n-anaim.*

May I thank former editors in particular Hadrian Bonello and John Stirling who have developed the publication over the years and acknowledge their assistance and advice in the production of this edition. Also I would like to extend my sincere thanks to the IFEH President Elect and IFEH webmaster Henning Hansen who has helped me a lot in the production of this issue of the IFEH Magazine Environmental & Health International.

I dedicate my contribution as Honary Editor to my late father who left Ireland's shores in the 50s and trained in Environmental Health in the United Kingdom. Indeed I was born in Enniskillen, Co Fermanagh where he took up an EH post in his mission to return home to the land of Ireland. He did return to his beloved Kilkenny in the 70s after a stint in Hammersmith Borough but always spoke highly of the contribution that the UK and EH made to his career. May I extend a thank you to those countries that have offered employment opportunities to our graduates in recent years due to Ireland's economic downturn and in particular would like to mention Australia and the UK.

**Kathryn A.Young. MSc., PGDip., BA., DHI., MEHAI.**

**Honary Editor**

**International Federation of Environmental Health**

# Capacity Building for Environmental Health Disaster Management

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## Abstract

Environmental health professionals from across the world have a critical function in addressing public health risks during disaster response. To ensure this capacity exists, in a predictable and consistent manner, the International Federation of Environmental Health, the Centers for Disease Control and Prevention (CDC), USA, and the National Environmental Health Association, USA, are working together to develop and deliver an international training course. The course Environmental Health and Disaster Management prepares trained environmental health professionals to better assess and address the impacts of disasters. The content is guided by the successful Environmental Health Training in Emergency Response (EHTER) Awareness Level course developed by CDC. To test the sustainability and effectiveness the course in the international arena, pilot courses were delivered over two days in Brisbane, Australia and four days in Bali, Indonesia. Comparison of knowledge gains and feedback from participants indicated a high-level of need for a two to three day course across the Asia-Pacific and in other parts of the world.

Keywords: environmental health, public health, disaster, training

## Introduction

The number and frequency of disasters in the past few decades have increased steadily (De Smet et al., 2012.). During the last quarter century, more than 3.4 million lives have been lost due to disasters, with billions more affected, and tens of billions of dollars have been spent on repairing damage and reconstructing lives (Hogan and Burstein, 2007).

Throughout the world between 1980 and 2005, 90% of natural disasters, 72.5% of casualties, and 75% of economic losses were caused by weather, climate, and water-related hazards (such as droughts, floods, windstorms, tropical cyclones, storm surges, extreme temperatures, or landslides and wild fires), or by health epidemics and insect infestations (World Meteorological Organization, 2003).

Managing environmental health disasters well can significantly address their impact on environmental health infrastructure and, consequently, the public. This includes protecting systems required to maintain general health and well-being, such as water supply, food safety, sewerage, waste management, and stormwater, and mitigating risks to those systems (Commonwealth of Australia, 2008).

The preparedness and response actions to the environmental health aspects of disasters vitally influence the amount of human suffering, loss of life, and ill-health encountered surrounding disasters. For example, more than two years after the 2004 Indian Ocean tsunami caused massive devastation, people were living in temporary shelters and reconstruction projects were struggling to ensure that new housing had clean water supplies and good sanitation. At this time, diarrhoea was prevalent and many vector-borne disease cases (e.g. dengue and malaria) were identified in Indonesia's capital, Aceh (Chang, 2007).

### **Role of Environmental Health**

The role of environmental health professionals is to manage the public health effects caused by disaster and improve preparedness and response to future events (UCLA, 2006). The response settings include, but are not limited to, drinking water, hazardous waste (e.g. asbestos), general waste, sanitation, food safety, communicable diseases, vector issues, and mass gatherings (e.g. evacuation centres). Environmental health professionals are able to assess the impact of disasters on populations and conduct evaluations on responses due to their population-based focus (Degutis, 2008). Also, the core skills of environmental health professionals allow them to collaborate with the community, government, and others entities to effectively respond to, monitor, and assess public health issues in a disaster situation.

The risk of communicable diseases after a disaster is a concern; however, risks are dependent upon many factors that need to be systematically assessed by environmental health professionals. The most effective way to protect the health of people affected by disasters is to ensure adequate shelter, water, food, and sanitation. A systematic approach by environmental health professionals to assess and control communicable diseases and other public health issues is a key component of a response, and is crucial to protect the health of affected populations (TFQCDM/WADEM, 2002).

### **Capacity Building through Training**

Globally, environmental health professionals have a critical role in addressing public health risks before and after a disaster. This role is going to increase in the future as the world's population density continues to rise. Increased urbanization and industrialisation place a greater proportion of the world community at risk, with most of the population migrating to

urban, disaster-prone areas that are often without an adequate level of environmental health protective infrastructure (World Health Organization, 2011). Many of these risks can be addressed within the existing roles of environmental health professionals; however, a disaster response has unique challenges, and a specific skill set from a range of professions and collaboration at all levels of government is required.

Environmental health and disaster management professionals must be equipped to prepare for, respond to and recover from the adverse impacts of disasters. To build this capacity there needs to be a consistent and standardized curriculum which can be adapted to specific global settings. To achieve this, the International Federation of Environmental Health (IFEH), the Centers for Disease Control and Prevention (CDC), USA, and the National Environmental Health Association (NEHA), USA, have collaborated to develop the course, "Environmental Health and Disaster Management".

A paper on this initiative was presented at the 12<sup>th</sup> World Congress on Environmental Health in Vilnius, Lithuania, at the 5<sup>th</sup> Alliance for Healthy Cities Global Conference in Brisbane, Australia, and at the 3<sup>rd</sup> All Africa Congress on Environmental Health in Durban, South Africa. At these events, the need to build capacity for environmental health and disaster management was identified and supported.

## **About the Training**

### ***Details***

The training, "Environmental Health and Disaster Management", identifies and addresses the critical role environmental health professionals have in addressing risks from a disaster. This includes the need to identify, assess, and address key risks such as those related to drinking water, shelters, overcrowding, food safety, wastewater, disease-causing vectors, and solid waste and hazardous materials.

The content is guided by the successful Environmental Health Training in Emergency Response (EHTER) Awareness Level course developed by CDC (CDC, 2013). EHTER has been widely accepted and attended by environmental health professionals across the USA (CDC, 2013). An IFEH member, Mr. Ben Ryan, attended and reviewed the course in Boston, Massachusetts, USA, in April 2012. The course delivery method and modules were found to be suitable and adaptable for building capacity for environmental health disaster management in the global setting.

The course recognises that the certification, roles, legislative responsibilities and population-based focus of environmental health professionals places them in the best position to assess and address the impacts of disasters. The course provides the necessary training to allow environmental health professionals to effectively apply their knowledge, skills, abilities and information in a disaster setting (CDC, 2013).

### ***Curriculum Development***

The curriculum has been developed based on the need to build the capacity of environmental health professionals to prepare for, respond to and recover from the adverse impacts of disasters in a predictable and consistent manner across the globe. The



modules are based on the experiences of environmental health professionals working in disasters settings. This process has allowed the key public health risks and roles of environmental health professionals to be practically applied in the learning materials. The modules include food safety, drinking water, waste management, sewage systems, sanitation, shelters, responder safety and an understanding of local, state, national and international disaster systems.

### ***Learning Outcomes***

By the end of the course participants will be able to:

- Describe how environmental health infrastructure, practices and responder safety are central to disaster management activities;
- Recognize and understand key environmental health infrastructure and how it can be affected by natural disasters;
- Understand what should be considered when preventing, preparing for, responding to and recovering from environmental health risks in the disaster setting;
- Form and maintain effective partnerships to perform environmental health disaster related duties; and
- Provide clear guidance when assessing, addressing, and responding to the environmental health impacts of a disaster using a population-based focus.

The competency of participants will be measured through a self-assessment before and after the course. This will be conducted using entry and exit tests. The results will also be used to measure the effectiveness of the course in achieving the learning outcomes.

### ***Structure***

The course focuses on the content areas needed by environmental health professionals to increase their knowledge, skills and attitudes related to public health consequences of disaster management. This is achieved by covering nine environmental health modules, however, these can be selected to meet the needs for shorter sessions (see [Attachment A](#)). This flexibility ensures the course can meet demand while providing the information necessary for environmental health professionals to prepare for, respond to and recover from the adverse impacts of disasters in a predictable and consistent manner across the globe.

The course concludes with a group exercise that lasts one and a half hours. The exercise is based on a scenario relevant to the course location (for example, storm damage, flooding or earthquake) to demonstrate the relevance and application of the modules in the disaster setting. Groups separately identify the environmental health needs, priorities and strategies for the specific scenario. The findings and recommendations are discussed in an open forum amongst other participants and the instructors. Ultimately, the exercise provides an opportunity for participants to openly evaluate their understanding of environmental health when preparing for, responding to and recovering from the adverse impacts of disasters.

### ***Target Audience***

To maximise the potential for predictable and consistent approaches to environmental health issues in the disaster setting across the globe, no specific prerequisites have been set. However, participants either need to be environmental health, public health, and

disaster management professionals or students who plan to broaden their understanding of environmental health's role during the preparedness, response, and recovery phases of disaster management. Participants can be from any level of management and from the local, state, federal, international, and private sectors.

### ***Delivery Mode***

The course is delivered in person as either a two-day short course or over four days.

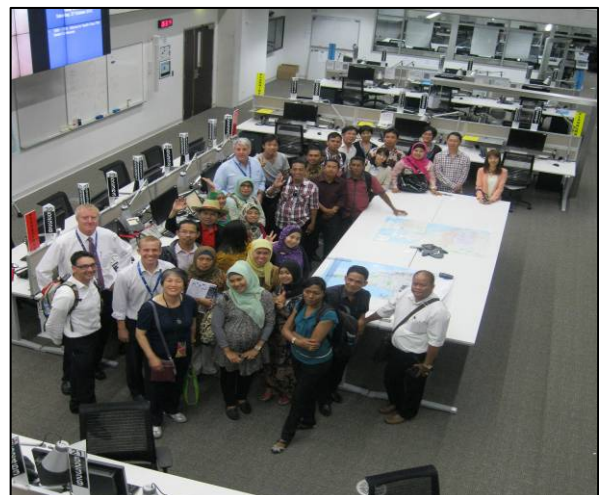
### ***Course Facilitators***

The course is facilitated by Dr. Peter Davey, Tim Hatch and Ben Ryan with local (in-country) and international presenters working in partnership to deliver the content.

### ***Implementation***

The current plan for implementation includes four courses across the Asia-Pacific between 2012 and 2014. In addition, there are courses planned for Canada and Jamaica that will begin this process across the Americas (outside of the United States). At the conclusion of these courses, an evaluation will be conducted to measure the effectiveness of the course design. By late 2014 it is anticipated the evaluation findings will inform future directions for sustainably building the capacity of environmental health professionals to prepare for, respond to and recover from the adverse impacts of disasters across the globe in a predictable and consistent manner.

As part of implementation a two day course has been delivered in Brisbane, Australia, and four day course in Bali, Indonesia. An analysis of evaluations from the courses has demonstrated the potential for this initiative. The Brisbane training was delivered on 27 and 28 October, 2012, at the 5<sup>th</sup> Alliance for Healthy Cities Global Conference in Brisbane, Australia. The course was attended by 30 public health and disaster management students and professionals from Indonesia, China, Japan, Korea, and Australia. An evaluation of feedback from participants depicted the course as very successful with 97% of the participants indicating it met expectations. Also, a self assessment of the participants' awareness level of the environmental health risks associated with a disaster was found to increase on average by 25% for each participant. This is a very good outcome considering the content is designed to be delivered over a four-to-five-day period.



**Course in Brisbane – Tour of Disaster Coordination Centre**

The Bali training was held from 17 to 21 June 2013. The course attracted 27 public health and disaster management students and specialists from Australia, Indonesia, South Africa, Sudan and New Zealand. An evaluation of the feedback found to be very successful with 93% of participants indicating it met expectations. The awareness level of environmental health risks associated with a disaster increased on average by 20% for each participant.



**Course Participants – Bali**

Discussions with participants found the preferred option was a two to three day course. The main reason is the need to shorten the time required out of the office. This approach would allow more people to attend the course, particularly managers, decisions makers and those who need to travel a long-distance.

The feedback also highlighted the demand for similar trainings. Requests have been made for future courses in Australia, Canada, Indonesia, Malaysia and South Africa. This demand is expected to increase as future courses target participants from Ministry's of Health and emergency management agencies who play an active role in emergencies.

### **Summary and Long-term Goals**

The authors are partnering to develop an internationally recognized course that is accredited by IFEH. This will enhance the capacity of environmental health, public health, and other disaster professionals to respond to disasters. Such a course would also promote environmental health and ensure that professionals are adequately equipped to prepare for, respond to and recover from the adverse impacts of disasters.

As part of building disaster preparedness capacity globally, IFEH would welcome any opportunity to work with member organisations, individual members, and other bodies to deliver future courses. Achieving this will not only benefit the environmental health profession but also ultimately help save many lives and protect livelihoods.

For further information, please visit [www.ifeh.org](http://www.ifeh.org) or contact Mr. Ben Ryan, Director Disaster Risk Reduction, Asia-Pacific, IFEH, via e-mail at [benjamin.ryan@my.jcu.edu.au](mailto:benjamin.ryan@my.jcu.edu.au).

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## **Attachment A – Core Modules Topics**

The following nine core modules are presented during the entire course; however, they can be selected to meet the needs for shorter sessions. This flexibility ensures the course can meet demand while providing the information necessary for environmental health professionals to prepare for, respond to and recover from the adverse impacts of disasters in a predictable and consistent manner across the globe.

### **1. Disaster Management**

- Discuss plans, systems, guidelines and programs that guide the role of environmental health during the disaster management cycle
- Identify and discuss disaster prevention, preparedness, response and recovery resources for environmental health
- Outline the structures and parameters in which environmental health may function during a disaster
- Discuss environmental health disaster preparedness and response systems

### **2. Drinking Water**

- Water issues faced in disasters
- The role of environmental health practitioners in addressing water issues
- Identification of key response partners
- Increase understanding of the basic components of drinking water systems
- Practice and demonstrate basic skills related to water issues
- Common tests, sampling, treatment and assessment
- Identify key messages for the public and response partners

### **3. Food Safety**

- Discuss food safety preparedness and response considerations
- Operational considerations for mass feeding
- Methods that may be used for assessing and mitigating food safety risks
- Considerations for reopening food establishments
- Actions that environmental health professionals can take to promote food protection

### **4. Wastewater**

- Environmental health role in wastewater issues
- Describe onsite (septic) and public sewer wastewater systems
- Discuss system vulnerabilities, failures and recovery considerations
- Identify alternative means of treating wastewater
- Assessment and response to wastewater spills
- Identify areas to improve wastewater preparedness

### **5. Solid Waste and Hazardous Materials**

- Discuss solid and hazardous waste issues
- Identify key response partners
- Increase understanding of solid and hazardous waste planning, collection and disposal

## **6. Vector Control**

- The impact of vectors disaster events
- Control measures needed in disaster events
- The role of environmental health in addressing vector control issues
- Identification of key response partners

## **7. Shelters**

- Shelter types and their operations
- The role of environmental health within shelters
- Planning and operational considerations for shelters
- Considerations and processes for conducting an environmental health shelter assessment
- Identify key environmental health preparedness, response and recovery actions for shelters and interim housing

## **8. Building Assessments**

- Discuss how disasters can impact buildings
- Identify exterior and interior building components
- Explain assessment preparation and process for buildings
- Identify building-related health hazards
- Exercise recovery and reoccupancy evaluations
- Identify preventative actions to improve building resiliency

## **9. Responder Safety**

- Identify common hazards that may be encountered during a response
- How disaster related hazards can affect your health
- Health and safety precautions that should be taken during a response

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## **Disaster Risk Reduction Initiative – Kuching, Malaysia (25 and 26 June 2013)**

**Ben Ryan, Director Disaster Risk Reduction, Asia-Pacific, International Federation of Environmental Health**

**Dr Peter Davey, President, International Federation of Environmental Health**

As part of IFEH's disaster reduction initiative, a two day training course in Environmental Health and Disaster Management was held in Kuching, Malaysia on 25 and 26 June 2013. The course was held in partnership with the Malaysia Association of Environmental Health (MAEH), Kuching Public Health College, the Sarawak Environmental Health Union and Aspen Medical. Over 120 public health and disaster management students and specialists from across Malaysia attended the course.

The IFEH teaching team included Dr Peter Davey, President, and Ben Ryan, Director Disaster Risk Reduction. The material was modified from the four-day Environmental Health Training in Emergency Response (EHTER) Course, run by the CDC and Prevention across the USA.

The training discussed and analysed the environmental health aspects of various disasters including Hurricane Katrina, the Haiti Earthquake and Cyclone Yasi. Also, participants discussed strategies for reducing environmental health risks such as those relating to drinking water, shelters, overcrowding, food safety, wastewater, disease-causing vectors, solid waste and hazardous materials. Due to the positive feedback from participants, IFEH is now working with the MAEH, Kuching Public Health College and Sarawak Environmental Health Union to implement further capacity building activities across Malaysia.



**In partnership with the Centers for Disease Control and Prevention (CDC), USA**

# Water, sanitation and hygiene status of two urban slums in Uganda: a baseline survey

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## Abstract

In urban slum settlements in Uganda, the major risk factor for water borne diseases such as diarrhoea is contaminated drinking water due to poor latrine status, low safe water coverage, and poor domestic plus personal hygiene practices. This study therefore aimed at establishing the water, sanitation and hygiene status in 2 urban slum communities in Uganda.

A cross-sectional survey involving both quantitative and qualitative data collection methods was carried out before implementation of a project targeting water, sanitation and hygiene in these slums. A total of 213 households were involved in the survey in 2 urban slums in Kampala and Mukono districts, Uganda. Twenty four key informant interviews and 8 focus group discussions were also held. The bacteriological quality of water used by the selected households was established.

The major sources of water used by the community were piped water (38%); plus protected (30%) and unprotected springs (20%). Although majority of households (86%) had latrines, the sanitary status found at most of them was poor. This included lack of hole covers (84%) and hand washing facilities (70%). The main method of waste disposal was dumping in open pits then burning (55%). Although majority of households (94%) claimed to boil their drinking water, only 39% samples had water with no *Escherichia coli*.

The water, sanitation and hygiene status in the communities was inadequate which justified the implementation of the project in these areas. This survey provided sufficient baseline information necessary for designing water, sanitation and hygiene interventions for the slum communities.



## Background

Between 1900 and 1930, total mortality in the United States (US) fell from 17.5 to 8 deaths per 1,000 population (McKinlay and McKinlay, 1977). This was a period prior to there being any effective antibiotics, prior to most immunizations and certainly prior to the current excellent but expensive modern medicine. The reason is almost entirely the provision of clean drinking water and improved general sanitation. The decline in total mortality in the US in the 30 years period is greater than any proportional improvement at any time since, even with the development of high-tech medicine. Thus access to clean drinking water is one of the most important factors in determining the health of a population.

Worldwide, low-income populations inhabit the fringes of cities and often these settlements transform into slum settings. Rapid growth of slums has become a global concern (UN-HABITAT, 2003; UNDP, 2003). In particular goal 7, target 11 of the millennium development goals (MDGs), aims at significantly improving the lives of at least 100 million slum dwellers by the year 2020 (UNDP, 2003). The majority of this population resides in low income countries, accounting for 43% of the urban population, in contrast to 6% in high income countries. Sub-Saharan Africa had the largest proportion of the urban population resident in slums, which reached 71.9% in 2001 (UN-HABITAT, 2003). The worldwide number of slum dwellers increased by 36% in the 1990s to 923 million people. At its current pace, the number could double to 2 billion by 2030 (Beth, 2009).

As cities continue to expand and the economic situation deteriorates, the poor are pushed to the outskirts which are congested, unplanned and inadequately provide infrastructure and services. This is particularly true for sub-Saharan Africa cities. Furthermore, the continued rural-to-urban migration of a predominantly poor population, the bulk of who are engaged in informal economic activities, has accelerated the growth of slums. The government of Uganda has launched a national urban campaign with a pledge to promote policies that would provide more access to housing and services for the urban poor (UN-HABITAT, 2007).

Slums are characterized by problems that only vary in magnitude from one place to another. Slums are conspicuous for environmental decay, giving rise to unprecedented health risks to communities. Clear manifestations of the fast declining health status triggered by the degradation in the ecosystem in slums in Uganda, and especially in Kampala, are evidenced by the epidemics of cholera and typhoid, and a high incidence of diarrhoeal diseases with a case fatality rate of 2.5% and causing 19% of infant deaths (Alajo *et al*, 2006). Other ill health conditions common in slums which affect mostly children under 5 years of age include malnutrition, malaria and pneumonia.

According to the Uganda Demographic and Health Survey (2012), only 21% of households in urban areas had improved and non-shared toilet facilities. This leads to most households in urban settings using non-improved facilities such as pit latrines without standard slabs and are shared facilities with other households that are often unhygienic and foul smelling.

While there has been rapid growth of a poor population in the slums in Africa, and in Uganda in particular, these areas lack adequate safe drinking water and sanitation services, leading to poor personal and general hygiene. The situation is aggravated by the fact that urban authorities lack the resources to satisfactorily provide the required services

and infrastructure. As a result, slums have become breeding grounds for disease, making the search for solutions to improve health in slums an utmost urgency.

In most slum settlements in Uganda, the major risk factor for diarrhoeal diseases is contaminated drinking water due to low latrine coverage, low safe water coverage, and poor domestic and personal hygiene practices. As a result of poor planning, often the location of pit latrines and other sanitary facilities is such that they end up contaminating drinking water sources. The majority of pit latrine facility users have insufficient knowledge of the link between faecal matter and health, making the utilization and maintenance of such facilities poor.

While the linkage between water quality and disease is not well appreciated at the community and household levels, waterborne diseases constitute a major public health burden for communities in Uganda, often leading to serious epidemics of diarrhoea, typhoid and cholera. Inadequate training, lack of appropriate equipment and facilities for water quality testing and treatment at the source and at household levels, inadequate budget allocations for water quality testing and management, low levels of public awareness and poor enforcement of legislation regarding safeguarding water quality, and source protection all contribute to the poor state of water quality management including in slums.

To obtain background information for use in implementing a water and sanitation project in 2 urban slums in Uganda, a baseline survey was conducted to assess the water, sanitation and hygiene status in these communities. This baseline survey was conducted in 2011.

## **1 SURVEY METHODS**

### **1.1 Survey design**

It was a cross-sectional survey that involved both quantitative and qualitative data. Quantitative data were obtained from household assessment questionnaires and checklists. Qualitative data were collected using key informant interviews and focus group discussions (FGDs).

### **1.2 Survey area**

The survey was conducted in Kawempe Division, Kampala City and Mukono Municipality, Mukono District both located in the central region of the country. One village in Kawempe (Kikulu) and four villages from Mukono Municipality (Kikooza, Kiteega, Lweza and Ngandu) were involved in the survey. Kampala is the capital city of Uganda and is made of 5 administrative divisions while Mukono is located 21 km from Kampala city centre.

### **Survey population**

The study units were households. The respondents for the survey were household heads or the next responsible adult found at home at the time of data collection. Key informants were chosen from a section of people who were well informed about the different aspects of the survey including water, sanitation and hygiene. The categories among which these key informants were selected included local leaders, teachers, health workers and religious leaders.

A total of 213 households from both sites were included in the study. This included 102 households from Kampala and 111 from Mukono. Twenty four key informants were held and 8 FGDs conducted for the different categories of populations in the community. The FGD categories were adult male, adult female, male youth and female youth. Each FGD had 7 – 9 participants.

### **1.3 Data collection**

Household questionnaires were administered to respondents at selected households. For each household, an observational checklist was used to assess the sanitary status of the latrine and general environmental sanitation. The use of observation checklists entailed data collectors making key observations using their senses majorly sight and smell. In this aspect of data collection, the judgment of the data collectors was very crucial. Water samples were collected from all the sampled households that were visited. Specifically, the water samples were obtained from the drinking water storage facilities for each household. Equipment for water sample collection included sterile water sample collection bottles (300ml), cool box for storage of collected water samples and sample labels. At each household, a soil sample was also collected which was taken for laboratory analysis in search of the presence of helminthes. Soil samples were collected from the places where children mostly played within their compound. The public water sources used by the community were also inspected using a standard checklist. For the FGDs, there was a chairperson and two secretaries. The chairperson moderated the discussions while the secretaries took notes which they later compared and merged. The discussions were also tape recorded and later transcribed for inclusion in the report.

### **1.4 Data analysis**

Data from questionnaires were edited and entered in Epidata software. The entered data was cleaned and transferred to SPSS for Windows version 17.0 for analysis using Stata transfer version 10. Qualitative data was analysed by thematic analysis. Standard bacteriological procedures for water quality testing for *Escherichia coli* using the membrane filtration method were adopted.

### **1.5 Quality control and assurance**

A team of ten experienced data collectors were involved in this survey. These were trained by experienced researchers for four days to get acquainted with the tools. During data collection, data collectors were paired to ensure there was efficiency in the data collection process at households. The survey supervisors closely followed the work of the data collectors throughout the entire process and at the end of each day, held debriefing meetings to share experiences to improve the process whenever there was need. Collected samples were transported in a cool box to the laboratory for analysis within 2 hours.

### **1.6 Ethical considerations**

The project got approval from University at Albany, State University of New York Institutional Review Board (IRB Protocol Number: 10-138). Ethical approval was also obtained from Makerere University School of Public Health Higher Degrees, Research and Ethics Committee. Research clearance was also obtained from the Uganda National

Council for Science and Technology. Several meetings were held with the community local leaders informing them about the baseline survey activities. All the respondents who participated in the survey did so only after clearly understanding the purpose of the survey and giving written consent.

## **2. RESULTS AND DISCUSSION**

### **2.1 Demographics**

A total of 213 respondents participated in the survey of which majority (93%) were females. Many of the women were housewives and were found doing domestic work at their households. The majority of respondents (57%) were aged between 25-34 years. A total of 41% of the respondents had lived in the area for more than five years. This is an indication that many of the respondents should have had knowledge about the water and sanitation situation of the area. A high proportion of respondents (86%) were married / cohabiting. Regarding religion, 30% were Muslims while 28% were Anglicans.

More than half of the respondents (56%) had attended at least secondary education. This reflects the relatively high level of literacy in the area. In the Uganda Human Development Report (2007), the national adult literacy rate was 69%. It is anticipated that the higher the education level, the more an individual is able to make right choices in terms of water and sanitation. For example, the highly educated are expected to be more judgmental and probably know the benefits of hygiene and sanitation within their households.

### **2.2 Sources of water**

The main sources of water used by the households were piped water (38%); and protected (30%) and unprotected springs (20%). Although piped water was the commonest water source used by the community, residents had to pay for each jerrycan of water. This was also noted in one FGD that: *“..... we have taps, boreholes and a spring that are used by the community but access to the spring was cut off by the northern bypass road. Not all the water sources are functioning; some broke down and have never been repaired like the borehole. Most people use tap water as they buy it from people who own taps in their households”*. (Adult male FGD, Kampala)

The sources of water used by the community in urban slums are important since water sources have different water quality due to the various risks they may be exposed to. Generally, water sources like streams are more prone to contamination as opposed to underground water sources like boreholes. Piped water systems are normally of better water quality compared to other sources as long as the entire piped water system is not compromised such as by leakages in the piping system. However, studies have shown that piped water is sometimes contaminated (Brick *et al*, 2004; Welch *et al*, 2000). This therefore necessitates treatment of all drinking water in such settings irrespective of the source.

According to UNICEF/WHO Joint Monitoring Programme for Water Supply and Sanitation (2004), improved drinking water sources include household connection, public standpipe, borehole, protected well, protected spring and rain water collection. Unprotected springs

are categorized as unimproved drinking water sources. The results show that some households were using unimproved water sources. This finding is of public health significance since use of such water sources in many communities has been known to be the commonest channel of spreading diarrhoea, dysentery, typhoid, cholera, worm infestation and other hygiene related diseases (Shrestha *et al*, 2013).

On physical inspection of the protected springs, some had poor drainage of water that led to wastewater collecting at the water collection chamber (Photos 1 and 2). This could easily lead to contaminating the water during collection from the spring outlet. Effort is therefore needed by community members to improve the drainage at such water sources as was confirmed by a key informant: *“The spring we have in our community is in a very poor state. A lot of water stagnates at the source due to poor drainage which was brought about the construction of the northern bypass road. Community members need to unblock the drainage regularly”*. (Local leader, Kampala)



**Photo 1**

**Photo 2**

Water sources found in the slums with poor drainage of wastewater.

### **2.3 Household water treatment**

Nearly all respondents (94%) indicated they boiled water before drinking. Boiling water helps to kill pathogens and makes it safe to drink. Boiling water for drinking is a good practice which should be encouraged among such communities. The households that did not treat drinking water need to be sensitized on the effects of drinking unsafe water such as contracting diarrhoea and related diseases including dysentery, cholera and typhoid. Other consequences are high costs incurred treating diseases and time lost taking care of the sick household members. These socio-economic effects have been known to greatly affect slum communities (Riley *et al*, 2007).

### **2.4 Drinking water storage facilities**

*2.4.1 More than half of the households (62%) stored their water for drinking in plastic jerrycans with narrow openings that had covers. Covering water storage containers is very important as it prevents dust and other contaminants from falling into the water. Using*

containers with narrow openings for storage of drinking water reduces the chances of fingers coming into contact with drinking water. Such contamination would normally occur while using vessels such as cups to draw water from storage containers (Wright et al, 2004). Other water storage facilities used were traditional pots with / without covers which are not recommended because of the ease of possible contamination of the water.

## 2.5 Cleaning of drinking water storage containers

2.5.1 Although a significant number of respondents indicated they cleaned their water storage containers regularly ranging from daily (16%), twice a week (39%) and weekly (13%), it was also noted that a good number (31%) did not know how often they cleaned their containers. The Ugandan Ministry of Health Sanitation Guidelines (UNSG, 2000) recommend that drinking water storage containers should be cleaned at least once a week which should be followed by such communities. Regular cleaning of water storage containers is necessary to keep them clean and prevent build up of contaminants in the water.

## 2.6 Bacteriological quality of drinking water

Although the majority of households (94%) claimed to boil their drinking water, only (39%) had water with no *E. coli* (Table 1). This indicates that a significant number of households had their water contaminated and unsafe for consumption without any treatment. Sensitizing such communities on the importance of drinking treated water is of paramount importance. Although boiling was the main form of treatment used, other methods such as point-of-use chlorination could be explored (Sobsey et al, 2003).

**Table 1 Bacteriological quality of drinking water**

CFU*/50ml of water	Frequency (n = 213)	Percentage (%)
0	84	39.4
< 10	24	11.2
11 - 50	31	14.6
51 - 100	9	4.2
101 - 200	3	1.4
TNTC**	62	29.1

\* CFU – Colony Forming Unit

\*\* TNTC – Too Numerous To Count

## 2.7 Sanitation facilities

The majority of households (86%) had latrines for disposal of human excreta. This could be an indication that the community was aware of the importance of having latrines for proper disposal of human waste. However, on physical inspection, many of the latrines

were in poor condition (Photos 3 and 4). Proper latrine use is a behaviour issue which goes beyond existence of a physical structure (Bufardereci *et al*, 1991). The respondents whose households had no latrines reported using those of their neighbours. However, use of shared latrines is associated with several challenges including cleaning and maintenance. The major hindrance to some families to construct latrines was poverty. A similar finding was obtained during one FGD: “... some people don't have latrines because they don't have money to construct them. They end up sharing with neighbours or using the bushes. It's actually very expensive digging a latrine”. (Female FGD, Mukono)



**Photo 3**

**Photo 4**

#### **Some of the latrines found in the community**

From the inspection of latrines used by the inhabitants, the sanitary status found at most of them was poor. This included lack of hole covers (84%) and handwashing facilities (70%) (Table 2). Availability of handwashing facilities near latrines promotes people to use them to prevent sanitation related diseases (Scot *et al*, 2007). Handwashing is an effective means of preventing diarrhoea when done properly at critical times. Promotion of handwashing with soap after defecation and handling of human or animal feces is therefore very important. Handwashing with soap, particularly after contact with faeces can reduce diarrhoea incidence by 42 - 47% (Curtis and Cairncross, 2003). The *tippy tap* technology (which uses a small jerrycan and string) for handwashing can be explored in such slums so as to improve their handwashing practices. In addition, some of the latrines had faecal matter/urine on the slab and flies while others were smelly. These all suggest that the latrines were not cleaned regularly and the spread of diarrhoeal diseases could easily occur among households using such latrines. Poor state of latrines can affect their use which can lead to undesirable practices such as open defecation (Schouten and Mathenge, 2010). It is therefore important to maintain latrines clean and safe for use by the community.

**Table 2 Sanitary situation of latrines**

No.	Aspect	Frequency (n = 213)	Percentage (%)
1.	Latrine more than 5 metres from the house	92	43.2
2.	Latrine had no proper access leading to it	76	35.7
3.	Latrine lacked a door	53	24.5
4.	Latrine lacked a roof	23	10.8
5.	Latrine lacked a hole cover	178	83.6
6.	Latrine lacked a ventilation pipe	186	87.3
7.	Fecal matter/urine present on the slab	111	52.1
8.	Latrine smelly	126	59.2
9.	Latrine infested with flies	75	35.2
10.	Latrine walls smeared with fecal matter	82	38.5
11.	No handwashing facility at latrine	149	70.0
12.	No soap near latrine handwashing facility	148	69.5

## 2.8 Household environmental inspection

Several undesirable conditions were found at the households including lack of dustbins (48%), lack of utensil drying racks (55%) and keeping drinking water storage containers on floor level (54%) (Table 3). Storage of drinking water on the floor makes it prone to contamination from dust and other pollutants. Children may also easily contaminate such drinking water which is in their reach (Jensen *et al*, 2002). It is therefore advisable for drinking water to be stored on a raised surface such as in a refrigerator or on a table.



### 2.8 Table 3 Household environmental inspection results

No.	Aspect	Frequency (n=213)	Percentage (%)
1.	Household environment dirty	90	42.3
2.	No dustbin for household rubbish	102	47.9
3.	Dustbin dirty and overflowing	25	11.7
4.	Fecal matter around the household	22	10.3
5.	Poor drainage around the house	91	42.7
6.	Drainage around the house clogged	45	21.1
7.	No utensil drying rack	118	55.4
8.	Household utensils dirty and left unclean in the open	44	20.7
9.	Drinking water container with wide mouth / opening	35	16.4
10.	Drinking water container with no lid / cover	99	46.5
11.	Drinking water container kept on the floor level	114	53.5
12.	Inside of the container dirty	24	11.3
13.	Outside of the container dirty	48	22.5

### 2.9 Disposal of rubbish

Over half of the respondents (55%) disposed of their rubbish in open pits and burnt it while others buried (11%), disposed indiscriminately (18%) or used skips (7%). Burning of waste is not recommended as it is likely to lead to air pollution which can affect the health of the population (Afroz *et al*, 2003). Although collection of waste in skips is popular in urban communities, this was not the case in this area as there were only a few skips provided by the local authorities. This was confirmed by several key informants including local leaders: “We do not have any skip in our village for collecting rubbish therefore households have to find their own means of disposing their waste”. (Local leader, Kampala) Lack of skips leads to indiscriminate disposal of rubbish by residents in such urban slums which sometimes end up in open drains (Photo 5 and 6).



**Photo 5**



**Photo 6**

**Solid waste dumped near a stream used by the community as a water source (Photo 5). Plastic bottles and other waste in a drainage channel (Photo 6).**

### **2.10 Soil analysis**

The majority of soil samples (94%) did not have any helminthes. *Ascaris lumbricoides* (3%) and hookworm ova (3%) were observed in very few households. This could be an indication that parents ensured that children's faeces are disposed of in latrines. This practice should be encouraged among slum communities especially since in some cultures, it is thought that children's faecal matter is safe and cannot transmit diseases which is not the case (Yousef *et al*, 2000).

## **3. Conclusion**

**3.1** The water, sanitation and hygiene status in the urban slums was found to be poor. This therefore provided the basis for implementation of the project in these areas. The baseline information obtained from the survey was crucial for designing water, sanitation and hygiene interventions for the slum communities as part of the project.

**3.2** Avenues for improving the situation in urban slums in developing countries include sensitization on best practices in safe water, sanitation and hygiene at household level. Specifically, the following should be considered for health education: safe water chain, sanitary condition of latrines, handwashing facilities at latrines and refuse management.

## Acknowledgements

We would like to extend our gratitude to the Higher Education for Development (HED) under USAID for the financial support towards this survey. Special thanks go to the local community who gave valuable information that was used in the compilation of the report. We also extend our gratitude to the local council leaders and all members of local organizations that were consulted during this study. We are also grateful to the entire research team that worked during the process of the study including data collection, entry, analysis and report writing.

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# Water for Kids

[www.waterforkids.org.uk](http://www.waterforkids.org.uk)

## **Our Mission**

To preserve and protect the good health of children and communities in the developing world by assisting in the provision of safe drinking water, good sanitation and other public health related measures.

## **Overview**

Water for Kids (WfK) has continued to integrate sanitation and health education into our projects in 2012/13: an ecosan toilet block was built at the Iganga orphanage in Uganda and the Mukunkiki project in Western Zambia is more about health education and sanitation than water. We also engaged more closely with local people by working with communities to set up water committees to look after protected wells in Uganda and linking with existing community structures in Mukunkiki for health education and sustainability.

In 2012/13 WfK's income increased to nearly £50,000 enabling expenditure of £45,000, 86% of which was spent directly on projects overseas.

We are very grateful to partners overseas and in the UK, who make these vital projects happen, and to supporters in the UK who provide the precious funds and other valuable assistance to sustain the charity and enable its work.

## **Projects**

WfK continued to work in Uganda and Zambia and to fund other organisations to work in Kenya, Rwanda, Sierra Leone and Tanzania.

## **Uganda**

A substantial programme of work has continued in and around the town of Iganga for the eighth year. Peter Minhinnett, Muzamiru Bidondole, Acting Divisional Public Health Inspector, Iganga Municipality manages all the project work locally, we are grateful for his continuing effective and reliable work.

During 2012/13 WfK started working with communities to ensure that a water committee was in place to look after protected sources once they were in use.

This year's work has included the protection of 7 new water sources serving rural villages. These provide safe water for approximately 4000 people, who no longer have to use contaminated ponds for their water supply.

During the year funds were approved for 200 more sanplats to enable households in villages to build their own latrines. A total of 248 latrines are now in use thanks to help from WfK during the last 3 years.

The year's pride and joy in Uganda was the construction of an eco-san toilet at the Orphanage in Iganga. The EHO for the region and ex-Commonwealth Fellow, Christine Nsungwa is to use it to demonstrate the advantages of eco-san toilets to promote them to other villages. A recent visit has found that the eco-san is being used satisfactorily.

Much of the work referred to above was carried out during the annual field trip in June and Peter's 2<sup>nd</sup> visit in February. Successful field trips continue to Uganda annually with over 100 people, many of them supporting the work of WfK while at the same time, experiencing a different culture. More visits are already being planned for 2014 and 2015, if interested please contact us.

Water for Kids has nearly 50 projects they have been involved with in Uganda, mainly in Iganga District, since we first started in 2005. We are providing a new water testing kit with plans to test the quality of water provided at all projects, both as a means to provide evidence of our success but mainly to ensure our projects are providing the clean water we aim to provide. In addition, we are looking closely at our Rain Water Harvesting projects to ensure the first flush of rain water, which can sometimes be dirty, is diverted away from the main storage tank.



**Pre Latrine Building**



**Post Latrine Building.**

## **Zambia**

WfK's work in Zambia has been going on for over ten years through the well established partnership with the Zambian Institute of Environmental Health (ZIEH). Until this year the projects have been in five locations within 90 minutes of Lusaka. Recently the Mukunkiki project was set up five hours from Lusaka, in Western Province.

Mukunkiki is in a remote and sparsely populated rural area with nearly 3000 inhabitants, they had only one water supply and few households had a latrine. Two boreholes have now been refurbished by WfK, but as the area is so large, it is not cost effective to make safe water available in this way to the whole community. So the main focus of this project is health education which involved:

- Training of 30 volunteers to become Hygiene Promoters
- Hygiene awareness and maintenance training for 12 water committee members, including two pump minders

Since their training, the Hygiene Promoters and those trained in hygiene awareness have worked with households in the area. 126 households have already built their own latrine, 106 now have a refuse pit and 70 have a hand washing stand. Many more will build these facilities by the end of this year. These households are also aware of the importance of

using safe water (including boiled water and solar disinfected water [SODIS](#)). The community is improving their hygiene practices. This will lead to a significant reduction in the incidence of waterborne disease and improve the health and well-being of the community.

Phase three of our work in Chipapa has involved the building of a protected well in Shamanji, a remote village which is over 25km from a tarmac road. In addition WfK has funded the local production of sustainable concrete san-plats in Chipapa. 140 households have so far built new latrines using these san-plats with another two hundred planned. The EHT based at Chipapa Clinic, Mathew Chansa, continues to provide health education, with the Water Committee. He oversees the sustainability of the water supply system installed by WfK in 2009.

The trustees would like to thank Edgar Mulwanda who continues to do a great job of managing the WfK projects in Zambia on behalf of ZIEH.



**Bugabba Uganda Protected Water Source**

## **Rwanda**

In January a grant of £3000 was approved for [Help a Rwandan Person](#) to install RWH (Rain Water Harvesting) at Gatwaro School, Karongi.

## **Sierra Leone**

A water tank and much needed latrines are now available for use at Sobowan market in Bo, Sierra Leone's second largest city, thanks to a grant from Water for Kids of £2,500 towards the cost. This is helping over 100 market traders and their children secure better hygiene sanitation every day, with a knock on effect for thousands of market users.

## **Tanzania**

Repairs and refurbishment of the Bulongwa water tank and distribution system were achieved during the year by providing a grant to the charity [Tanzania Rural Revival](#) (TRR). This provided water to a large community living in a remote part of the Southern Highlands



of Tanzania. A further grant of £3,000 was given to TRR in January for a rain water harvesting system at Kabwe secondary school.



**Bugabba Uganda Unprotected Water Source**

## **Kenya**

Following a grant awarded to the [Kenya Acorn Project](#) (KAP), rain water harvesting, and latrines have been installed in the new nursery classroom in Ndhiwa. In addition KAP has carried out an evaluation which shows a significant improvement in school attendance at the six primary schools in Ndhiwa following rainwater harvesting and hand-washing facilities provided by WfK in 2011.

## **Supporters**

2012/13 was another successful year for fundraising in increasingly difficult times for all charities. We were very close to meeting our target income of £50,000. The trustees would like to express its sincere thanks to all those who supported WfK.

## **The year ahead**

Once again there will be a full programme of work in Uganda and Zambia with applications expected from existing partners for projects in Tanzania and Sierra Leone. In Zambia a new project in a remote area in the North of the country is being considered to provide safe water to a market and surrounding area. We also intend to carry out further evaluation of our project completed in Chipapa in 2009.

We are also reviewing the way we recruit and use volunteers to increase the charity's capacity at no extra cost.

## **Trustees**

We are sorry to report the death of Stephen Young, who has been the Chairman of Water for Kids for almost a decade. Stephen died on 29 July after a six year long fight with cancer. He had a great passion for providing safe water and sanitation in developing countries. His dedication and enthusiasm for Water for Kids has driven the Board of Trustees for many years and he impressed so many of those who saw him in action at our annual meetings. Stephen visited Peru, Tanzania and Uganda to contribute first hand to the work of Water for Kids overseas. He was a friend and an inspiration to all of the trustees; he will be very much missed.

## **How to participate**

Please email [administrator@waterforkids.org](mailto:administrator@waterforkids.org) if you want more information or can help in anyway. [www.waterforkids.org.uk](http://www.waterforkids.org.uk)

## **Peter Minhinnett Trustee, Water for Kids**

October 2013

### **Water for Kids Study and working visit to Uganda 2014**

Health Professionals have been working in Uganda for over 15 years on Community Projects involving Environmental Health.

Water for Kids has been supporting this work since 2005.

A group led by Peter is planning on travelling there for up to 3 weeks next year to work on new projects, evaluate previous projects, support local communities and work with health professionals.

Anyone with an interest in helping in a developing country is welcome to join us.

Are you interested in visiting Uganda 2014? If so contact Peter Minhinnett on +44(0)116 2393061 or Mobile +44(0)7876 475713.

or [peter@minhinnett.fsnet.co.uk](mailto:peter@minhinnett.fsnet.co.uk).

[www.waterforkids.org.uk](http://www.waterforkids.org.uk)

## Universities Working Together

Universities delivering Environmental Health Courses have a history of working closely together, establishing professional links, sharing practice and supporting each other.

This has been expanded recently by 3 Universities; University of Ulster (UK), Dublin Institute of Technology (Ireland) and the College of Health Technology of Coimbra (Portugal). These Universities have increased their engagements benefiting both the student experience and teaching practice.

### Erasmus

The Erasmus Programme is a European Union student exchange programme established in 1987. It forms a major part of the EU Lifelong Learning Programme enabling higher education students to study or work abroad as part of their degree and staff to teach or train in 33 European countries.

Erasmus agreements have been set up between the Universities allowing both student and teaching exchanges

Ursula Walsh from the University of Ulster completed a teaching exchange at the College of Health Technology of Coimbra April 2013 and participated in the 1st Annual Student EH Conference, Coimbra University, Portugal.



**Ursula Walsh (University of Ulster), Steve Cooper (CIEH, NI) and Fiona Campbell (Belfast City Council) with staff and students at the 1st Annual Student EH Conference, Coimbra University, Portugal**

Joao Almeida reciprocated by visiting the University of Ulster in May 2013 and again completed teaching environmental health undergraduates. He also presented at the CIEH NI Centre's Health and Safety Meeting.



**Health and Safety meeting, University of Ulster, May. Speakers - Elise Logan (Ballymena BC), João Almeida (University of Coimbra) and Region officers.**

The University welcomed 2 students (Margarida Correia and Ricardo Matias) from the College of Health Technology of Coimbra from January 2013 – April 2013. The two students successfully completed a project for a local food business in conjunction with Castlereagh Borough Council. They were commended for the standard of their work.



**Ricardo Matias and Margarida Correia students from the College of Health Technology of Coimbra at the University of Ulster with Marie Vaganay, Lecturer in Environmental Health at the University of Ulster**

### **Dublin Institute of Technology, Dublin, Ireland and Perdue University, Indiana, United States of America.**

The School of Food Science and Environmental Health in DIT and the School of Health Sciences at Perdue University have recently agreed to facilitate the exchange of students between Institutions. Sara Boyd, Lecturer in Environmental Health and Dr Jesus Frias Assistant Head of Department visited Perdue in September 2013 and arrangements have been put in place to allow students to study selected modules in Year 1 and Year 2 of the Programme. The students will spend 6 months at respective Institutions. Modules studied at Perdue will include Essentials of Environmental, Occupational, and Radiological Health, and Toxicology courses. These courses along with other general courses will significantly improve the overall strength of the EHS programme for the purpose of training next generation of researchers and workers in the EHS field.

## **Joint European Masters in Environmental Health**

The College of Health Technology of Coimbra, Dublin Institute of Technology and University of Ulster are currently investigating the possibility of a joint European Masters in Environmental Health and are meeting in January 2014 to discuss and progress.

## **University of Ulster (UU) and Dublin Institute of Technology (DIT) Visits**

Joint activities during visits between UU and DIT have been expanding and developing over a number of years. These have enhanced understanding in students (and academics) of educational and professional needs in the two states (with different needs, priorities and regulatory framework) and furthered student awareness and application of knowledge. A problem based learning approach has allowed students to apply their differing educational experiences to shared scenarios and compare their environmental health experiences.

All Universities have found the exchanges and collaboration very worthwhile and would be open to the potential to working with other universities.

**Lindsay Shaw,**

**Lecturer in Environmental Health,**

**University of Ulster**

**28 October 2013**

## **WHAT'S IN A NAME.....**

**The Environmental Health Officers Association (EHOA) Changes it's Name to the Environmental Health Association Ireland (EHAI).**

What's in a name? That which we call a rose by any other name would smell as sweet... correct? Well in the case of the EHOA not quite. In actual fact, the EHOA is no more. At the EGM of the 4<sup>th</sup> of July this year a motion was passed to change the name of our association from the Environmental Health Officers Association to the Environmental Health Association Ireland. So let's get used to saying it, the EHAI is here to stay. To those who would accuse us of fickleness let me assure you there are solid reasons for doing so.

Firstly, adding the "of Ireland" to our Association name makes sense because the EHAI operates in an international context as one association in a global federation of environmental health associations – the IFEH. We're one of the founding members of the IFEH, a fact of which we can be justly proud, and have always had a contribution that belies our relative size. In terms of our standing nationally it also underlines our role as the primary environmental health body in Ireland.

Secondly, our environmental health family has spawned a diverse membership over recent years – it is no longer a professional organisation that benefits only environmental health officers. The EHAI family now work in a growing variety of public service agencies, government departments and private industry with a variety of job titles. Dropping the term “Officers” recognises this development and explicitly acknowledges these colleagues and members.

Thirdly and most crucially, when EHOA gained registered charity status, we amended our Main and Subsidiary Objects, and these are our legal obligations as a Registered Charity and Company. In doing so we made a conscious decision to put the benefit to the public at the centre of our mission. This change was not taken lightly. This element of the proposed name change reflects that change in emphasis.

And so now we can see... it all makes sense. In the humble opinion of yours truly, I think it's a positive, progressive step. The EHAI is a representative, inclusive association to be proud of. Make way folks – the EHAI is here to stay!

**Marie Ryan**

**Public Relations Officer**

**Environmental Health Association of Ireland (EHAI)**

# Recognising Excellence in Environmental Health

## Environmental Health Association of Ireland (EHAI) Awards and Bursaries.



**Catriona Stack. Chairperson. EHAI Ireland.**

The EHAI has steadily built up an impressive stable of awards and bursaries over the years to encourage and promote excellence and endeavour in environmental health. Our two longest running awards are our Student of the Year Award and the John Shelley Bursary.

In the case of the John Shelly Bursary, a diverse range of charities across the globe have benefitted from our contribution, and we receive updates on how particular projects are progressing. The awarding of these two stalwarts takes place each December and is one of the social highlights of the EHAI. More recently two further awards - The Excellence in Environmental Health Awards, have been established. The purpose of these awards is to:

- Highlight outstanding contributions or achievements or innovations in, the environmental health field by environmental health practitioners or others (including individuals and groups)
- Promote increased awareness within the community of the important role played by environmental health and
- Enhance the public profile of the EHAI.

The first of these awards is the EHAI Excellence Award: The 'Con Healy Medal' for Environmental Health Professional of the Year. This is awarded for demonstration of excellence in professional practice. It is fitting it should be awarded in memory of our late colleague Con Healy, who for many years epitomised such excellence. Nominees and nominating persons for this award must be a member of the EHAI at the time of their nomination. The second award is the EHAI Excellence award: Outstanding contribution to the field of Environmental Health. This is awarded for exceptional research, lobbying or other activities associated with environmental health. Nominees for this award do not necessarily have to be a member of the EHAI. The inaugural recipient of this award was

Professor Luke Clancy in recognition of his contribution to both improving ambient air quality and striving for a tobacco free society.

In a further development, EHAI decided in March 2013 that in future, commencing with the International Federation of Environmental Health World Congress in Las Vegas, Nevada, USA, two places at the Congress will be funded by EHAI on the basis of papers submitted and accepted for presentation at the Congress. One of these will be awarded to a member and the other to a student or newly graduated member.

In the case of the award to a student or newly graduated member, this will be known as the “Michael Griffin Award” in memory of the late Michael Griffin who lectured for many years at the Dublin Institute of Technology. The award to the member of EHAI will be known as the “EHAI Education Bursary”.

**Martin Fitzpatrick,  
Honorary Secretary,  
Environmental Health Association of Ireland (EHAI)**

## **Environmental Health Education: A Global Perspective.**

**John O’ Connor**

### **Abstract**

In 1998 the International Federation of Environmental Health (IFEH) commissioned the International Environmental Health Faculty Forum (IEHFF) to explore the possibility of creating an international curriculum for Environmental Health (EH). Here they hoped to address the following:

- Professional identity
- Status and transportability of qualifications

One of the aims of creating an international curriculum was: *to ensure the development of EHPs who have relevant knowledge, skills and attitudes through training and research required for the improvement of health in communities* (Keraka, et al. 2010). However some 14 years later the debate continues and no definite curriculum has been established. This is mainly because this subject is of much discussion between Environmental Health academics and Environmental Health Professional’s (EHP’s). With this in mind the project focused on Environmental Health education in its current format, curricula content and construction, current on-going issues and associated topics such as Continuous Professional Development (CPD), the transferability of qualifications and the identity of Environmental Health. Results have shown that EH curricula globally vary considerably in numerous areas; begging the question; what classifies an Environmental Health



qualification and course? Through the use of different surveys data was gathered which points towards the need for action, debate and discussion to be held amongst the concerned parties in order to explore all options and to answer the IFEH's questions once and for all.

## **Historical Perspectives**

Principles of Environmental Health have existed for thousands of years. Throughout history, society has had to deal with Public Health issues even as far back as Ancient Civilisations, such as the Egyptians and the Romans. Fast forward to the Industrial and Agricultural Revolutions in Britain and Public Health became a significant issue with many EH related knock on effects, including on housing, drainage, refuse disposal, supply of potable water, pollution, food supplies, sanitation *etc.*

Numerous, widespread outbreaks of various communicable diseases, combined with deplorable sanitary conditions caused the concept of Public Health to be born. Throughout the 19<sup>th</sup> century and the intervening years to the present day the concept has developed and changed many times.

With legislation being introduced to try and improve the level of Public Health in the United Kingdom, the position of Environmental Health Professional was also created to enforce this legislation, although referred to as Her Majesty's Inspectors of Nuisances in its earliest incarnation. This role has changed with time, both in name and function. To go hand in hand with this, regulations were also introduced which set the standard for the education of EHPs. In the early 1970's the terms Environmental Health and Environmental Health Officer were formally adopted in the UK (Davies 1977).

Modern day EH varies globally. Developing countries have a greater focus on the inhibition and avoiding of infectious diseases while the focus of developed countries is on the prevention of worldwide environmental impacts such as climate change (Goldman and Torres 2009).

## **Environmental Health Education**

EH Inspectors and the education they receive have historically been influenced by a country's needs, government policy and legislation. National EH organisations, such as the Chartered Institute of Environmental Health (CIEH) in the UK or the National Environmental Health Association (NEHA) in the United States, have also become more involved with EHP's education. These organisations are commonly involved with the accreditation of EH degrees. This normally means that curricula are focused primarily on national issues with little concentration on international issues. This can often lead to issues with transferability as international graduates seek work in these countries without an accredited degree.

The topic of EH education has been a point of discussion and debate amongst both academics and professionals alike for a number of years, especially within the IFEH and the IEHFF. Over the years numerous theories and models have been put forward for discussion (including a possible international curriculum), particularly within this publication, Environment & Health International (EH&I) and at the IFEH World Congress.

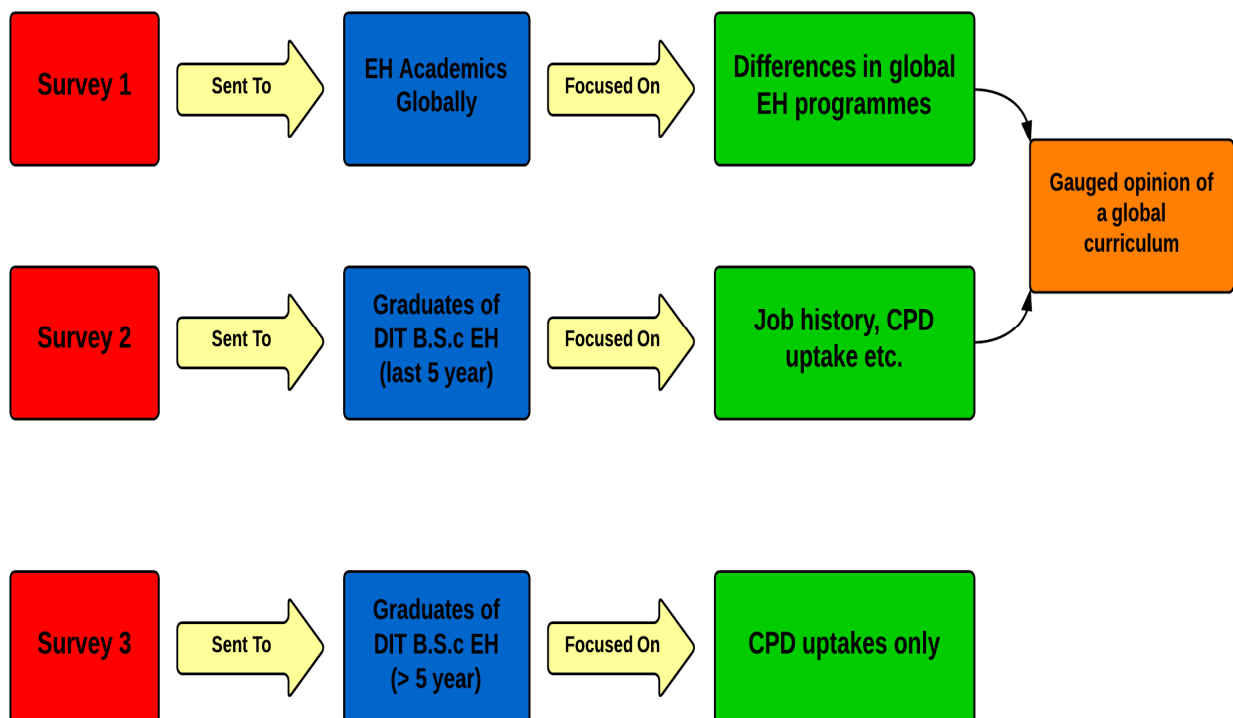
- Morris, et al (2002), proposed the use of a modular system.
- Harvey & Hetherington (2002), proposed the usage of integrative case studies to develop essential skills in the EH specialist.

- Kitagwa (2007), proposed Problem Based Learning (PBL) and Community Based Education and Service (COBES) as a way forward.
- Akinmoladum (2008), proposed problem and reality based learning as a method to be incorporated into the EH curriculum.
- Delaney, et al (2008) at the 2008 IEHFF meeting in Brisbane presented a paper to the IEHFF entitled “Environmental Health Qualifications” and addressed issues such as the aims of an EH education programme, learning outcomes, skills and knowledge that’s all EHPs should have, competence and the importance of professional practice.
- Brennan, et al (2009), put forward their concept for an international curriculum.
- Finley, et al (2010) discusses the possibility of an internationally recognised qualification.

In Dublin at the 2006 IEHFF meeting it was concluded by those in attendance that a one size fits all approach of an international curriculum is not practical and that a document looking at the EH qualification should be created, focusing primarily on competencies. However despite this and with multiple theories having been put forward as highlighted above, little progress has been made on the matter.

**Methodology:**

The overall aim for this project was to view EH education on a global scale, particularly in relation to ongoing issues. Three surveys were created to generate a picture of the current position of EH education. The diagram below gives a quick overview of what each survey contained and who its target audience was.



The surveys contained a wide variety of question types, including classification, knowledge based, attitude, behavioural and both closed and open ended questions. A combination of online surveys and electronic versions were created in order to maximise the response rate.

### **Survey distribution**

- **Survey 1:** For this various email lists of academic institutions which were sourced from numerous websites, including the sites of the IFEH, NEHA and Environmental Health Australia. The live version of this survey can be viewed at the following link: <http://goo.gl/ebK7Ys>
- **Survey 2:** This survey was distributed mainly using social media. Facebook and LinkedIn were primarily used due to their ever increasing and popular use in Ireland. Specific EH groups were contacted on both sites to circulate the surveys. The live version of this survey can be viewed at the following link: <http://goo.gl/Ut6LXZ>
- **Survey 3:** For this survey collaboration with the Environmental Health Officers Association (EHOA, now the EHA) was necessary in order to make use of their emailing list. The live version of this survey can be viewed at the following link: <http://goo.gl/0pu6hB>

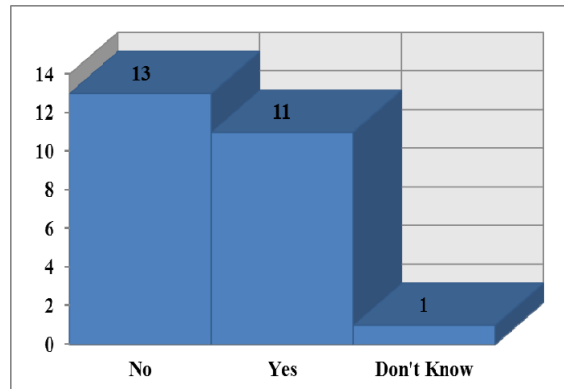
### **Results/Discussion:**

For the purposes of this article only the most significant results from the surveys will be mentioned as each survey had a significant number of questions. The survey results pointed favourably towards the introduction of a global Environmental Health qualification. Results gave a good indication that both academics and professionals believe that a global qualification may be possible to achieve and that it would be beneficial. The consensus is that a global structure would aid in the transferability of qualifications. Both professionals and academics agreed that a global universal curriculum would be the wrong method to use and would not work due to the different national issues in individual countries and that a different format would be more suitable.

In theory the idea of an international curriculum has numerous benefits, such as aiding in the transferability of qualifications. However due to various reasons as previously mentioned its execution would not be possible. Battersby (2011) recognises that different countries have alternating approaches to Environmental Health and that the components of EH in one country are not necessarily relevant in another country. If each country has different needs then each academic institution would have to offer modules to meet those needs. Therefore an international curriculum could not be created if each country requires different subject material.

A global “knowledge curriculum” may not be possible to create but if EHPs were all trained to have a particular skill set then this could aid in the transferability of qualifications to different countries. However regardless of what approach is taken, the most important thing that needs to happen is for all concerned parties to come together to properly discuss the issues at hand because these topics have been brought up at countless World Congresses but due to the constraints of time and global distances progress has not been made.

Results from Survey 1 showed that work placement as part of the EH course curriculum proved to be important in providing EHPs with essential skills. However 52% of the 22 institutions (from 10 countries) who responded did not have work placement incorporated into their programme.



**Work Placement Statistics**

With competence being the key identified by the IEHFF going forward work placement needs to be incorporated and made a compulsory part of any new potential curriculum as work placement is where skills are developed, knowledge tested and attitudes produced.

Other results from this survey included:

**The Broad Core Areas Covered on courses globally:**

Environment	31	
Health and Safety	26	
Food Safety	24	
Built Environment	24	
Public Health	24	
Health Promotion	18	
Other	14	
	Psychology	1
	Biology	1
	Law	1
	Risk Assessment	1

**How students are examined:**

Mixture of both	20
Examinations only	3
Assessments only	2

**Does thesis/dissertation/research project have to be completed as part of the course?**

Yes	18
No	7
Don't Know	0

**If yes how much is it worth towards the final award?**

10%-20%	7
Greater than 20%	7
Less than 10%	4

**Is the course accredited by an external Environmental Health body? If yes who?**

Yes	18	
	EHAC	8
	CIEH	7
	IOSH	1
	Canadian Institute of PH Inspectors Board of Certification	1
	External Expert	
	Soon to be Malawi EHA	1
	EH Australia	1
	Minister for Health	1
No	6	

72% of courses had some form of accreditation. This was mostly UK and American colleges. Whilst course accreditation is broadly viewed as a good thing it has in the past caused issues for graduates trying to seek employment in these countries from areas which have no course accreditation as the qualifications are not compatible. In turn these graduates have had to train further in order to be allowed work in the new host country.

**Is the degree/award recognised in other countries? If yes please name the registration body.**

Don't Know	15	
Yes	7	
No	3	
	CIEH	1
	EU	1
	Different arrangements for different countries	1

These are just some of the results which highlighted the wide ranging differences which occur in curriculum globally. Some are more significant than others, particularly in terms of course syllabus. This asks the questions; what constitutes a course in Environmental

Health if certain areas are not covered in the curriculum; and what is the identity of Environmental Health?; something which was first asked by the IFEH in 1998.

EH curricula globally tend to vary significantly in a number of areas and whilst it has been established that a universal curriculum is not practical the differences highlight the need for genuine discussion and debate on the issues at hand.

For the past five year plus global economies have been struggling. Irish graduates have been emigrating at an increasing rate year on year and in other countries similar situations exist. It is important that these graduates and other established EHPs are able to seek employment in other countries without encountering issues in getting their qualification recognised. Debate, discussion and conclusions are needed on this subject and a system put in place for the future.

Other survey results showed that in Ireland the uptake of Continuous Professional Development by EHPs is at a high level with the majority of professionals taking part because they want to improve themselves professionally and not because of job requirements *i.e.* CPD being compulsory.

A formal CPD system should be established in Ireland for EHPs as it has been done for many professionals such as architects. CPD should become an important part of the continuous education of EHPs in Ireland and globally. Keeping up to date and remaining competent may also help EH qualifications transfer from country to country.

### **Conclusion:**

After carrying out the methodologies in this area and interpreting the results numerous conclusions have been formed.

- An international curriculum in Environmental Health is not possible to achieve.
- A EH education template would allow universities freedom and also the ability to educate students to tackle national issues while at the same time giving structure to the EH education system globally.
- In order to explore all options, discussion will be required as will a sufficient amount of time and effort to deliberate all issues and to try and incorporate everyone's needs/opinions.
- This system would also help to cement the identity of Environmental Health, one of the tasks assigned to the IEHFF in 1998.
- Competency needs to be focused on going forward. Competency should be the basic global requirement. EHPs may not have the same knowledge but the same basic skill set is essential, for example in risk assessment, analysis *etc.*
- Work placement plays an important role in developing the skills of Environmental Health Professionals.
- CPD is vital going forward for EHPs and to help solving the issue of transferability of qualifications. CPD will also need to become a global feature for Environmental Health Professionals as CPD and competency go hand in hand.

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**This study was carried out between April 2012 and December 2012 for a Final Year Thesis as part of B.Sc. Environmental Health in the Dublin Institute of Technology (DIT).**

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# **Nanotoxicity of Nanoparticles and Identifying Knowledge Gaps in Risk Communication in Relation to Key Food Nanotechnology Information.**

**Catherine Deeney.**

## **Abstract**

Nanotechnology refers to the design and production of structures, devices, and systems by the utilisation of atoms and molecules at the nanoscale, whereas Food Nanotechnology is referred to as the application of nanoscience to the food sector. Nanotechnology is not a new field of science and engineering, but a new way of looking at and studying materials and it is believed to be one of the key technologies of the 21<sup>st</sup> century. With nanomaterials, as the size of the particles decreases the specific surface area increases, indirectly proportional to their size, until the properties of the surface molecules dominate. These properties include increased toxicity, chemical reactivity, conductivity, and strength.

Nano-sizing of bulk materials may offer many benefits, to the food industry, however due to the unique properties, found at the nano scale, engineered nanoparticles, may also present potential risks, with major concerns stemming from the increased toxicity of nanoparticles to humans and the apparent abundance of misinformation of the risks.

This study conducted a risk analysis by assessing the nanotoxicity of two metallic nanoparticles; nano Zinc Oxide (nZnO), and nano Silver (nAg) as they have potential applications in both food products and food contact materials. The results from the risk analysis clearly indicate that both nanoparticles had a toxic effect on the tested cell lines. These results are significant and it is imperative that a cautionary approach is taken when utilising these nanomaterials in food products or food contact materials.

It is vital that the most accurate and up to date, information be communicated to the correct audiences. Therefore it was important to identify knowledge gaps in risk communication and dissemination in relation to key food nanotechnology for practising Environmental Health Professionals. Significant results from this survey are that serious knowledge gaps are evident in both risk communication and in the dissemination of key food nanotechnology information to professionals. It was also important to determine if risk communication was a deciding factor in dissemination modes used by academic and researchers, and are these modes effective in communicating risk to regulators and legislators. Albeit a small sample of responses were received from this survey, one could make the hypothesis that strategies are ineffective. Findings such as these may have serious consequences, as nanomaterials are being incorporated into food and food contact materials. A key recommendation from this project is that Environmental Health need to have the most relevant and most updated information and be aware of where to find such information lest there is serious public health issues.

## 1.1 INTRODUCTION

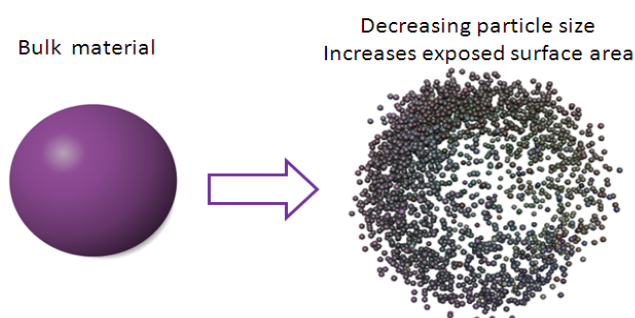
Nanotechnology is not a new field of science and engineering, but a new way of looking at and studying it. According to Mukherjee *et al.*, 2012, Duncan, 2011, and Davoren *et al.*, 2007 it is believed to be one of the key technologies of the 21<sup>st</sup> century. Nanotechnology refers to a branch of science and engineering dedicated to the design and production of structures, devices and systems by the utilisation of atoms and molecules at the nanoscale, that is having one or more dimensions of the order of 1nm to 100nm (European Food Safety Authority, 2006).

Early examples of nanostructured materials can be seen from as far back as the 4<sup>th</sup> century. The Lycurgus Cup from Rome shows craftsmen's empirical understanding and manipulation of material, (National Nanotechnology Initiative, 2011).

## 1.2 Properties and Characteristics of Nanomaterials

According to the Scientific Opinion of the Scientific Committee of the European Food Safety Authority, (2009), molecules at the surface of a material generally do not have a full quotient of covalent bonds and are in an energetically unstable state giving rise to increased surface reactivity. Micelles, liposomes and microemulsions for example, result from surface reactivity or properties and the tendency of the constituent molecules to lower their surface energy. For macroscopic or microscopic materials the proportion of the molecules in the material that are in this energetically unstable state is very low, with the majority of the molecules being in their lowest free-energy state in the bulk, therefore it is the properties of this majority of molecules that determine the properties of the material such as conductance or strength.

With nanomaterials as the size of the particles decreases the specific surface area increases, (figure 1.1) indirectly proportional to their size, until the properties of the surface molecules dominate, nanomaterials therefore have novel properties determined by their high surface-to-volume ratios.



**Figure 1.1** How the surface area changes as the particle become smaller  
(Chambers, G. 2012, Dublin Institute of Technology)

Their very high surface area makes them exhibit unique properties that are considerably different from the properties of the same bulk material, due to many more molecules being located at the surface in energetically unstable states.

Properties such as increased toxicity, chemical reactivity, conductivity, strength, melting point, fluorescence, and magnetic permeability change as a function of the size of the particle (Takhar & Mahant 2011).

Due to the unique properties of nanomaterials, there has been huge expansion in research on nanomaterials in the scientific and commercial fields. Numerous commercial products, which depend on nanoparticles and processes, are now available on the market, and include, products in the food sector and medical sector, consumer products such as, tonic drinks, sun-creams, eyeglass lenses, tennis rackets, motorcycle helmets, and fabric, (Project on Emerging Nanotechnologies, 2012).

### **1.3 Nanotechnologies in the Food Sector**

Nanotechnologies in the food sector or 'food nanotechnology' refers to the application of nanoscience to the food sector and it has the potential to manipulate various areas of food science that could benefit the food industry and therefore benefit consumers.

The research into naturally occurring nanostructures in foods is according to Sekhon, 2010, mainly designed to improve the functional behaviour of the food, whereas food nanotechnology research is focused on modifying food substances to produce nanoparticles that have a different function from the original substance. According to Gruère, 2012, the number of commercialized products in the agricultural-food sector has been increasing progressively over the past number of years. There is no official repository for nano-enabled products; however, three databases have attempted to classify commercialised consumer products which are using nanomaterials, these databases are:

1. The Project on Emerging Nanotechnologies, 2012, in the United States,
2. The inventory of nano products called 'NANO inventory' launched by the European Union, (Nano Inventory, 2010) and
3. The database of 'products with nanotech related claim' by the European Consumers' Organisation (BEUC, 2010).

BEUC (2010) reported finding 27 food and drink products on the European market, which is up from 10 products in 2009, and the Project on Emerging Nanotechnologies' reported 89 products as of 2010.

According to the Food Safety Authority of Ireland, <sup>a</sup>, 2008, nanotechnology-based materials of relevance to food and food contact materials include, nanoemulsions/nanodispersions, nanoencapsulation, nanocomposites, active food packaging materials and intelligent food packaging materials.

### **1.4 Risk Assessment Paradigm and Food Nanotechnology**

According to the Food and Agriculture Organisation and the World Health Organisation, 2005, a risk assessment is a process or system that is intended to facilitate the description, understanding, and management of contentious issues or complex systems. Nanotechnology could come under this. It provides a framework that allows the information and evidence connected with nanotechnology to be objectively collected and combined.

The European Food Safety Authority, 2009 stated, "The risk assessment paradigm is appropriate for the applications of nanoscience and nanotechnologies in the food and feed chain.

Risk assessment for nanotechnology could therefore be seen as a combination of risk analysis, risk management and risk communication, (figure 1.2) and this paradigm could

form the basis for sound science-based decision-making. Risk assessment starts with the gathering of information on the risk issue of concern.



**Figure 1.2:** Risk Assessment Paradigm

### 1.5 Risk Analysis and Nanotoxicology

Nano-sizing of bulk materials may offer many benefits in the food sector, however due to the properties and characteristics found at the nano scale, engineered nanoparticles, may present potential risks to consumers. Nanotoxicology could be seen as a framework for nanotechnology risk analysis that is; a procedure to identify any harmful effects from nanomaterials, and to highlight how the effects could be eliminated or reduced.

In order to understand the concept of nanotoxicology, toxicology must be defined first. A definition of toxicology from the Society of Toxicology, 2008 states, “Toxicology is the study of the adverse effects of chemical, physical or biological agents on living organisms and the ecosystem, including the prevention and amelioration of such adverse effects”. The area of toxicology covers any effect on an organism that alters its regular processes and encompasses both *in vitro* and *in vivo* studies. Due to their size, nanomaterials are in a position to cause toxicological effects. Nanotoxicology aims to investigate the toxic effects of these particles while also assessing physicochemical characteristics of the particles being tested. For nanotoxicology, the agent’s; chemical, physical or biological, must have at least one fully defined dimension of 100 nm or less. A definition for nanotoxicology therefore could be given as “the assessment of the biological response in a cell, biological system or organism to the presence of nanomaterials”. In order for a material to have, a toxic effect on an organism or its surrounding there has to be some route of exposure.

The human body has three primary routes of exposure when considering the toxicity of a material:

1. Inhalation – involves the toxic responses, which are contained in the lungs, trachea and any other area of the respiratory system. This generally occurs when particles become suspended in air as a fine dust and are inhaled (Ayres *et al.*, 2008).
2. Oral - This exposure covers all exposure via ingestion, from the oral cavity to the upper and lower gastrointestinal tract, (Ó Clonadh, 2012).
3. Dermal – This exposure relates to the absorbance of the materials through the skin or outer membrane of an organism (Sharma *et al.*, 2009).

## 1.6 Risks from nanomaterials

According to Cockburn *et al.*, 2012, the physicochemical properties of materials, combined the body's response to them, are the major determinants of the materials fate in the body. However, while it is mainly the chemistry of bulk materials that determines their fate, it is a combination of physical as well as chemical attributes, the so-called physicochemical characteristics, i.e. large surface area to volume ratio, shape, reactivity, charge, and toxicity, that predominantly influences how the body handles engineered nanoparticles.

Mukherjee *et al.*, 2012, showed that prolonged exposure to silver nanoparticles, may lead to an irreversible pigmentation of skin and or eye. Nanoparticles of 50 and 70 nm can enter cells and lungs, while those of 30 nm can even pass through the blood and brain barriers (ETC 2005, cited Chau *et al.*, 2007). Chau, 2007, showed that nanoparticles could translocate from respiratory systems to blood circulatory systems, distributed throughout the body, and further taken up into liver, spleen, bone marrow, heart, brain, and other organs.

A major area of concern to humans from nanotechnology is where food products contain insoluble, indigestible, and potentially biopersistent nano particles such as metals or metal oxides. These nano particles have the potential to cross biological barriers to reach those parts of the body which are otherwise protected from entry of (larger) particulate materials, (Chaudhry & Castle, 2011).

According to Cockburn *et al.*, 2012, Chaudhry & Castle, 2011, there are a number of knowledge gaps in the current understanding of the physicochemical properties, behaviour and effects of nanomaterials on cells in human body, and the they require a detailed evaluation compared to products which do not contain insoluble and biopersistent nanomaterials. Standard cytotoxicity assays such as Alamar Blue (AB) assay and MTT assay, can be used to study the effects of nanoparticles on cell lines. AB and MTT assays show the effect of nanoparticles on different aspects of cellular activity, (Mukherjee, *et al.*, 2012).

## 1.7 Risk Management and Nanotechnology Regulation

The European Agency for Safety and Health at Work, a, 2012 states that risk management of nanotechnology is challenged by uncertainties in; regulation, the physicochemical properties, potential risks and benefits, and the future direction of nanotechnology applications. Because of the uncertainties in nanotechnology, there is significant debate concerning whether nanotechnology or nanotechnology-based products merit special government regulation, (Falkner & Jaspers, 2012). According to Fulekar, 2010, another challenge for Governments and regulators is whether a matrix can be developed which would identify nanoparticles or whether it is more reasonable for each particle to be tested separately.

Regulation in nanotechnology is lacking in many areas, however the European Union has been increasing its efforts since 2004, with regard to regulatory aspects of nanotechnology. New legislation is based on existing regulations; with the assumption that current legislation would be suffice to cover nanotechnology. However, some fields have started to adapt, in particular with regard to chemicals, cosmetics, and food. The regulation of nanotechnologies is within the span of both the horizontal legislation and vertical legislation. Existing horizontal legislation is broad and covers attributes of nanotechnologies although it does not specifically aim to do so. Vertical legislation is specifically aimed at regulating nanotechnologies and areas of industries expected to make use of nanotechnologies and so the vocabulary used makes the legislation more applicable to issues faced by users of nanotechnologies. Compared to horizontal

legislation, vertical legislation for nanotechnologies is relatively recent and was non-existent until a few years ago, (Cushen *et al.*, 2012).

### **1.8 Risk Communication and Dissemination strategies in Nanotechnology**

The World Health Organisation, 2012, defines risk communication as an interactive process of exchange of information and opinion on risk among risk assessors and risk managers. Nanotechnology risk communication is a vital part of the risk assessment paradigm and the risk communication strategy must be three-way communication. The overall nanotechnology communication strategy must include decisions on what information is going to be communicated, who is going to communicate the information, to whom is the information communicated too, and how it is going to be communicated.

Dissemination is the process of sharing information and knowledge. The challenge of dissemination is to improve the accessibility of research findings to those it is trying to reach. Successful communication depends on being planned as part of the research process itself, (nanoimpactnet, <sup>b</sup>, 2012) This is particularly important for communication on nanotechnology, as uncertainty, risk, social perceptions, concerns and expectations play a crucial role for building social acceptance or rejection of nanotechnology.

Following legislation updates and the increasing availability of scientific information on nanotechnology, various Government agencies have produced reports and statements on nanotechnology to communicate and inform their regulators and the public, and include; Food Safety Authority of Ireland, The Health and Safety Authority, Environmental Protection Agency, Irish Medicines Board and Teagasc.

Many other Irish, EU and USA websites are dedicated to the dissemination of key nanotechnology information to Governments, enforcers of legislation, and the general public several of the important and updated include; INSPIRE Ireland, The nanodialogue project, and The National Nanotechnology Initiative. Environmental Health Officers (EHO's) play an important role in food safety both in industry and in the state sector, through advice, education, monitoring and regulation. EHO's are principal regulators involved in implementing; current regulations, updated legislation and new legislation, therefore EHO's, will ultimately be the enforcers of food nanotechnology legislation.

However, legislation in nanotechnology, and in particular food nanotechnology legislation, is encountering to some extent, difficulties in keeping up to date with the rapid growth and rise in the production of engineered nanoparticles. With the lack of legislation, a cautionary approach must be taken in relation to food nanotechnology; therefore, relevant updated research findings and regulations must be disseminated to the correct audiences, to avoid situations such as Genetically Modified (GM) foods debacle. Policy makers, researchers and academia in the field of nanotechnology, must ensure that dissemination strategies on communicating key food nanotechnology information are effective in particular for EHO's, who are, and will ultimately be the enforcers of food nanotechnology legislation.

## **2. Methodology**

This project essentially had two underlying themes, firstly to assess risk of nanomaterials and secondly to explore the communication of that risk.

The project aims were as follows;

- 2.1. To conduct a risk analysis, by assessing the nanotoxicity of two metallic nanoparticles; nano Zinc Oxide (nZnO), and nano Silver (nAg) as they have potential applications in both food substances and food contact materials,

- 2.2 To assess risk communication and identify knowledge gaps (if any) in the communication of risk with respect to key food nanotechnology information to practising Environmental Health Officers.
- 2.3 To determine if risk communication to regulators and or legislators is considered a deciding factor in the mode of dissemination by academics in the publication of research findings, and to assess if these dissemination modes are effective for on the ground regulators.

### **3 RESULTS.**

#### **3.1 General discussion of findings from The *in vitro* effects of nano Zinc Oxide (nZnO) and nano Silver (nAg) exposure in two cell lines; Caco-2 and AGS**

The assessment of risk is the first step in any risk analysis. Traditional with materials this entails performing a series of toxicological tests of assay. This study focused solely on *in vitro* cytotoxicity for demonstration of potential risk of nanomaterials to the public from consumer food products. The materials chosen were Zinc Oxide (nZnO) and Silver (Ag) as these are the most prolific materials found in consumer food products. Two cell lines: Caco-2 cell line (colorectal (colon) adenocarcinoma), and AGS cell line (Gastric (stomach) adenocarcinoma) were utilised as an intestinal model *in vitro*.

The results from the risk analysis indicated that the average size of Nano Zinc Oxide was  $17.0 \pm 1.1$  nm and nano Silver had a slightly higher average size of 68.55 nm. From the definition of a nanomaterial recently adopted by the EU Commission “any intentionally produced material that has one or more dimensions of the order of 100 nm or less...” it can be stated that both nanoparticles were indeed in the nanoscale.

In the assays studied (Alamar Blue, MTT and Clonogenic) it was shown that nZnO and nAg had a toxic effect on the cell lines tested, who’s origin were the stomach and colon, and it appeared that toxicity was dependant on dose.

Indeed long-time -exposure, even at low concentrations was also seen to be a significant contributing factor to the generation of the toxic effect. Nano Zinc Oxide appeared to more toxic to the AGS (stomach) cell lines when compared to the toxicity of nano Silver, to this cell line. The toxicity of the nano Silver appeared to be more time dependant that that of the nano Zinc Oxide, and the nano silver particle also displayed the hormetic effect. It was clearly demonstrated that a potential risk exists with both these particles respect to Caco-2 and AGS cell lines.

#### **3.2 Survey of Environmental Health Profession.**

The demonstration of this risk highlights the need for rapid communication of research findings to frontline legislators and on the ground regulators. To assess if there is knowledge gaps in risk communication within an Irish context this study aimed to firstly canvass practising Environmental Health Officers awareness, and knowledge of nanotechnology in particular in relation to food nanotechnology and secondly to canvass academics/researchers. This was achieved via a series of surveys. Delivery methods used

were hand delivery, email and using an internet based survey method. A total of 122 responses were returned.

The most significant results from the survey conducted on practising Environmental Health Officers in Ireland is that serious knowledge gaps are evident in risk communication and dissemination in relation to key food nanotechnology information.

This knowledge gap is evident in that almost all surveyed EHO's (91%) are not aware of any legislation or pending nanotechnology legislation in consumer products and only half of surveyed EHO's (50.4%) had an awareness of nanotechnology in food or food products.

There is a clear lack of risk communication, as the majority of surveyed EHO's (67%) did not have sufficient information regarding nanotechnology as an emerging public health or environmental health issue. The results from the risk analysis of nano Zinc Oxide and nano Silver clearly indicate otherwise.

The effectiveness of dissemination in communicating key information to relevant environmental health target audiences is questionable, as surveyed EHO's indicated that if they had a query regarding nanotechnology they would ask nobody and would read-up themselves using websites and library resources etc.

The responses to an open-ended question regarding naming two, peer review journals (if any) surveyed EHO's would frequently use. Trade journals were the most frequently used and included: The Food Safety Authority of Ireland newsletter, Journal of Environmental Health, the Environmental Health Officers Association (EHOA) yearbook and EPI Insight (a monthly report on infectious disease in Ireland, produced by the Health Protection Surveillance Centre). This question was asked in order to highlight the fact that if new research on nanotechnology in relation to the food industry is being published constantly in specific journals, it is not reaching the correct reading audiences. It could be stated, that current dissemination strategies are not effective and no risk communication is taking place between risk managers and risk assessors. Therefore, the responses to this question has identified a knowledge gap.

### **3. 3 Researchers/ Academia Survey**

The aim of this survey was to canvass nanotechnology researchers and academia to determine if risk communication to regulators and or legislators is considered a deciding factor in the mode of dissemination and to assess if these dissemination modes are effective for on the ground regulators.

Due to the number of respondents from the researchers and academia survey, 12 in total, (there is however approximately only 60 principle researches in this field in Ireland at present,) these results could not be used as a true reflection of the surveyed population; though it does give a small insight into the publishing field of nanotechnology.

An interesting result was that trade journals are not considered by researchers/ academia when publishing their research results or findings; however, EHO's frequently use trade journals. These findings may have serious consequences, as nanomaterials are being incorporated into food and food contact materials, EHO's need to have the most relevant and most updated information and be aware of where to find such information lest there is serious public health issues.

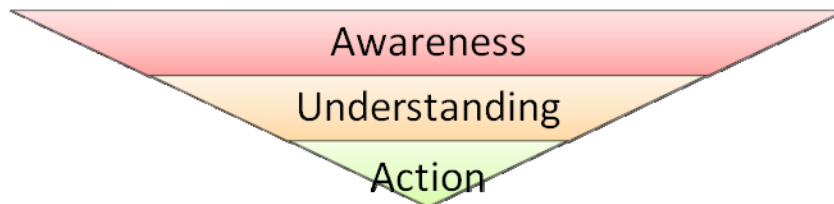
### **3.4 Future Work**

Future work in risk communication and dissemination area would involve a more in-depth survey of researches and academia in the field of nanotechnology. Canvassing at seminars, meetings, conferences, the use of telephone surveys, face-to-face meeting



or/and interviews, would ensure a larger number of respondents. This could possibly reveal very interesting results regarding disseminating strategies.

The Environmental Health survey did however reveal knowledge gaps and training needs in relation to food nanotechnology. Future work in this area would entail a more comprehensive investigation in to the three levels of dissemination strategies (figure 1.3); Awareness, Understanding, and Action. This investigation would engage a much larger population, including the general public, (awareness) EHO's, (Understanding and Action) and legislators (Action).



**Figure 1.3:** The three levels of dissemination, (Chambers, G. 2012, Dublin Institute of Technology)

#### 4. Conclusions

Food nanotechnology is a rapid emerging discipline which has the potential for many benefits; however by conducting a risk analysis of two nanomaterials potential public health issues are evident. These results are significant and it is imperative that a cautionary approach is taken when utilising these nanomaterials in food products or food contact materials. There are currently food products available on the Irish market which contains these nanomaterials and it is vital that the Government takes an immediate course of action to ensure that these products are safe and will not cause serious public health issues.

Risk assessment was assessed and knowledge gaps were identified in the communication of risk with respect to key food nanotechnology information to practising Environmental Health Officers.

A clear lack of risk communication is also evident and knowledge gaps were found in the communication of key food nano information between, Government agencies, researchers, academia and Environmental Health Officers. These findings may have serious consequences, as nanomaterials are being incorporated into food and food contact materials, EHO's need to have the most relevant and most updated information and be aware of where to find such information lest there is serious public health issues.

Risk communication to regulators and or legislators could not be thoroughly determined, due to the number of respondents from the researchers and academia survey. However, an interesting result was that trade journals are not considered by researchers/ academia when publishing their research results or findings; however EHO's frequently use trade journals. This could be seen as an ineffective dissemination mode for on the ground regulators.

#### 5. Recommendations

The main recommendations from the completion of this project were as follows; The introduction of legislation that regulates the application of both nano Zinc Oxide and nano Silver is vital. These nanomaterials are clearly toxic to human cells, and they must be regulated.

Training for Environmental Health Officers in the key areas of food nanotechnology, this could be provided by the researchers/ academia in the field of nanotechnology. By providing training, it would ensure that the key relevant information is being disseminated correctly. However due to the unstable economy climate in Ireland training is unlikely to be forthcoming. Nevertheless, training is imperative and risk communication dialogues could be opened up between the various groups with other various means. EHO's use websites and trade journals most frequently, training information could be conveyed and imparted easily through these. A website or an online forum dedicated to the dissemination of key food nanotechnology information to EHO's could be simply set-up by a recognised expert group. This would both inform EHO's and the decrease knowledge gaps. Government agencies need to be more proactive in updating their online information on nanotechnology in particular in relation to food nanotechnology, and upcoming legislation on food nanotechnology, especially as EHO's are the main enforcers of food safety.

Future work in the three levels of dissemination strategies could be undertaken through having a major input from Governments and their agencies. They themselves could be canvassed in addition to the general public to gain an overall view of the effectiveness of dissemination strategies.

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*This study was carried out between April 2012 and December 2012 for a Final Year Thesis as part of B.Sc. Environmental Health in the Dublin Institute of Technology (DIT).*