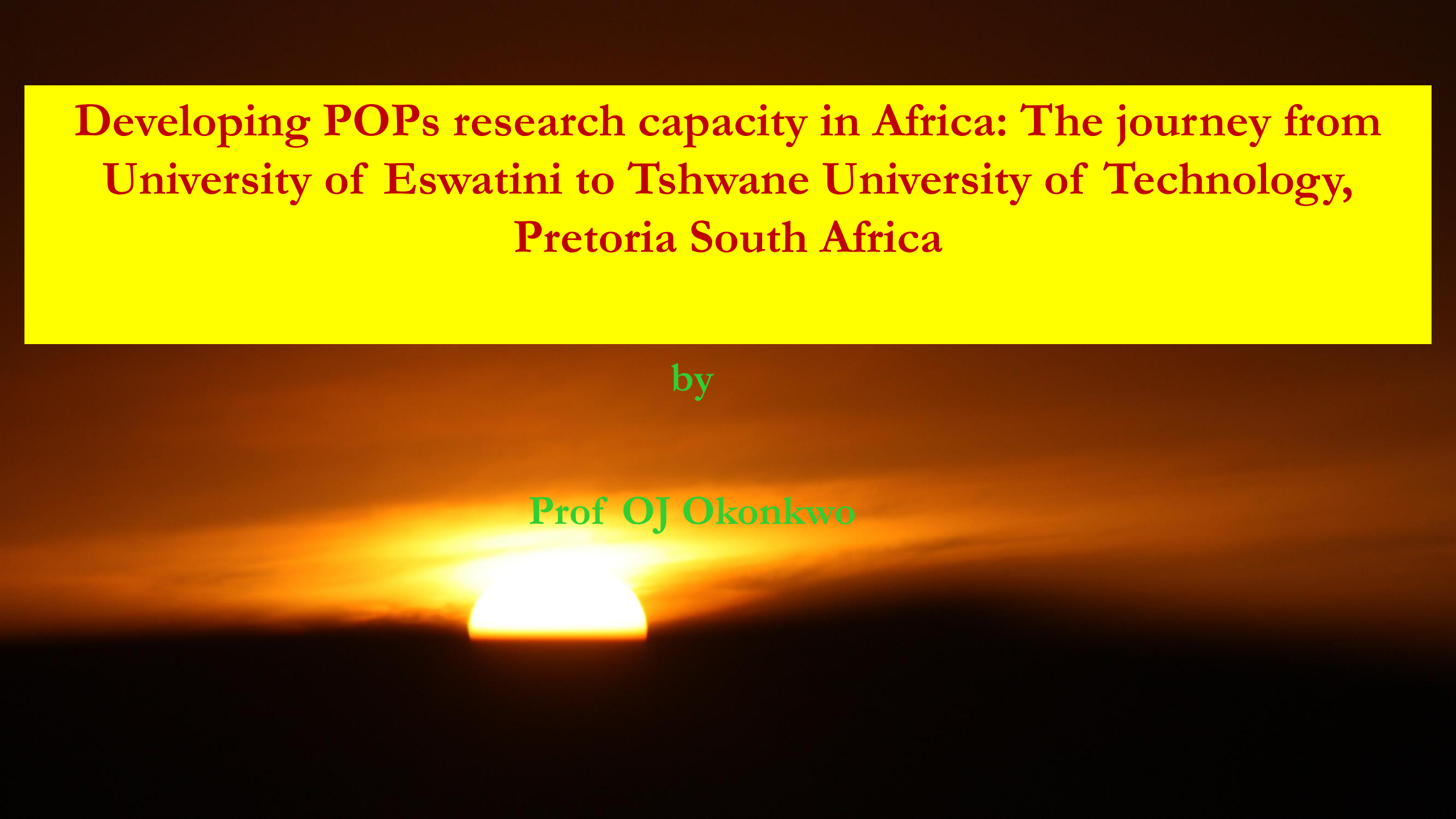
Developing POPs research capacity in Africa: The journey from University of Eswatini to Tshwane University of Technology, Pretoria South Africa



by

Prof OJ Okonkwo

THE BEGINNING

Interest in contaminants research stemmed during my MSc in Environmental Pollution Science at Brunel University, UK;

Earlier research focus was on developing new methods to measure organic and inorganic contaminants in environmental media;

Joining the University of Swaziland (now Eswatini) my research focused on monitoring DDT and its metabolites in human breast milk;

Joining the Tshwane University of Technology, my research continued with method development to monitor organic contaminants in different environmental matrices but has also expanded to adsorption technology, particularly on the conversion of waste biomaterials into useful adsorbents for the removal of POPs from aqueous media

Established POPs and other chemicals of concern

We have developed analytical procedures of POPs and other chemicals of concern over the years at our Tshwane University group considering the need of supporting the assessment of new listed POPs in Africa but also other relevant chemicals of concern in the African context:

- ✓ **DDT and its metabolites (in human breast milk, soil and plants);**
- ✓ **PBDEs (atmosphere, landfill leachates, indoor dust, sediments, rivers and others);**
- ✓ **OPFRs (landfill leachate and sediment using eutectic solvents for extraction).**
- ✓ **SCCPs (in consumer products and landfill leachate);**
- ✓ **PCN (in consumer products and landfill leachates);**
- ✓ **PFASs (in water, plastics, sediment and atmosphere);**
- ✓ **HBCD (in plastics and sediment);**
- ✓ **UV328 (in plastics);**
- ✓ **Dechlorane plus**
- ✓ **PPCPs (in water)**
- ✓ **Alkylphenols (in water)**

QUALITY ASSURANCE & QUALITY CONTROL

The Quality assurance and quality control is key for establishing POP & other pollutant monitoring in Africa

- ✓ **Blanks sample are analysed;**
- ✓ **Certified reference material;**
- ✓ **Recovery using surrogate standard;**
- ✓ **Use of thoroughly cleaned ware;**
- ✓ **Avoid cross contamination;**
- ✓ **Using of solvents/gases that are free of interferences**

PROGRESS & CHALLENGES

Progress

- ✓ Developed the capacity to analyse POPs in different environmental matrices;
- ✓ **Training future analysts on POPs –MSc, PhDs from, Ethiopia, Ghana, Kenya, Nigeria, South Africa, Tanzania, Zimbabwe**

Challenges

- ✓ Cost of standards and reagents;
- ✓ Cost and maintenance of equipment;
- ✓ Retention of postgraduate students;

UNIDO in training of LDCs SADC on POPs

Cooperation with UN bodies like UNIDO or UNEP for POPs monitoring capacity in Africa can facilitate capacity building and networking in African regions and the continent.

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
REGIONAL OFFICE

Prof. Jonathan Okonkwe, Professor Research and Innovation,
Department of Environmental, Water and Earth Sciences, Faculty of Science, Private Bag X680 Pretoria 0001, Tshwane University of Technology,
Republic of South Africa Email: okonkwooj@tut.ac.za

Pretoria, 21st October 2012.

Subject: UNIDO Cooperation with TUT on POPs

We are here to inform you that after the visit made by UNIDO team last September 2011 to your laboratories in TUT in Pretoria, and the attending to your scientific research results and contributions published on the subject of environmental management of Persistent Organic Pollutants (POPs), we are pleased to convey to you that during the meeting of the Africa Least Developed Countries (LDCs) of the COMESA and SADC sub--regions held last January 2012 in Ethiopia, these participating countries have selected your laboratory in TUT to be the training institution on management of POPs for them.

Member countries have also requested UNIDO to proceed with the matter and provide the technical support to your laboratory in TUT, to enable the countries benefit from the training opportunities to be provided at different durations according to the academic levels of their candidates.

In this regard, UNIDO would appreciate entering into negotiations with TUT to agree on the training models and subsequently identify the needs of your laboratory and the conditions of undertaking these training opportunities for the countries.

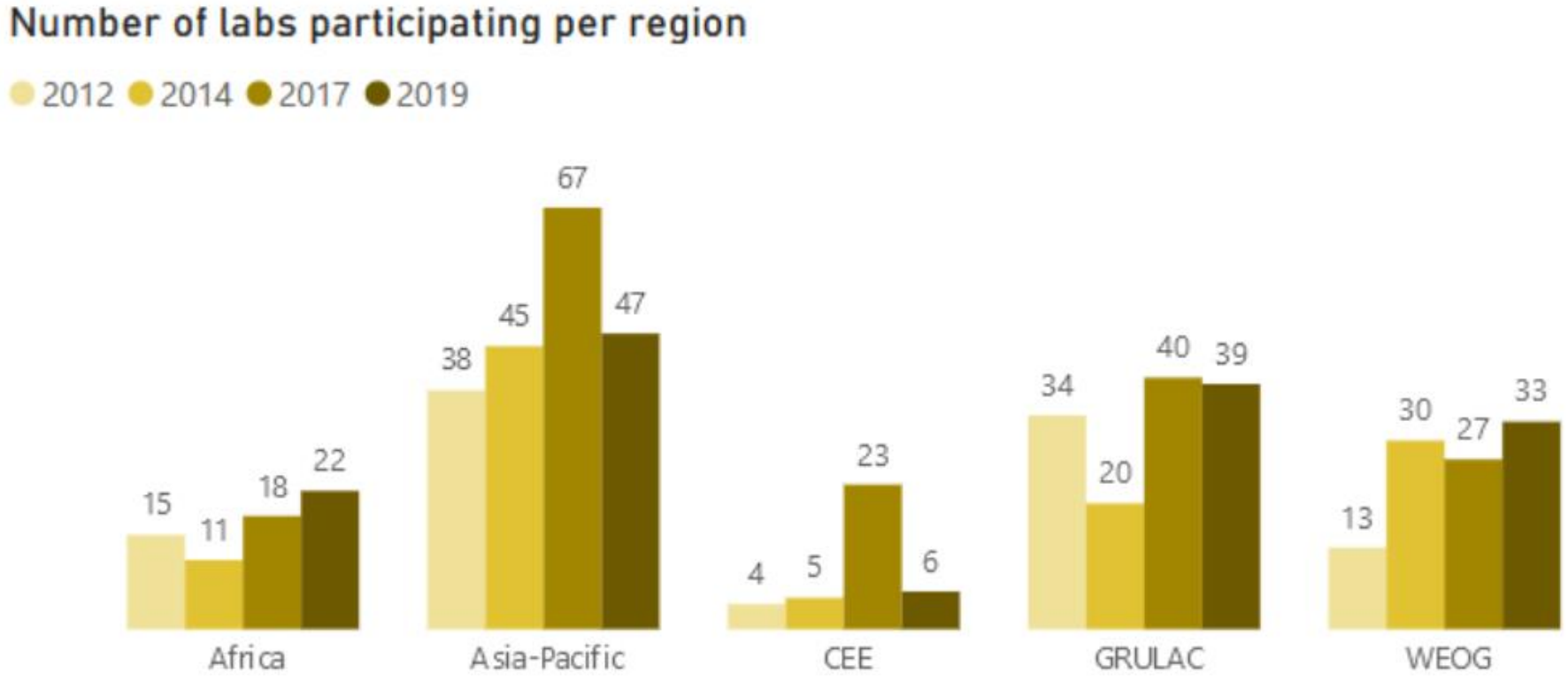
Please accept our highest considerations and looking forward for close cooperation. Yours Sincerely,

Dr. Mohamed Eisa,
UNIDO Representative and Regional Director, Pretoria-- South Africa

RECOMENDATION

Support the call to identify and support laboratories in Africa that can analyse POPs. And possibly participate in interlaboratory studies.

UNEP global interlab study under GMP https://www.unep.org/pops-interlaboratory-assessments



Interlaboratory assessment: Participation per year and per region

Participation in 2nd UNEP interlaboratory studies.

UNITED NATIONS ENVIRONMENT PROGRAMME

Programme des Nations Unies pour l'environnement | Programa de las Naciones Unidas para el Medio Ambiente
Программа Организации Объединенных Наций по окружающей среде | برنامج الأمم المتحدة للبيئة
联合国环境规划署

UNEP

E-mail contact: Heidelore.fiedler@unep.org
Ref: FT/HF/jd
Date: 26 May 2014

Subject: Final results and assessment workshop of the UNEP project "Bi-ennial Global Interlaboratory Assessment on Persistent Organic Pollutants, 2nd Round" Freiburg, Germany, 24-25 June 2014

Dear Mr. Okonkwo,

I have the pleasure to confirm your registration and welcome your participation in the final results and assessment workshop of the 2nd Round of the Interlaboratory Assessment on Persistent Organic Pollutants in Freiburg, Germany. The two day workshop will consist of presentations of the assessment and the results and interpretation of the outcome of the Interlaboratory assessment. It will also contain some presentations from participating laboratories and leave time for questions and interaction. The workshop will be organized and hosted by the State Institute for Chemical and Veterinary Analysis of Food (CVUA), Freiburg, Germany (also EU Reference Laboratory for Dioxins and PCBs; EURL for Pesticides in Food of Animal Origin; WHO / UNEP Reference Laboratory).

Venue and date:

European Union Reference Laboratory (EU-RL) for Dioxins and PCBs in Feed and Food
Chemisches und Veterinäruntersuchungsamt Freiburg
(State Institute for Chemical and Veterinary Analysis of Food)
Bissierstrasse 5
D-79114 Freiburg

Supporting Governments in key monitoring (PFAS in water sources)

After establishing robust analysis with appropriate QA/QC, a laboratory can support the government to conduct studies in matrices of national importance

Publishing research in peer reviewed journals

During the past 20 years we have published more than 120 articles in peer reviewed journals and have been cited 4500 times

Levels of brominated flame retardants and other pesistent organic pollutants in breast milk samples from Limpopo province, South Africa

Per Ola Darnerud [a,*], Marie Aune [b], Lotta Larsson [b], Sanna Lignell [a], Tshinanne Mutshatshi [c], Jonathan Okonkwo [c], Ben Botha [c], Nana Agyei [d]

[a] Toxicology Division, National Food Administration, P.O. Box 622, SE-751 26 Uppsala, Sweden
[b] Chemistry Division 2, National Food Administration, P.O. Box 622, SE-751 26 Uppsala, Sweden
[c] Faculty of Science, Tshwane University of Technology, Pretoria, South Africa
[d] Department of Chemistry, Limpopo University, Medunsa, South Africa

JOURNAL OF FIRE SCIENCES

Original Article

Journal of Fire Sciences
2021, Vol. 39(3) 207–223

DOI: 10.1177/0734904121001296
journals.sagepub.com/home/jfs
SAGE

Brominated flame-retardant composition in firefighter bunker gear and its thermal performance analysis

Vincent Mokoana[1], Joseph Asante[1,2] and Jonathan Okonkwo[3]

Synthesis and application of choline chloride based deep eutectic solvents in liquid-liquid and solid-liquid assisted extraction of organophosphorus flame retardants from landfill leachate and sediment

Innocentia Velaphi Sibiya, Adegbenro Peter Daso & Okechukwu Jonathan Okonkwo

Polybrominated diphenyl ethers (PBDEs) in leachates from selected landfill sites in South Africa

David O. Odusanya, Jonathan O. Okonkwo *, Ben Botha

Department of Environmental, Water & Earth Sciences, Faculty of Science, Tshwane University of Technology, Private Bag X680, 175 Nelson Mandela Drive, Arcadia, Pretoria 0001, South Africa

The occurrence of brominated flame retardants in the atmosphere of Gauteng Province, South Africa using polyurethane foam passive air samplers and assessment of human exposure☆

Zainab J. Katima [a,b], Olubiyi I. Olukunle [c], Olga-Ioanna Kalantzi [d], Adegbenro P. Daso [a], Jonathan O. Okonkwo [a,*]

Targeted and non-target screening of persistent organic pollutants and organophosphorus flame retardants in leachate and sediment from landfill sites in Gauteng Province, South Africa

Sibiya Innocentia [a], Poma Giulia [b], Cuykx Matthias [b], Covaci Adrian [b], Daso Adegbenro Peter [a], Okonkwo Jonathan [a,*]

> Environ Sci Pollut Res Int. 2014 Mar;21(6):4376-86. doi: 10.1007/s11356-013-2312-7. Epub 2013 Dec 10.

Distribution of polybrominated diphenyl ethers and dust particle size fractions adherent to skin in indoor dust, Pretoria, South Africa

Kebede Keterew Kefeni [1], Jonathan O Okonkwo

Bull Environ Contam Toxicol (2008) 81:348–354
DOI 10.1007/s00128-008-9495-5

DDT, DDE and DDD in Human Milk from South Africa

Jonathan Okechukwu Okonkwo · Tshinanne N. Mutshatshi · Ben Botha · Nana Agyei

CONTACT DETAILS

Name: Prof Okechukwu Jonathan **OKONKWO**

***Address*:** Department of Environmental, Water & Earth Science, Faculty of Science, Tshwane University of Technology, Pretoria,

South Africa

***Research Field*:** Analyses of organic and inorganic contaminants in environmental samples;

Adsorption technology –use biowaste to remove contaminants from aqueous media

***Email*:** OkonkwoOJ@tut.ac.za; okereokonkwo@gmail.com

Thank you for your attention!