



CHEMRAWN XXII conference: E-waste in Africa

<https://iupac.org/project/2020-021-2-021>

tentatively scheduled for Nov 2021

Scoping paper

Background

E-waste is now the fastest growing waste stream globally. It is a complex mixture of valuable and hazardous chemicals and therefore difficult and expensive to handle in an environmentally sound way. Furthermore, the legal framework surrounding it is often weak or totally lacking, and so is the enforcement of the law and associated regulations. As a consequence, the e-waste issue becomes very complex and very difficult to handle, and this is the reason why as much as 80 per cent of the e-waste sent for recycling in developed countries end up being shipped to developing countries where it is handled by hundreds of thousands of informal workers, frequently in inadequate ways.

This globalization of e-waste has an adverse environmental impact and serious health implications and can, frankly speaking, not go on much longer. An abundance of literature, available on internet or published by many organizations, gives a clear picture: the dumping of e-waste, particularly in Africa, is an irresponsible act with a range of devastating consequences.

A very realistic description of the situation is found in the Executive Summary of *“The global impact of e-waste; Addressing the challenge”*, an International Labour Organization (ILO) report which was published by Karin Lundgren in 2012 (see https://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---sector/documents/publication/wcms_196105.pdf):

“Within the informal economy of such countries [China, India, Ghana and Nigeria], it is recycled for its many valuable materials by recyclers using rudimentary techniques. Such globalization of e-waste has adverse environmental and health implications. Furthermore, developing countries are shouldering a disproportionate burden of a global problem without having the technology to deal with it. In addition, developing countries themselves are increasingly generating significant quantities of e-waste.

It is clear that the future of e-waste management depends not only on the effectiveness of local government authorities working with the operators of recycling services but also on community participation, together with national, regional and global initiatives.

The solution to the e-waste problem is not simply the banning of transboundary movements of e-waste, as domestic generation accounts for a significant proportion of e-waste in all countries. Fundamental to a sustainable solution will be tackling the fact that current practices and the illegal trade provide economic stimulus. It is important to recognize local and regional contexts and the social implications of the issue; implementing a high-tech, capital-intensive recycling process will not be appropriate in every country or region. Effective regulation must be combined with incentives for recyclers in the informal sector not to engage in destructive processes. Cheap, safe and simple processing methods for introduction into the informal sector are currently lacking; hence, it is necessary to create a financial incentive for recyclers operating in the informal sector to deliver recovered parts to central collection

sites rather than process them themselves. Multidisciplinary solutions are vital in addition to technical solutions, as is addressing the underlying social inequities inherent in the e-waste business.

Recycling operations in the informal sector of the economy enable employment for hundreds of thousands of people in poverty. A possible entry point to address their negative impacts is to address occupational risks, targeting poverty as the root cause of hazardous work and, in the process, developing decent working conditions. More generally, solutions to the global e-waste problem involve awareness raising among both consumers and e-waste recyclers in the informal economy, integration of the informal sector with the formal, creating green jobs, enforcing legislation and labour standards, and eliminating practices, which are harmful to human health and the environment. It is also imperative to target electrical and electronics manufacturers by introducing Extended Producer Responsibility (EPR) legislation and encouraging initial designs to be green, long lived, upgradeable and built for recycling.”

It is clear that many issues have to be addressed if e-waste is going to be treated in a sustainable way, and with its current growth-rate, the situation is becoming urgent. The reason for this is the significant negative impact of e-waste on soil, air, agricultural produce, human health, and biodiversity in countries where most of such waste ends up legally, but also illegally and does irreversible damage. This serious situation is a consequence of chemical pollution, which is allowed to occur because the management of this waste does not function properly even at the national level around the world. The reason for this is a series of factors, which are interconnected and have to be addressed more or less simultaneously to improve the situation.

In order to address the e-waste problem, the CHEMRAWN committee decided to organize a conference on *E-waste in Africa*. Africa has been selected as the continent to have such a CHEMRAWN meeting because many African countries carry an enormous health and environmental burden due to the handling of e-waste arriving legally or illegally in these countries. The consequences are particularly severe in Nigeria, and the venue was therefore picked as the venue.

Specific African Challenges

In Kenya, electronics producers, investors, and local organizations recently collaborated to launch the country’s first large-scale, e-waste recycling hub. Ghana and Nigeria have also undertaken efforts to address the public health and environmental impacts of e-waste and to generate opportunity and innovation in e-waste management. Considering the role of the extractive industry in these two countries, it is notable that sound e-waste management practices can save valuable commodities. It is estimated that e-waste recycling could produce 40-50 times more rare metals than deposits mined from the ground.

E-waste has been identified as one of the fastest growing waste streams in South Africa. Many electronic items, such as computer monitors, contain valuable materials such as gold, platinum, and indium, but also hazardous materials such as mercury, cadmium, and lead.

In addition to the fact that economically developing countries themselves produce a share of the world’s e-waste, huge amounts of such waste are being exported from developed countries to these same countries. As far back as in 2006, approximately 80% of the e-waste generated in developed countries were exported to developing countries (Schmidt, 2006). Nigeria ranks among the top ten importers of this waste after China. Other major importers are India, Pakistan, Vietnam, the Philippines, Malaysia, and Ghana (Robinson, 2009).

E-waste contains substantial amounts of reusable materials, such as metals, that can be recovered in the form of secondary raw materials and has a relatively high residual value if

recycled. However, e-waste also contains significant amounts of hazardous substances, such as metals (for example, As, Ba, Cd, Pb, Ni, and Cr), polychlorinated biphenyls (PCBs), and brominated organic compounds.

In view of the environmental impact and the high residual value of e-waste, recycling has achieved worldwide attention in terms of legislation and technologies. With this global trend, e-waste is one of the fastest-growing waste streams in Lagos State, owing to an increase in consumption of electrical and electronic equipment and being a major sea and air port routes for imported goods to Nigeria and other West-African states.

Nevertheless, as is the case in some other countries, e-waste management has not received sufficient attention. For the successful implementation of any waste management plan (including an e-waste management plan), the availability of sufficient and accurate information on the quantities and composition of the waste generated and on current management conditions is a fundamental prerequisite. At present, in Lagos state, there is no available and accurate information that describes the characteristics and generation rate of e-waste or the actual practice of management and handling of the waste.

Currently, despite the fact that there exist fragmented national legislations for e-waste management in Africa, much of the primary legislation is not fully implemented across Africa. In practical terms, therefore, there are no definite policies or plans for the allocation of funds to prepare suitable equipment and facilities for the management of e-waste.

Rationale and objective

E-waste is the fastest growing waste stream globally. This has adverse environmental consequences and serious health implications because, as an abundance of literature shows, dumping of e-waste, particularly in Africa, is an act with devastating consequences (see attachment). A global act, with the international chemical community actively involved, is therefore urgently needed, and this is the rationale behind this conference.

The conference objective is to inform stakeholders about the complexity of the e-waste problem and give guidance as to how to address it. This will be done in lectures, workshops, fieldtrips, and interaction with industries (see Description). Available literature clearly shows that a range of issues have to be addressed if the situation is going to improve. Among these are the following:

- Increase the public awareness of the consequences of e-waste pollution;
- Include a course unit relevant to e-waste recycling in chemistry programs at university level;
- Stimulate young chemists to start e-waste recycling businesses;
- If necessary, improve programs currently in place in some countries to document the level of pollution in the biosphere and geosphere;
- Document land remediation programs currently in operation to clean up highly polluted areas in developing countries;
- Discuss what it takes to introduce new technologies for e-waste recycling with the aim of curbing illegal handling of e-waste.

Conference planning, structure, and contents

When the decision to organize an e-waste conference was taken, it was entitled CHEMRAWN XXII E-waste in Africa. An International Advisory Committee (IAC) of IUPAC volunteers was appointed with the following composition:

International Advisory Committee (IAC)

Leiv K. Sydnes, Norway (Chair)	Nadia G. Kandile, Egypt
	Slavko Kaucic, Slovenia

Rameshwar Adhikari, Nepal
 Peter Asewe, Kenya
 Othman Chande, Tanzania
 Hemda Garelick, UK

Vincent O. Nyamori, South
 Africa
 Charles O. Ochieng, Kenya
 Jay O. Oghifo, Nigeria
 (Secretary)

The Nigerian Chemical Society volunteered to host the conference and appointed the following Local Organizing Committee (LOC):

Local Organizing Committee (LOC)

Jay O. Oghifo, Effurun (Chair)	Dr. Iyabo Phillips, Lagos
Raymond A. Wuana, Makurdi (Secretary)	Lami A. Nnamonu, Makurdi
Joseph C. Akan, Maidugiri	Gloria U. Obuzzor, Port Harcourt
Al A. Akinlabi, Abeokuta	Oluseun E. Popoola, Yaba
Kevin I. Idehen, Effurun	Rufus Sha'Ato, Makurdi
Joseph E. Imanah, Auch	Ohimor Innocent (Event Consultant)
Mrs. Adebayo Adedayo, Lagos	

The project did in essence start to shape up in June 2018 with exchange of ideas for an e-waste conference. Then, the process almost stopped when the IUPAC leadership proposed to terminate the CHEMRAWN committee. Discussions then resumed at the GA in Paris in July 2019. Since then the Task Group has interacted regularly and planned the conference, discussed both topics and speakers, and assessed venues in close cooperation with the Local Organizing Committee. It was decided that the Task-Group Chair should visit Nigeria and meet with LOC before final decisions regarding venue and logistics were taken. Such a visit took place at the end of January this year. Lagos as the venue was then settled.

Speakers and some funders were then approached to make the conference proposal more solid. To our great satisfaction, world-class speakers were very willing to be on the program and some would even pay their way to Lagos!! But then, to our immense dismay, the corona pandemic started, and plans had to be reassessed and reshaped.

This led to a decision to opt for a hybrid conference provided testing of the available technical facilities in Lagos showed that the virtual part of the conference could be run in a stable way with high picture and sound quality to participants in Nigeria the rest of the world. Two such tests have been performed with very satisfactory result so CHEMRAWN XXII will be a hybrid conference.

CHEMRAWN XXII can be regarded as an outcome of the IUPAC e-waste workshop held in Sao Paulo in 2017. However, the scope of this conference is wider, industries are involved, a fieldtrip to see firsthand the complexity of the issue is included, a workshop for young participants to nourish entrepreneurship is integrated, and educational aspects will be discussed.

The complexity of the global e-waste handling infrastructure and its societal impact will be presented by specialists from international organizations and industries; university teachers will lead a discussion of teaching students relevant recycling chemistry; representatives from the recycling industry will present the challenges from their position; and the environmental human impact already documented in several African countries will be communicated by researchers in medical, environmental and chemical sciences. Finally, a so-called Future Action Committee (see below) will be working through out the conference and at the end of the third day, present proposals for follow-up projects which will be discussed in the closing plenary session.

The conference will last for three days, with the traditional conference dinner day 2 so that participants at the physical part of the meeting can save one hotel night. The **fieldtrip** will also be day 2; participants in Lagos will go by busses whereas those on Zoom will have a drone excursion with an interactive guide.

The **lectures** will cover everything from the Big Picture to details about sophisticated metal recycling. The Opening lecture will point to all the problems that have to be addressed to move globally in the direction of eco-friendly recycling of e-waste. Then in-depth lectures about many relevant topics will follow, including e-waste recycling: new opportunities and technologies; advances in recycling; from e-waste to new products; environmental impact from e-waste; educational challenges; and clean-up of e-waste landfills. For more details, see attached conference summary.

A bottleneck in most African countries is the lack of professional recycling capacity, which therefore must be expanded. To support such a development, a **course or workshop** in entrepreneurship will be held, primarily for young chemists. The course will be given by highly competent people with significant legal and industrial experience from the recycling business. Among the topics covered are *Solid Waste Management* by Dr. Kevin Idehen, *From Waste to Wealth Ventures* by Dr. Ifeanyi Ochonogo, and *Business and Investment Opportunities* by Adrian Clew.

Milestones promotion and dissemination

The conference will be actively advertised and promoted through a web site, press releases which will be distributed globally, notes in chemical magazines particularly in Africa, and articles on the IUPAC home page and in Chemistry International, the IUPAC news magazine. And after the conference, dissemination will be actively pursued following the plan developed under the leadership of FAC.

The timeline and milestones for the final preparation of and the follow-ups after CHEMRAWN XXII have been set as follow:

- First announcement immediately after IUPAC approval. The website, already ready to go, will be launched. A flyer will be sent to the IUPAC NAOs and ANAOs for circulation in member countries and to the chairs of all IUPAC divisions and committees for distribution to the membership.
- Announcement will be published in the January issue of CI of 2021 (already approved the CI Editor).
- Deadline for submission of posters 10 April 2021.
- Deadline for registration 15 April 2021.
- Conference 5-7 May 2021 in Lagos, Nigeria.
- Circulation of preliminary *Conference Report* by 15 June 2021.
- Final Conference Report (including the FAC report) by 31 July 2021.
- Submission of an article about the conference to CI by 1 September 2021.
- Work with manuscripts for publications in PAC and elsewhere to December 2021. Deadlines for publication in PAC will be discussed with the PAC Editor when the conference has been approved.
- Launch a website with educational material dealing with e-waste by 1 November 2021.
- Final project report by 15 January 2022.

Future Action Committee

A unique feature of the CHEMRAWN conferences is the Future Action Committee (FAC). This committee is in session every day to digest the material and ideas presented by the lecturers, discuss the outcome of the poster presentations, and systematize proposals from exhibitors and other stakeholders. At the end of the conference, a preliminary report will be presented and discussed, and the input from this discussion will taken into consideration when the FAC report is finalized (before 31 July 2021). An important part of that report will be the dissemination plan that will be carried through after the conference has come to and end.

The membership of FAC is as follows:

Professor Leiv K. Sydnes (Chair), Norway

Professor Othman Chande, Tanzania

Dr. Kelvin Idehen, Nigeria

Professor Slavko Kaucic, Slovenia

Prince Jay O. Oghifo, (Secretary) Nigeria

Some relevant literature

- Step (2014) <http://www.step-initiative.org>
- Charles W. Schmidt, (2006), Unfair trade: e-waste in Africa, www.ncbi.nlm.nih.gov/pubmed/16581530
- Robinson, B.H. (2009). E-waste: An assessment of global production and environmental impacts, <https://www.sciencedirect.com/science/article/abs/pii/S0048969709009073>.
- Leney, A. (2013). *Review of Regional E-waste Recycling Including a Model Product Stewardship Approach for Pacific Island Nations*. Published by SAICM, Clean Pacific, SPREP PROE: (https://www.sprep.org/attachments/Publications/Regional_Ewaste_Recycling.pdf)
- Technopedia (2017): <https://www.techopedia.com/definition/2108/electronic-waste-e-waste>
- United Nations Environment Management Group (2017), *United Nations System-wide Response to Tackling E-waste*, <https://unemg.org/images/emgdocs/ewaste/E-Waste-EMG-FINAL.pdf>
- A New Circular Vision for Electronics http://www3.weforum.org/docs/WEF_A_New_Circular_Vision_for_Electronics.pdf
- <https://www.smithsonianmag.com/science-nature/burning-truth-behind-e-waste-dump-africa-180957597/>
- The Global Impact of e-waste (an ILO report): https://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---sector/documents/publication/wcms_196105.pdf

A summary of the structure of CHEMRAWN XXII

Day 1

09:00 – 09:30	Opening; Governor, IUPAC, Minister, CSN, LOC (2 Sponsors) Responsibility: LOC
09:30 – 09:45	Conference outcome (as an introduction to the first speaker) JAY O. OGHIFO, Nigeria
09:45 – 10:30	Plenary lecture; presenting the big picture ABIOLA OLANIOPEKUN, UNEP (not confirmed)
10:30 – 11:00	Coffee break
11:00 – 11:45	Relevant International Conventions, Basel, Stockholm Management of Nigerian regulations OLADELE OSIBANJO, Nigeria
11:45 – 12:30	Current activities to improve the situation FREDERICO MAGALINI, Italy (not confirmed)
12:30 – 13:00	Green-chemistry aspects; speaker from OPVW Rohan Perera and Farid Tata To be determined
13:00 – 14:00	Lunch
14:00 – 14:30	E-Waste and Health Impact on Nigerians Scavengers SEUN POPOOLA, Nigeria Popoola and Purchase will coordinate their presentations
14:30 – 15:00	Lecture with focus on chemical aspects/challenges related to the previous topic; pollution clean-up; soil; contamination DIANA PURCHASE, UK Popoola and Purchase will coordinate their presentations
15:00 – 15:30	A forward-looking business alliance in Nigeria ADRIAN CLEWS, Hinckley Recycling, Lagos, Nigeria
15:30 – 16:00	Two reports about situation/management in African countries SAR, Egypt Speakers: Will be determined after interviews of proposed candidates
16:00 – 17:00	Poster presentations Visit exhibition. A program with presentations by the exhibitors will be set up. After each presentation, there will be a live visit at the exhibitors' sites for questions and closer look at what they have to offer. Coffee available during the session
17:15	Meeting for the Future Action Committee (FAC) starts

Day 2

08:00 – 12:00	<p>Several parallel events.</p> <p>1) Field trip to e-waste locations (Departure 08:00, Return 12:00)</p> <p>2) Three short courses; one about entrepreneurship (Start 08:00, Tea/Coffee 10:30-11:00, End 12:30)</p> <p>The participants have to register at the field trip and the courses when they fill in the conference registration</p> <p>In addition, videos will be made in advance from the sites that will be visited and will be available for all the Zoom participants</p>
12:30 – 13:30	<p>LUNCH</p> <p>Simple food (wraps) and something to drink to accommodate that the courses may finish at different times and the people may return from the field trip at different times due to traffic.</p>
13:30 – 14:00	<p>E-Waste Management Legislation & Producer’s Responsibility in Nigeria</p> <p>IFEANYI OCHONOGHO, E-Terra Technologies Ltd</p>
14:00 – 15:00	<p>Four reports about situation in other countries Kenya, Tanzania, Ghana, South Korea</p> <p>Speakers: Will be determined after interviews of proposed candidates</p>
15:00 – 16:00	<p>Participant involvement – Plenary discussion</p> <p>Moderator: Leiv K. Sydnes</p> <p>Panelist: TBD</p>
19:00 – 21:00	<p>Conference Dinner LOC</p>
21:15 – 21:45	<p>Meeting in FAC</p>

Day 3

09:00 – 09:45	Electronic-waste recycling: new opportunities and technologies CHRISTER FORSGREN, Stena Recycling, Sweden
09:45 – 10:30	From recycled waste to commercial products in demand VEENA SAHAJWALLA, Australia
10:30 – 11:30	Poster presentations Visit exhibition Coffee available during the session
11:30 – 12:00	E-waste in education case study of an Egyptian University NADIA KANDILE, Egypt
12:00 – 13:00	E-waste as reflected in the chemistry curriculum at (UNILAG, UI and UNN). Coordinated presentations, so that there is not much repetition Speakers: UNN-Prof Chris Magu, two more tbd
13:00 – 13:45	LUNCH
13:45 – 14:45	Roundtable discussion Panelists: To be decided when we know who will participate Moderator: Jay O. Oghifo
14:45 – 15:30	Presentation of the preliminary FAC report LEIV K. SYDNES, Norway
15:30 – 16:00	Announcement of the poster prizes Closing of the conference Adjournment