



BAHIR DAR UNIVERSITY

BAHIR DAR INSTITUTE OF TECHNOLOGY

PROF. INYANG'S SEMINAR SERIES (5)

TOPIC: COMMON SUBSURFACE CONTAMINATION SCENARIOS AND THEIR ANALYSES

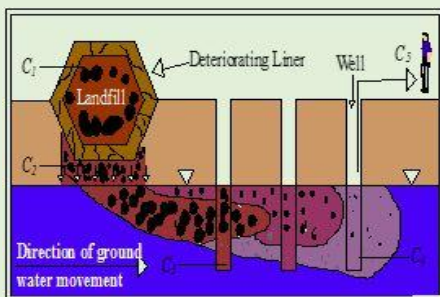


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Science and Director, Global Institute, University of North Carolina, Charlotte, NC, USA.
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DATE: Friday, February 17, 2020, **TIME:** 2:00 – 4:00 pm (Gregorian Time) **VENUE:** BIT Seminar Room

ABSTRACT

Anthropogenic sources of subsurface soil and groundwater contamination are numerous. Among them are gasoline storage tanks, waste landfills, wastewater impoundments, waste injection wells, septic tanks and surface waste heaps. From these facilities, contaminants typically leach into the ground and travel there in, under physical and chemical gradients. The fate and transport of such contaminants can be quantitatively described using knowledge of sorption and desorption processes of the contaminants with the transport media (geomaterials), the textural characteristics of the geomedia, the degree of saturation of the geomedia with fluids, and the environmental conditions of the contaminant/geomedia interactions as defined by the environmental pH, Eh and temperature. In this lecture, fundamental mathematical formulations for tracking the transport of contaminants in the subsurface will be analyzed.



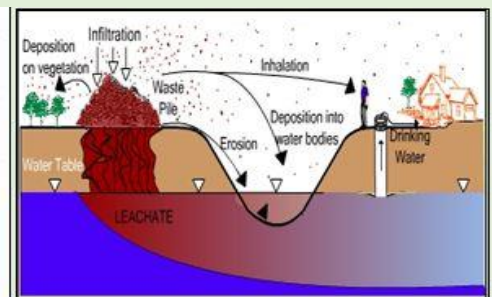
Case 2: Continuous Source in 1-D with Adsorption

- Initial condition: $C(x,0) = 0$
- Boundary conditions: $C(0,t) = C_0$
 $C(\infty,t) = 0$

$$C(x,t) = \frac{C_0}{2} \left[\operatorname{erfc} \left(\frac{Rx - v_x t}{2\sqrt{RD_x t}} \right) + \exp \left(\frac{v_x t}{D_x} \right) \operatorname{erfc} \left(\frac{Rx + v_x t}{2\sqrt{RD_x t}} \right) \right]$$

Remarks:

- When $\frac{D_x}{v_x x} < 0.002$, the second term can be neglected since it produces an error of less than 3%.
- When $R=1$, the above equation becomes the conventional governing equation.
- R for organics is usually in the range of $2 < R < 10$, and larger R for hydrophobic organics.



INTRODUCTION TO THE SPEAKER

Prof. Hilary I. Inyang is a world-renowned researcher, expeditionist and educator in the areas of environmental science and engineering, geohazards, energy systems and international development. He is a member of the Education Caucus of the United Nations Commission on Sustainable Development and served for two terms (1997-2001) as Chair of the Science Advisory Board (Engineering Committee) of USEPA in Washington DC, USA. He is a former Duke Energy Distinguished Professor and Director of the Global Institute of Energy and Environmental Systems of the University of North Carolina, Charlotte, USA, former Dupont Professor of Environmental Engineering and Science and Director of CEEST, University of Massachusetts, Lowell, USA, former President of the African University of Science and Technology, Abuja, Nigeria, and former Vice Chancellor of the Botswana International University of Science and Technology. He chaired the Steering Committee of the Africa Science Plans under the auspices of the International Council for Science, UNESCO and the United Nations Economic Commission for Africa. He has authored several research proposals and won about 50 research grants from several agencies including the US National Research Foundation, Sandia National Laboratories (USA), General Electric Corporation, US Environmental Protection Agency, and the African Development Bank. He has won more than 20 professional prizes and is a former AAAS/USEPA Environmental Science and Engineering Fellow, US National Research Council Young Investigator and Eisenhower/Randolph Fellow. He has authored about 270 publications and served on 29 journal editorial boards. He won the 2013 Nigerian National Order of Merit (NNOM) in science and technology and is a Fellow of both the African Academy of Science and the Geological Society of London. He is also a Proost Poet.



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