

EditorialDOI : <http://doi.org/10.22438/jeb/43/1/Editorial>**Contribution of Toxicology in Sustainable Development****S. V. S. Rana**Former Vice Chancellor, Bundelkhand University, Jhansi-284 128, India
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The concept of sustainable development attained prominence after the World Summit on Sustainable Development (WSSD) held at Johannesburg in September, 2002. Earlier, the World Commission on Environment and Development (WCED), also known as Brundtland Commission Report (1987), named after its chairperson Gro Harlem Brundtland of Norway, had warned the global community on unwise use of natural resources for economic development. It defined sustainable development, “the development that meets the need of present without compromising the ability of future generations to meet their own needs.” The report highlighted the fundamental components of sustainable development, environment protection, economic growth and social equity. Much could not be done till September 2015, when 70th session of UN general assembly adopted 17 sustainable goals. These goals together constitute a blue print of development by the people and for the people conceived by active participation of UNESCO.

Amongst these, five goals viz. good health and well-being, clean water and sanitation, decent work and economic growth, life below water and life on land, fall under the ambit of toxicology. National Toxicology Program (NTP) that was established by US Department of Health and Human Services in 1978 with its headquarters at National Institute of Environment Health Sciences, administers a unique collaboration between several federal agencies to develop new ways to test adverse effects of substances on human health. This program is known as Toxicology in 21st century (Tox-21) (<http://tox21.gov>). The Tox21 collaboration was formalized in 2008 through a MOU between the National Institutes of Health, NTP, National Chemical Genomics Centre and the National Centre for Computation Toxicology. FDA joined Tox21 in 2010. The goal of Tox 21 is to research, develop, evaluate and translate innovative test methods that will better predict the effects of chemicals on human and environment health. The new focus areas include – development of expanded portfolio of alternative test systems to predict human toxicity, to address limitations of in vitro test systems, to curate the legacy of in-vivo testing, to establish confidence in in-vitro test systems. Excellent job has been done by Toxicity Forecaster (ToxCast). Through robotic screening system housed at NCATS, toxicologists are screening 10,000 environmental chemicals for their potential to cause toxicity (www.ncats.nih.gov). Toxicology is also contributing to Planetary Health initiative launched by Lancet (2015).

The European Union (EU) has introduced a regulation – Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) by legislation in 2007. Other programs that address the goal of good health and well being include, International Program on Chemical safety (IPCS), Inter-organization Program for the Sound Management of Chemicals (IOSMC), Inter-government forum for Chemical Safety (IFCS), Health and Environment Linkage Initiative (HELL), Strategic Approach to International Chemical Management (SAICM) and Global Chemical Outlook.

The next goal of clean water and sanitation is addressed by regulatory toxicology through Clean Water Act (1972; amended 1977, 1978, 1987), Safe Drinking Water act (1974, amended in 1977, 1986, 1996) and Water Quality Act of 1987. In India, Water (Prevention and Control of Pollution) Act (1974) addresses this issue. The sub-discipline of aquatic toxicology nicely embraces this particular goal of sustainable development.

Decent work or safe work environment is directly associated with human health. Science of toxicology considers it under another sub-discipline, i.e., occupational health/ industrial health or hygiene. Agencies like Occupational Safety and Health Association (OSHA), American Conference of Governmental and Industrial Hygienists (ACGIH) and International Labour Organization (ILO) have enacted suitable laws/ regulations to safeguard human health. Toxic Substance Control Act (TSCA, 1976) remains to be the most

powerful act. In India, National Institute of Occupational Health (NIOH), an ICMR institute located at Ahmedabad, Indian Institute of Toxicology Research (IITR) located at Lucknow and Factory Advice Service Labour Institute (FASLI) Mumbai, are contributing to sustainable development through their commitment to safe work environment. Universities in India and abroad do teach occupational toxicology, thus generating a good human resource to work for sustainable development.

Next goal, *i.e.*, life below water is covered by aquatic toxicology. This discipline by definition is the study of the effects of chemicals and other anthropogenic and natural materials on aquatic organisms and ecosystems. The concepts of eco-magnification or bio-magnification emerged from aquatic toxicology. A toxicologist understands that life below water is vulnerable to toxins. Famous episodes related to aquatic toxicology include acid rain, toxic oil syndrome and contamination of water bodies with pesticides, heavy metals, TCDD and phenols. Therefore, the powerful acts like Federal Insecticides Fungicides and Rodenticide Act (FIFRA) and TSCA have been enacted to deal with health issues raised by the presence of hazardous materials in water. Accidental release of hydrocarbons in sea and their effects on flora and fauna have been studied by toxicologists. Efforts are being made to restore ecosystems like Great Barrier Reefs.

Sustainability of life on land is a big issue. It includes- animal toxicology, plant toxicology, wild life toxicology and veterinary toxicology. Eco-toxicological problems, soil contamination by chemicals, air pollution, solid waste pollution and bio hazards, fall under the scope toxicology. Clean Air Act (1970, amended in 1974, 1977, 1990) and Central Air Pollution Control and Prevention Act (1981), Wild Life Protection Act (1972) are available to safe guard life on land.

The foregoing paragraphs establish a link between toxicology and sustainable development. It offers an opportunity to ponder that principles of environment management viz. environmental impact assessment (EIA), environmental auditing, Environmental Impact Assessment and risk assessment - need to be supplemented with toxicological assessment/ monitoring of exposure to chemical hazards (Rana, 2018, Everyman Science., 103, 373-380). Quantitative concepts, *i.e.*, NOEL, LOEL, PEI, BEI etc., need to be introduced in parameters that monitor sustainable development. Putting toxicological inputs into the selected goals of sustainable development will help in making our planet chemically safe. In other words, multiphase science of toxicology too, is a partner of other sciences that are working towards sustainable development. Efforts being made by Journal of Environment Biology in encouraging the activities related to sustainable development deserve profound appreciation.

It is my proud privilege to describe, in brief, my association with *Journal of Environmental Biology* since its inception in 1980. I am a witness to its journey of 42 years and persistent growth. There were no computers at that time and publication of a journal was an arduous task. I have seen its Editor-in-chief Dr. R. C. Dalela devoting most of his time and energy to the regular publication of journal. With the increase in the reputation of journal, number of foreign contributors also increased and it succeeded in becoming an international journal. Today, it is very popular amongst Asian Environmental Biologists. Special issues on a particular theme were also published from time to time. It encouraged the young scientists by awarding them JEB Award every year. Dr. R. C. Dalela Oration Lectures were also organised under the aegis of this journal. It was enlisted as online journal in 1988 and continues to maintain the same status even today. Its h index today is 48. This all could be possible due to tremendous energy and efforts put by Dr. R. C. Dalela in this journal. I fondly cherish my association with Dr. R. C. Dalela, as his student and with JEB as a contributor, the member of its editorial board, research advisor and editor of special volume(s). My articles published in this journal achieved good citations. I must appreciate the present Editor of Journal, Dr. Sumati Gaumat and her publication team for their efforts in maintaining the standard of this journal. I wish it all success in coming years.

" Nature provides us free lunch but only if we control our appetites."

William Ruckelshaus