Trends in Environmental Analytical Chemistry 3–4 (2014) 7–13

Contents lists available at ScienceDirect

Trends in Environmental Analytical Chemistry

journal homepage: www.elsevier.com/locate/teac

Review

The social responsibility of environmental analysis

Miguel de la Guardia *, Salvador Garrigues

Department of Analytical Chemistry, University of Valencia, Research Building "Jeroni Muñoz", Dr. Moliner str., 46100 Burjassot, Valencia, Spain

ARTICLE INFO

Article history:
Received 31 July 2014
Received in revised form 9 September 2014
Accepted 9 September 2014

Keywords:
Social responsibility
Green analytical chemistry
Environmental studies

ABSTRACT

A literature updated has been made on the academical studies focused on the social impact of environmental studies, paying attention to both, the quality of the information provided and the side effects of the methodology employed, also considering the importance of the analytical methodologies in the development of remediation processes and the key subject of the transmission of the environmental information to the policy makers and the general society.

© 2014 Elsevier B.V. All rights reserved.

Contents

1. Introduction

Environmental analysis is nowadays one of the main fields of application of analytical methods and it covers from private to public studies, focused to evaluate the effect of human activities and their impact on the quality of air, water, soil or biota. Proper analytical environmental data provide evidences about bad industrial practices and offer the prime matter to develop mathematical models suitable to evaluate the sustainability of our life style [1–3].

The North American Environmental Protection Agency (EPA) has insisted many times on the need of deep analytical studies to correctly evaluate the risks of technological processes and to alert about environmental side effects of human activities and, in this frame, the interest of greening both, chemistry and analytical chemistry, has been extensively influenced the political activities and attract academic interest [4–8].

The main objective of this paper is to discuss the state-of-the-art of the ethical involvement of academic and social institutions in order to evaluate aspects regarding both, the side effects of methodologies used, and the intrinsic aspects of the environmental analytical studies concerning both, the subject of study and the transmission of the information to the policy makers and the society in general.

2. Man and the biosphere

The presence of man in the earth planet creates tremendous changes, difficult to be interpreted without taking into account the capability of humans to build new tools and to change dramatically the natural equilibrium on the earth [9]. Because of that, from the last century many voices claimed about the risks of an increasing population and the limits of growth in all the different aspects of the life.

As Fig. 1 shows, the presence of humans completely modifies the natural chemical cycles between air–water–soil and biota and new chemicals and processes are incorporated by anthropogenic activities in both, industrial and habitation sites covering from

* Corresponding author. Tel.: +34 96 3544838; fax: +34 96 3544845.

2214-1588/$ – see front matter © 2014 Elsevier B.V. All rights reserved.
http://dx.doi.org/10.1016/j.teac.2014.09.001

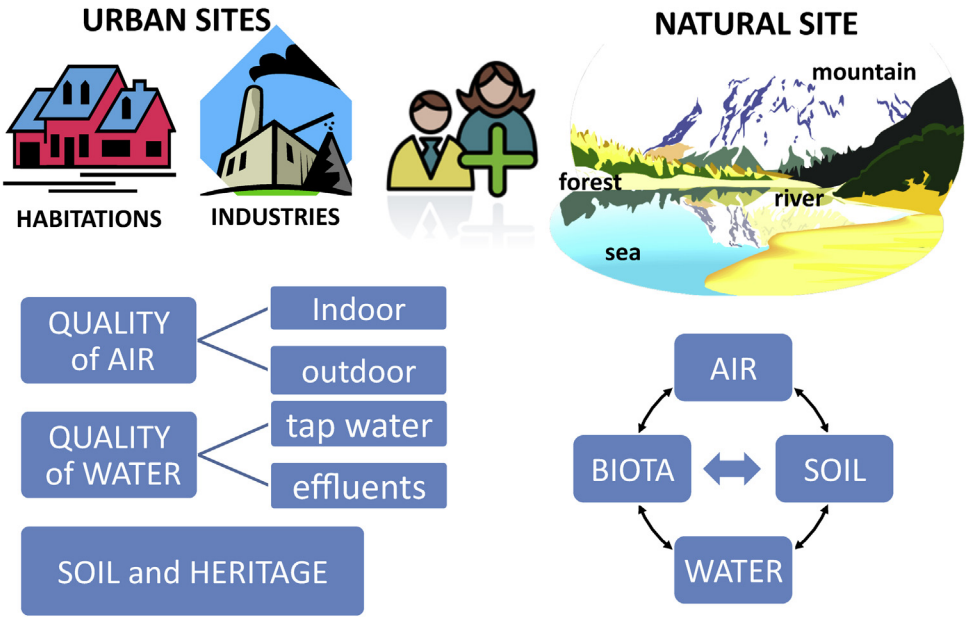

Fig. 1. Man and the biosphere. A complex relationship.

remote practically isolated environments to our big cities, thus establishing really complex relationships which dramatically influence the quality of air and water also providing long term changes in the earth crust [10]. Because of that, special care must be taken in order to well focus environmental studies, considering all the factors influencing the quality of air, soil and water and providing data about as much as possible elements and molecules in order to correctly evaluate the present state of both, natural and polluted sites, and to prevent their future evolution.

On the other hand, the social demands on complete informations about any kind of samples increase year after year and to be able to create significant models to evaluate the environment we need to process data from different compounds and different kind of samples. All that increases the analytical efforts and could increase the side effects and collateral damages involved on the use of chemicals. So, this is a kind of paradox than the increasing of environmental studies could be one of the reasons of environmental pollution, thus affecting in a negative way the quality of our air, water and land. However, it must be also considered that analytical methodologies could be of a great value for the development and control of remediation processes.

Because of the social demand of analysis and the potential negative impact of this activity, Green Analytical Chemistry (GAC) becomes a solution for the challenge to extend the advantages of the chemical knowledge in many aspects of the life without deleterious environmental effects. Additionally, in the last five years Green Analytical Chemistry has been evidenced its importance in the scientific literature through the publication of many special issues of analytical journals devoted to this fact [11–14] and by the publication of several books covering many aspects of the fundaments and applications of that [6–8,15].

3. Evolution of environmental conscience on analytical chemistry

Taking into consideration that accuracy is the main analytical characteristics in all kind of analysis and representativeness is the main problem in environmental analysis to obtain a correct picture of problems, in former times the basic analytical features as sensitivity, selectivity and precision were in the focus of the analytical practice and every effort to search for highly selective and sensitive methodologies was justified in order to move from molar concentration to parts per million or parts per billion, looking for the development of specific methods suitable to determine quantitatively a single molecules in a complex sample, being the rest of method features considered just as practical aspects.

So, every kind of sophisticated instrumental and complex methodologies were deeply explored in former years to look for the improvement of the analytical properties in spite of their actual needs. That was a clear reflect of the chemiurgical paradigm in terms of Malissa interpretation of the Analytical Chemistry development [16] and thus environmental and safety side effects of the use of new toxic reagents and tremendously big amounts of energy and consumables was totally out of consideration by method makers.

We must recognize that the chemiurgical analytical chemistry provided a tremendous development in both, instrumentation and methods, moving from the availability of tools for major and minor sample components to new possibilities to evaluate the target analytes at trace and ultra trace levels, thus providing a good knowledge about sample composition and accurate data for earlier diagnostic of problems found in the long term use of industrial products. From the environmental point of view we are nowadays able to speak about emerging pollutants because of the improved sensitivity of our methods to make visible very low amounts of chemicals used from the past but which remain unappreciable in environmental matrices till the possibility to measure these compounds with an enhanced sensitivity [17,18].

However the increase of the number of analysis made at all the chemical activity levels, from the industrial to the health and environmental fields, has created economic problems including a high demand of reagents and solvents and the need of waste management of hazardous materials, thus increasing dramatically the cost and risks of analytical practices and, because of that, a new relationship between method developers and method users with the social community must be explored in deep in the frame of social responsibility.

Green Analytical Chemistry (GAC), as a difference of other ecological mentality movements, does not implies the increase of costs of operation. On the contrary, in some cases the search for simplified and direct methods and the minimization of these

Download English Version:

https://daneshyari.com/en/article/1251494

Download Persian Version:

https://daneshyari.com/article/1251494

Daneshyari.com