The present issue of *Annali dell’Istituto Superiore di Sanità* contains a monographic section dedicated to the health impact of contaminated sites. A number of scientific papers on this topic have been published by *Annali* in the last few years, among them a study on cancer incidence in Italian contaminated sites [1], a meta-analysis of mortality in Italian contaminated sites with industrial waste landfills and illegal dumps [2], epidemiological investigations on specific sites such as Ferrara-Quadrante Orientale, a residential area built over a previous industrial waste dumping site [3], Bagnoli, the district of Naples where the Eternit plant was located [4], the areas of Campania Region characterized by hazardous waste dumping sites [5], Taranto [6] and the Biancavilla area with its naturally occurring fluoro-edenite fibrous amphibole [7-12]. In the meanwhile, other papers dealt with methodological issues associated with the epidemiological study of contaminated sites, namely the use of GIS applications for selecting populations at risk and procedures to take into account socioeconomic deprivation on assessing the health risk [13, 14]. More recently, Granieri (2015) [15] reported the findings of an innovative research on the psychological effects of residence in the asbestos contaminated site of Casale Monferrato. This sequence of studies exemplifies the development of research on the health impact of contaminated sites in Italy in the last decade. The way for the above studies was paved by the SENTIERI Project (an Italian acronym for *Epidemiological Study of Residents in National Priority Contaminated Sites*), a permanent epidemiological surveillance program of residents in the Italian National Priority Contaminated Sites (NPCSs) financed by the Italian Health Ministry (Ricerca Finalizzata 2006, ex. art. 12 Decree 502/1992 and CCM 2009 “Epidemiological surveillance of populations living in polluted sites”). The results of the SENTIERI Project are presented in four supplements of the *Epidemiologia & Prevenzione* journal. The first, centered largely on methodology, appeared in 2010 [16] and explained the approach adopted and the results of the *a priori* evaluation of the epidemiological evidence linking 63 causes of death with the environmental exposures in the NPCSs. The second, published in 2011 [17], presented the first systematic analyses of mortality among residents of the 44 NPCSs. Following this way a third supplement was published [18] where the study of mortality was updated and two additional health outcomes, hospital discharges and cancer incidence were analyzed. The investigation was restricted to 18 NPCSs that were part of the AIRTUM Network of Cancer. The 2016 supplement, SENTIERI-ReNaM Project, analyses mesothelioma incidence to estimate asbestos impact among residents in 39 sites, the ones where the National registry of malignant mesothelioma is active for the years 2000-2011 [19].

The results of the SENTIERI Project as a whole indicate that the health status of residents in NPCS is less favorable than that of the comparison population. For example, in all NPCSs combined, for the years 1995-2002, 9,969 excess deaths were observed (men and women) with an average of 1200 cases per year. Almost all of the excess deaths were observed in the Centre-South SNI sites [17].

In several cases the Project’s findings have been consistent with the *a priori* evidence [18]. This is the case, among others, of stomach cancer (in both genders excess cancer incidence) in the Fidenza NPCS, excess of hospitalization from respiratory diseases in Brescia-Caffaro, Milazzo and Terni Papigno NPCSs and excesses for non-Hodgkin lymphomas, melanoma (incidence and hospitalization in men and women) and breast cancer (incidence and hospital discharge, women) in Brescia-Caffaro NPCSs. In the analyses of three health outcomes it is of some interest to observe whether results are consistent for all three outcomes or in both genders [18]. The first is the case of excess mortality, cancer incidence and hospital discharges for bladder cancer (men) in Porto Torres and diseases of the urinary tract in the Basso bacino del fiume Chienti Chienti NPCS. Gender consistency is observed, for instance, for all cancer in Bolzano, Porto Torres, Venice, Litorale Domizio Flegreo, Priolo, and for all causes in Taranto, Litorale Domizio Flegreo and Trieste. The SENTIERI ReNaM analysis of the overall mesothelioma burden (2000-2011) in 39 sites combined [19] shows that mesothelioma incidence excess is present, in addition to
the sites hosting/having hosted asbestos-cement manufacturing plants, also in sites where mines/quarries, dockyards, landfills containing asbestos material, petrochemical plants, refinery and steel industry are/were located.

The development of an original epidemiological approach to the study of contaminated sites in Italy has been favored by a long-lasting cooperation between Istituto Superiore di Sanità (ISS) and the World Health Organization (WHO) European Centre for Environment and Health, originally located in Rome and subsequently moved to Bonn. The first health-based definition of contaminated sites ("Areas hosting or having hosted human activities which have produced or might produce environmental contamination of soil, surface or groundwater, air, food-chain, resulting or being able to result in human health impacts") is in fact reported in a WHO publication based on two workshop held in Sicily [20]. The ISS-WHO cooperation has led to the institution of a WHO Collaborating Centre for Environment and Health in Contaminated Sites at ISS, whose activity has started in 2013, resulting first of all in the creation of a European network of scientific institutions engaged in this domain and willing to realize a major collaborative effort: the COST Action “Industrially Contaminated Sites and Health Network” (ICSHNet) (see for a detailed description of the Action the websites http://www.icshnet.eu/ and http://www.cost.eu/COST_Actions/isch/IS1408). The COST Action aims at developing a common framework for research and response in environmental health issues related to industrially contaminated sites across Europe. Training of early carrier investigators (ECIs) is a milestone of the Action, aimed at strengthening in-country building capacity to face the environmental health challenges posed by industrial contamination: two international training schools, open to young researchers from all participating countries, will be held during the life of the Action.

The benefits of the Action concern scientific, societal, environmental and public health aspects, and will result in the collection, formulation and dissemination of information and advice on contaminated areas, environment and human health. This information will include consideration of health and social inequalities, provision of guidance and resources on health impact assessment, risk governance and communication on environmental health risks in industrially contaminated areas across Europe, including the transfer of scientific findings into the policy making process. The COST Action IS1408 will create the conditions for the undertaking of comparable health impact assessments of contaminated sites in Europe and beyond, accounting for local needs and feasibility. The Action currently involves 30 countries and it is officially supported by the WHO European Centre for Environment and Health, and the Directorates Environment and Joint Research Centre (JRC) of the European Commission. A comprehensive analysis of the available options in characterizing the health impact of industrially contaminated sites is provided by Pasetto et al in this Monograph, taking into account both epidemiological investigations and risk assessment procedures, with emphasis on limitations of available knowledge and identification of research priorities; this paper clearly illustrates the novel approaches set up by the WHO Collaborating Centre for Environmental Health in Contaminated Sites and its links with the ICSHNet COST Action.

The paper by Colin Soskoline explores the ethical questions raised by the very existence of contaminated sites, that subsumes the operation of powerful players in society, whose self-interest originally overcame the right-to-health of affected communities. Special attention in this respect is devoted to the ethical aspects of epidemiological studies concerning these communities, whose primary aim should be the demonstration of harm in order to plan the best possible remedial actions.

The subsequent papers throw light on specific issues by the use of case-studies. Ancona et al. and Harari et al. illustrate the use of biological monitoring as a tool for estimating exposure to heavy metals in communities resident close to industrial settlements, in Italy and Ecuador respectively. An integrated examination of the two papers is particularly interesting in view of the longlasting cooperation between the Ecuadorian Non-Governmental Organization IFA (Corporación para el Desarrollo de la Producción y el Medio Ambiente Laboral) and some Italian scientific institutions including ISS and the Latium Region Department of Epidemiology [21, 22].

Vanni et al. and Mancini et al. investigate the health implications of food chain contamination from two different perspectives. Vanni et al. review different issues related to the presence of contamination sources in proximity of agricultural areas and the appropriate risk assessment procedures, while Mancini et al. especially focus on the contribution of different routes of exposure to environmental contaminants including dietary exposure due to contamination of the food chain.

De Castro et al. present a position paper on how to increase the level of awareness of public health institution operating in contaminated sites especially by training and dissemination of pertinent scientific information, with a focus on the role of a wide range of stakeholders in risk evaluation and decision making.

Finally, Marsili addresses the connection between the issues related to assessment and management of contaminated sites and the very notion of global environmental health.

The present Monograph, obviously, is not exhaustive of the issues at stake, but it appears to be relatively self-consistent in providing scientific support to three main messages.

Firstly, contaminated sites represent a public health issue that requires an effort of the scientific community in order to provide a conceptual frame to deal with it and a set of operational tools in order to estimate its impact and prioritize the subsequent remedial action. The ICSHNet COST Action is likely to be the appropriate setting where to develop the strategic response to the health problems represented by contaminated sites. National ad hoc programs, such as SENTIERI Project in Italy, can be regarded as the basic tools to be used within the individual countries. Potential value of ap-
plication of this approach to low- and medium-income countries has recently been examined with reference to the Latin American setting [23].

Secondly, a successful strategy aimed at estimating the health impact of contaminated sites in order to take the best decisions in terms of environmental cleanup and health promotion requires a participatory approach on behalf of affected communities, which in turn is favored by the occurrence of well-designed communication programs between investigators and resident populations (see reference [24] for an exhaustive illustration of this point).

Finally, awareness of the underlying connections between socioeconomic determinants and occurrence of contaminated sites at a global level is essential. The three main drivers of this phenomenon are represented by selective migration of hazardous industrial productions to low-income countries characterized by absence or anyhow weakness of environmental regulation [25], selective transboundary export of hazardous waste to low-income countries, as well exemplified by the deadly dumping of high concentration hydrogen sulphide oil industry waste in Abidjan, Ivory Coast [26, 27] and inappropriate working procedures applied to locally available natural or anthropogenic materials, such as gold extraction from lead contaminated mining industry by-products in Nigeria [28]. In this frame, international scientific cooperation coupled with the pursuit of environmental justice appears to be the most effective and ethically sound option.

REFERENCES


