

# EkoMiasto#Społeczeństwo

Zrównoważony, inteligentny i partycypacyjny rozwój miasta

pod redakcją

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**ENVIRONMENTAL HEALTH  
– GLOBAL AND URBAN ASPECTS**

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## 10.1. What is the environmental health?

The definition of environmental health varies from organization to organization, because the “Environmental Health” as a term is not easy to define. Firstly, we should know what the health is. In scientific sources, there are available three kinds of health definitions. Considering, the first one, we can find that health is the absence of any disease or impairment. With regard to the second definition: the health is a state that allows the individual to adequately cope with all demands of daily life (implying also the absence of disease and impairment). The third term of health indicates that the health is a state of balance, an equilibrium that an individual has established within himself and between himself, his social and physical environment [Sartorius, 2006, pp. 662–664]. According to World Health Organization (WHO) health is “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” [WHO, 1948]. Although, the WHO definition of health has been criticised over the past 60 years, it is the one commonly used by authorities, people and scientists. On the second side of the environmental health is the environment. J.M. Last [1995] defined environment as “all that which is external to the individual human host. [It] can be divided into physical, biological, social, cultural, any or all of which can influence health status in populations”. It means that a person’s health is determined by genetics and the environment. With regard to the well-being it is a state that “requires meeting various human needs, some of which are essential (e.g. being in good health), and includes the ability to pursue one’s goals, to thrive and feel satisfied with their life” [OECD, 2011]. There is no doubt that the interactions between environment, human health and well-being exist. However, they are highly complex and difficult to assess. Clean environment is essential for human health-it provides a high level of well-being. The more or less known environmental influence on health is related to, e.g.: ambient air pollution, poor water quality and insufficient sanitation, hazardous chemicals, noise, climate change, depletion of stratospheric ozone, loss of biodiversity, and land degradation. The main current problem is an urban environment. Most of populations of developed and developing countries have chosen urban areas as their place to live, thus the health of urban populations has changed as cities have evolved. As a result, an urban growth (urbanization) is an ongoing phenomenon and can also affect human health. The pressure from overcrowding or decline, social inequity, pollution and traffic are the main problems of cities to cope with. It is also empirically proved that environmental exposures cause hundreds of thousands of illnesses each year (e.g. asthma, cancers). Undoubtedly, environmental challenges and urbanization opportunities are closely connected. The environmental health policy gives the opportunity to eliminate or reduce health hazards associated with the state of above-mentioned environmental factors as well as a healthy city can be a process not a result of practical and political commitments.

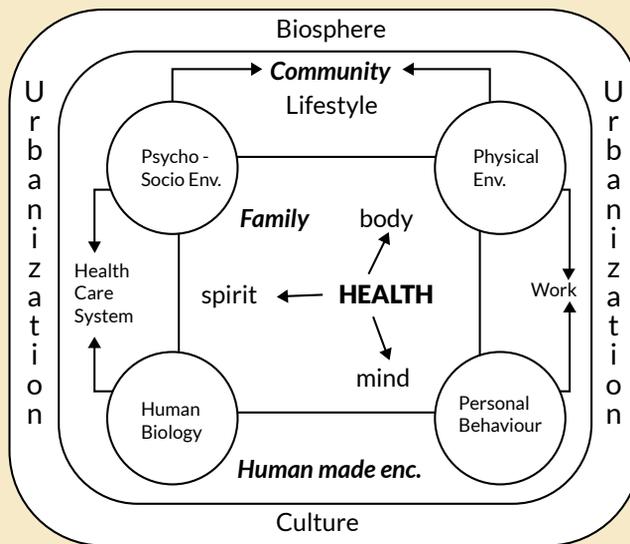
Cities focus on three core themes:

- ▶ caring and supportive environments,
- ▶ healthy living,
- ▶ healthy urban design.

Over the years it has become clear that without amendment in social, economic and environmental conditions the global health in urban and rural background improvement cannot be achieved. In 1978, WHO in the context of these conditions, at the conference in Alma Ata highlighted the great role that health services play in social needs of any community. World Health Organization stated that people should gain such level of health that will permit them to lead a socially and economically

productive life. It could be attained only through a better use of the world's natural resources [Yassi, 2001, p. 5]. In this context, WHO claims that “health is only possible where resources are available to meet human needs and where the living and working environment is protected from life-threatening, health-threatening pollutants, pathogens and physical hazards” [WHO, 1948]. In fact, this definition of health is the most commonly quoted, however it was formalized by WHO over half a century ago. Generally, there are several other definitions of health. For example, Bircher says that health is “a dynamic state of well-being characterized by a physical and mental potential, which satisfies the demands of life commensurate with age, culture, and personal responsibility” [Bircher, 2005]. According to Hancock and Perkins body, mind and spirit are the factors which create health [Hancock, Perkins, 1985, pp. 8–10]. What is more, the state of health is determined by, e.g.: human biology, physical environment, lifestyle, urbanization, human made environment, Figure 10.1.

Figure 10.1. The selected definition of HEALTH



Source: own elaboration based on Hancock, Perkins, 1985, pp. 8–10.

Undoubtedly, the quality of physical and social environment plays great roles in the health of individuals and communities [Friis, 2012, p. 3]. Figure 10.2 shows one of the possible ways to define environment considering the scale of influence of different factors (natural, social, physical, behavioural and urban).

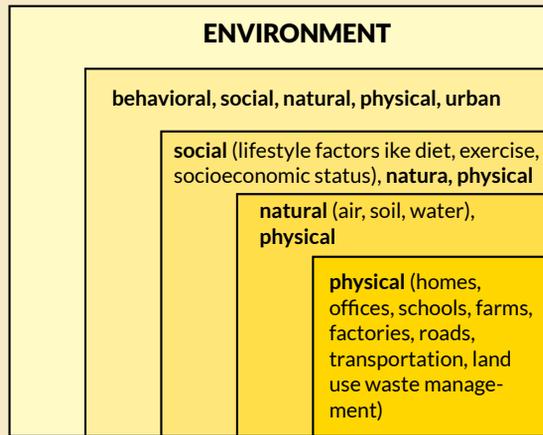
Above all, the environment is one of the greatest elements that undoubtedly bias health through such ways as:

- ▶ exposures to physical, chemical and biological risk factors,
- ▶ related changes in our behaviour in response to those factors [Prüss-Üstün, Corvalán, 2006].

According to the WHO report, the evidence shows that environmental risk factors play a role in more than 80% of the diseases [WHO, 2012]. In the context of urbanization, in densely populated urban areas, there is often a lack of facilities and outdoor areas for exercise and recreation. In addition, air quality is often lower in urban environments which can be exposed to chronic diseases, epidemiological

transition and road traffic injuries. Moreover, urban dwellers often live in large slums which lack basic sanitation, utilities (water, electricity) and access to health and social service. Finally, urban environments are more likely to see large disparities in socioeconomic status, higher rates of violence and crime as well as the presence of marginalized populations. These worrying trends reinforce the need for better prevention human being from environmental risk. The environmental health, as a piece of science and strategy makes the areas of environment, health more integrated and understandable. It focuses on the prevention and control of environmental exposures as well as it is an action plan for national and local authorities.

Figure 10.2. ENVIRONMENT in the context of behavioural, social, natural, urban and physical factors



Note: each square indicates the scale of the environmental factors.

Source: own elaboration based on Smith, Corvalán and Kjellström, 1999, p. 374.

There are many definitions of the environmental health. In the early twenties of XIX century, in 1997, the Environmental Health Policy Committee (EHPC) asked the Subcommittee of the Risk Communication and Education to consider various available terms of the described phenomenon. It occurred, that in 1998 there were 28 definitions of the environmental health. For example [Pamuk et al., 1998]:

- ▶ Agency for Toxic Substances and Disease Registry written that “environmental health is the branch of public health that protects against the effects of environmental hazards that can adversely affect health or the ecological balances essential to human health and environmental quality” [Johnson, 1998];
- ▶ Institute of Environmental Health (Australia) stated that “environmental health is the professional practice of improving and preserving residential and industrial hygienic environments and housing for individuals and communities, and improving and preserving public health and allied matters including the control and management of the total environmental and ecological balance by educating processes and enforcement of statutory provisions by the application of preventive science and practice” [Burq, Gist, 1998];
- ▶ Institute of Medicine said that “environmental health refers to freedom from illness or injury related to exposure to toxic agents and other environmental conditions that are potentially detrimental to human health” [Pope, Rall, 1995];

- ▶ National Association of County and City Health Officials claimed that “environmental health focuses on the health interrelationships between people and their environment, promotes human health and well-being, and fosters a safe and healthful environment” [Milne, 1996, 1998];
- ▶ National Environmental Health Association (NEHA) declared that: “environmental health and protection refers to protection against environmental factors that may adversely impact human health or the ecological balances essential to long-term human health and environmental quality, whether in the natural or man-made environment” [NEHA, 1996];
- ▶ World Health Organization Scientific Group by environmental health defined the phenomena “concerned with the control of all physical, chemical, and biological processes, influences, and factors that exercise or may exercise, by direct or indirect means, a significant effect on the physical and mental health and social well being of man and his society” [WHO, 1972, p. 6];
- ▶ World Health Organization, Environmental Health Services – “environmental health is comprised of those aspects of human health and disease that are determined by factors in the environment. It also refers to the theory and practice of assessing and controlling factors in the environment that can potentially affect health” [WHO, 1990];
- ▶ World Health Organization (draft definition developed at a WHO consultation in Sofia, Bulgaria, 1993): environmental health comprises of those aspects of human health, including quality of life, that are determined by physical, chemical, biological, urban, social, and psychosocial factors in the environment. It also refers to the theory and practice of assessing, correcting, controlling, and preventing those factors in the environment that can potentially affect adversely the health of present and future generations [WHO, 1993].
- ▶ National Institute of Environmental Health Science: “environmental health is the field of science that studies how the environment influences human health and disease” [NIEHS, 2005].

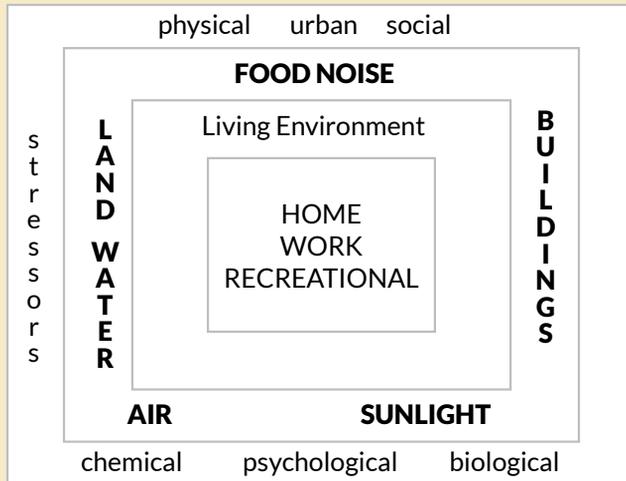
The commonly accepted definition of environmental health (of WHO) assumes that “environmental health addresses all the physical, chemical, and biological factors external to a person, and all the related factors impacting behaviors. It encompasses the assessment and control of those environmental factors that can potentially affect health. It is targeted towards preventing disease and creating health-supportive environments” [WHO, 2015]. This definition excludes behavior not related to environment, as well as behavior related to the social and cultural environment as well as genetics, however it includes also urban hazards. Realms of the definition are presented on Figure 10.3.

In accordance with above-presented definitions, they include environmental and health factors which are widely understood. What is more, environmental health it is also the issue of sustainable development, social policy, economy, justice, ecology, law, urbanization etc. [Jarosińska, 2012, p. 94]. However, there are some common elements of above-mentioned definitions of environmental health [Pamuk et al., 1998]. As we can see, they:

- ▶ mention ecological health (embraces the deeply fundamental complex interrelationships that collectively influence human and environmental health, [Schettler, 2006, p. 2]) or ecological balances (a state of dynamic equilibrium within a community of organisms in which genetic, species and ecosystem diversity remain relatively stable, subject to gradual changes through natural succession or a stable balance in the numbers of each species in an ecosystem);

- ▶ contain such words as: human health, public health, or humans;
- ▶ mention specific environmental stimulant that cause stress, such as physical, chemical, urban and biologic factors.

Figure 10.3. Realms of ENVIRONMENTAL HEALTH



Source: based on Jukes, 2011.

#### Environmental health officer (EHO) or environmental health practitioner (EHP)

Considering the phenomenon of the environmental health we can come across the environmental health officer (EHO) or environmental health practitioner (EHP). Considering job descriptions, the EHO and EHP makes sure that people's living and working surroundings are safe, healthy and hygienic. This kind of job takes place both in the private and public sectors. The officers could deal with a wide range of issues including: food safety, environmental protection, unsustainable urbanization, pollution control, noise control, health and safety at work, waste management, housing standards.

Source: <https://nationalcareersservice.direct.gov.uk> [accessed on: 10.09.2015].

### 10.2. Main aims and themes

The Prevention Institute announced that the health of people (especially people living in metropolitan areas) is under the influence of four main factors [Prevention Institute, 2007]:

- ▶ lifestyle choices (50%),
- ▶ genetics (20%),
- ▶ ENVIRONMENT (20%),
- ▶ health service, medical care (10%).

Communities are concerned about the environment they live in, about their health and about their quality of life. More and more diseases of citizens are caused by conductive circumstances, i.e. lifestyle, genetics, health care as well as by environmental hazards (i.e. bacteria, viruses, indoor and outdoor air pollutions, chemicals, loud noise). However, do diseases could be prevented through better management of our environment? We can find the answer in an effective policy regarding environment and health issues. Hence, environmental health includes such issues as: air quality, drinking water, chemical safety, children's environmental health, occupational safety and health, electromagnetic fields, quantifying environmental health impacts.

The main source of indoor pollutions is connected to using solid fuels to heat, cook and tobacco smoke; indoor pollutions include fine particles and carbon monoxide which produce such diseases as pneumonia among children and chronic respiratory diseases among adults. WHO says that 4.3 million urban and rural population a year die from the exposure to household air pollution. To defeat this problem, WHO has developed a comprehensive Programme on Household Air Pollution, which focuses on: research and evaluation, capacity building, evidence for policy – makers and databases. On the other hand, European Union developed the strategy of Promoting actions for promoting healthy indoor air (IAIAQ) [Jantunen et al., 2011]. Outdoor pollutions: the main sources of outdoor pollutions include transportation, stationary power generation, industrial and agricultural emissions, and residential heating and cooking (home stoves). They produce such pollutions as particulate matter, carbon monoxide, ozone, nitrogen dioxide and sulfur dioxide. The natural sources include oxides of sulphur and nitrogen from volcanoes, oceans, biological decay, lightning strikes and forest fires, VOCs and pollen from plants, grasses and trees, and particulate matter from dust storms. In 2013, the International Agency for Research on Cancer (IARC), announced that outdoor pollutions have been classified as carcinogenic to humans. "The most recent data indicate that in 2010, 223 000 deaths from lung cancer worldwide resulted from air pollution", due to the chemical cancer – causing mixtures, e.g. diesel engine exhaust, solvents, metals, and dusts included [Stacy, 2013].

The quality of drinking-water is a major environmental determinant of health. What is more, assurance of drinking-water safety is a foundation for the prevention and control of waterborne diseases. These diseases include that connected with micro-organisms and chemicals in water people drink; diseases like schistosomiasis which have part of their lifecycle in water; malaria with water-related vectors; drowning and some injuries; legionellosis carried by aerosols containing certain micro-organisms. WHO states, that inadequate drinking-water, sanitation and hygiene are estimated to cause 842 000 diarrhoeal disease deaths per year [WHO, 2014]. In 2015, WHO and UNICEF have published the report on *Progress on sanitation and drinking water*, where the new approaches to monitoring aspects of water and sanitation accessed are highlighted and should be monitored as new post-2015 targets [WHO, UNICEF, 2015].

When properly used, many chemicals can significantly contribute to the improvement of the quality of life, health and well-being. However, such chemicals as air pollution, arsenic, asbestos, mercury, cadmium or lead are highly hazardous. Moreover, they can negatively affect health and environment when improperly managed. It covers e.g.: respiratory infections, cardiovascular diseases, lung cancer, skin lesions, peripheral neuropathy, diabetes, lung cancer, mesothelioma, cancer of the larynx and ovary, and asbestosis (fibrosis of the lungs) or neurological damage. The main aim of actions is to ensure early warning and prevention of harmful effects of chemicals to which humans are being increasingly exposed, and assesses poten-

#indoor and outdoor pollutions

#drinking-water

#chemicals

tial risks to human health. Other activities include the provision of information on chemicals, the provision of information management tools, and the development of internationally peer-reviewed guidelines concerning the prevention and clinical management of poisoning. Through preventing programmes (e.g.: International Programme on Chemical Safety, IPCS INTOX Programme, Poisoning Prevention and Management) WHO provides activities to assess risks to human health from exposure to chemicals.

Children's health problems resulting from exposure to hazardous factors in the environment rank among the highest environmental burden of disease worldwide. According to WHO facts children are more vulnerable than adults to environmental risks because children:

- ▶ are constantly growing (they breathe more air, consume more food, and drink more water than adults do, in proportion to their weight);
- ▶ own central nervous, immune, reproductive, and digestive systems that are still developing;
- ▶ behave differently from adults and have different patterns of exposure (for example they crawl on the ground);
- ▶ have little control over their environment, they may be both unaware of risks and unable to make choices to protect their health;

Children's health problems include: asthma, respiratory infections, diarrhoea, learning problems, cardiovascular diseases, neurological, developmental, reproductive problems, cancers. "Nearly one-third of the 6.6 million under-5 child deaths every year are associated with environment-related causes and conditions".

To maintain a safe and healthy working environment the occupational safety and health refers to the identification and control of the risks arising from physical, chemical, and other workplace hazards (which include chemical agents and solvents, heavy metals such as lead and mercury, physical agents such as loud noise or vibration, and physical hazards such as electricity or dangerous machinery). Conditions of employment, occupation and the position in the workplace hierarchy also affect health. Why is the health of workers so important? It makes an essential prerequisite for household income, productivity and economic development. WHO states that certain occupational risks (such as injuries, noise, carcinogenic agents, airborne particles and ergonomic risks) result in a substantial part of the burden of chronic diseases:

- ▶ 37% of all cases of back pain,
- ▶ 16% of hearing loss,
- ▶ 13% of chronic obstructive pulmonary disease,
- ▶ 11% of asthma,
- ▶ 8% of injuries,
- ▶ 9% of lung cancer,
- ▶ 8% of depression
- ▶ 2% of leukemia;

What is more, annually 12.2 million people, mostly in developing countries, die from occupational diseases while still of active working age. The occupational health and safety is monitored by the Global Plan of Action on Workers' Health 2008–2017, endorsed by the World Health Assembly in 2007 [WHO, 2007].

Electromagnetic fields are present everywhere but in the same time they are invisible to the human eye. The natural sources of electric fields include the local build-up of electric charges in the atmosphere associated with thunderstorms and the earth's magnetic field. On the other hand, the fields generated by human-made sources concern: X-ray, the electricity that comes out of every power socket (low

frequency electromagnetic fields), and higher frequency radiowaves that are used to transmit information – whether via TV antennas, radio stations or mobile phone base stations. Reported symptoms of electromagnetic fields influence include headaches, anxiety, suicide and depression, nausea, fatigue and loss of libido. However, to date, scientific evidence does not support a link between these symptoms and exposure to electromagnetic fields as well as there have been no evidences that field exposures is the cause of prematurity and low birth weight in children of workers in the electronics industry. It is clear that if electromagnetic fields do have an effect on cancer, then any increase in risk will be extremely small. There is also little scientific evidence to support the idea of electromagnetic hypersensitivity.

Current and future research focus on: the study of electromagnetic fields in relation to cancer as well as to the long-term health effects of mobile telephone use (the International EMF Project).

The aim of quantifying environmental health impacts is to estimate the environmental burden of disease that quantifies the amount of diseases caused by environmental risks. WHO assumes that disease burden can be expressed in deaths, incidences (for instance: mortality form air pollution, mortality or burden of disease from water and sanitation) and also in Disability-Adjusted Life Years (they can be an be thought of as a measurement of the gap between current health status and an ideal health situation where the entire population lives to an advanced age, free of disease and disability). In accordance to WHO's: DALYs for a disease or health condition are calculated as the sum of the Years of Life Lost (YLL) due to premature mortality in the population and the Years Lost due to Disability (YLD) for people living with the health condition or its consequences. The other measures combine the burden due to death and disability in a single index. We can browse the data from e.g. Global Health Observatory (GHO). It contains an extensive list of indicators, which can be selected by theme or through a multi-dimension query functionality. Using indexes permits the comparison of the burden due to various environmental risk factors with other risk factors or diseases as well as it is additional information required for the rational development of policies by the health sector and activities of other sectors. Moreover, selected exposure-based, modelling and effectiveness-based methods used to estimate:

- ▶ the effectiveness and cost-effectiveness of interventions,
- ▶ the availability of resources,
- ▶ the burden of disease from air pollution,
- ▶ the risk of environmental disease and death,

strongly evidence the global health impacts which are caused by the environment.

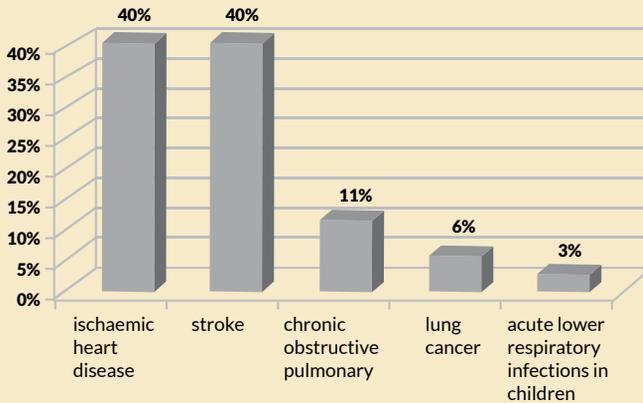
### 10.3. Determinants

Environmental hazards in particular, have made immense negative contributions to health, including occupational health hazards, poor sanitation, agricultural and industrial contaminations, of air, food, water and land. Meanwhile there are some others determinants that influence the environmental health state of communities, e.g. environmental justice, global environmental man-made disasters, urbanization, global environmental changes, health services, strategic actions and sustainable development.

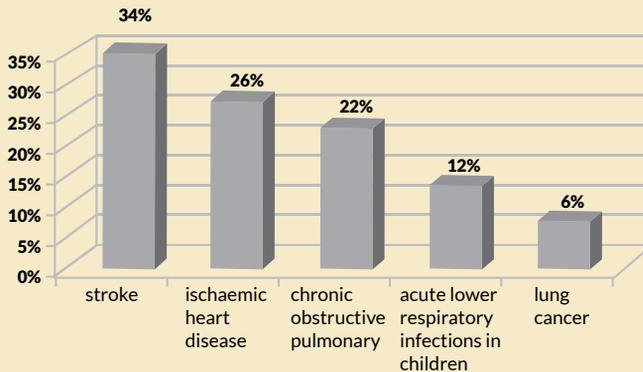
According to the Environmental Protection Agency the environmental justice is “the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies” [EPA, 2015]. The

WHO reports that in 2012 around 7 million people died as a result of air pollution (including people living in metropolitan areas) exposure (one in eight of total global deaths).

Outdoor air pollution-caused deaths-breakdown by disease



Indoor air pollution-caused deaths – breakdown by disease



European countries: over 90% of citizens in Europe are exposed to annual levels of outdoor fine particulate matter that are above WHO’s air quality limits. This accounted for 482 000 premature deaths in 2012 (from e.g. respiratory and heart diseases, as well as strokes, lung cancer and blood vessel conditions). In the same year, indoor air pollution resulted in an additional 117 200 premature deaths, five times more in low-and middle-income countries than in high-income countries.

European cities: it is stated that in European cities outdoor pollution from transportation result in 130 000 premature deaths and from 50 to 70 million causes of respiratory diseases [Jarosińska, 2012, p. 95]. For example in London, according to new research, nearly 9,500 people died early in a single year as a result of long-term exposure to air pollution.

Source: own elaboration based on WHO.

fair treatment means that no group of people (including racial, ethnic, socioeconomic), should bear an unequal share of the negative environmental results (industrial, municipal, and commercial operations or the execution of federal, state, global and local environmental programmes and policies). Moreover, the meaningful involvement assumes that, e.g. affected community have an opportunity to participate in decisions about the proposed activity that will affect their environment and/or health [EPA, 2014]. The place of the presented phenomenon was United States (at the beginning of 1980's) [Steger, 2007, p. 11]. To sum up, in the context of the environmental health, the socio-economic factors deprivation is important. It often determines the environmental exposures. On average, people with low-income tend to live in more contaminated and polluted as well as less healthy areas. Therefore they are more vulnerable to the effects of exposures. They have lower health status and poorer accessed to health services. Simultaneously, people living in more deprived areas, consume fewer resources, thus are responsible for fewer of the emissions that pollute environment.

Environmental man-made disasters include such risks as collapsing ecosystems, freshwater shortages, nuclear accidents and failure to mitigate or adapt to climate change. Disasters result in deaths, severe injuries, requiring extensive treatments, increased risk of communicable diseases, damage of health facilities, damage to the water system, food shortage and population movements [Yasuyuki et al., 2011]. Dynamic industrialization, globalization as well as a development of huge concerns lead to increasing release of chemical contaminants outdoor pollution into local land and environment. Some selected environmental disasters that had impacted several human's health and live are presented as follows:

- ▶ 1952, London; the smog covered London for 5 days. Thousands of people died and hundred thousand fell ill. The smog consisted of airborne pollutants from the use of coal. It was estimated that 12 000 premature deaths can be attributed to this smog;
- ▶ 1986, Ukraine; the worst nuclear power-plant in history; One of the reactors exploded and as a result the meltdown and dusts sent a massive amount of radiation into the atmosphere (more than from Nagasaki and Hiroshima). That radiation drifted even toward Europe. Since then, thousands of kids have been diagnosed with thyroid cancer. The range of radiation was estimated on almost 20 miles area around the plant;
- ▶ 1991, Kuwait; oil wells were blown up; the fires burned for seventh months. The black rain fell and lakes of oil were created. Scores of livestock and other animals died;
- ▶ 2010, Gulf of Mexico; the Deepwater Horizon oil ring exploded and started sinking. The floor of oil gusher flowed for 87 days; it is recognized as the worst oil spill in U.S. history. 11 people were dead. Environmentalists and others braced for an environmental collapse on a massive scale.

As mentioned above urbanization is an ongoing phenomenon and it is a process of global scale changing the social and environmental landscape. What is more, urbanization is a result of population migration from rural to urban areas as a reason of industrialization, employment opportunities, lifestyle considerations, etc. Half of all people now live in urban environments and it is expected to reach about 66% by 2030 [Friis, 2011, p. 11]. It is worth considering that urban life is often polluted and unhealthy (especially in low income countries). Environmental challenges and urbanization opportunities are closely connected, thus there is an urgent need to find the balance between quality of life in a healthy urban environment (considering consumption and environmental quality). The quality of the urban environment plays an increasingly important role in public health. With regards to environmental health

it includes such urban problems as: solid waste disposal, provision of safe water and sanitation, transport, overrated density, concentration of trade, road-communication congestion, land use, noise pollution, urban air pollution, road traffic accidents, etc. A contemporary resource depletion issue is global climate change (arising from emission of carbon dioxide and other green emission gases) and ozone depletion. The origin of air problem in cities is their large energy demands [Campbell-Lendrum and Corvalán, 2007, pp. 109–117]. It is estimated that in cities more than one billion people are exposed to outdoor air pollution annually. According to WHO urban air pollution results in more than one million premature deaths and one million pre-natal deaths each year [Jarosińska, 2012, p. 95].

In accordance to World Commission on Environment and Development sustainable development “is development that meets the needs of the present without compromising ability of future generations to meet their own needs. It contains within it two concepts:

- ▶ the concept of needs, in particular the essential needs of the world’s poor, to which overriding priority should be given;
- ▶ the idea of limitations imposed by the state of technology and social organization on the environment’s ability to meet present and future needs” [WCED, 1987, p. 43].

The integration between sustainable development and environmental health is based on two-way relations. It means that health is important input to sustainable development: without health, there is no sustainable development (healthy people are essential for development: they are better able to learn, work and contribute to their economies and societies). On the other hand, sustainable development produces more health [PAHO and WHO, 2013, p. 2]. Smarter development of regions and mainly cities (smart, health city) in such sectors as transportation, energy and housing can generate more health co-benefits and fewer risk for particular environmental diseases [NIEHS, 2011, p. 2]:

- ▶ recognizing efforts to reduce environmental problems that can bring health benefits (e.g. creating surroundings that encourage biking and walking for transportation reduces greenhouse gas and toxic air pollution emissions (they are environmental benefits) and rises physical activity-health benefits;
- ▶ amending environmental quality for the poorest communities with the most burden of diseases (reducing exposures to indoor and outdoor air pollution, providing clean water, sanitation);
- ▶ noticing that some practices designed to promote sustainable development may have adverse environmental health effects and making efforts to prevent these before they are implemented.

The environmental health issues are also aims of the Millennium Development Goals of United Nations.

#### 10.4. Economic aspects

Costs of illnesses associated with environmental contamination include [Davies, 2005, p. 5]:

- ▶ directs costs, e.g. health care costs (hospital and nursing home care), medical care expenditures for diagnosis, treatment, rehabilitation, prescription drugs, physician and other services (informal care, e.g. transportation and patient time loses, e.g. time spent travelling, waiting time),
- ▶ indirect costs, generally comprehend lost productivity expenditures due to morbidity and premature mortality;

For example, in the U.S. total annual asthma care costs (direct and indirect) exceed US\$6 billion (€5.4 billion). At present Britain spends about US\$1.8 billion (€1.62 billion) on health care for asthma and because of days lost through illness. In Australia annual direct and indirect costs of above mentioned disease reach almost US\$460 million (€414 million).

#### WHO European Healthy City Network

Nearly 100 cities from 30 countries are members of the WHO European Healthy Cities Network, phase V. The overall goal of this network is to put health high on social and political agendas. The network is consisted of the European cities that are committed to health and sustainable development. This European Cities Network has six main goals of strategic actions, e.g.:

- ▶ to promote policies and actions for health and sustainable development at local levels, with an emphasis on the determinants of health, people living in poverty, and the needs of vulnerable groups;
- ▶ to generate policy and practice expertise, good evidence, knowledge and methods that can be used to promote health in all cities in the Region;
- ▶ to play an active role in advocating for health at the European and global levels through partnerships with other agencies concerned with urban issues and networks of local authorities;
- ▶ to increase the accessibility of the WHO European Network to all Member States in the European Region;

The joining criteria for cities are renewed every five years. The facts about cities are compiled and published in reports at the end of each Phase.

Łódź is also a member of the above mentioned Vth Phase of this network. The published data said that in years 2012 to 2014 Łódź was above medians' values (medians of: WHO European Regions and members of this Phase of the network) considering all core indicators. For example, the level of crude mortality per 1000 inhabitants was 14.3 whereas medians for motioned groups equaled 8.8 and 9.3. Moreover, the scale of the generated of municipal waste achieved 211 thousands of tones, in Europe on average, properly: 66 and 210. The two measures that indicated Łódź on the top of ranking were green space where the public has accessed and length of cycling network. Adequately, considering the first motioned indicator, Łódź had 3340 km<sup>2</sup> green space where the public has accessed, whereas in cities, on average 39 km<sup>2</sup> were estimated! With regard to the cycling network, the length of that in Łódź was 99 km, and in European cities the median indicated 73–90 km. Finally, the level of unemployment in Łódź (11.9%) exceeded the European median: 9.4–10.5%.

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*Source: own elaboration based on WHO Regional Office for Europe, 2015.*

In Europe, in 2011, the direct annual and indirect costs reached US\$80.2 billion (€72.2 billion). Total annual costs of environmental diseases in Europe in 2011 exceeded €370 billion. It, apart from asthma costs, included, e.g. lung cancer (€106.4 billion), chronic obstructive pulmonary disease (€141.4 billion) as well as tuberculosis (€5.9 billion) [ELF and ERS, 2013, p. 16]. What is more, the cancer costs in Europe provide 6.5% of all health care expenditure in Europe. The obesity-related illness costs make over 1% of GDP in the US and between 1–3% of health spends in most countries [WHO and UN, 2015, p. 98].

By measuring and comparing the economic burdens of environmental diseases can help health-care decision-making, i.e. to set up and prioritize health-care policies and activities. Thus, the valuation of costs of illness, COI, (widely known also as burden of disease, BOD) is considered to be an essential evaluation technique in health care [Jo, 2014, p. 328]. Most of values of direct costs we can find in the National Health System Accounts. The only informal care and patient time losses should be converted into financial equivalents using one of the indirect costs valuation methods (see below). When measuring indirect costs we can apply one of three major methods presented below [Jo, 2014, pp. 329–330]:

- 1) Human capital method (HCM): is designed to estimate the value of human capital (which constitutes the individual's productivity in a society [Schultz, 1961]) as a present value of person's future earnings. It assumes that we will use future earnings as a proxy for future productivity. This method has been criticized because of assumption that a worker cannot be replaced even if the unemployment rate is high. In that case this method overestimate the value of production, on the other hand, this tool is widely accepted by most researchers.
- 2) Friction capital method (FCM): it is an alternative method to HCM. It estimates the value of human capital when another person from the unemployment pool replaces the person value of worker's future earnings until the sick worker returns or is eventually replaced. The friction costs (initial disruption costs plus training costs) are limited to the illness, injury or premature death of the short term period defined as "friction time". The FCM assumes that impairment or premature death will not affected the total productivity following the friction period. It is controversial that illness, injures or premature death would reduce the total unemployment;
- 3) Willingness to pay (WTP): measures the amount that a person is eager to pay in order to reduce the probability of illness or mortality. The various methods to determine and estimate an individual's WTP (e.g. conducting surveys, examining the extra wages for highly risky job, examining the demand for products that leads to greater level of health or safety) are called "conjoint analysis", CA, and "contingent valuation method", CVM. They commonly are named CA methods. These techniques require a hypothetical survey questions and some calculations that elicit utility and finally determine a person's maximum WTP for some goods that usually has no market prices (such as health).

The World Bank Group named as Global Environmental Facility (GEF) is one of the institution's largest and longest funded programmes. It has integrated global environmental benefits across the Bank programmes through more than 790 investment projects in 120 countries. The funds are used in areas directly or indirectly connected to environment and health, e.g. climate change, international waters, persistent organic pollutants [Kayser, 2014].

The European Union also has significant funding programmes for environment and health research known as Framework Programmes for Research and Technological Development (named just Framework Programmers, FP). The first EU FP with research activity dedicated to environment and health took place during 1998–2002 and engaged €160 million as well as more than 90 transnational research projects. In the next Framework Programme (FP6) from 2002 to 2006 more than 60 environmental health projects were funded with annual EU contributions of about €50 million. A total of 147 of environment and health projects were funded by the Seventh Framework Programme (FP7), from 2007 to 2013, with the EU contributing about €550 million (€79 million a year). Most projects are still ongoing.

## Indirect costs of asthma in Poland. Influence on the revenues of public sector accounting (using HCM)

Considering five categories of indirect costs of asthma (giftedness, absenteeism, informal health care, disability to work, loss of productive working time, deaths, excluding costs of complications), it was estimated that in 2012 total costs of mentioned disease reached above PLN 704.5 millions. The human capital method was applied. Table includes indirect costs of asthma as shares of GDP in percentages of productivity loss.

Indirect costs of asthma as shares of GDP in percentages of productivity loss in Poland in 2012

Loss of productivity due to asthma costs	% of productivity loss	PLN millions
	100	704.5
Contributions on health and social insurances, incl.:	11.46	80.7
Revenues from health contribution	3.82	26.9
Revenues from CIT	2.08	14.7
Revenues from PIT	4.47	31.5
Revenues from VAT	7.93	55.9
Revenues from excise	3.92	27.6

Source: EY, 2013, p. 70.

## GEF in Eastern Europe and East Asia Cities (examples of projects during 2010–2014)

In Europe programming of GEF reached \$242.4 million. Activities involved 16 countries as well as 5 at sub-regional and regional levels and 38 projects (plus 7 new projects being under preparation). In Asia, on programming there were spent \$677.5 million, and engaged 12 countries and 5 at sub-regional or regional levels. There were 46 active projects and 10 new projects under preparation.

Asia: Supporting China's Goals To Build Climate Smart Cities. GEF with government of China invest in the Sino-Singapore Tianjin Eco-City Project (SSTEC). It is designed by 2020 to become a model eco-city that promotes energy efficient and low carbon urban systems, replicable in other Chinese municipalities. The eco-city design calls for high population density, transit oriented development, a mixed land use plan, an explicit local working/living ratio and affordable housing.

Poland: Poland Energy Efficiency. The main aim of this project was to increase public and private sector investments in energy efficiency (EE) in buildings. Finally, the project leveraged an estimated 30700 t CO<sub>2</sub> emission reductions per year through increased public and private investments in energy efficiency in buildings.

Source: own elaboration based on: Kayser, 2014, p. 8–29.

All 28 EU Member States are represented in FP7-funded projects. Of the 1 central and eastern European Member States, the ones showing the strongest participation are the Czech Republic, Poland, Romania and Slovenia. An additional

12 countries from the WHO European Region have taken part, the most frequent three being Norway, Switzerland and Turkey. The largest participation from outside Europe has come from the United States (24 participants in 35 projects), followed by China (12 participants in 16 projects) and Canada (11 participants in 12 projects).

The greatest number of projects concerned cancer and genotoxicity (26 activates), the lowest: overall mortality, diabetes (per 4), see Figure 10.4.

Future aspects of FP (for 2014 to 2020) will include, e.g.: understanding health, ageing and disease (determinants, risk factors and pathways); health promotion, urban health and disease prevention [WHO, 2015, p. 107].

## 10.5. Environmental health in Poland

The strong and dynamic industrialization in Poland in the second half of 20th century resulted in high level of environmental urban air and water pollution [Cembrzyńska et al., 2012, pp. 31–38]. Despite, the quality of environment has steadily improved in Poland in past the 15 years, however there are many environmental risk factors to health. The main environment and health issues in Poland and Polish cities include [WHO and MH, 2009, p. 19]:

- ▶ water and sanitation,
- ▶ exposure to environmental tobacco smoke,
- ▶ exposure to urban outdoor air pollution,
- ▶ road traffic injures (especially at the urban level),
- ▶ unintentional injuries among children.

The WHO and Polish Ministry of Health calculated that main causes of death in Poland are cardiovascular (in 2012 it was 47% in all cases of death) and cancer (in 2012 it was 26% of all cases of death). What is more, the high mortality rate of road traffic injures in children and young people were noticed. Healthy life years at birth in 2013 in Poland of:

- ▶ females was 62.7 years (the average of the phenomenon in EU28 was 61.5 years),
- ▶ males was 59.2 years (the average of the phenomenon in EU28 was 61.4 years);

The total death rate due to chronic diseases per 100 000 persons in 2009 in Poland was 159 whereas in EU27 amounted to 116 cases. Moreover, urban population exposure to air pollution by particulate matter (in micrograms per cubic meter) in Poland in 2012 was 36.6, in EU28 it gained 24.9. Proportion of population living in households considering that they suffer from noise in Poland in 2013 was 14%, whereas in EU28 reached 19%. Health expenditures on health care in 2012 in Poland comprised 7% of GDP, an average for EU27 was 9%.

WHO estimated of the environmental burden of disease for Poland in 2009 reached 17% and our country is in the middle of the range of WHO European Regions.

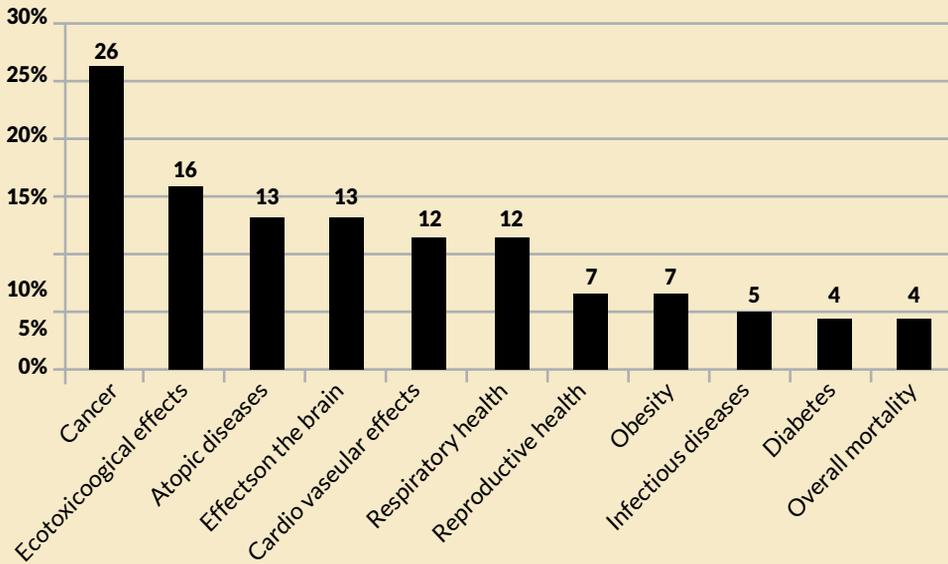
The main health institutions in Poland responsible for health risks related to environmental factors are the [WHO and MH, 2009, pp. 31–39]:

- ▶ Department of Public Health of the Ministry of Health. Within the Ministry of Health, the Department of Public Health covers disease prevention activities related to environment and health. What is more, the most noteworthy activities of this department are issues in physical activity and nutrition areas, road safety, anti-tobacco campaigns and respiratory diseases (asthma) as well as prevention activities that mainly focus on children's and environmental health. The department is mainly responsible for drafting legislation and policy-making.

- ▶ Department of Environmental Hygiene of Chief Sanitary Inspectorate. The main tasks of the Department are, e.g. setting priorities and guidelines for State Sanitary Inspection in the fields of labour hygiene, radiation hygiene, communal hygiene and preventive sanitary supervision; professional supervision of activities of Voivodship level Sanitary-Epidemic Stations in the fields of labour hygiene, radiation hygiene, communal hygiene and preventive sanitary supervision responsible for implementing prevention activities, conducting of Administrative procedures for occupational diseases; supervision of compliance with rules concerning chemical substances and mixtures, drug precursors, biocides and detergents; conducting of administrative procedures for awarding and withdrawing authorization for sanitary expert, sanitary supervision of management and disposal of medical waste in the field of human health care .
- ▶ National Institute of Public Health – National Institute of Hygiene (NIPH-NIH). The mission of the NIPH-NIH is to protect the health of the population through actions taken in the field of public health, including research and training. This refers to the monitoring of biological, chemical and physical risk factors in food, water and air as well as diseases and infections control. NIPH-NIH offers expertise for the government, NGOs and civil society in the field of public health, risk assessment and indication how to avoid risks. The Institute also conducts research of sera and vaccines quality.
- ▶ Nofer Institute of Occupational Medicine. Department of Environmental Health Hazards. Main activities include: assessment of exposures to dusts and bioaerosols (are airborne particles that are living (bacteria, viruses and fungi) or originate from living organisms [Srikanth P. et al, 2008, p. 302–312]) in the occupational and living environments, development and improvement of methods used to assess exposures to dusts and bioaerosols in the occupational and living environments, development of scientific background and preparation of the documentation of MAC values for the components of dusts and bioaerosols in the industrial atmospheres, assessment of health risks due to environmental and occupational exposures to various dusts and bioaerosols, improvement of methods used to identify harmful environmental agents in samples of materials and dusts, assessment of health risk associated with environmental exposures of populations to other harmful agents.
- ▶ Institute of Occupational Medicine and Environmental Health (IOMEH). It is a research centre which on the basis of its statute conducts research and implementation studies, training, diagnostic and treatment activities in the field of occupational medicine and environmental health. IOMEH is involved in public health and other statutory based tasks, particularly in health campaigns and disease prevention. The important marker of IOMEH is a unique Outpatient Clinic of Environmental Medicine in Poland and the only Training Centre for Occupational Health.

Poland has no public health act that could be considered a legally binding document controlling the effects of the environment on health [WHO and HM, 2015, p. 53]. The key of national policy for setting priorities and the agenda for public health is the National Health Programme. The government has adopted the current Programme for 2007–2015 on 15 May 2007. This policy is based on the previous National Health Programme, which was introduced during 1996–2005. It is also shaped in accordance with the Health for all policy framework for the WHO and European Union. The main goals of the

Figure 10.4. Number of health end-points and diseases investigated projects in FP7



Source: based on: WHO, 2015, p. 105.

National Health Programme are:

- ▶ reducing inequality in health,
- ▶ promotion of physical activity for preventing cardiovascular diseases and shaping desirable health behaviour,
- ▶ improvement of the eating habits of the population and food health quality and reducing the obesity level,
- ▶ reduction of tobacco smoking and exposure of children and pregnant women to environmental tobacco smoke,
- ▶ reduce of exposure to harmful factors in the living and working environments,
- ▶ improvement of the sanitary conditions,
- ▶ reduction of the number of accidents and injuries, especially among children and adolescences,
- ▶ creating healthy and safe conditions for older people,
- ▶ children as a main target group of the Programme.

The next National Health Programme for 2016–2020 (the project of this document was signed on 15 May 2015) includes prevalence actions against obesity. The obesity of young people is a common issue which results in a more and more diseases. The major change in the presented Programme will be the centers of psychic health centers and the Council of Public Health.

The total amount of funds allocated for the above-mentioned Programme is PLN 1.4 billion. It is estimated that the successful implementation of the Programme goals in practice will lead to:

- ▶ reduction of the number of smokers by 2% to 2020,
- ▶ stoppage of an increase of obesity and diabetes to year 2025,
- ▶ reduction of the number of heavy drinkers by 10% to year 2025,
- ▶ increase of the life expectancy of males to 78 years and females to 84 years in year 2030,
- ▶ reduction of the difference in an average number of years of life expectancy between males and females from 8 to 6 years.

The WHO Health City is a crucial international programme on urban health and environment that engages local governments in health development through a process of political commitment, institutional change, partner-based planning and innovative projects. It was introduced in 1988. According to this movement health is the business of all sectors. Local governments are in a unique leadership position with power to protect and promote their citizens' health and well-being. Nearly 100 cities are members of the WHO European Healthy Cities Network, and 30 national Healthy Cities networks across the WHO European Region have more than 1500 cities and towns as members. The primary goal of this Network considers improvement of health conditions in the cities, which is the environment and health of their residents. A Healthy City gives:

- ▶ clean, safe, high quality environment,
- ▶ significant participation in undertaking and controlling the decisions on the life of the residents,
- ▶ health and well-being, the possibility of satisfying basic needs,
- ▶ constant access to health care at a relevantly high level,
- ▶ physical and psychological condition, mutual support and quiet life.

In Poland the Healthy City Network has been introduced in 1991 as a Polish Healthy City Network, and since 1993 it is known as an Association of Polish Healthy Cities. The City of Łódź hosts the association's coordination office. It includes 44 Polish cities and communities. It is one of the longest established national healthy cities networks in Europe. To join the network, cities must fulfill a set of criteria that include passing a city council resolution, agreeing to comply with the constitution of the. The Association has developed an innovative and popular way to stimulate new activities in cities through an annual grant competition. The Association devotes about 20% of its budget, which is based on membership fees, to the competition. It is open to organizations and institutions from the Association's member cities. The Association sets the rules and criteria for assessing the grant applications. From 1994 to 2013, there were 972 applications for support, and 153 applications were supported.

#### Łódź as a member of Polish Health City Network

As a member of Polish Health City Network, Łódź has gained PLN 2.7 billion on the project realisation: Łódź kontra choroby wątroby. It is the part of the PL13 Programme: Ograniczenie społecznych nierówności w zdrowiu, which is funded by Norway Grants on 2009–2014 and Polish budget in 100%. The main aim of the project is to recover the citizens' health state through the reduction of chronic liver diseases. These incidences are results of obesity and alcohol abuse. The project activates include three age groups of people: females and males (age: 18–64) at risk of alcohol abuse; females and males (age: 18–64) with overweight and obesity; children and youth.

*Source: own elaboration based on The City of Łódź Office, 2015.*

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