NATIONAL UNIVERSITY OF LIFE AND ENVIROMENTAL SCIENSES OF UKRAINE

Department of General Ecology, Radiobiology and Life Safety

HUMAN ECOLOGY

STUDY GUIDE

Kyiv 2020

УДК 574(075.8)

Rakoid O.O., Solomenko L.I. Human Ecology. Study guide. – Kyiv: NUBIP, 2020. – 191 p.

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Рекомендовано до видання вченою радою Національного університету біоресурсів і природокористування України

(протокол № _ від _ листопада 2020 р.).

Розглянуто найважливіші теоретичні питання з курсу дисципліни «Екологія людини»: розкриття суті екології людини як науки; взаємодія з природою людини як біологічної істоти на рівні організму та популяції; вивчення впливу окремих факторів середовища та їх комплексів на здоров'я і життєдіяльність людської популяції.

Для студентів, що навчаються за спеціальностями екологічних напрямів, а також аспірантів, викладачів і всіх небайдужих до екології людини.

LIST OF CONTENT

FOREWORD

Normative discipline "Human Ecology" studies the patterns of human interaction with the environment, the impact of the latter on health, adaptation of the human body to man-made environmental changes, determines the individual characteristics of man and seeks principles and methods of moral and spiritual education in the way of restructuring thinking to realize their role in nature.

The future ecologist must realize that any human activity affects the environment, and the deterioration of the biosphere is dangerous for all living things, including humans.

This raised the problem of preserving the human population. A comprehensive study of man, his relationship with the environment led to the understanding that human health is not only the absence of disease, but also the physical, psychological and social well-being of man.

Methodical tasks of the course: to form in young people the need to understand the naturalness of man as a species being, which has a certain set of features and interactions and enters into material − energy and informational relationships with the environment.

Cognitive tasks of the course: to give students a general idea of the structure of tasks and methods of research of human ecology, modern directions of research in the field of human ecology and international cooperation, system of concepts in human ecology: quality of living conditions, health, disease, etc.; biological and social human needs; the impact of environmental factors on the human body; dependence of health on environmental factors: stress and

other psychological problems (smoking, alcoholism, drug addiction); risk factors and organization of public health; general patterns of the adaptive process of man; cultural and geographical aspects of recreation.

Practical tasks of the course: to apply cartographic, mathematical-statistical, social-hygienic methods of control and management in the field of human ecology; determine the types of adaptations and their mechanisms; make ecological forecasts of the influence of environmental factors on the implementation of the genotype; apply methods for determining the ecological aspects of chronobiology to study biological rhythms and their adaptive role in ecosystems of anthropogenic origin.

Topics 1, 3, 4 were created by Solomenko L.I., Prof., Assoc. Prof., Candidate of Biological Science; topics 2, 5−8, Annexes were created by Rakoid O.O., Assoc. Prof., Candidate of Agrarian Science. Dictionary of terms was prepared collectively.

SECTION I. STRUCTURE AND CONTENT OF THE DISCIPLINE

1. The purpose and objectives of the discipline

The main objective of discipline is to develop in young people the necessity of understanding of the naturalness of man as a species being, which has a certain set of features and interactions and enters into material-energy and information relations with the environment.

One of the most important tasks of human ecology is the study of the general laws of interaction between the biosphere and the anthroposystem of mankind, its groups (populations) and individuals, the impact of the natural sphere on man and group of people.

Knowledge about the laws and ecological-physiological mechanisms of human adaptation to different climatic-geographical and anthropogenic environmental factors will help to develop scientifically-based measures for the prevention of diseases that can be caused by the environment, which will allow timely adjustment of the impact on health of different regions of our planet.

After mastering the course, the student should ***know***:

- structure of tasks and methods of research in the field of human ecology;
- modern areas of research in the field of human ecology and international cooperation;
- system of conceptual framework in human ecology (environment, quality of life, health, disease, etc.);
- biological and social needs of man;

- impact of environmental factors on the human body;

- dependence of health on environmental factors: stress and other psychological problems (smoking, alcoholism, drug addiction); risk factors and organization of public health;

- problems of energy impact of man-made environmental factors on human body and personality;

- demographic problems, ecological problems of marriage and family;

- the dependence of dietary habits on the environment;

- modern global and regional epidemiological features;

- general patterns of human adaptive process;

- cultural and geographical aspects of recreation.

Student should **be able**:

- to determine the indicators that characterize the human population and the state of its environment;

- to carry out a statistical evaluation of dangerous and harmful factors for human life;

- to calculate the index of human potential;

- to simulate dangerous events and to evaluate extent of risk;

- to create optimal hygienic conditions of work and rest;

- to specify the "quantitative" indicators of health behavior and assess its level;

- to determine the adaptive potential of the organism;

- to measure the level of stress resistance of the individual;

- to determine individual features of the rhythm of working efficiency;

- to designate the degree of relevance for basic human needs;

- to develop the anthropoecological section of the EIA (environmental impact assessment);

- to predict possible changes in the characteristics of human health under the influence of dynamic changes in the external environment;

- to apply cartographic, mathematical and statistical, socio-hygienic methods of control and management in the field of human ecology;

- to determine the types of adaptations and their mechanisms;

- to make ecological forecast of the influence of environmental factors on the realizing of genotype;

- to apply methods for determining the ecological aspects of chronobiology to study biological rhythms and their adaptive role in anthropogenic ecosystems.

These learning outcomes are the basis for the formation of the following competencies:

general competencies:

K01. Knowledge and understanding of the subject area and professional activity.

K02. Skills in the use of information and communication technologies.

K03. Ability to adapt and act in a new situation.

K05. Ability to communicate in a foreign language.

K07. The ability to act socially responsibly and consciously.

professional (special) competencies:

K13. Ability to preserve and increase moral, cultural, scientific values and achievements of society based on understanding the history and patterns of development of the subject area, its place in

the general system of knowledge about nature and society and in the development of society, engineering and technology, use different types and forms of physical activity for active recreation and a healthy lifestyle.

К14. Knowledge and understanding of the theoretical foundations of ecology, environmental protection and sustainable use of nature.

К18. Ability to assess the impact of technogenesis on the environment and identify environmental risks associated with manufacturing activity.

К23. Ability to use modern information resources for environmental research.

К24. Ability to inform public about the state of environmental safety and sustainable use of nature.

2. The content of the discipline

Meaningful module 1. Theoretical and methodological aspects of human ecology (HE)

Subject, purpose, objectives and content of the discipline. Modern directions of research in the field of HE. Relevance and methods of HE research in environmental optimization. Methods of assessment, control and management in the field of HE: cartographic, mathematical and statistical, socio-hygienic, biogeochemical. System approach to analysis of relationships of human with their environment.

Place of human ecology in the system of sciences. History of development of the discipline "Human Ecology". Stages of human

relationship with nature. The destructive way of development of civilization. The role of Ukrainian and foreign researchers in the formation of human ecology. V.I. Vernadsky on the role of the biosphere and noosphere in the history of the Earth.

World and features of its existence. The human phenomenon and the main interpretations of its origin. The role of natural-historical environment and heredity in the formation and development of man. International cooperation.

Conceptual framework in HE: environment, quality of life, health, disease, etc. Biological and social human needs. Anthropo-ecological criteria of quality of the environment. Indicators of health status of the population. Ecological niche of Homo sapiens as species. Morphophysiological changes of the human body. Norm of reaction and geographical environment.

Revival of human population and natural environment. Human gene pool and aggressive environmental factors. Natural population growth. Ethnicities and ethnic processes.

Nutrition ecology. Endoecological status of man. Ecotrophology as a science of optimal nutrition of different segments of the population in compliance with national customs and traditions.

Meaningful module 2. Impact of the environment on human health

The concept of adaptation and acclimatization of man. Adaptive strategies. Specific and nonspecific adaptations. Adaptations and heredity. Congenital anomalies/birth defects. Genetic adaptation, genetic manipulation, genetic engineering and biotechnology. The

role of genotypic and phenotypic features in the spread of pathologies.

Human ontogenesis, its critical periods, causes of anomalies. Growth, development and aging in different environmental conditions. Influence of abiotic (climatic) factors. Geophysical factors: people in mountain terrain conditions, solar-terrestrial relationships. Impact of natural radiation. Geochemical natural environmental factors. Threshold concentrations of chemical elements. Natural endemic diseases. Interaction with biological objects. Theory of natural-focal diseases.

Cosmic and terrestrial rhythms. Biorhythms and their classification. Desynchronosis as a pathological condition in violation of the biorhythms of the human body.

Influence of anthropogenic factors on the human body. Impact of physical factors. Aftereffect of radiation exposure. Effects of heavy metals, pesticides and other chemical factors. After-effects of mutagens and carcinogens.

Practical lessons

№	Topics and content of practical lessons	Hours
1	The place of human ecology in the system of sciences.	4
2	Research methods in human ecology	2
3	Introducing to the phytoncide plants and identifying the possibility of their using in interior design	4
4	Ecological aspects of chronobiology: definition of	4

	chronobiotype. Determining the duration of an individual minute.	
5	Evaluation of the frequency of stressors	4
6	Methods of self-assessment of some physical conditions of man	4
7	Nutrients needed by the human body: determining the provision of human body with vitamins and micronutrients	4
8	Study of physiological mechanisms of adaptation of an organism to low temperatures	4

Self-dependent work

№	The topic title	Hours
1	The human phenomenon and the main interpretations of descent of man	5
2	Aerospace monitoring	5
3	Biological and social of human needs. Anthropo-ecological criteria of environmental quality	5
4	Problems of epidemiological information. International standards. Global ecological disasters, catastrophes, epidemics.	5
5	The influence of environmental factors on the human body. Classification of diseases and morbid conditions in terms of degree and type of the dependence on environmental factors. The concept of natural prerequisites for diseases	5
6	Human gene pool and aggressive	4

	environmental factors	
7	Natural population changes. Ethnicities and ethnic processes	5
8	Geochemical natural environmental factors. Threshold concentrations of chemical elements. Natural-endemic diseases. Interaction with biological objects. Study of natural focus of diseases	5
9	Impact of natural disaster. Extreme environmental conditions. Epidemiological consequences of various forms of transformation of nature: agriculture; forest operation and forestry works; creation of artificial reservoirs; reclamation works; intensification of livestock production; construction works	5
10	Problems of life quality and environmental safety. Methods of environmental risk assessment	5
11	Genetic engineering and biotechnology. Contribution of genotypic and phenotypic features in the spread of pathologies	5
12	Ecological problems of marriage and family	5
13	Stress and other psychological problems. Smoking, alcoholism, drug addiction	5
14	Nutrition ecology. Ukrainian cuisine and its traditions	5

15	History of global human epidemics. Wars and epidemics. Modern global and regional epidemiological identities	5
16	Cultural and geographical aspects of recreation. Public health organization in Ukraine	5

SECTION II. THEORETICAL BASICS OF THE DISCIPLINE

TOPIC 1.

SUBJECT, METHODS AND TASKS OF HUMAN ECOLOGY

For the first time the term "Human Ecology" appeared in 1921 in the work of American researchers Robert E. Park and Ernest Burgess, who used it in sociological research.

Park himself explains human ecology as, "fundamentally an attempt to investigate the processes by which the biotic balance and social equilibrium are disturbed, the transition is made from one relatively stable order to other".

Another American sociologist E. Bogardus acknowledges that Park is the father of human ecology, proclaiming, "Not only did he coin the name but he laid out the patterns, offered the earliest exhibit of ecological concepts, defined the major ecological processes and stimulated more advanced students to cultivate the fields of research in ecology than most other sociologists combined."

Today, human ecology is a science that studies the patterns of man as a biosocial individual with a complex multicomponent world, with a dynamic, constantly becoming more difficult, habitat, problems of maintaining and promoting health.

The short but capacious definition of human ecology, which was formed in the first half of the past century, has not lost its relevance.

Human ecology is a science which studies the patterns of human-to-human interaction and human interaction with the

environment, i.e. the conditions of human life and their impact on the human body.

The study of the biosphere, its age and spatial components, the impact of anthropogenic factors on it cannot be studied outside of man, human populations, and humanity as a whole.

Human ecology studies anthroposystems of different levels − from global to local and microlocal.

The global ecosystem can be considered as an anthropoecosphere, which is a multidimensional space that covers the entire surface of the Earth and consists of the biosphere (as interpreted by V.I. Vernadsky), with the inclusion of all the people who inhabit the planet (human society), who, using the natural resources of the planet by technical means, are with her (the planet) in a complex contradictory relationship.

Human ecology is considered as an analogue of autecology within the ecology of animals (action on the organism and its reactions) and from the standpoint of the interaction of the anthroposystem with the environment.

Understanding of social ecology can be multifaceted. From the point of view of N.F. Reimers, the division of these disciplines (human ecology and social ecology) is possible based on the dualistic quality of man himself:

- when it comes to the individual, the reproductive group − it is human ecology;

- when considering the social series, personality, family − it is social ecology;

- unification of scientific branches that study the relationship of the individual, family and other social groups with nature and the social environment − it is the synecology of man;

- the relationship between "nature and human society" on a global scale is studied by the global human ecology.

Human ecology is not limited to the study of environmental issues, the preservation of optimal parameters of natural, cultural, man-made environments, and appears as a synthesis of knowledge about man and everything around him, their relationships and interactions, enriches other fields of knowledge and human activity with anthropogenic principles.

The subject of human ecology as a science is the study of the interaction of the human body and human population with their environment as a whole system.

The object of study of human ecology is the system "man - environment (nature)". Man is considered at the level of the organism and at the level of the population, and the environment covers natural, social and man-made components.

Areas of research on human ecology:

- medical and biological, which studies the impact of environmental factors on humans, ways to prevent and counteract them;

- interdisciplinary (complex), which, in addition to environmental, takes into account socio-cultural factors.

Like every academic discipline, human ecology has a pedagogical task and overriding task.

The first is the formation of specific environmental knowledge, the second - in the formation of ecological consciousness, culture,

ethics, morality, human awareness of their place in nature, connections with the natural world and the universe inclusive.

Make aware to future ecologists the need to understand the naturalness of man as a species being that has a certain set of features and interactions and enters into material-energy and informational relationships with the environment - one of the most important, in our opinion, the course "Human Ecology".

TOPIC 2.
RESEARCH METHODS OF HUMAN ECOLOGY

Human ecology as an interdisciplinary and at the same time focused on clearly defined, specific issues, science in its research uses as a general scientific (based on philosophical principles), and specific (specific to a particular field of scientific activity) methods (ways) of knowledge of reality.

General scientific methods include empirical research (observation, measurement, comparison), empirical and theoretical (abstraction, analysis and synthesis, induction and deduction, analogy, modeling), theoretical (ascent from the abstract to the concrete, forecasting, system method), methods of mathematical statistics (variation series with the definition of mathematical expectation, variance (dispersion), standard deviation, obtaining intensive and extensive indicators to compare groups of people who have been exposed to various harmful environmental factors).

The most well-known ***specific method*** of studying human ecology is anthropoecological monitoring (a word derived from the Latin *monitor* − observation) − system of observations of changes in the processes of human life in connection with the effect of environmental factors on them, and monitoring and evaluating environmental conditions that adversely affect public health and cause disease spread.

When conducting anthropoecomonitoring, they often resort to invisible, specially organized observation of a real object. The experiment is little involved because because it is associated with health risks. Surveys and tests provide some information, but the

information obtained from respondents often contains a lot of subjective information, which requires additional verification.

To obtain the most objective information, it is necessary to use various research methods alongside.

Given the diversity and complexity of the interaction of society, man and the environment, human ecology minimizes the use of deductive (drawing conclusions from the general to the particular) models, which are largely influenced by subjective preferences, preferring a comprehensive analysis of the situation on the basis of comprehensive objective information.

Actively use in studying the impact of the environment on public health methods of mathematical statistics: construction of variation series with definition of mathematical expectation, variance, standard deviation, obtaining intensive and extensive indicators for comparison of groups of people who have been exposed to various harmful environmental conditions, etc.

The choice of research method depends on the geoclimatic conditions in which it takes place, the tasks that need to be solved, and the features of the research problem and so on.

To obtain objective data, you have to combine different methods and techniques, several ways to verify the results.

Depending on scientific preferences and methodological bases, two main directions of research of human ecology problems have been formed:

1) medical and biological, studying the impact of natural factors on humans, ways to prevent, counteract them;

2) interdisciplinary (complex), which, in addition to natural, takes into account socio-cultural factors.

Most researchers consider it necessary to use various methods of obtaining data, methods of analysis, taking into account all factors influencing humans, studying as many forms of interaction with the world, inclining thus to complex methods of cognition of the person and its existence in the world.

Human ecology is a young science, subject area, research apparatus, methodology, the theoretical foundations of which are in the process of formation.

In recent decades, it has developed particularly dynamically, due to the emergence of new challenges and threats to humanity.

Observations and conclusions of this science make a person think about the fact that its irrational, reckless actions in nature are harmful not only to a particular object (pond, tree, air, etc.), but also is a threat to their health, life, security of mankind.

The consequences of such activities can haunt its descendants for centuries, destroying the genetic code, provoking destructive mutations.

Realizing this, humanity has gained the strength to rise above their own instincts, the satisfaction of selfish passions, expanded the vision of the world and themselves in it to a planetary, global scale. Such feelings and considerations are the platform and the main resource of the culture of post-industrial humanity, which is beginning to realize the benefits and risks of a globalized world.

In this regard, human ecology as a science accumulates not only environmental, technological knowledge, but also ideas, principles from various fields of cognitive, research activities of man, concentrates in itself the anxieties of mankind for its existence and future.

TOPIC 3.
STRATEGY AND PRINCIPLES OF ECOLOGICAL DEVELOPMENT OF SOCIETY

In the course of its historical development, civilization periodically encountered problems (or crisis situations), the solution of which depended on its future life and destiny.

The paradigm shift of civilization is always associated with changes in the social order and, as a rule, the formation of new goals and objectives for the education system.

At the beginning of the XXI century, humanity once again stood on the brink of a civilizational crisis.

Dynamic, focused on the quantitative growth of development indicators man-made civilization, which was formed at the end of the twentieth century, has reached its critical limits.

Global problems which are called ecological have been identified and continue to deepen: uncontrolled population growth of the planet, powerful anthropogenic impact on the biosphere, depletion of natural resources, loss of biodiversity, environmental pollution, and threat to human health.

All of that is by no means a complete list of problems on the solution of which the life and destiny of mankind in the third millennium depend.

The study of the biosphere, its age and spatial components, the impact of anthropogenic factors on it cannot be studied outside of man, human populations, humanity as a whole.

3.1. History of the relationship between man and nature

In the history of mankind there are *three main types of human relations to nature*:

- adaptive,
- consumptive,
- responsible.

These types were formed under the influence of social relations and features of labour, characteristic of a certain type of development of society.

Until about the 1930s, the field of human activity coincided with the field of his immediate residence. What human perceived were mostly natural things, which he could see, hear, and feel with his senses. Man possessed nature, fitting into it, but his activities left nature essentially intact.

Modern human knows much more than he can see, or at least imagine. They can plan and perform actions that she is no longer able to feel. This changes their attitude to nature.

This relationship loses immediacy, becomes indirect, is mediated by calculations and devices. It loses its clarity, becomes abstract and formal.

Nature is increasingly becoming a confusing system of relations and functions that only mathematics can comprehend. Science and technology have learned to use the energy of nature and man himself on such a scale that indicates the onset of a new stage in the history of civilization.

Human is forced to live side by side with the danger that is constantly growing and threatening him. Hence the desire to regain

"naturalness", "conformity to nature" in the way of life and treatment of diseases, in upbringing and education, etc.

But it is impossible to go back. Hence, a new living space is needed for human who is aware of the meaning of his life and the ability to have a future. V.I. Vernadsky predicted that humanity would have to overcome an extremely difficult frontier – to learn a way of behaving that would stop the impending catastrophe and stimulate further progress.

Today, more than ever, there is a clear need for a new "environmental morality," a new vision of the world for every person living on Earth. The new attitude towards nature grows out of the awareness that humanity has reached the last limit, and requires vigilance and responsibility − things that are closely related to the problems of the "Ego" identity in human.

In the past centuries, economic considerations have forced people to shy away from the problems associated with unhealthy industries and products.

Even today, the demands of economic growth sometimes overshadow the problems of environmental pollution in underdeveloped countries. Therefore, it is not surprising that only in the recent past has there been an increase in the level of environmental awareness, which is associated with a number of events that have drawn our attention to the danger that threatens the planet.

It is known that the progressive economic development of nature and the accompanying numerous violations of the natural balance have become a source of civilizational problems, which today are called *environmental*. In the initial stages of civilization,

they were local in nature and did not significantly affect the stability of the biosphere.

During the formation of man-made civilization, according to the figurative conclusion of V.I. Vernadsky, "humanity is becoming a powerful geological force" that transforms the natural landscapes of the Earth. The transition to the industrial-informational stage of development in the second half of the twentieth century was characterized by an unprecedented growth in production, technology, agriculture, and the basic and applied sciences. Humans began to conquer outer space, created various weapons, learned to use the energy of the atom.

The growth of the planet's population as well as the powerful anthropogenic impact on the geosphere and uncontrolled technical development has exacerbated economic problems. For the past fifty years, civilization has been in a state of permanent ecological crisis that has put the biosphere on the brink of extinction.

Among all the problems of civilization, researchers distinguish three interrelated groups:

– political and socio-economic (normal functioning of the world economy, overcoming the backwardness of underdeveloped countries, etc.);

– natural and economic (raw materials, energy, food, environmental pollution, etc.);

– social (demographic, interethnic relations, crisis of culture and morals, lack of democracy, urbanization, declining health, etc.).

These problems have become global (universal), the development of civilization approached critical limits, the limits of the

growth of its quantitative indicators was clearly marked, and destructive processes became irreversible.

Today, the world has finally formed the idea that increasing the level of consumption is a destructive way of civilization.

With this in mind, the international community is creating organizations that are designed to define a strategy for solving global problems at the international level through international cooperation, implement practical measures aimed at protecting the environment.

In the 60s and 80s of the last century, the international community developed and adopted a number of conceptual documents: appeals to governments and peoples "The planet is in danger", report "Our Common Future", program "Agenda 21", in which it is emphasized that the path to the survival of mankind in the third millennium, to its sustainable development lies in the plane of changing the stereotypes of human interaction and the socio-natural environment, regulation of the population, reduction of consumption of resources by each person, economy and thrift, formation of reasonable material needs.

However, despite the measures taken by the world community, the destructive trends continue to grow. Repeated attempts to address at least some of the global problems in a purely technical way have failed, they continue to escalate.

It becomes obvious that within the technocratic paradigm of development of society and all its subsystems, overcoming the crisis of civilization is impossible. It is necessary to look for new conceptual approaches and new models of development.

Such approaches in the early twentieth century originated in the form of the idea of the noosphere, the concept of which is substantiated in the works of V.I. Vernadsky, Édouard Le Roy, Pierre Teilhard de Chardin.

Even earlier, ideas close to the noosphere were expressed by many scientists and thinkers: cosmism of Alexander von Humboldt and Rudolf Steiner, Russian cosmism of the early twentieth century (V.S. Solovyov, M.O. Umov, M.F. Fedorov, P.O. Florensky, K.E. Tsiolkovsky, O.L. Chizhevsky, etc.), later - the philosophy of Albert Schweitzer. Their works raised the problems of the unity of man and nature, the cosmic essence of man, his cosmic mission and the cosmic scale of his activities.

The ideas of the noosphere are most fully reflected in the works of V.I. Vernadsky on the role of the biosphere and noosphere in the history of the Earth. Today, these ideas are being developed by a large group of scientists: L. Anderson, D. Becker, M. Moiseev, O. Yanshin, O. Ursul and others.

In 1987, the Report of the World Commission on Environment and Development proposed the main provisions of the concept of *sustainable* (acceptable self-sustaining) *development*.

Sustainable development is a model of development of the global ecosystem − the biosphere, which maintains a dynamic balance between its individual subsystems (nature, society, geosystems). His leading idea is the ecological imperative: only what does not disturb the natural balance is right and allowed.

In 1992, the UN Conference on Environment and Development, held in Rio de Janeiro, adopted the program “Agenda 21” and approved it as a guide to action for all countries in the 21st century.

Fig. 3.1. What sustainability includes: social, environmental, and economic aspects

Among the main provisions of the concept was that humanity is able to give the development of world civilization a sustainable and durable character so that it meets the needs of people living today and does not deprive future generations. On its basis, concepts of sustainable development of a number of countries have been developed and implemented.

This idea is actively developing in Ukraine as well.

Philosophical understanding of the situation suggests that the problems of civilization are anthropological in nature and related to the philosophy and psychology of technocratic society.

Numerous studies show that human consumer thinking, which has been formed for millennia, the bifurcation of a once unified culture, disharmony in the development of its individual parts, dehumanization and technocracy - the root causes that underlie the

crisis of relations in the system "society-man-nature", and the rest − environmental pollution, biodiversity conservation, powerful anthropogenic impact on the landscape − just a consequence.

3.2. The stages of man's relationship with nature

Among the relationship of man with nature throughout human history today can be divided into the following stages:

The first stage. The appearance of the first people. Duration is ≈2 - 3 million years before the advent of *Homo sapiens*.

The biological essence of man as a biological being prevails. Relations with nature are limited by biological metabolism, without disturbing the dynamics of basic biological processes. Human society and the biosphere at this stage are the only functionally open global system in which weak anthropogenic influences could not cause political changes in the environment.

The second stage. (≈40 thousand years) lasted from the late Paleolithic to the middle of the twentieth century.

Humanity is already having a significant impact on the environment. The pressure on nature increases with the development of society and the improvement of production capacity and tools:

– Human activities have led to the degradation of natural ecosystems over large areas.

– Extinction of many higher plants and animals.

– But the nature of the functioning of the natural cycle of substances and energy flows on the planet itself, i.e. the dynamic balance of the biosphere, does not change.

The third stage (modern) – is the period of scientific and technological revolution.

According to Academician V.I. Vernadsky, humanity began to play the role of the most powerful geological force on the planet; its activities began to exceed the scale of the most powerful forces. Unfortunately, these forces were not directed at the formation of the sphere of mind (noosphere), as V.I. Vernadsky dreamed, and as a result of irrational use of nature and economic activity led to damage and depletion of natural resources, destruction of the mechanisms of self-regulation of the biosphere, deformation of the processes of the natural cycle of substances and energy, formed in the process of centuries of evolution.

Consequence: the progressive destruction of the biosphere, which can become irreversible and can lead to the impossibility of human existence on Earth.

Human ecology at all stages of historical development is interested in the following issues:

a) The number of individual groups of people and all mankind.

b) Age and gender structure of society.

c) Human health can be determined by life expectancy, the most common diseases and the most common causes of death.

d) The specifics of nutrition of people of each era, the caloric content of food, methods of its preparation.

e) Type of work, mechanisms and tools, energy sources used in the economy and everyday life.

e) Settlement system.

g) Cultural and hygienic skills.

The analysis of the listed characteristics will allow to receive knowledge of some important indicators which will be able to quantitatively reflect interaction of the person with an environment.

3.3. Human health as a comprehensive indicator of the state of human society

A comprehensive indicator of the state of human society is the level of health of people themselves.

The concept of "human health" is very capacious and covers biological, social, economic, scientific, ethical and other aspects. Scientists are still debating the interpretation of this concept, which in modern conditions is becoming a fundamental problem not only of medicine but also of human ecology.

According to modern ideas, ***health*** is a natural state of the organism that is in complete equilibrium with the biosphere and is characterized by the absence of any pathological changes.

According to the World Health Organization (WHO, 1948), “health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity”.

Given the above, most scientists attribute the following basic elements to health criteria:

- normal functioning of all systems and structures of the body;
- dynamic balance between the human body and the environment;
- human ability to perform basic social functions, to productive work;

- adaptability (ability to adapt) of the human body to changing environmental conditions;
- absence of disease or any signs of disease;
- physical, spiritual, social well-being, harmonious development of physical and spiritual forces.

Table 3.1. Risk factors for the formation of human health

Spheres	Specific weight, %	Group of factors
Lifestyle	49 –53	Smoking Alcohol consumption Drug use An unbalanced diet Working conditions Living conditions Stress, distress Adynamia, hypodynamia Instability of family life
Genetics	18 – 22	Predisposition to hereditary diseases
External environment, nature	17 –20	Pollution of air, soil, water (chemical, carcinogenic, allergic substances) Sharp changes in atmospheric phenomena
Health care	8 – 10	Ineffectiveness of preventive measures Low quality of medical care Untimely medical care

Thus, the problem of human health is in the preservation and development of its mental, physiological and biological abilities,

which will contribute to optimal performance, social employment and maximum life expectancy.

From table 3.1. it is clear that the category of health is formed of three components: a way of life, an organism and the environment.

To a large extent, depending on hereditary factors, health is the result of human interaction with their environment and is largely (49-53%) determined by human mode of life.

Mode of life (way of life, habit of life) is a certain, historically determined type, type of life. Mode of life is a biosocial category that integrates the idea of a certain type of human life and is characterized by his work, life, form of satisfaction of material and spiritual needs, the rules of individual and social behaviour.

In other words, the way of life is the "face" of the individual and at the same time a reflection of the level of social progress.

A person's mode of life is largely determined by social and environmental conditions, but at the same time it depends on the motives of human activity, the peculiarities of his psyche and the functional capabilities of the organism. This, in particular, explains the real variety of lifestyle options for different people.

Social conditions of human life are determined by the socio-political structure, socio-economic structure. Social conditions are manifested through social factors: working conditions, conditions of rest, living conditions, food, housing, cultural needs, relationships.

Mode of life includes three categories:

- standard of living;
- quality of life;
- lifestyle.

The standard of living is primarily an economic category that reflects the degree of satisfaction of material, spiritual and cultural needs of man. Quantitative side of the standard of living is national income, consumption funds, the size of real incomes, housing, and health care.

Quality of life is a degree of comfort in meeting human needs (mostly a social category).

Lifestyle characterizes the behavioural features of human life, ie the model that reflects the psychology and psychophysiology of the individual (socio-psychological category).

If we try to assess the role of each of the categories of lifestyle in the formation of individual health, we can note that the first two are equipotential because they are social in nature.

It is clear that human health will depend primarily on a lifestyle that is more personal and determined by historical and national traditions (mentality), as well as personal inclinations.

The most complete relationship between lifestyle and health is expressed in the concept of "healthy lifestyle" (or Healthy Living − HL).

According to WHO, “a healthy lifestyle is a way of living that lowers the risk of being seriously ill or dying early”.

A healthy lifestyle combines everything that contributes to the performance of professional, social and household functions in optimal health conditions and expresses the orientation of the individual in the direction of forming, maintaining and strengthening their health.

According to modern scientific research, the health of an individual is influenced *by three basic factors*: biology, behavior, and

environment. When determining how to create changing in health, we know that changing an individual's biology is not feasible and changing an individual's behavior is challenging. This leaves addressing the environment in which an individual lives, works, learns, and plays. We know that where you live affects how you live.

Policy, systems, and environmental improvements is a way to modify the environment that defaults to the healthier choice for all which has more of an impact on the health of the population.

Dr. Thomas R. Frieden (2010) constructed the health impact pyramid (Figure 3.2.) which provides a framework to guide health promotion efforts.

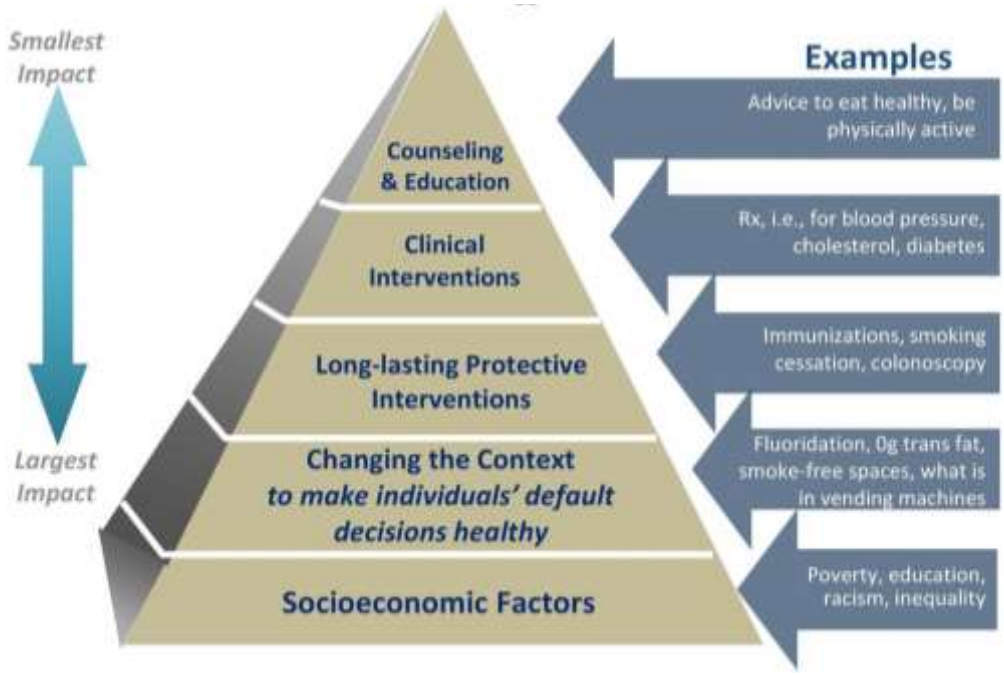

Fig. 3.2. The Health Impact Pyramid

(Source: Frieden, 2010)

The pyramid describes 5 levels of intervention to prevent poor health outcomes and promote well-being. The levels are organized

according to the individual effort required to participate in the interventions and the interventions' ability to change population-level conditions.

According to the model, these two are inversely related (i.e. those interventions that require the most individual effort have the least potential to create widespread change).

Much like the familiar “Hierarchy of Needs” proposed by Abraham Maslow, the base of the pyramid reflects the most fundamental of interventions to promote health: assuring positive and equitable socioeconomic conditions for all. This represents the foundation on which all health promotion efforts must be built; the prerequisite for well-being.

Individual-level counseling and education are situated at the peak of the pyramid, representing a class of interventions that require substantial individual participation and produce minimal impact on population-wide conditions. These are the interventions with which practitioners in the violence prevention field may be most familiar.

They include school-based violence prevention programs and therapy for youth with elevated risk for violence. These programs are capable of producing significant changes in individuals' attitudes and behaviors when they are delivered with adequate dose. They are an essential part of violence prevention.

They are, however, fairly expensive and time-consuming to carry out. As a result, they tend to reach fewer people. What's more, they do little to change the contexts and environments in which people live, work, play, and learn - all of which have *a greater*

influence on health than individual traits do, and all of which are essential to bolstering the effects of counseling and education.

Interventions focusing on lower levels of the pyramid tend to be more effective because they reach broader segments of society and require less individual effort. Implementing interventions at each of the levels can achieve the maximum possible sustained public health benefit.

TOPIC 4.

HUMAN ADAPTATION TO ENVIRONMENTAL CONDITIONS

In the second half of the twentieth century on the planet Earth formed the Noosphere. The criterion for its emergence was a qualitatively new, autonomous from the Biosphere, internally self-sufficient system of existence of the world community *Homo Sapiens*.

Throughout world history, humanity has evolved as part of the Biosphere as part of it. That is, humanity was connected to the Biosphere, its control mechanisms, like any other species.

At the present stage, humanity is faced with the problem of conscious harmonization of its interaction with the physical environment - mutual adaptation.

Adaptation is a purposeful system of reactions of the organism, which provides the possibility of all types of social activities and activities under the influence of factors, the intensity and extent of which leads to a violation of homeostatic balance.

The body's response to new and sufficiently strong environmental influences is provided, first, by a system that specifically responds to the stimulus and, secondly, stress − is provided by implementing adrenergic and pituitary-adrenal systems, non-specifically responding to various changes in the environment (Hans Selye, 1956; P. Anokhin, 1965).

Provided that the acting factor is extremely strong, or when the situation that has arisen in the environment is quite complex, an effective functional system is not implemented.

As a result, the initial disturbances of homeostasis persist, and the stress syndrome stimulated by them reaches extreme intensity and longevity.

In this situation, this syndrome can turn from an instrument of adaptation into a tool of injury and there are numerous stressors, which are observed, according to scientists, among the population living in areas contaminated with radionuclides.

4.1. Adaptogenic factors

Since the existence of man, his health has been formed and continues to be formed under the influence of environmental factors.

Man has adapted to the environment in the process of evolution and cannot live without it, because it is common to his inner environment.

This interaction should not disrupt the adaptive mechanisms of the human body, because from the beginning of embryonic origin to the end of his life a person comes into contact with environmental components (air, water, soil, food, etc.).

Adaptive factors in the evolutionary development of the human body are manifested in extreme situations, when the body is suddenly affected by stimuli, as well as due to changes in the general conditions of its existence.

In relation to humans, adaptogenic factors are inherently natural and social (Fig. 5.1).

Natural factors of human adaptation. Human as a result of the development of nature is evidence of the inseparable interaction of abiotic natural factors and living organisms.

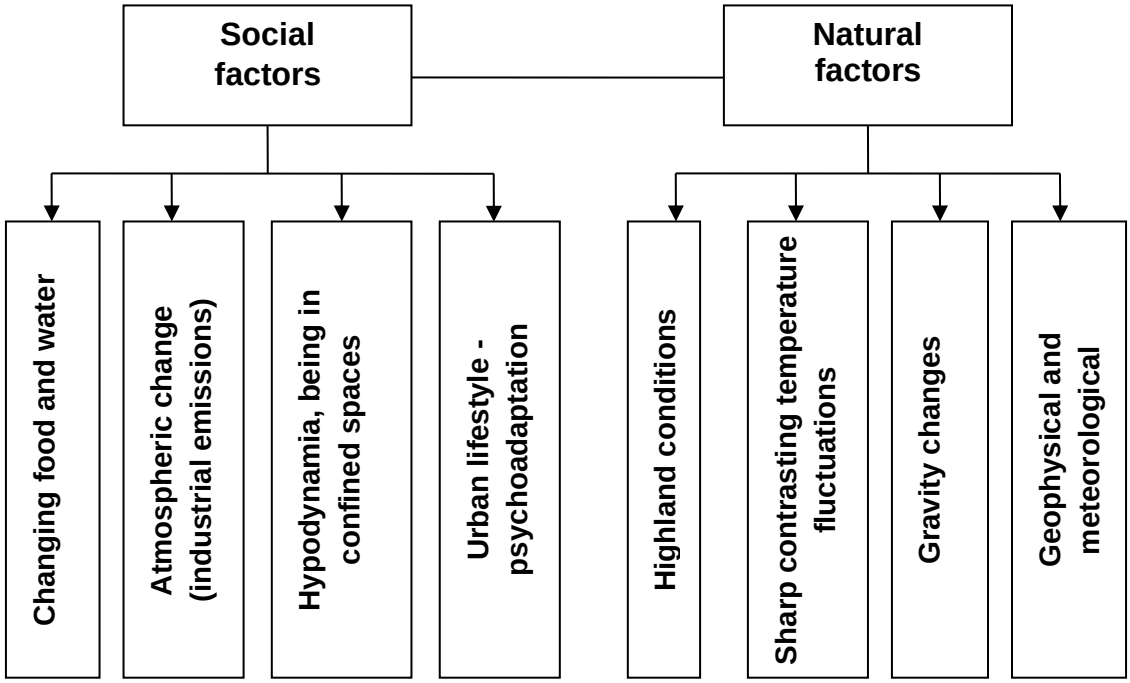

Fig. 4.1. Factors of adaptation

Natural factors that determine the development of adaptation mechanisms are always complex. From the very beginning, all living organisms adapted to the earth's living conditions (barometric pressure, gravity, radiation, the state of the planet's gas shell, the chemical composition of food, etc.).

In the process of evolution, the human body has adapted to the natural change of the seasons, each of which is characterized by a certain temperature, light, humidity, radiation fluctuations. In this regard, an important role is played by the mechanism of previous changes in the body, such as hardening, which ensures the body's resistance to temperature changes.

In addition to seasonal changes, the human body adapts to changes of day and night, physiological biorhythms.

Social factors of human adaptation. Social conditions of human life, especially factors related to his work, have created a specific environment to which his body also needs to adapt.

The number and direction of these conditions develops in proportion to the development of civilization.

For example, with the deployment of space exploration, man had to adapt to a state of weightlessness that causes hypodynamics (disorders of body function, especially the musculoskeletal system, blood circulation, respiration, digestion, caused by limited motor activity, and decreased muscle contraction), changes in daily biorhythms and more.

Social adaptogenic factors are work in deep underground mines, deep dives, work on high-temperature technologies or in too cold conditions.

Human has to adapt to living in conditions of changing light, high noise, environmental pollution, food with high content of synthetic products and more.

In the process of development of society and changed the conditions of human production, evidence of which is the replacement of physical labour by machines and mechanisms that reduce physical activity, leads to hypodynamics, stressful situations, which negatively affect all body systems.

The number of adaptogenic factors is especially growing at the present stage, with rapid man-made development, which modifies and increases the number of both social and natural adaptogenic factors.

At the present stage of its development, mankind has greatly expanded the boundaries of its residence and activities. Today, it is

possible and even necessary to live in conditions that are radically different from those in which humanity was born and evolved over millennia.

Development of areas with extreme natural conditions (with too high or low temperatures of high mountain areas where there is a lack of oxygen), introduction of new technologies, which force employees, for example, with a significant reduction in physical activity to feel too high psychological load and responsibility, cause an imbalance between the biological nature of man and the need to adapt to ever-changing conditions.

4.2. General patterns of human adaptation

Adaptation of organisms to environmental conditions occurs in the following **areas**:

a) genetic adaptation − the ability of organisms distributed over a large geographical area to form ecotypes (populations) adapted to specific natural conditions;

b) biochemical adaptation − the ability of organisms to change their metabolic activity (metabolism) and chemical reactions, which allows to preserve life processes in the new environment;

c) morphological adaptation − adaptation at the level of cells and tissues of the body;

d) physiological adaptation − a set of physiological features that ensure optimal functioning of organisms in stable or changing external conditions.

Depending on the type and characteristics of the impact on the human body, there are the following **groups of adaptation processes**:

a) mutational adaptation − the evolution of a population, which culminated in the creation and formation of races;

b) modification adaptation − the process of human acclimatization to changes in environmental conditions;

c) modulation adaptation − direct human adaptation to rapidly changing environmental conditions (positive or negative reactions to short-term changes).

In far from optimal conditions of existence the biological and labour activity of the person decreases, and in a certain environment the human organism cannot exist at all. For example, a person without special training will not be able to fully work and live permanently in the highlands (at an altitude of more than 5000 m) or in the arid (dry) zone of the desert at an average air temperature of +40° C.

It is best if everyone has the opportunity to live in an optimal place for themselves, where their physiological systems would coexist harmoniously with the physical and social environment, which is a prerequisite for maintaining long-term performance.

Otherwise, her body is forced to adapt to the external environment, and the form, content, duration of adaptive activity, acquired qualities are determined by the characteristics of this environment.

This human activity is universal, covering climate-geographical, physiological, social and other aspects. Evidence of adaptation of the organism to unusual living conditions can be members of Arctic expeditions, astronauts, submariners, representatives of other professions.

The first form of human adaptive activity is **genotypic adaptation**, as a result of which modern species of living organisms have been formed on the basis of heredity, mutations and natural selection.

The complex of species hereditary traits (genotype) is the basis of individual adaptation, which occurs in the process of interaction of a particular organism with the environment and is provided by ***specific*** environment structural changes.

In the process of individual adaptation, a person creates reserves of memory and habits, forms vectors of behaviour. The genetic program of the organism provides an effective focus of vital adaptive responses to environmental influences. Each new generation of people adapts in its own way to many factors that require a kind of specialized reactions.

According to research, the active adaptation of the organism to one factor improves its resistance to a complex of other factors, after which the organism acquires a new quality. Under such conditions, adaptive reactions are formed, which increase resistance to overload, extreme temperatures, physical performance and inhibit the development of many pathologies.

Adaptive behaviour of living organisms can be realized in the form of escape from an adverse stimulus, passive submission to it, and active resistance to the environment due to specific adaptive reactions.

That is, with the change of certain components of the environment, the human body is forced to change some of its functions. There is a restructuring of its homeostasis (internal environment and the activities of various body systems) in

accordance with specific conditions, which is the basis of adaptation. Thus, adaptation is a specific chain of reactions of body systems, in which some of them change their activities, others regulate these changes.

Nonspecific reaction of the body, which occurs under the influence of any strong influences (stressors) and is accompanied by a restructuring of the body's defence systems is defined as stress.

The term "**stress**" (after the English − *tension*) refers to a nonspecific reaction of the body, which occurs under the influence of any strong influences (stressors) and is accompanied by a restructuring of the body's defence systems. Stress also can be defined by psychologists as the body's reaction to a change that requires a physical, mental, or emotional adjustment or response (Dyer, K. A., 2006).

Canadian scientist Hans Selye pointed out that despite the variety of stressors (trauma, infection, hypothermia, intoxication, narcosis, strong emotions, etc.) − all of them lead to the same type of changes in the thymus and adrenal glands, lymph nodes, blood composition and metabolism. In experiments on rats, he observed a typical triad, which includes hypertrophy of the adrenal cortex, diseases of the thymic-lymphatic system and haemorrhagic ulcers on the mucous membrane of the stomach and duodenum.

Stress manifests itself in the form of a general adaptation syndrome, which consists of three successive stages (general adaptation syndrome − GAS):

- alarm reaction;
- stage of resistance;
- stage of exhaustion.

Alarm reaction means immediate mobilization of the body's defenses. It consists of a phase of *shock and counter-shock*.

In the *shock phase* there is muscular and arterial hypotension, hypothermia, blood clotting, eosinopenia, increasing the permeability of capillaries. This phase is characterized by decay processes (catabolism).

The *counter-shock phase* is characterized by changes in the opposite direction (increase in blood pressure, muscle tone, blood glucose), which leads to the development of the next stage of resistance. In the counter-shock phase, the secretion of corticotropin and corticosteroids is steadily increased.

In the ***stage of resistance***, the cortical substance of the adrenal glands is hypertrophied, which secretes a large number of hormones that activate anabolic processes.

Signs of the resistance stage include:

- irritability;
- frustration;
- poor concentration.

At long action of a stressor adaptation of an organism is broken. There is a depletion of functional reserves, atrophy of the cortical substance of the adrenal glands, lowering blood pressure, the breakdown of protein molecules. This stage is called the ***stage of exhaustion***.

Signs of exhaustion include:

- fatigue;
- burnout;
- depression;

- anxiety;
- decreased stress tolerance.

The physical effects of this stage also weaken your immune system and put you at risk for stress-related illnesses.

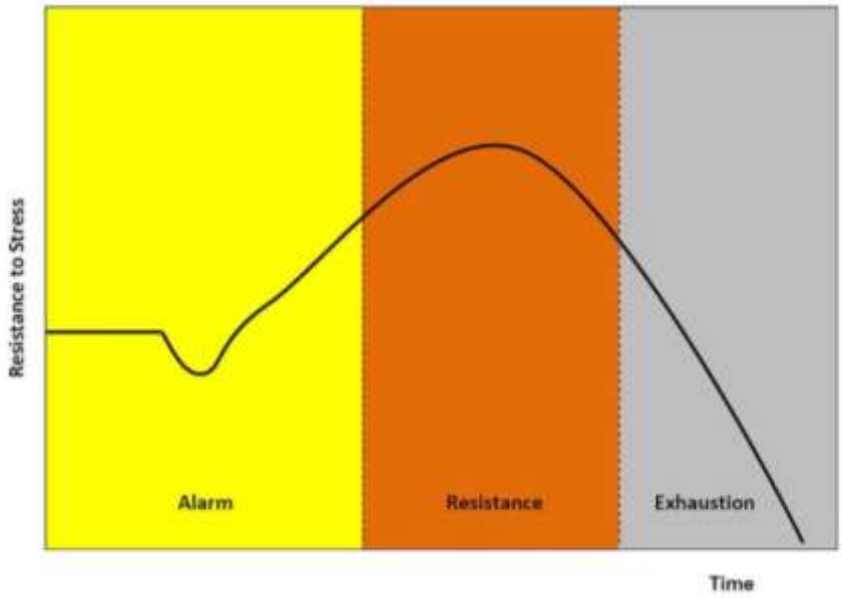

Fig. 4.2. In Selye's GAS model, stress affects an individual in three steps: alarm, resistance, and exhaustion

The end result of stress depends on the ratio of strength and longevity of the stressor and the potential of the body's defences.

The biological significance of the adaptation syndrome is not only that in its second stage increases the resistance (endurance) of the organism to the factor that caused the state of stress, but also because at not so strong and long-term stress nonspecific resistance of an organism to other factors can be created or increased. Corticotropin and corticosteroids play a leading role in the formation of nonspecific resistance, so they are called adaptive hormones.

Systematic effects on the body of weak and moderate stimuli (cold shower, exercise) maintain the readiness of the endocrine system for adaptive responses.

Insufficient adaptation is the cause of the development of adaptation diseases (hypertension, gastric and duodenal ulcers, rheumatism, bronchial asthma, skin diseases).

Factors such as hypothermia, overheating, physical fatigue, and excessive salt intake are of great importance in the occurrence of adaptation diseases.

Not only endocrine mechanisms but also the nervous system is involved in the stress response. Thus, stress is a complex neuro-humoral reaction, the development of which involves the nervous and endocrine systems.

As can be seen from the above, since the basis of life is metabolism (metabolism), the process of adaptation must be manifested through changes in metabolism and maintain it in new conditions.

Steady and directed changes in metabolism are preceded by changes in certain systems of the body, especially in the circulatory and respiratory systems. A special role in the adaptation process belongs to the nervous system and internal secretion glands.

TOPIC 5.
THE RELATIONSHIP BETWEEN HUMAN HEALTH AND ENVIRONMENTAL FACTORS

5.1. The impact of the natural environment on humans

Since the existence of human, his health has been formed and continues to be formed under the influence of natural factors on the body.

Man has adapted to the environment in the process of evolution and cannot live without it, because it is common to his inner environment.

From the beginning of embryonic birth to the end of his life, human being is in contact with the components of the environment (air, water, soil, food, etc.). The vital activity of the organism is in a continuous dynamic relationship with environmental factors. This interaction should not disrupt the adaptive mechanisms of the human body.

Under the influence of various stimuli of the internal and external environments of the person in his body unconditional and conditioned reflexes are created, which determine the maintenance of dynamic balance, which is based on the exchange of substances and energy between the organism and the environment.

Environmental factors must effectively affect health and ensure the normal course of all human life processes.

Human being, as a biological species, is a part of nature, and environmental factors affect it in the same way as any other species. Even in the absence of anthropogenic impact, human health depends on many abiotic and biotic factors. The output of the values

of certain factors outside the range of the optimum worsens the human condition, reduces its resistance and resistance to various diseases.

Abiotic factors that influenced humans in the past continue to influence today.

Space, helio- and geophysical factors. The influence of the sun on human health has been observed since ancient times. However, detailed research on this began only in the XVIII - XIX centuries.

Today it is known that the influence of the Sun is associated primarily with an 11-year cycle of solar activity, the increase of which causes perturbation of the magnetosphere and ionosphere. Such perturbations, in turn, cause an increase in the strength of the Earth's electromagnetic field, and this directly affects the body.

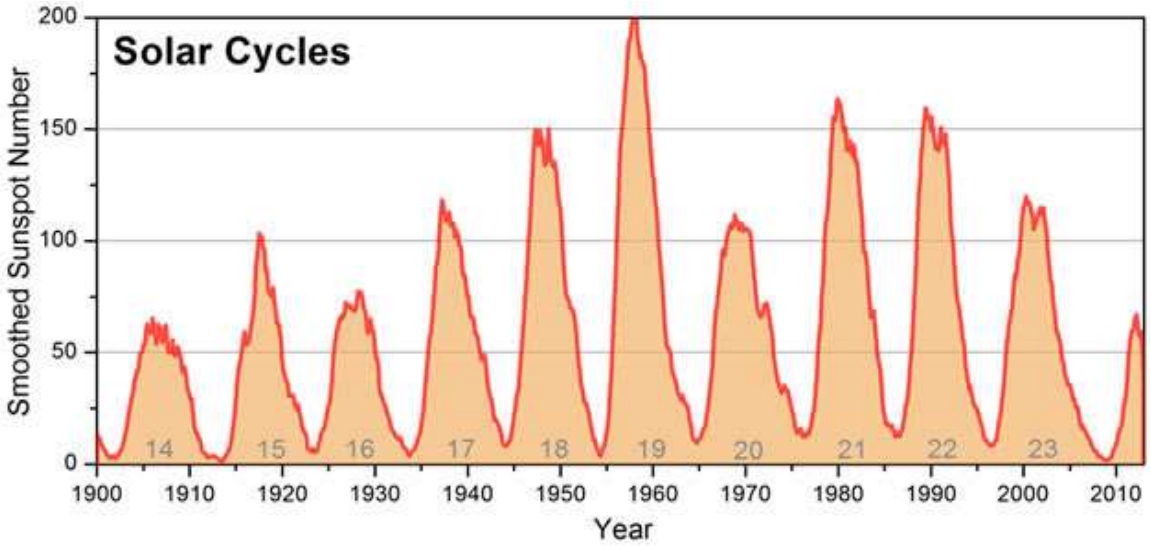

Fig. 5.1. The Solar Cycle

(Source:

https://training.weather.gov/nwstc/spacewx/wmo/lesson2/solarcycle.html)

During the years of increased solar activity or when magnetic storms occur, there are more cases of disorders of the cardiovascular and nervous systems, psyche and behavior. Bursts of solar activity lead, on the one hand, to a weakening of immunity, on the other hand - to increase the aggressiveness of pathogens and natural carriers of infections.

Thus, the probability of infectious diseases, including those that have the nature of epidemics, including influenza, cholera, and dysentery.

Another factor is the level of ***ultraviolet radiation***. It determined the frequency of mutations throughout almost the entire history of the biosphere. In small doses, ultraviolet light is necessary for the evolution of the biosphere: mutations create genetic diversity in populations and thus supply material for natural selection.

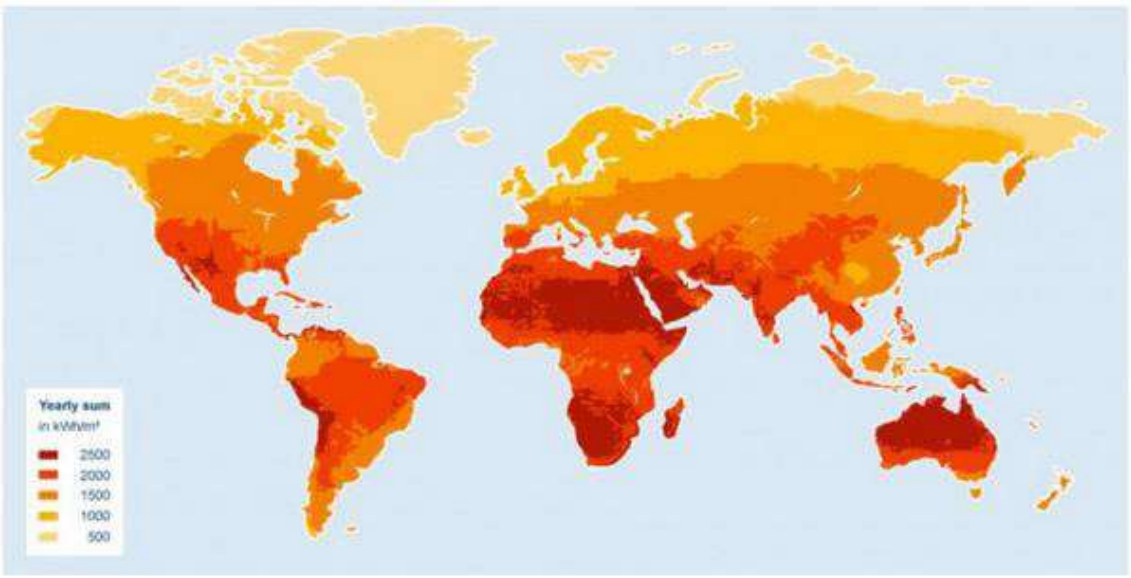

Fig. 5.2. World solar radiation map

(Source: https://www.researchgate.net/figure/World-solar-radiation-map_fig1_273695628)

Ultraviolet in small doses is useful for humans: it has an antiseptic and bacteriostatic effect, prevents inflammatory processes in the hair follicles, and inhibits the development of pathogenic fungi that cause skin diseases − dermatomycoses.

In large doses, ultraviolet radiation is dangerous: it causes mostly harmful mutations (yes, one beneficial mutation accounts for about a few thousand deaths). Excessive radiation increases the likelihood of developing malignancies - cancer, sarcoma, leukemia.

A thin ozone shield in the upper atmosphere protects living matter from the harmful effects of ultraviolet light. Today, the existence of this screen is under threat. Therefore, ultraviolet radiation is increasingly seen as a factor, the degree of danger of which depends on the person.

Climatic and meteorological factors. Of these, a person is most affected by temperature, relative humidity and atmospheric pressure. Climatic factors are closely related to the functional state and protective reactions of the body, as well as motivation for behaviour. This, in turn, determines the likelihood of a number of diseases, including mental disorders.

At excessively high temperature physical activity of people is suppressed, probability of diseases of cardiovascular system and kidneys increases.

Low temperature contributes to the development of inflammation of the respiratory system and rheumatism. It is believed that low temperatures and relative humidity of less than 50% contribute to the survival and spread of the influenza virus.

Sudden temperature fluctuations are especially dangerous: they cause disorders of the cardiovascular system, mental disorders. The effect of temperature is amplified in conditions of high humidity.

Changes in atmospheric pressure affect the health of those people who suffer from arthritis and osteoarthritis (diseases that are accompanied by joint pain and changes in their shape).

One of the manifestations of atmospheric pressure is mountain sickness. At an altitude of about 3,000 m, due to a decrease in the partial pressure of gases, hemoglobin is insufficiently saturated with oxygen, and hypoxia (oxygen starvation) develops. At the same time there are shortness of breath, weakness, rapid heartbeat, sometimes the person faints. At high altitudes (more than 5000 m) may develop pulmonary edema, and due to cerebral hypoxia - coma. Mountain sickness is more common in untrained people, especially those who abuse alcohol.

Large and rapid changes in atmospheric pressure can cause caisson disease, which is also associated with sudden changes in the partial pressure of gases in the blood and "boiling" in the vessels of nitrogen. The released nitrogen bubbles can clog the capillaries and lead to fainting and even death. Caisson disease most often develops in aqualungers and divers if they violate the rules of ascent to the surface.

Into the nervous system of people and their psychotic stun, they pour it into a lot. Through frequent heat, dryness is often caused by abnormal behaviour of people.

Many people are affected by wind-related "foehn disease", when 1-2 days before the onset of winds in the blood and tissues increases the content of the biologically active substance serotonin,

which affects the transmission of nerve impulses. Some people suffer by headache, nausea and sleeplessness, together with irritability, depression and a general feeling of debility. Medical examination reveals an increased pulse rate and a fall in blood pressure.

Forests are being cut down, steppes are being plowed, fertile lands are turning into barren salt marshes, and dry winds are increasingly sweeping over the Earth. Climate and weather are shaken by man, and this inevitably affects his well-being.

Climate change, together with other natural and human-made health stressors, influences human health and disease in numerous ways.

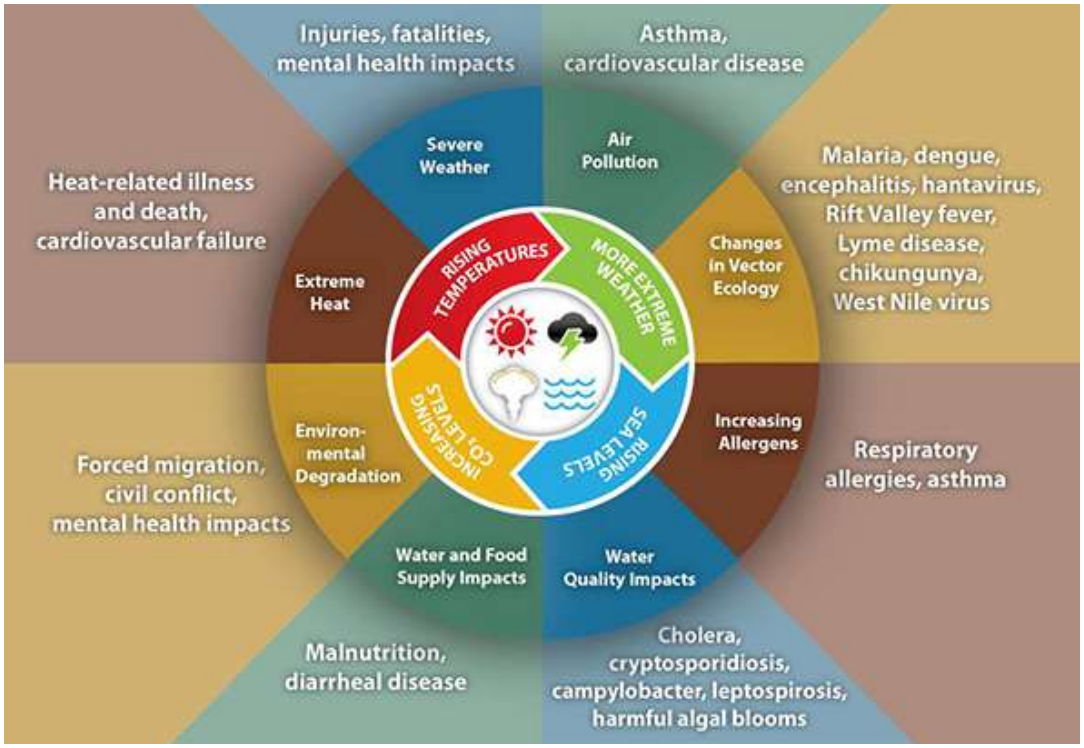

Fig. 5.3. Impacts of climate change on human health

(Source: Centers for Disease Control and Prevention (CDC), 2016: https://www.cdc.gov/climateandhealth/effects/default.htm)

Some existing health threats will intensify and new health threats will emerge. Not everyone is equally at risk. Important considerations include age, economic resources, and location.

Climate change threatens human health and well-being in many ways, including impacts from increased extreme weather events, wildfire, decreased air quality, threats to mental health, and illnesses transmitted by food, water, and disease-carriers such as mosquitoes and ticks.

Edaphic and hydrological factors. Lack or excess in the environment of certain chemical elements and substances largely determines the health of definite populations.

Diseases associated with regional edaphic (soil), hydrological or epidemiological features are called *endemic diseases* (i.e. specific to certain regions).

For example, iodine deficiency in water and food causes thyroid disease, calcium deficiency causes bone fragility, and cobalt or iron deficiency causes anemia.

Excess of certain elements is also dangerous. Yes, excess boron causes digestive diseases and pneumonia. Due to the lack of fluoride, caries usually occurs, but its excess (up to 1 g/l) leads to tooth damage - fluorosis; at even higher concentrations (from 5 g/l) begins ossification of the ligaments, impaired liver function, and stomach.

In many cases, several factors, each of which is in the zone of pessimum, affect in a complex way. Thus, low calcium content in combination with excess iron, strontium, lead and zinc causes bone deformation, impaired cartilage formation, curvature of the spine.

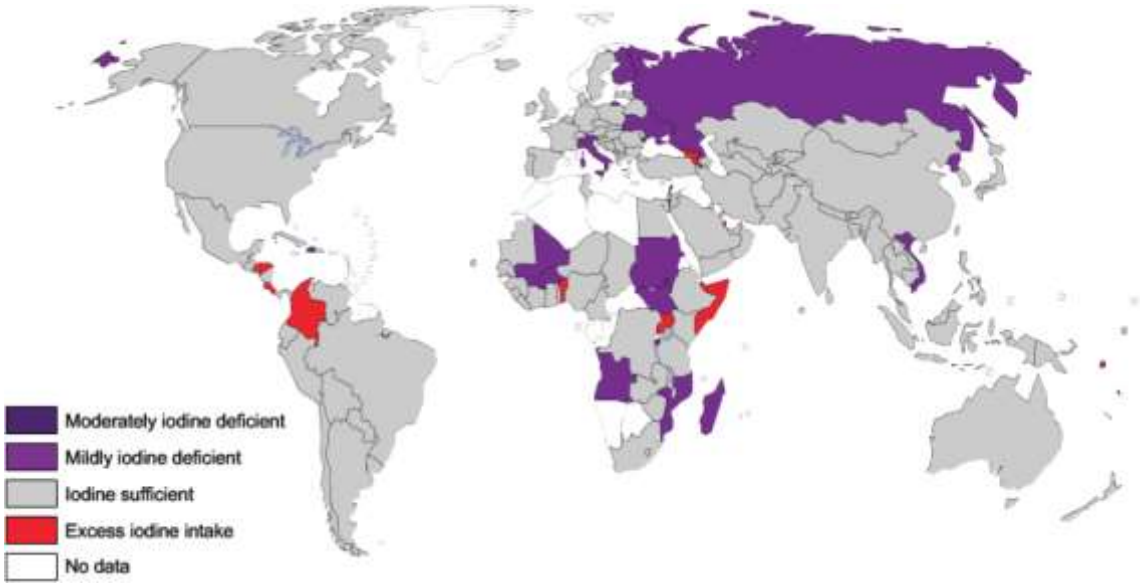

Fig. 5.4. Shows countries classified by iodine nutrition in 2017. Iodine intake is inadequate in 19 countries, adequate in 110 and excessive in 10.

(Source: Iodine Global Network Global Scorecard of Iodine Status. http://www.ign.org/cm_data/Scorecard_2016_SAC_PW.pdf)

This is an endemic disease called urov disease, "in honour" of the Urov River (the Trans-Baikal territory), which occurs in areas where the disease is very common.

Most of the deterioration of health due to lack or excess of certain substances in water and food is associated with a deficiency of calcium, iron, iodine or an excess of certain metals, especially manganese, zinc, lead, mercury, boron.

Lack of trace elements, which are part of vitamins - a common cause of avitaminosis (for example beriberi − a disease caused by a vitamin B-1 deficiency).

However, now human himself has begun to have a significant impact on climate and weather. As a result of emissions of large

amounts of carbon dioxide into the atmosphere, the range of temperature and pressure fluctuations increases.

Biotic environmental factors are factors of organic nature that affect the organisms of other organisms.

Human beings, like other living organisms, can enter into various relationships with animals, plants and with their own kind. Some forms of this relationship have developed during the natural evolution of organic society.

From generation to generation, people passed information about the benefits and harms of certain living organisms. At the same time used the most ancient method of research − the method of observation.

Useful plants have long been part of the room culture. However, it was not until the 20th century that their usefulness was scientifically proven.

In particular, houseplants affect the microclimate of the room, absorbing some harmful substances, including excess carbon dioxide. In addition, houseplants have aesthetic and recreational value.

The green colour of plants has a positive effect on health. It does not tire the eyes, relieves eye strain, normalizes intraocular pressure, and improves blood supply to the eyes.

In the second half of the twentieth century, aromatology began to develop, which attracted the interest of chemists, physicians, and ecologists. Plant aromas have been found to be able to affect respiration, muscle excitability, nervous system, and brain biorhythms.

For example, the scents of lavender and rosemary relieve stress and calm the nervous system. When working with a computer monitor, the number of errors is reduced if you inhale the smells of houseplants: lemon - by 54%, jasmine - by 33%.

Many houseplants are grown due to their excellent property - to emit phytoncids into the environment.

Phytoncids – these are bactericidal (bacterial antagonists), fungicidal (antagonists of fungal infection), antiscidal (antagonists of protozoa) volatile substances, which play a significant role in the relationship of organisms in plant groups and is one of the factors of natural plant immunity.

Phytoncides increase the bactericidal ability of air, making it clean. The mechanism of its phenomenon is associated with the transformation of ozone molecules into electronically excitable oxygen molecules - ozone, which can destroy the DNA structure of pathogenic microorganisms.

A bactericidal property of air, which contains volatiles, determines its properties, such as freshness.

Fresh air cures many diseases, improves health: has a positive effect on the nervous system, increases motor activity, secretory function of the gastrointestinal tract, improves metabolism, stimulates the heart.

There is a need to deeply develop the theory of phytoncides in close connection with the theory of phytodesign. Plants, properly selected and placed with good taste, create a psychologically favorable environment, have a positive effect on people's mood, give the room a unique color and a certain comfort.

5.2. Anthropogenic impact on nature and human health

Anthropogenic disturbances of the biosphere. As a result of its economic activity, humanity is already influencing the Biosphere 2,000 times stronger than it does on itself.

This is projected to lead to huge global changes over the next 50 years. The area of deserts will increase by 50%, a quarter of all living beings will disappear, it is possible to destroy the Biosphere as a self-sufficient system and create a fully controlled subsidiary economy of the Noosphere instead. The Noosphere itself as a system is likely to survive. The Noosphere will obviously survive, but the world will change radically with unpredictable consequences for the further evolution of the Noosphere.

The sphere of distribution and evolution of life − the biosphere, has existed for more than three billion years.

Human evolution within the biosphere takes place at the stage of bio- and anthropogenesis. Gradually, humanity becomes a powerful factor in the biosphere, which changes the structure of the very foundations of the biosphere.

But we do not rule over nature, we are inside it. The highest social laws play a leading role in human society and the biosphere as long as they do not conflict with the laws of biology, chemistry, physics, etc. The highest social law is not able to stop the laws that are leading at all levels of development of nature, although it has a real opportunity to use it for themselves.

Mankind needs to realize that our planet is a kind of living organism that lives in accordance with certain principles, laws and norms of existence.

Ignoring this situation, the spontaneous use of the resources of the inorganic world and the biosphere on a huge scale has led to unpredictable serious violations of the laws of the biosphere, in particular the laws of the biotic cycle, caused by anthropogenic pollution.

Chemical, radioactive and bacteriological contamination of air, water, soil and food, as well as noise, vibration, electromagnetic fields and other physical contamination of the environment cause genetic changes in the human body and severe pathological phenomena. This leads to an increase in disease, the birth of defective children, premature aging and death.

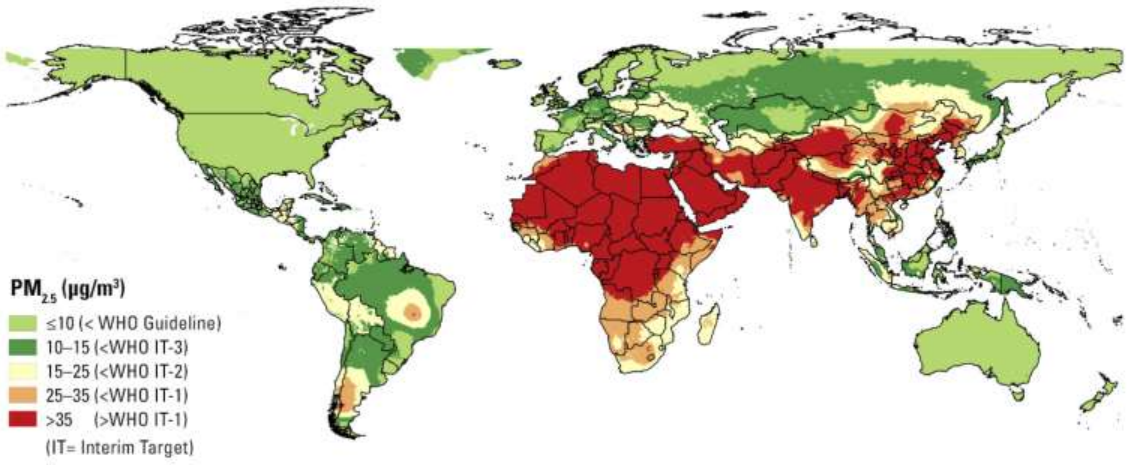

Fig. 5.5. Annual average $PM_{2.5}$ concentrations in 2017 relative to the WHO Air Quality Guideline

(Source: https://www.stateofglobalair.org/)

The end of the XX century was marked by the fact that as a result of the scientific and technological revolution and urbanization

of our planet, the negative impact of violations of the Earth's biosphere on human health has increased significantly.

The human body is no longer able to adapt quickly to these rapid and global changes. Anthropogenic pollution of environmental components is a particular threat to human health.

Atmospheric air pollution (see Fig. 5.5.) is a common cause of inflammatory diseases of the respiratory system and eyes, diseases of the cardiovascular system, infectious diseases and lung cancer. In areas with polluted air, children are more likely to get sick. They have low body weight and level of physical development, as well as functional disorders of the cardiovascular and respiratory systems. The incidence of respiratory diseases is about 75% of the total number of diseases.

Water is also one of the most important environmental factors. It is necessary to ensure the viability of the human body. Water pollution is the cause of many diseases. Diseases caused by chemical and bacteriological water pollution occur as a result of contaminated wastewater entering reservoirs.

Intestinal infectious diseases (cholera, typhoid fever, dysentery, tuberculosis, leptospirosis, anthrax, etc.) pose the greatest danger of spreading diseases by water. According to the WHO, 80% of all diseases in economically underdeveloped countries are associated with poor quality water and violations of sanitary and hygienic standards.

Chemical contamination of water with mercury causes Minamata disease with severe damage to the central nervous system (there are impaired motility, impaired vision, hearing loss,

severe headaches, muscle weakness, paralysis, coma and often fatal).

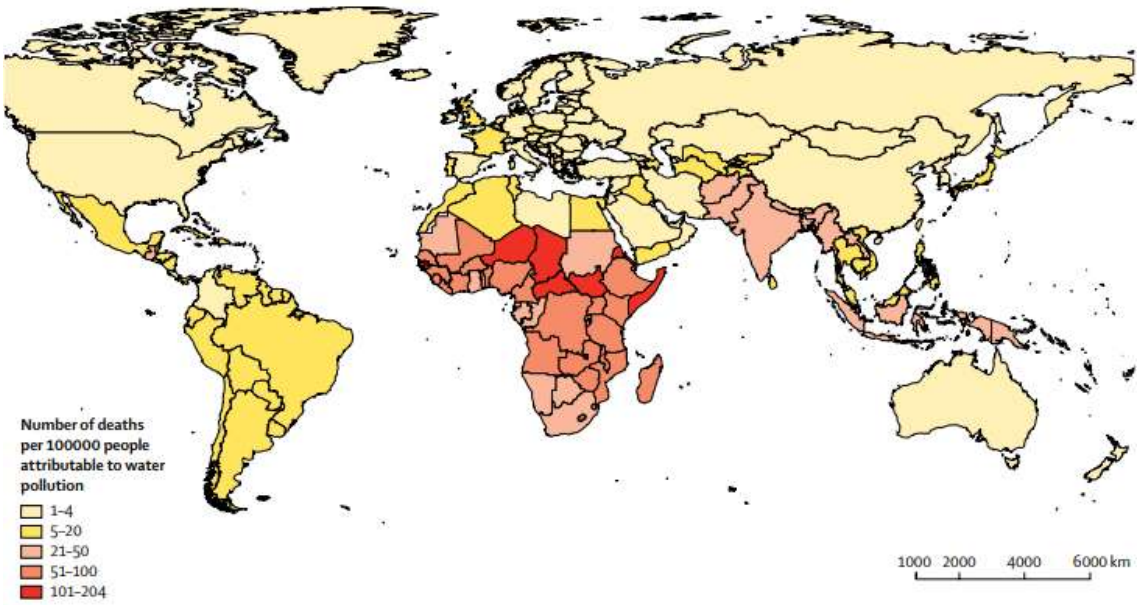

Fig. 5.6. Number of deaths per 100000 people due to water pollution, 2015

(Source: The Lancet Commission on pollution and health)

This disease, quite severe and deadly, has become a kind of symbol of the fight against environmental pollution, in connection with which harmful industrial waste entering the atmosphere, water, etc. leads to the development of new serious diseases.

Elevated nitrate levels in drinking water cause cyanosis, methemoglobinemia, and difficulty breathing in infants. There is a correlation between the concentration of nitrates in water and the incidence of cancer of the stomach, bladder, kidneys, small intestine, esophagus and liver.

Synthetic detergents cause skin irritation and allergies, dermatitis, metabolic disorders of the skin and the whole body.

Changes in the content of trace elements in the composition of water can cause diseases such as goiter, fluorosis, caries and more. Increasing the amount of fluoride in drinking water to 1.9 mg/l causes the appearance of fluorosis, which is characterized by damage to the teeth with the formation of yellow-brown pigment spots, enamel defects and the like.

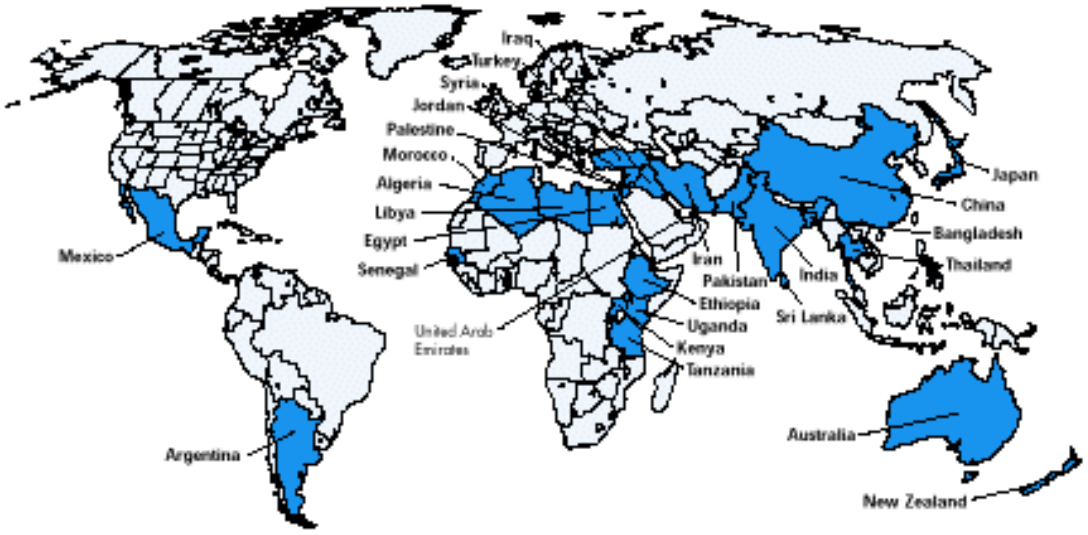

Fig. 5.7. Countries with endemic fluorosis due to excess in drinking water

(Source: https://fluorosis.foundation/fluorosis/global-profile/)

Contamination of soils with mineral fertilizers, pesticides and industrial and domestic wastewater has led to the source of tuberculosis, brucellosis, paratyphoid and other diseases of the digestive tract and helminthiasis.

Pesticides and fertilizers are the cause of many poisonings. Getting into drinking water and food, they disrupt the central nervous, cardiovascular and other systems, cause the growth of malignant tumours and reduce life expectancy.

Industrial emissions and wastes contaminate soils with sulfur, iron, lead, zinc, mercury, copper, magnesium and many other ingredients and cause poisoning through plant and animal foods and drinking water.

Contamination of soils with radionuclides is especially dangerous. The effects of these contaminants on the human body have been manifested for many generations.

Prolonged exposure to radiation leads to the development of radiation sickness, local lesions of the skin, lens of the eye, bone marrow, pneumosclerosis and more. Small doses of radiation have long-term consequences. In industrialized countries, every 4th to 6th person gets cancer, and 6-10% of newborns have genetic disorders.

The tragic consequences of the Chernobyl nuclear power plant accident pose a threat to the nation's genetic health.

More than 600 settlements have been affected by radioactive contamination. Radioactive decay products have created a high radiation background, which contributes to the external radiation of people.

Radioactive iodine accumulates in the thyroid gland, and then with its hormones spreads in the body, is broken down in the liver and partially excreted through the kidneys.

Radioactive cesium is deposited mainly in the muscles, penetrates into cells and irradiates the body.

Plutonium is transformed into americium and absorbed by the body, causing serious illness.

The number of gastrointestinal diseases is increasing among the population, and cases of anemia have become more frequent among children and pregnant women.

The state of the genetic fund of the population, predisposition to hereditary diseases is essential. They make up about 17 - 20% of the factors that determine the current level of health of the population. Directly on health care and medical care, the state of preventive institutions accounts for 10% of the contribution from the entire budget.

The statistics of morbidity of the population of Ukraine, based on the registration of patients' visits to the doctor, shows that in the structure of morbidity the first place is occupied by respiratory diseases, followed by diseases of the circulatory system, in third place - diseases of the nervous system and organ of senses.

Since 1992, there have been significant changes in the incidence of the population of Ukraine. Of all diseases, there is an increase in its level by 27.0%.

The morbidity of diabetes increased 2.1 times, bronchial asthma − 2.1 times, peptic ulcer of the stomach and duodenum − 1.9 times.

Especially significant growth is observed in the class of diseases of the circulatory system: the incidence of angina increased by 8.6 times, acute myocardial infarction − by 2.6 times.

For other groups of diseases there is also an increase. Thus, malignant neoplasms increased by 27.8%, thyrotoxicosis − by 21.2%, mental disorders − by 26.8%, chronic otitis − by 32%.

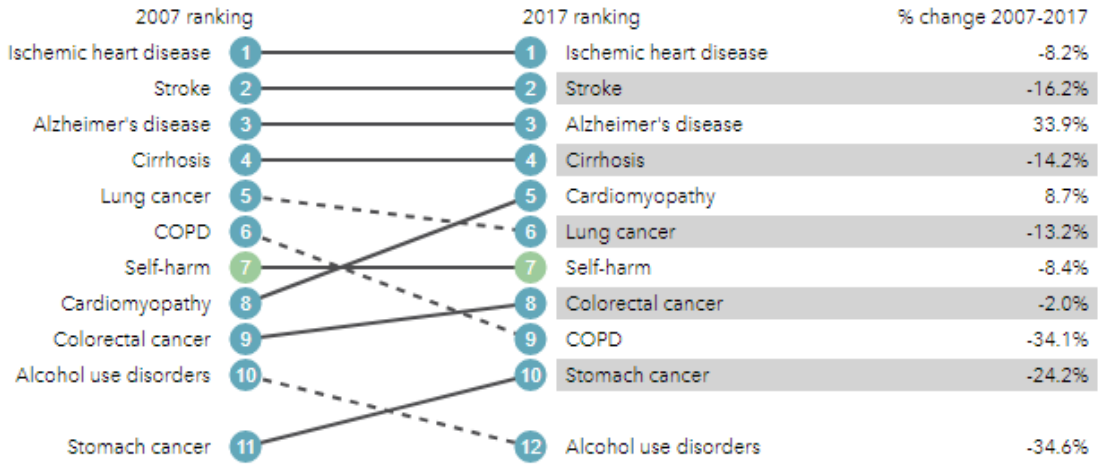

Fig. 5.8. Top 10 causes of death in 2017 and percent change, 2007-2017, all ages, number

(Source: http://www.healthdata.org/ukraine)

In recent years, there has been an increase in the incidence of blood and hematopoietic diseases by 51.3%, congenital malformations − by 21.5%, circulatory diseases − by 54%, chronic bronchitis − by 21%, gallstones disease − by 28%.

Over the past 10 years, the incidence of diabetes has increased 1.6 times, the share of which among endocrine diseases is 70% or more. The country has a tendency to increase the prevalence of hyper- and hypofunction of the thyroid gland and so on.

Thus, the state of health reflects the dynamic balance between the natural environment and the body. Human health, as noted above, is influenced by lifestyle, genetic and environmental factors.

Homeostasis is considered to be the relative dynamic constancy of the internal environment and some physiological functions of the human and animal body, which is supported by the

mechanisms of self-regulation in the conditions of fluctuations of internal and external stimuli.

Human health, ensured by the homeostasis of his body, can be preserved in the event of some change in environmental factors. Such changes cause the appearance of appropriate biological reactions in the human body, but due to the processes of adaptation, they do not lead to negative health consequences within certain limits of the change of factors. For everyone, these boundaries are different.

The process of adaptation depends on the individual reactivity of the organism and the strength of the action of environmental factors.

The criterion for the degree of adaptation is the preservation of homeostasis regardless of the duration of the factor to which the adaptation was formed.

In the conditions of the disease there is compensation, ie the body's struggle for homeostasis. This includes additional protective mechanisms that counteract the emergence and progression of the pathological process.

In the case of signals of great danger and insufficiency of the involved mechanisms, stressful diseases occur, such as diabetes, coronary heart disease, hormonal dysfunctions, occupational diseases, etc.

TOPIC 6.
BIORHYTHMS. TEMPORAL ORGANIZATION OF THE HUMAN BODY

The science of biorhythms studies the mechanisms of living chronometers, the reasons for their inclusion and violation, the possibility of practical application. It is established that the "biological clock" is important for efficiency, health, mood of people, to choose the right routine, sports, recreation.

Biological rhythms can be considered as one of the fundamental adaptations of living nature to the conditions of existence.

Biological rhythms are periodically repeated changes in the nature and intensity of biological processes and phenomena.

Biological rhythms can be observed at all levels of organization of living matter: from intracellular to population. The biological rhythms of physiological functions are so precise that they are often called "biological clocks".

Biological rhythms develop in close interaction with the environment and are the result of adaptation to those environmental factors that change with a clear periodicity

- rotation of the Earth around its axis (with a period of about 2 hours),
- the rotation of the Moon around the Earth (with a period of about 28 days),

and which lead to fluctuations in light, temperature, humidity, electromagnetic field strength, which serves as time indicators for the formation of "biological clocks" of living organisms.

6.1. Classification of biorhythms

Classifying rhythmic processes depending on their frequency, biological rhythms are combined into several groups:

- ***high-frequency*** oscillations of high-frequency biorhythms range from a fraction of a second to half an hour. This is, for example, fluctuations in the bioelectrical activity of the brain, heart, muscles and other organs and tissues. This group of biorhythms includes the rhythm of external respiration;
- ***medium frequency*** with a duration of half an hour to 28 hours. A large number of biorhythms are combined into a group of medium-frequency oscillations.

Biorhythms with a period of half an hour to several hours are called *ultraradian rhythms*. The most important of them have a period of up to 90 minutes. They are already observed in newborns, which activity is replaced by relative rest approximately every 90 minutes. In adults with such periodicity alternate different stages of sleep and wakefulness, periods of relatively high efficiency and relative relaxation.

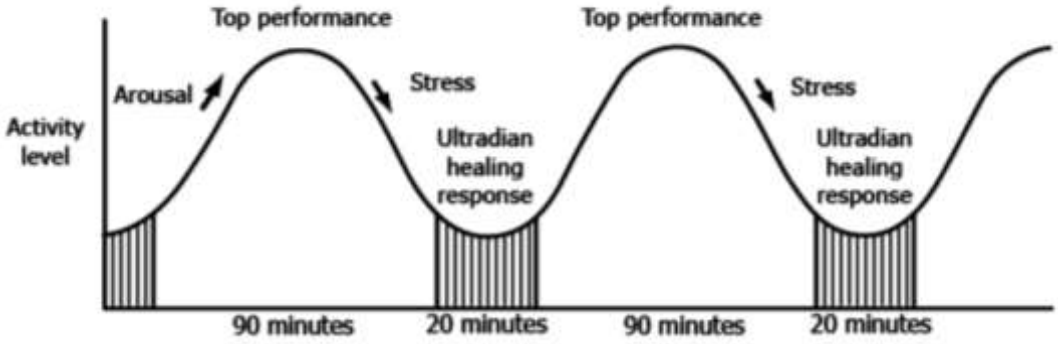

Fig. 6.1. Ultraradian Rhythm Performance

(Source: https://www.eeginfo.com/research/articles/David-Kaiser-ILF-Ultradian-Rhythms.pdf)

Our ultradian rhythm is our “balance of activity and rest” throughout the day. And as it turns out, most of our ultradian rhythms are way off.

Biorhythms with a period of 20 - 28 h are called *circadian* (or diurnal). These are, for example, periodic fluctuations in body temperature, pulse rate, blood pressure, working capacity;

- ***low frequencies*** are weekly, monthly, annual, perennial biorhythms. At the heart of each of them are clearly registered fluctuations of any functional indicator. For example, weekly biorhythms correspond to the level of urinary excretion of any physiologically active substances; monthly ovarian-menstrual cycle in women; seasonal biorhythm − changes in sleep duration, muscle

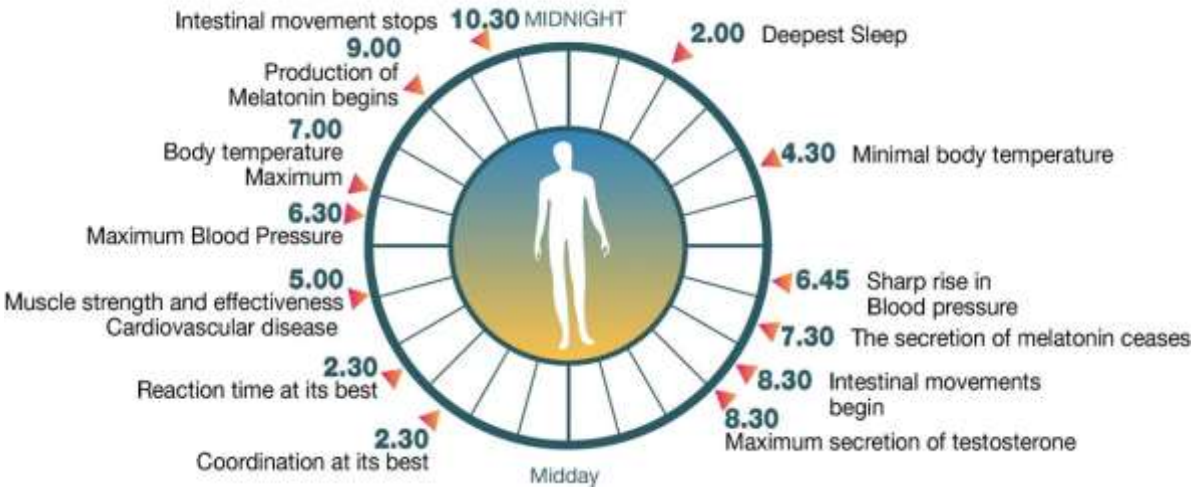

Fig. 6.2. Light plays a fundamental role in the regulation of circadian rhythms which are spread over a period of about 24 hours

(Source: https://www.staplesadvantage.co.uk/get-inspired/workplace-health-and-hygiene/what-is-circadian-rhythm/)

strength; annual and perennial - the rate of growth and physical development of children, indicators of immunity, etc.

Many physiological processes are characterized by seasonal (variability) rhythm. For example, the maximum birth rate is observed in the period from March to May, the minimum - from November to February.

Seasonal changes play a significant role in a number of diseases. For example, in the autumn-spring period, exacerbations of peptic ulcer disease often occur.

In addition to seasonal rhythms, there are rhythms with a longer period. In the course of the tuberculosis process there is a three-year periodicity: after 4, 7, 10, 13 years from the beginning of the disease, exacerbations often occur. There are five-six-year and eleven-year periodicity of some diseases associated with external factors - meteorological, heliogeographic influences, in particular, with fluctuations in the magnetic field and changes in solar activity.

Most biorhythms are formed during ontogenesis. Already in the body of the newborn functions are registered that have a daily rhythm (with a period of 2 to 25 hours).

However, the appearance of such rhythmicity depends on the maturity of the child's body: in premature infants rhythmicity develops much later than in children born at a normal time.

The development of daily fluctuations of biorhythms in the newborn is significantly influenced by environmental conditions. For example, careful adherence to the feeding regime of the child accelerates the emergence of daily rhythm.

Synchronization of the daily regime with the social daily cycle of each child occurs at different times (between 6 and 16 weeks after birth).

6.2. Desynchronosis and its consequences

Everyone should know about the favourable and unfavourable periods of the day to take precautions if necessary. You need to listen to your body in the "hard hours" of the day.

For example, the maximum probability of a heart attack occurs at 9 o'clock, at 17-18 o'clock, and at 2 o'clock at night. Therefore, the person with heart disease needs to start work later than 9 hours, and finish earlier than 17 hours.

The biorhythms of the body do not agree sharply with the daily biorhythms, if a person is in a different time zone (works in night shifts, in the polar latitudes).

Impaired coordination of certain biorhythms, which contributes to a kind of pathological condition, is called ***desynchronosis***.

Special studies have shown that the shift of the biorhythm by 2 h has a minimal negative impact. The human body adapts to new conditions gradually, due to the restructuring of biorhythms. For example, when shifted to a 12-hour time zone, the body adapts to new conditions within 10-15 days.

With desynchronosis, a person's working capacity decreases. If the new place provides work with maximum energy consumption (sports competitions), it is necessary in advance (for 3-10 days) to gradually change the mode of work and rest at the place of temporary residence, so that the human body adapts to the new latitude.

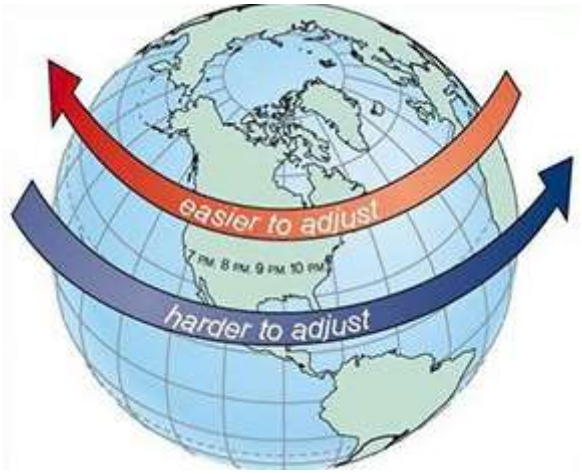

Fig. 6.3. Travel from west to east causes travelers to "lose" time, and this can be a more difficult adjustment

Scientists around the world are trying to use data on biorhythms to predict, prevent exacerbations of certain diseases, accidents, synchronization of social rhythm with human biological capabilities, as well as to improve the system of planning sports competitions.

Seasonal biorhythms are closely related to meteorological phenomena of nature: atmospheric pressure, temperature, humidity, oxygen, the mode of electromagnetic oscillations of the atmosphere, cosmic radiation, and so on.

When the season changes, there is a lack of various natural factors - light, ultraviolet rays. All these fluctuations affect the state of the human body, in particular, metabolic processes, blood pressure, endocrine glands, psyche, performance. These fluctuations of biorhythms have the most detrimental effect on the sick organism, the condition of which under adverse conditions significantly deteriorates.

Daily frequency of fluctuations in the intensity of physiological processes in the human body:

- between 1:00 a.m. and 3:00 a.m. − maximum activity of the gallbladder. "Heavy hours" of the liver in its intense activity − there is a great struggle with the poisons of the body.
- between 1:00 a.m. and 4:00 a.m. − blood pressure and respiratory rate are minimal. The body is resting; the body is physically completely exhausted and especially sensitive to pain.
- between 1:00 a.m. and 5:00 a.m. − low body temperature. Minimum blood sugar. The body works at the lowest "turns", but the hearing is sharpened and responsive to noise.
- at 2 a.m. − a sharp narrowing of the capillaries of blood vessels.
- between 2:00 a.m. and 5:00 a.m. − minimal physiological activity (a person is weak). Minimum lung capacity; pulse and respiration are the slowest.
- between 3:00 a.m. and 5:00 a.m. − maximum liver activity. At 3 a.m. − lowest blood pressure.
- at 4 a.m. − the lowest heart rate. The brain is supplied with the least amount of blood. This is the time when people often die.
- between 4:00 a.m. and 5:00 a.m. − maximum bone marrow activity.
- at 5 a.m. − minimum body temperature. The kidneys are free and do not secrete anything. Awakening from sleep − vigorous.
- between 5:00 a.m. and 6:00 a.m. − there is a hunger. Even if a person wants to sleep, his body wakes up. The pressure rises.

- between 5:00 a.m. and 7:00 a.m. − maximum lung activity. The heart beats faster.
- between 6:00 a.m. and 7:00 a.m. − the lowest erythrocyte sedimentation rate (ESR). The body's immune defenses are particularly strong.
- between 7:00 a.m. and 9:00 a.m. − maximum activity of the large intestine. Decreased activity of the gastric ducts and gastric function.
- at 9 a.m. − the maximum content of adrenaline in the blood. Increases mental activity, decreases sensitivity to pain. Blood pressure is reduced to a minimum. The heart is working at full capacity.
- between 8:00 a.m. and 12:00 p.m. − the first rise in efficiency (the person is strong).
- between 8:00 a.m. and 9:00 a.m. − the body rested, the liver completely freed the body from toxic substances. Alcohol is especially harmful to the liver at this time.
- between 9:00 a.m. and 10:00 a.m. − maximum blood sugar. From 9 a.m. to 11 a.m. − maximum activity of the stomach.
- at 10 a.m. − the first peak of increased efficiency (the strongest person). From 11a.m. till 12 a.m. − hunger. The heart continues to work rhythmically.
- between 11:00 a.m. and 1:00 p.m. − maximum activity of the pancreas and spleen. The liver rests, a small amount of glycogen enters the blood.
- at 12 a.m. − maximum awakening of biologically active points of the gastric ducts. Maximum feeling of hunger. Lunch is better to postpone for 1 hour later.

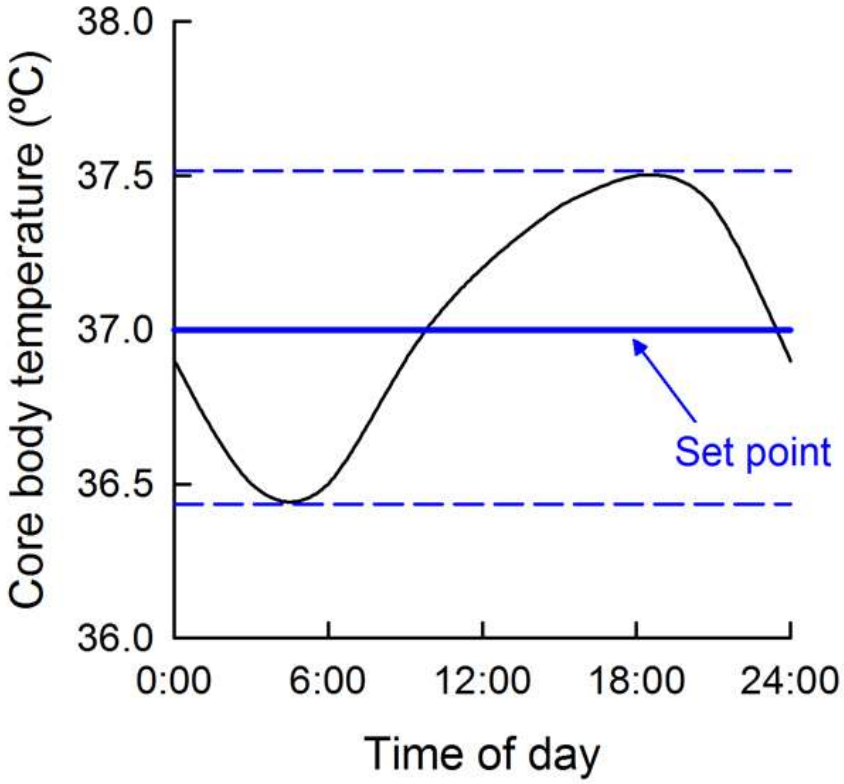

Fig. 6.4. Circadian rhythm of core body temperature

(Source: https://www.physiologyweb.com/)

- at 1 p.m. − the efficiency of the circulatory system decreases sharply. The first period of activity has passed, fatigue is felt.
- between 1:00 p.m. and 3:00 p.m. − minimal physiological activity (the person is weakest). Maximum heart activity.
- between 3:00 p.m. and 5:00 p.m. − maximum activity of the small intestine.
- between 3:00 p.m. and 7:00 p.m. − the second rise in efficiency (the person becomes strong). The senses are strained to the edge, especially the sense of smell and taste.

- at 4 p.m. — the maximum amount of nitrogen in the blood. Blood sugar rises, but then there is a decline in its amount.
- between 4:00 p.m. and 5:00 p.m. − hunger.
- between 4:00 p.m. and 6:00 p.m. − the highest content of hemoglobin in the blood.
- at 5 p.m. − the second peak of increased efficiency.
- between 5:00 p.m. and 7:00 p.m. − maximum activity of the bladder. This is a very bad time for allergy sufferers. Mental stability is zero. The person is nervous, can quarrel over trifles.
- between 5:00 p.m. and 8:00 p.m. − maximum activity of lymph nodes and spleen.
- at 6 p.m. − maximum body temperature, maximum number of heartbeats (pulse), dilation of capillaries. The maximum amount of adrenaline in the blood. Mental vigour gradually decreases. The feeling of physical pain decreases.
- between 7:00 p.m. and 9:00 p.m. − maximum kidney activity. Blood pressure rises, headaches begin.
- at 8 p.m. − the minimum amount of nitrogen in the blood. At this time, a person's weight reaches a maximum, a reaction of extraordinary speed.
- at 9 p.m. − a sharp decline in the efficiency of the circulatory system. The efficiency of the heart muscle decreases.
- between 9:00 p.m. and 10:00 p.m. − maximum erythrocyte sedimentation rate (ESR).
- between 9:00 p.m. and 11:00 p.m. − maximum activity of the vascular system. The blood is full of white blood cells. Body temperature decreases.

- between 10:00 p.m. and 11:00 p.m. − physiological decline (restructuring of the body to the night cycle).
- at 11 p.m. − the beginning of sleep.
- between 12:00 p.m. and 1:00 a.m. − hunger among “night owls”.

Obeying biorhythms, each physiological indicator during the day can change significantly, which should be taken into account in the diagnosis of various diseases.

Ignorance of such patterns can lead to diagnostic errors. This fact should always be taken into account when explaining to patients the harmfulness of self-diagnosis and self-treatment based on it.

The daily biorhythm of the sympathoadrenal system has been studied quite accurately. The simplest scheme looks like this: maximum activity (increased adrenaline release) in the morning (from 8.00 to 12.00), minimum − in the middle of the day (12.00 – 16.00), the second maximum − in the evening (16.00 – 22.00) the most articulated minimum − at night (22.00 – 8.00).

Accordingly, the level of life processes fluctuates. The greatest activity and productivity in the morning, in the afternoon it decreases, in the evening it increases slightly and decreases significantly at night.

Therefore, people have long lived in strict accordance with the requirements of biorhythms, not only because they used time according to the Sun, but also because they knew from personal experience − the most productive work in the morning.

They went to bed early not to save light, but first of all to get a good night's sleep and work productively during the day. In the afternoon they rested to regain strength by the end of the working

day. Such conditions were dictated by nature, providing a significant return on labour.

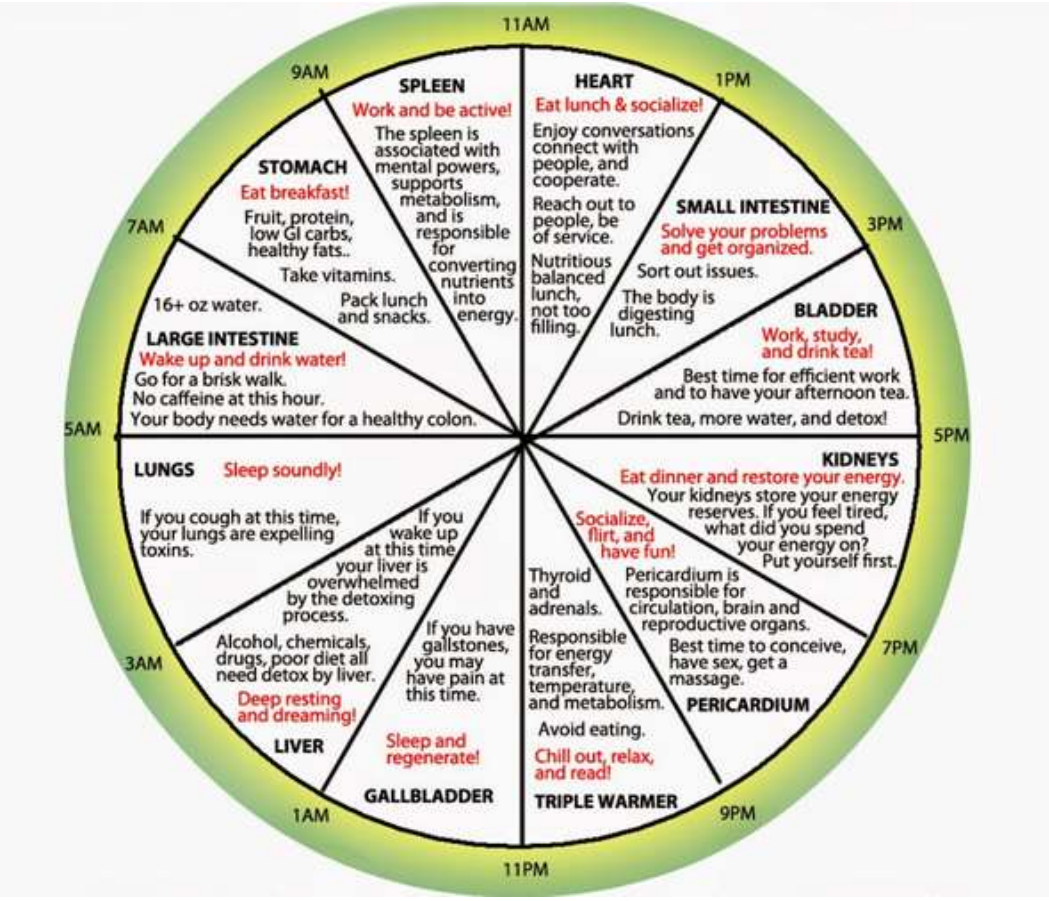

Fig. 6.5. Traditional Chinese Medicine body clock

With the development of mankind, the way of life and the nature of work have changed. However, natural biorhythms have remained the same because evolutionary changes do not keep pace with scientific and social progress.

Contrary to natural biorhythms, some people have developed the habit of going to bed late and getting up late. As a result, the adaptation mechanisms are broken, which contributes to the

emergence of neuroses. A healthy person has a single biorhythm, synchronous with nature; human deviations from it are undesirable.

Biorhythms are the basis of rational regulation of all human life routine. This ensures high productivity and well-being. This can be achieved only if you follow a stable daily routine.

The study of biorhythms is the basis of forecasts in many areas of our lives, medicine, art, psychology, sports. Rhythm is inherent in nature, our task is to live in union with it.

A healthy lifestyle, implementation of specific recommendations for relevant professions and types of work will help to neutralize disturbances in biorhythms.

TOPIC 7.
SOCIAL ASPECTS OF HUMAN ECOLOGY

Since about the last quarter of the last century, there have been two self-sufficient systems on the planet Earth - the Biosphere and the Noosphere, which have become virtually alternative. But, having broken the control mechanisms of the Biosphere, humanity has not created its own control mechanisms in its Noosphere. In the absence of internal control mechanisms for the system, it cannot be stabilized.

Any system devoid of internal self-control begins to disintegrate rapidly until complete self-destruction. The newly created system, in which there is no self-control, should behave in the same way.

These consequences underlie the beginning of the First Noosphere Crisis we are experiencing today. This crisis is not yet realized, but it is already acutely felt.

It has a noosphere character, noosphere scales, and it involves noosphere mechanisms. Therefore, its destructive directions will extend to the entire space covered by the Noosphere. Namely, to the Earth, as a planet as a whole, that is, as a celestial body; for the whole Biosphere; to humanity, both at the level of its individual components and at the level of the whole community - as the first and so far the only component of the Noosphere. Some of these destructive directions of the First Noosphere Crisis can already be identified.

It is also possible to form a criterion that makes it possible to separate the crisis processes inherent in the transition to the

Noosphere from the crisis processes of the pre-noosphere period of human existence.

Such a feature and a distinctive feature of the components of the First Noosphere Crisis is the fundamental impossibility of solving crisis problems within the framework adopted for the pre-noosphere period, that is, within the framework of political and social concepts, as well as technical, economic, social and technological capabilities of human civilization of the pre-noosphere period of its existence.

The state of the genetic fund of the population, predisposition to hereditary diseases is essential. This is about 17-20% of the factors that determine the current level of health of the population.

Directly on health care and medical care, the state of preventive institutions accounts for 10% of the contribution.

In recent years, there have been changes in a number of certain diseases and their groups, which indicate the impact of new factors such as environmental pollution by radionuclides, the impact on humans of stressful situations, due to the sharp deterioration of the socio-economic situation in the country.

7.1. Human as a natural and social being

The problem of the relationship between social and biological includes the most important issues of the development of the biosphere of our planet, the spontaneous and rational settlement of relations between human and nature, genetic and life development of human, the consequences of urbanization and industrialization, which directly or indirectly affect human health.

All this is the basis of human theory and is subject to analysis and integration in terms of internal unity, interconnection and

contradictions of social and biological in human being in the context of its health problems.

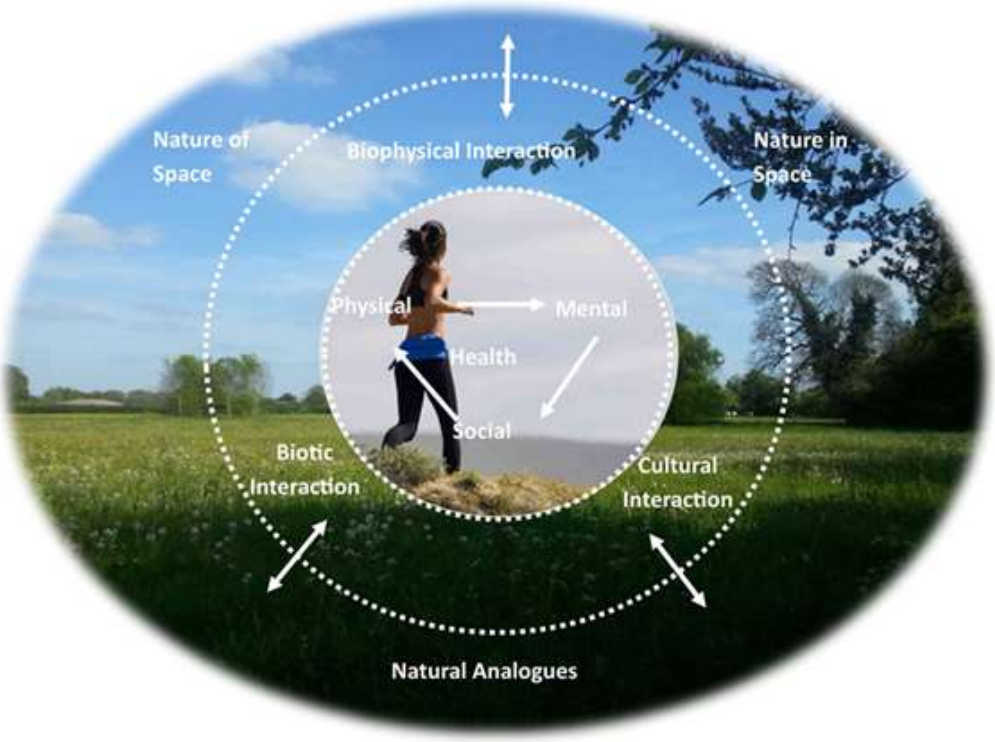

Fig. 7.1. Interdisciplinary perspective of human and ecosystem health

(Source: The Human–Nature Relationship and Its Impact on Health: A Critical Review https://www.frontiersin.org/articles/10.3389/fpubh.2016.00260/full)

Considering the problem of man, we must always take into account both the factor of heredity and the role of the environment under the influence of which human is formed as a natural-social being.

From parents we inherit not only the peculiarities of the genus, but also in general-social characteristics. In addition, we are a part

of nature and learn to live in harmony with both our own nature and the environment. Next to us are friends, acquaintances and strangers who make up society. So: human has his habitat − natural and social.

The concept of the natural environment is not limited to the sphere of the Earth, it includes space in general.

There is a hypothesis that states that life on Earth arose under the influence of cosmic processes. Therefore, it is natural that any living organism in some way interacts with space. Solar storms and associated electromagnetic disturbances affect cells, the nervous system, blood vessels, human well-being and psyche. We live "in unison" with the entire cosmic environment and any changes in it affect our condition.

The ideas of K.E. Tsiolkovsky, V.I. Vernadsky and A.L. Chizhevsky that we are surrounded on all sides by streams of cosmic energy that comes to us through a huge distance from the stars, planets and the Sun.

Human exists in the system of interaction of all the forces of nature and experiences all its various influences. Its mental balance is possible only under the condition of physiological and mental adaptation to the natural world.

But human, as a biological being, cannot exist without communication with nature, just as human, as a social being, cannot exist without society. Both social and natural factors act ruthlessly in this sense.

The formation of man in all its diversity is due to the assimilation of the values developed by mankind throughout history. This is the

language, and different ways of working, and the ability to use different charges.

Therefore, a child can become a real person only by living in society, communicating and interacting with other people, learning from them.

Neither Kamala nor Amala[1], who spent their childhood among wolves, nor four-year-old John, who was found among monkeys in Africa, were able to learn to talk.

Heredity and variability. In the process of individual human development, on the one hand, it implements a genetic program and reproduces certain traits passed on to it by its parents (*the set of such psycho-physiological qualities is called inclinations: musical hearing, visual memory, strong organism, ability to distinguish colours, sense of rhythm, etc.*).

On the other hand, human acquires new features that contribute to human evolution.

The inclinations of human are the basis of his abilities. However, whether the inclinations will be realized and whether they will develop in the ability depends both on the conditions in which a person develops and on our own efforts!

The main thing is to believe in your own strength and persistently strive to achieve your goal!

[1] In 1920, in India two girls named Amala twelve and Kamala eight years old were captured by a reverend named Joseph Singh in a wolves' den. These girls also known "The Wolf Girls" & it is one of the famous case of feral children. The girls were raised by wolves. When first time, Singh captured the girls they ran on all fours, didn't look. Singh claimed they preferred to eat raw meat and howl like a wolf. Their sense of smell, hearing and sight was exceptional. Singh tried his best to learn them manners and taught to speak in this case he got limited success. Soon Amala was died while Kamala learned few words to speak and walk upright. But in 1929 at age of seventeen, Kamala died due to the failure of her kidney.

But the question of what factors play a decisive role in the formation of human being, has not only cognitive but also vital and practical significance. One or another attitude of people to the world around them and to themselves depends on the answer to this question.

The exaggeration of the role of heredity leads to the conclusion that all our good and bad traits depend only on our parents, whom we usually do not choose.

Such an approach is due to the underestimation of the conditions of the environment in which we live, so, they say, the futile efforts of both society and our own, aimed at improving people.

But the influence of society on human development is very large.

Especially in childhood, when it is extremely important what kind of relationship has developed in the family. And you, as expectant parents, also need to keep this in mind.

It should be noted that the impact on a person of the social environment can be spontaneous, accidental, and conscious, purposeful. The latter is called *education*.

Education is, to a certain extent, also self-education, i.e. one's own efforts aimed at forming or improving oneself.

7.2. Natural, socio-cultural and spiritual dimensions of human life

Perhaps the most paradoxical is the fact that during the scientific and technological revolution, when the flow of information is growing uncontrollably, we know more about the world around us than about ourselves, about our body.

On the column at the entrance to the temple of Apollo in Delphi, Greece, embossed the inscription: "Know thyself"[2]. These words were the motto of the whole philosophical doctrine, which was based on the idea that knowledge of the world comes through knowledge of oneself, one's capabilities and aspirations.

This teaching of the ancient Greek philosophers can be interpreted today as follows: for penetration into the mysteries of nature and the world around us is important self-knowledge.

The famous ancient Greek thinker Socrates believed that people who know themselves do a lot of good and get many positive results. Conversely, one who does not know himself experiences many sorrows and failures. According to Socrates, knowledge is the only real factor and criterion of human behaviour, so man must first know himself. Self-knowledge leads a person to understand his place in the world, the meaning of life, forms his character and will.

Similar views on the role of self-knowledge were expressed by the prominent Ukrainian philosopher Hryhoriy Skovoroda (1722 - 1794). He wrote that when we want to measure the heavens, the earth, and the seas, we must first measure ourselves by our own measure. Without measuring ourselves, we cannot measure other objects.

Adolescence is the age when a person makes one of his greatest discoveries: he knows himself.

Self-discovery is the most wonderful thing a person can feel. In search of yourself - a huge meaning: everyone can reveal their real, but for some time still hidden opportunities, inclinations, and abilities.

[2] The motto γνῶθι σ(ε)αυτόν (“know thyself”) was one of the maxims inscribed on the pediment of the temple of Apollo at Delphi, along with μηδὲν ἄγαν (“nothing in excess”), inviting mankind to exercise moderation in life.

To identify them and use them for the benefit of yourself and society, you need to know yourself - that is, to study and be able to properly assess.

It is not enough to be born and just live. We must remember: each of us needs a desire to know ourselves more deeply, to feel our potential to become better. Desire is a great force: it is followed by action and work. And they are always accompanied by success and joy of creativity.

Self-improvement is an extremely difficult task. It is necessary to mobilize everything: abilities, will, energy, diligence.

A high goal is a good goal, it realizes itself through the activity of the individual, through his activity. The great German poet Goethe wrote: "How can you know yourself? Only by action, not by contemplation. Try to do your duty and you will understand who you are". The active, creative, inspired spirit − this is the driving force of human development.

Many of us still underestimate the importance of the ability to "read" and understand a person's psychological personality. Although this skill is considered as one of the main indicators of our overall culture.

Even in ancient China, the famous philosopher and scientist Confucius said: "Don't worry about not knowing you, but worry that you don't know people".

Modern science has proven true to the teachings of ancient philosophers that, above all, the spiritual health of human should be preserved, because its physical development largely depends on its spiritual state.

Actually spirituality, as a form of manifestation of human moral potential, aimed at benevolence, complicity and selflessness, able to save society and the individual from barbarism, aggression and cruelty.

We must strive to build into our souls mercy, kindness, justice, understanding of the soul of another person, its energy, and the customs of our ancestors. Without the soul there is no personality, without the personality there is no progress of civilization, without movement there is no life.

Spirituality is the connection between the outer and inner worlds of man. And not just a connection, but an awareness of inseparable involvement in animate and inanimate nature, to the outer microcosm and the inner microcosm.

High spirituality is the goal of all health systems. Without spirituality a person cannot overcome illness, recover, be healthy and happy.

"Know thyself" - this wise testament of the ancient Greeks must be reminded once again to all who care about their health, who want to live happily ever after.

7.3. Demographic problems of mankind

The study of the biosphere, its age and spatial components, the impact of anthropogenic factors on it cannot be studied outside of man, human populations, and humanity as a whole.

Problems related to these issues are studied by ***demography*** (from the Greek word *Demos* − people and *grahpo* − I write) - a social science that studies the population and patterns of its development.

Demographic problems of mankind along with issues of society structure, population migration, ethnic, racial and religious composition determine the ecology of human communities, which confirms the legitimacy of human-centered approach in environmental teaching.

Having crossed the twenty-year limit of the period of independence and radical socio-economic transformations in Ukraine, it must be acknowledged that the socio-demographic situation in the country remains extremely unfavourable. Its crisis nature is determined by a combination of large-scale depopulation with the deterioration of the qualitative characteristics of the population, in particular health.

During the years of independence, the country's population decreased by 5.3 million people, including only due to depopulation - by almost 4.6 million.

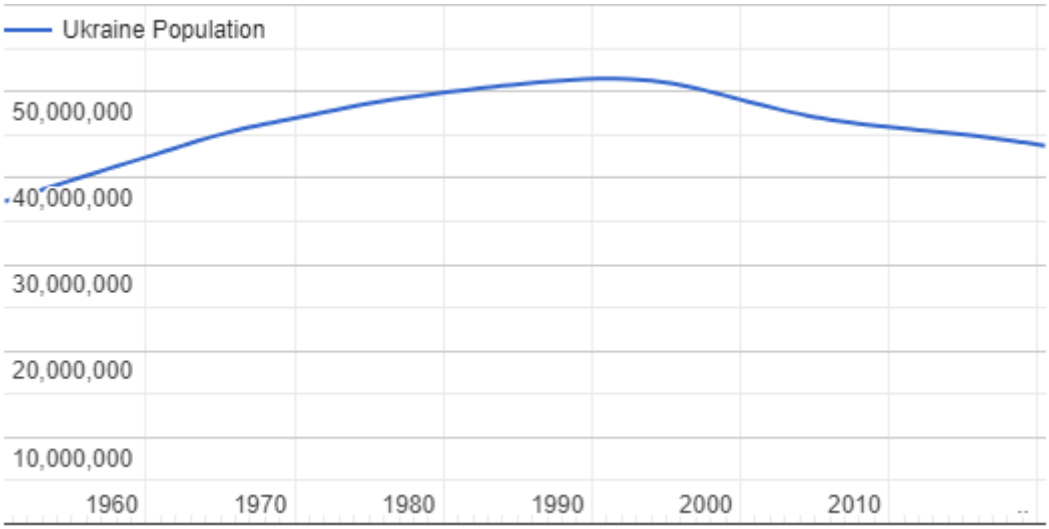

Fig. 7.2. Ukraine Population (1950 - 2020)

(Source: https://www.worldometers.info/world-population/ukraine-population/)

The socio-economic crisis of the 1990s accelerated and intensified unfavorable trends in the dynamics and structure of major demographic processes.

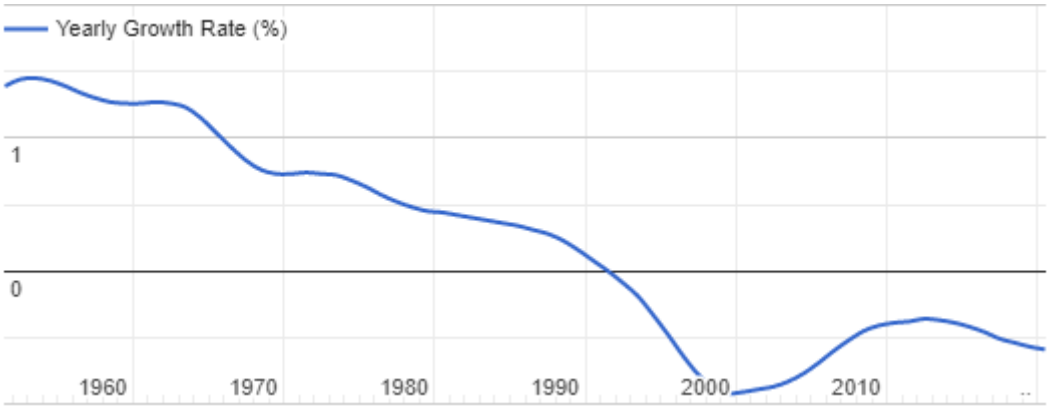

Fig. 7.3. Yearly Population Growth Rate (%)

(Source: https://www.worldometers.info/world-population/ukraine-population/)

During the first decade of transformation in Ukraine, the birth rate decreased steadily and at an accelerated pace, and single-child and childlessness spread.

A slight increase in the birth rate in Ukraine over the last 3-4 years, which was mainly the result of the realization of births postponed in the crisis years (mostly first-borns), does not give grounds to state the break of unfavourable tendencies of reproductive activity of the population of the country and to hope for appreciable growth of the birth rate in the near future.

In 2020, the total birth rate in Ukraine is 1.4 children per woman and is one of the lowest in Europe.

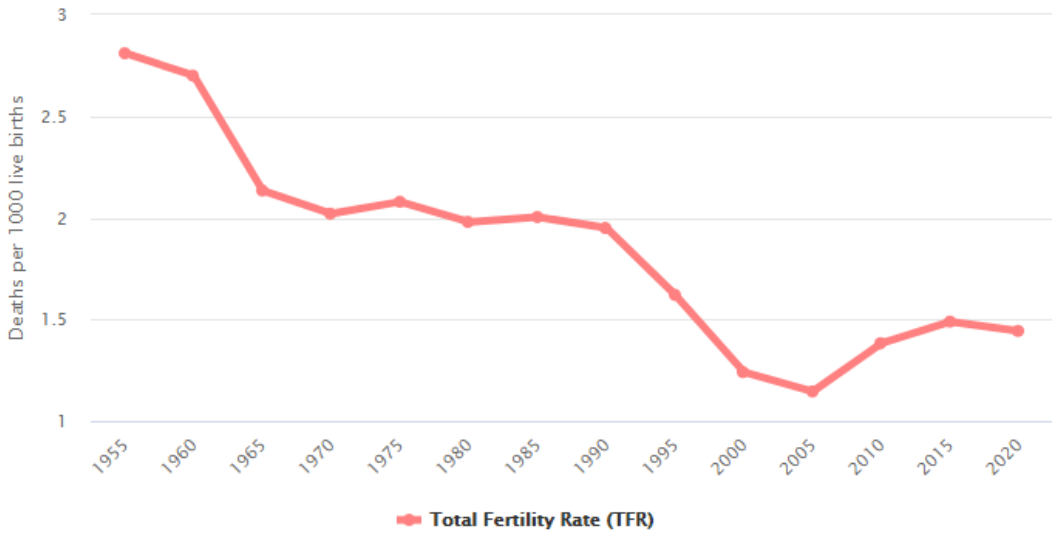

Fig. 7.4. Total Fertility Rate in Ukraine, 1955 − Present

(Source: https://www.worldometers.info/world-population/ukraine-population/)

Among the main factors of low birth rate and its unfavorable trends in our country should be noted that the demo reproduction process is not sufficiently provided economically.

In modern Ukraine as a whole the traditional family way of life of the population is preserved, family continues to perform its specific functions of providing physical and socio-cultural reproduction of generations, although the forms of family associations and marital relations, as in other European countries, are transforming and becoming more diverse.

At the same time, there are socio-demographic phenomena, the current scale of which indicates unfavorable conditions for the existence of the family, a certain deformation of its specific functions.

They are reflected in the significant share of single-parent families among families with children, the high level of separation of the population, a significant number of children - social orphans, the emergence of socially maladapted "street children".

These phenomena can be considered as crisis manifestations that go beyond the evolutionary transformation of marital relations and indicate serious "failures" in the mechanism of realization of the basic functions of the family.

A fundamental feature of the current demographic situation in Ukraine is the crisis of health and viability of the population.

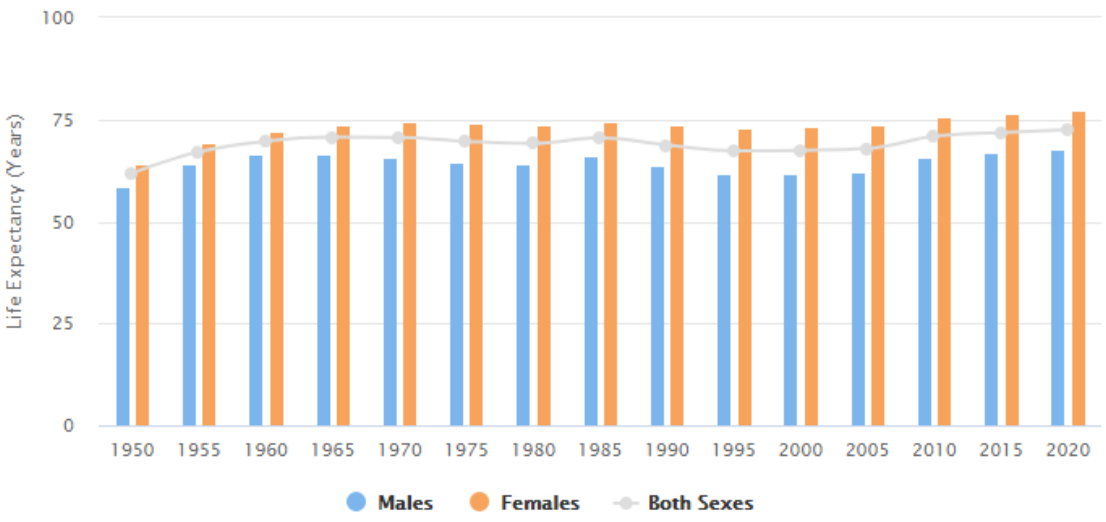

Fig. 7.5. Life Expectancy in Ukraine, 1955 − Present

(Source: https://www.worldometers.info/world-population/ukraine-population/)

High morbidity of children and adults, more than three times the male mortality rate in working age over female mortality rate, increased infant mortality rate − these are the most important signs

that characterize the unfavorable medical and demographic situation in the country.

Life expectancy (67.6 years for men; 77.3 years for women) is currently higher than in 1960 (when life expectancy in Ukraine exceeded its then level in Japan, France or Germany). But Ukrainian men now live on average 12 to 13 years, and women 8 to 9 years less than in the European Union.

The main role in the formation of such a significant gap in life expectancy is played by the excessive mortality of the working age population in Ukraine. Significant male mortality in the country is the result of unhealthy lifestyles, harmful working conditions, alcohol abuse and smoking.

Tuberculosis epidemics pose a serious threat to the demographic security of Ukraine; they are not only demographic but also socio-economic in nature, as their victims are mostly people of childbearing and working age.

The deterioration of the quality of the population of Ukraine in the transformation period is also evidenced by certain disparities in its socio - economic composition, which negatively affect the country's transition to an innovative model of economic development.

During the period of independence and economic transformations in Ukraine there was a decrease in the intensity of stationary migration, new forms of migration moved significantly: labor migration, refugee movement, transit of illegal migrants, return of formerly deported peoples.

During 1994-2004, Ukraine was a country of emigration. Migration losses during this time exceeded 1 million people.

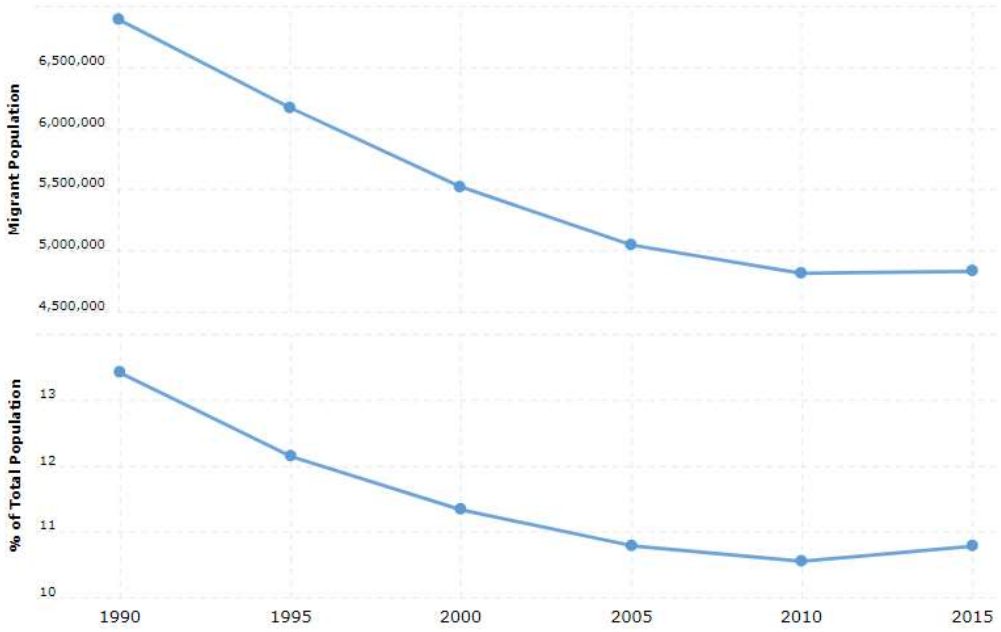

Fig. 7.6. Ukraine immigration statistics

(Data Source: World Bank)

Only in 2005-2006 did the migration balance become positive again.

According to the most probable "average variant" of the forecast of demographic development of the country, developed by scientists of the Institute for Demography and Social Studies of the National Academy of Sciences of Ukraine, in 2050 in Ukraine *the total birth rate* will be 1.5 children, *life expectancy for women* − 79.5 years, *for men* − 71.5 years, *the share of the population aged 60 years and older* − 32.5%.

The severity and urgency of today's socio-demographic problems, the unfavorable nature of the demographic situation in Ukraine determine the urgent need for the formation and implementation of effective public policy to address demographic problems, as well as predicting the concentration of efforts in those

areas that are most closely associated with changes in the qualitative characteristics of the population and the parameters of self-reproduction.

Socio-demographic policy in Ukraine should be aimed at:

- creation of socio-economic preconditions for full functioning and development of the family;
- formation and satisfaction of the need for children;
- improving the health of the population;
- reduction of premature mortality from causes and preventable diseases;
- improving the quality and prolonging the life expectancy of chronically ill people and the disabled;
- optimization of external labour migration of Ukrainian citizens; prevention of illegal migration;
- activation of migration reserves to mitigate depopulation;
- adaptation of society to the aging process.

7.4. Ethnos as the source of the ecological and social system

People (from the Greek word *ethnos*) are a multifaceted concept. Most often, this term has the following meaning: ***ethnos*** is a historical community of people that has developed in a certain area and has stable features of language, culture and mental composition, as well as awareness of their unity and difference from others.

Formed ethnos acts as a social organism that reproduces itself through predominantly ethnically homogeneous marriages and the transmission of language, traditions, etc. to new generations.

For a more sustainable existence, the ethnos seeks to create its own socio-territorial organization (state), and ethnic groups, especially in modern conditions, to their autonomous associations, enshrined in law their rights.

For the internal unity of the ethnos, the most important thing is culture, which gives people an awareness of their community. Culture, both as a necessary component and as one of the inherent features of the ethnos, ensures its full functioning.

But there is a reverse process - the convergence (convergence) of ethnic cultures due to historical development and interaction of peoples.

Therefore, today the culture of each ethnic group is characterized by a set, on the one hand, national-specific, and on the other − universal components.

The formation of ethnic culture is inextricably linked with the formation of the people themselves (ethnogenesis). Therefore, considering the Ukrainian culture, it is impossible not to dwell on the problems of ethnogenesis of Ukrainians.

Recall the main points of view:

- the theory of "primordiality": Ukrainians exist as much as there is a modern man, i.e. from 30-40 thousand to 2-3 million years;
- the theory of autochthony (M. Hrushevsky), according to which the ethnic basis of Ukrainians was the population of the late Paleolithic, who lived on the territory of Ukraine, and Russians and Belarusians had their own separate ethnic basis and territory of residence;
- the theory of the "single cradle" (which was common in the USSR in the 30-80's of the twentieth century.): the origin and

development of three close Slavic peoples from a single ancient n nation;

- the theory of "independent development of individual East Slavic peoples", that is, Ukrainians, Russians, Belarusians, which has become widespread recently.

Today it is emphasized that Kyivan Rus was a polyethnic, i.e. multinational state.

In modern literature, the beginning of the nation-genesis of Ukrainians is considered to be the period of Kyivan Rus, although it did not reach its end then.

Subsequently, due to unfavorable historical circumstances, this process was interrupted and resumed in full force in the XV-XVII centuries. This is probably the specificity of the ethnogenesis of Ukrainians.

The Ukrainian ethnos was finally formed at the turn of the XVI-XVII centuries, and the catalysts of this process were the threat of physical destruction by the Steppe (formation of the Crimean Khanate − the vassal of the Ottoman Empire), the national oppression of the Polish nobility and the internal betrayal of the elite − the transition of the aristocracy to Catholicism and the conclusion of the church union.

On the wave of national struggle, national self-consciousness grew. The latter appeared at the household level in the awareness of their belonging to the "Russian people", and at a higher, ideological level − in the struggle for national rights, for Orthodox Christianity, for the creation of national state institutions and attributes.

The complexity of the ethnic history of Ukrainians was reflected in the variety of self-names (ethnonyms), names from other nations, as well as the names of the country and state.

From the moment of the origin of the Ukrainian ethnos, the concept of Rus' was crucial.

Moreover, in different periods the following variants of it were dominated: VI-XI centuries − Rus'; since 1395 − Little Rus'; in the XVII-XVIII centuries − Little Russia; XIX century - early XX century − Ukraine - Rus'.

Recognition of the name "Ukraine" (first mentioned in 1187) took place in the XVII century, but then it coexisted with another − "Little Russia", which became widespread after Ukraine's accession to the Moscow state.

Only from the beginning of the twentieth century the ethnonym "Ukraine" became dominant.

It is necessary to allocate also such feature: at first Rus', and then Ukraine was called the central region, that is the Kyiv area earth, and then from here the name "Rus'" spread to all Eastern Slavs, and "Ukraine" later − for all Ukrainians.

That is, the name "Rus'" was formed as a common Slavic term, and that is why the Moscow state took it as a name for itself to affirm the concept of the "Third Rome."

As for the name "Ukraine", there are several explanations of its origin: or from the "edge" - the border with the Steppe, or from the word "country"; another version - "land" as a homeland, motherland, etc.

As for the self-name "Ukrainian", it has long been uncommon. This can be largely explained by the difficulties of ethnosocial development.

Synonyms were the terms "Cossack", "Cossack people", at the same time continued to exist and the old names "Rus'ki", "Rusyn" (Ruthenians).

Only in the conditions of national revival in the second half of the 19th century did the self-name "Ukrainian" finally become established. Thus, in the ethnic history of Ukrainians there are three key ethno-unifying self-names:

- the Slavs (Slovenes);
- the Rus (Rus'ki, Ross, Ruthenians);
- Ukrainians (Cossacks).

Today, Ukrainians make up the main population of the state of Ukraine. It is one of the largest nations in Europe and the second largest in the Slavic world.

According to the last census (2001), Ukrainians made up almost two-thirds of the country's population (77.8%). During the years that have passed since the census of the population ‘1989 the number of Ukrainians has increased by 0.3% and their part among other citizens of Ukraine has increased by 5.1 percentage points (Figure 7.7.).

Mostly Ukrainians are evenly distributed throughout the country except for the Crimea and the southeast. In rural areas they make up to 90% of the population, in cities − up to 70%.

Ukrainians belong to the Slavic group of the Indo-European ethnolinguistic family.

The Ukrainian ethnic group consists of:

- the main ethnic massif of the Ukrainian people, which basically coincides with the territory of its formation and the state borders of Ukraine;
- ethnic groups of Ukrainians outside the main ethnic massif in the near and far abroad - the diaspora;
- subethnic groups, i.e. communities among Ukrainians, distinguished by specific cultural features (Hutsuls, Lemkos, Boikos, Poleszuks, etc.).

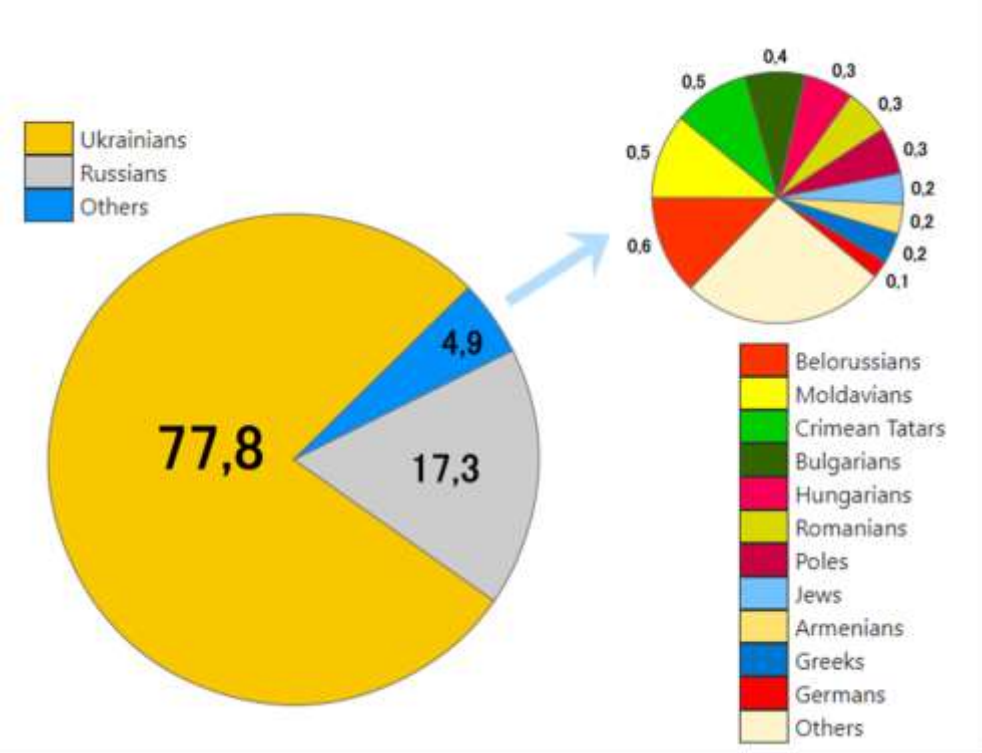

Fig. 7.7. National structure of the population of Ukraine (2001)

Today, as a result of national-state demarcation, hundreds of thousands of Ukrainians found themselves outside Ukraine, in adjacent regions − Kuban, Azov, Central Chernozem region of the

Russian Federation. A significant number of Ukrainians moved to Siberia and the Far East (Eastern Diaspora).

Emigration to the American continent took place mainly from the Ukrainian lands, which were part of Austro-Hungary. Only in the late nineteenth and early twentieth centuries it amounted to more than 700,000 people.

Modern emigration processes intensified after the collapse of the USSR. Abroad, most Ukrainians live (Figure 7.8.) in the United States − about 1 million, in Canada − approximately 1.4 million, in Argentina and Brazil − almost a million, in Poland − about 1.2 million.

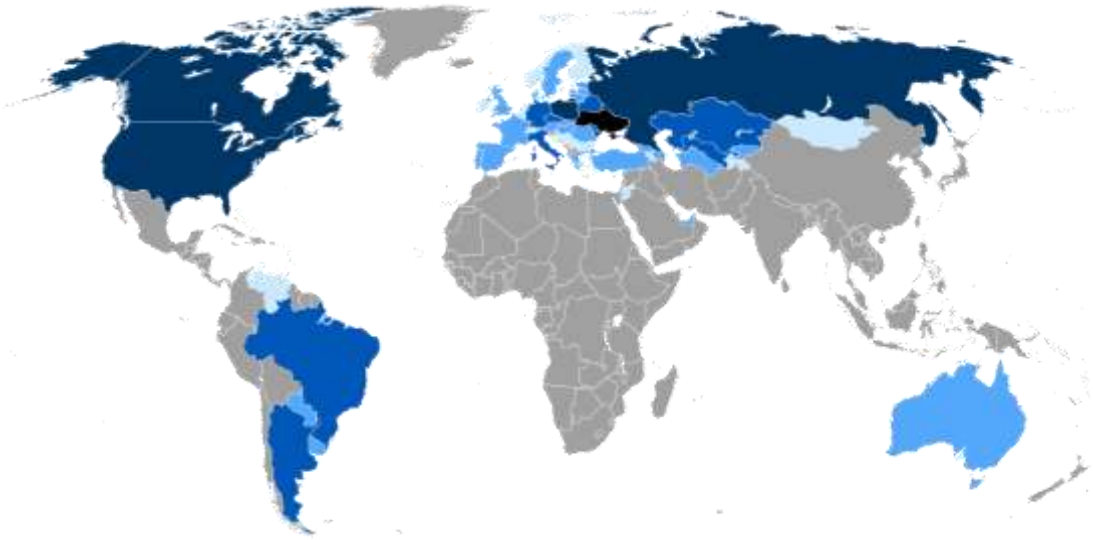

Fig. 7.8. Regions with significant populations

It should be noted that the powerful compact ethnic mass of Ukrainians that existed in Poland (Kholmshchyna, Pidlyashshya), after Operation 'Vistula' in 1947 to relocate them to the western voivodships, it virtually ceased to exist.

As of 2019, 11 to 13 million Ukrainians and their descendants live outside Ukraine, i.e. about a quarter of the population.

Despite significant emigration, Ukraine's population grew. Thus, in 1897 it amounted to 28.4 million, and in 1913 − already 35.2 million. At the same time, starting from the 19th century, mainly due to the development and industrial development of the South and East of Ukraine, which led to the relocation of a large mass of people from other regions of the Russian state, the share of Ukrainians here decreased.

Thus, if in the XVIII century Ukrainians made up about 85% of the population within modern Ukraine, in the XIX century − about 80%, and in the twentieth century − about 74%.

In recent decades, the rural population has declined sharply and the urban population has increased by more than 65%. Currently, 69.2 % of the population of Ukraine is urban (30,425,950 people in 2019).

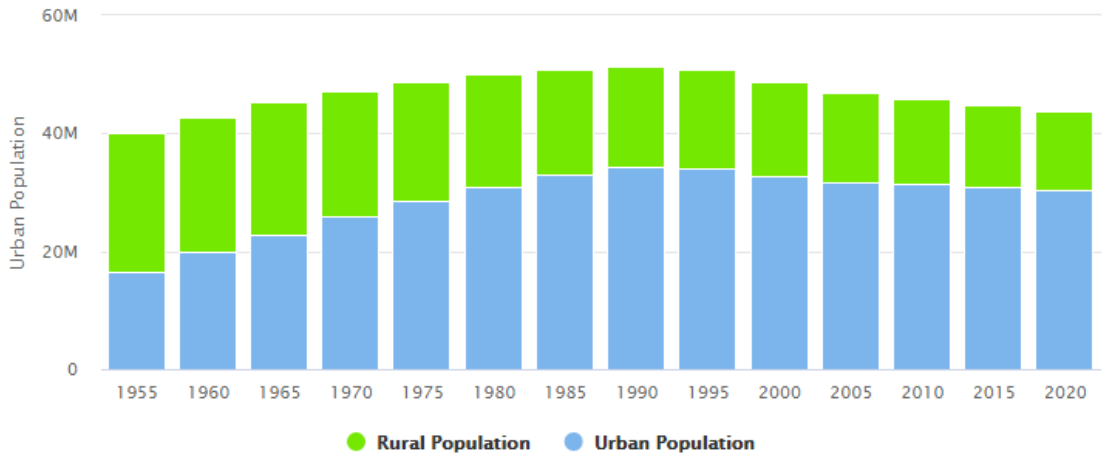

Fig. 7.8. Ukraine Urban vs. Rural Population, 1955 - 2020

(Source: https://www.worldometers.info/world-population/ukraine-population/)

Particularly dangerous phenomena were the decline in birth rates (in 1990 this figure was the lowest in the USSR) and an increase in mortality, resulting in depopulation since the 1980s. It has intensified since 1992.

Among the ethnic processes it is necessary to highlight the decrease in the share of the Ukrainian-speaking population from 71.8% in 1959 to 63.9% in 1989. This phenomenon is most characteristic of the Donetsk-Dnieper and Southern regions.

Among the reasons for the decrease in the share of the Ukrainian-speaking population in Ukraine, the dominant place is occupied by Russification, which accompanied the process of creating the "Soviet people".

Traditions and way of life of the Ukrainian people, which have many national features, still retain a number of territorial features. They are due to:

- the nature of the historical development of individual regions of Ukraine;
- natural and geographical conditions;
- relationships with other peoples.

From the historical and ethnographic point of view on the territory of Ukraine we can distinguish the following cultural and historical zones ().

- Over-Dnieper Ukraine.
- Podilia.
- Sloboda (Slobidska) Ukraine.
- Polissia.
- Pre-Carpathian region (Halychyna).
- Volhynia.

- Carpatho-Ukraine or Zakarpattia.
- Bukovina.
- Southern Ukraine.

The latter area is inhabited by several waves of migration, and finally its population was formed in the XVIII-XIX centuries. This is the youngest district of Ukraine in terms of ethnography.

The south can in turn be divided into a number of regions: the Zaporizhia, Transnistria, Tavria, Donbas, Crimea. It should be noted that the above distribution is largely conditional. More accurate zoning is possible with a comprehensive study of historical and ethnographic phenomena. In addition, these areas do not remain unchanged, as do the criteria that determine them.

Ethnographic groups that have their own peculiarities in culture and language are still preserved in Ukraine. The most significant of them are Ukrainian mountaineers (Hutsuls, Lemkos, Boikos) in Prykarpattia and Polishchuks, Pinchuks, and Lithuanians in Polissya.

Earlier, there were more such groups among Ukrainians. But with the development of capitalism, and then in Soviet times, many archaic, conservative customs and rites gradually faded into the past, and new elements in the life and spiritual life of the peasantry, which made up the majority of Ukrainians, developed.

Elements of urban clothing, new types of housing, and tools became widespread. That is, socio-economic conditions have become decisive factors that determined the formation of the modern face of the Ukrainian nation, influenced the number and geographical location of other ethnic groups, the nature of ethnic processes in Ukraine in general.

The most important feature of every nation is language.

Most Ukrainians speak Ukrainian, which was formed on the basis of territorial elements of the ancient Russian language (although there are other opinions).

According to most researchers, from about the second half of the twelfth century, some distinctive features of the Ukrainian, Russian and Belarusian languages began to appear. In general, the process of formation of the spoken Ukrainian language continued until the XVII century.

At an early stage of development of the Ukrainian nation, the traditions of the literary language of Kyivan Rus' were preserved in its language. In fact, there were two languages: colloquial language, which was formed on the basis of local territorial dialects, and a literary language common to the Eastern Slavs and close to the modern language of the Southern Slavs.

Since the 18th century, elements based on the living vernacular have become more widespread in the Ukrainian literary language. At the same time, the Ukrainian language retained an internal division into dialects (Middle Dnieper, Polissya, Podillia, Transcarpathian, etc.).

At the turn of the 18th and 19th centuries, the Middle Dnieper (Poltava-Kyiv) dialect became the basis of the modern Ukrainian literary language. Due to the fact that the western Ukrainian lands were part of Austria-Hungary, the literary language in these areas had a number of significant features, but was also understood by the inhabitants of Eastern Ukraine.

These are the main features of the development of the Ukrainian ethnos - a very complex process, many of the problems of which still remain controversial.

7.5. Ecological and economic problems of urban areas

Exacerbation of regional environmental problems is significantly influenced by urbanization processes, i.e. the growth of the number and density of urban settlements.

The city *is an anthropogenic ecosystem, which is a place of compact accommodation of people, industrial and domestic buildings, separated by a conditional boundary from the external environment.*

There are 459 cities (on 1 January 2010) and more than 900 urban-type settlements in Ukraine, where is located a significant part of industrial enterprises (over 80%), forming the main man-made load on the environment. Thus, according to statistics, up to 90% of different types of waste are generated in cities and only 10% - in rural areas.

Depending on the population of Ukraine, the following categories of cities are adopted (according to Ukraine Statistics Department):

- Small towns (<10k);
- Mid-size towns (10k-20k);
- Large towns (20k-50k);
- Small cities (50k-100k);
- Mid-size cities (100k-500k);
- Major cities (>500k).

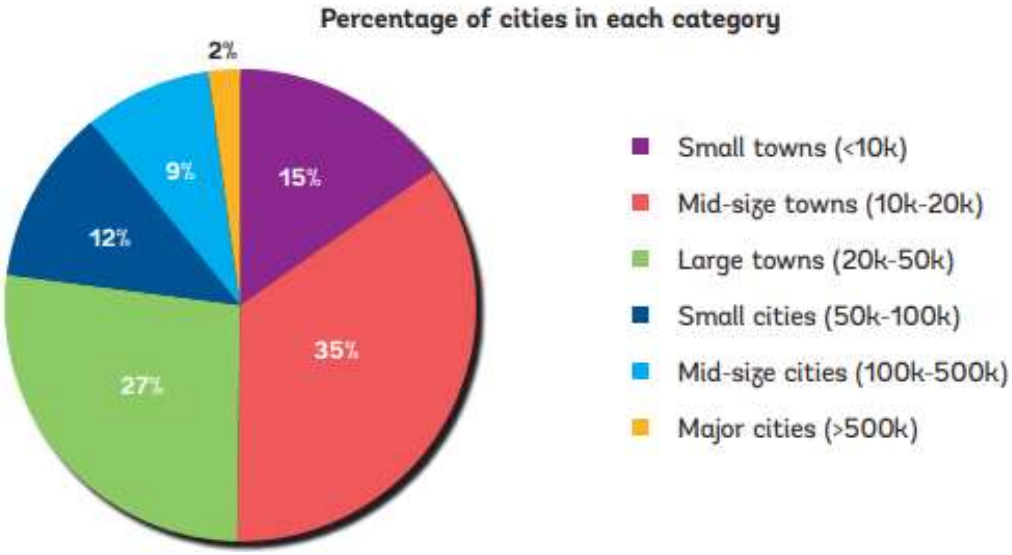

Fig. 7.9. Ukraine has a high percentage of small and mid-sized towns, 2013

(Source: Ukraine Statistics Department)

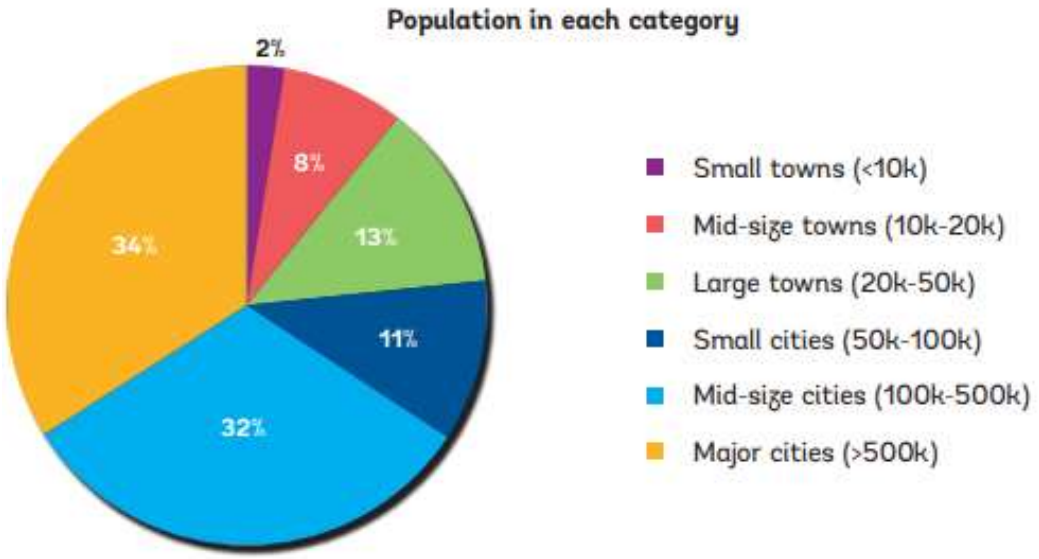

Fig. 7.9. Most of the urban population is concentrated in eight major cities, 2013

(Source: Ukraine Statistics Department)

The city is characterized by significant socio - economic human activity. Therefore, an urban or ***urban environment*** is a specific human environment that contains natural and artificial components, as well as people and their social groups.

The natural components of the city are represented by the physical environment (air, water, geological) and living organisms (except humans).

Artificial components are physical or spiritual objects that are the result of human activity: objects of artificial man-made and spiritual-cultural environment.

People make up the socio-psychological environment - gender, age, psychological, social, professional and ethnocultural groups. Thus, the city is an urban geosociosystem, or abbreviated ***urban system***.

The share of the population living in the cities of the country or region is an indicator of the urbanization of the territory. Thus, currently the most urbanized are the United Kingdom (about 90% of the population lives in cities), Kuwait (91%), Israel (90%), Sweden (83%).

For developing countries (Africa, South Asia) are characterized by the lowest rates of urbanization - 7-10%. In Ukraine, currently every two out of three residents live in cities.

Cities are open systems in which individual elements are connected not only with each other but also with the environment. This connection occurs through the flow of energy, substances and information.

The result of the functioning of urban systems is the production of material and spiritual goods and as a consequence −

environmental pollution by emissions and discharges of harmful substances, industrial and household waste.

The city is a complex system, which includes an urban ecosystem (man-made natural ecosystem of urban areas), social subsystem (sociosphere of the city), technosphere of the city (industrial and economic complex).

Features of the current stage of socio-economic and man-made development determine the rapid increase in urban population. At present, the production capacities of chemical, petrochemical, machine-building, metallurgical, defense, processing and other enterprises are concentrated in large cities, which are sources of anthropogenic impact on the environment.

General criteria for assessing the extent of anthropogenic impact on the environment in large cities may take into account the following:

- the size of the city;
- population size and density;
- multi-storey buildings and building density;
- functionality of land use;
- areas of open and green spaces;
- production economic specialization;
- level of engineering infrastructure provision.

A huge number of people in cities need to be provided with jobs, comfortable housing, places of rest, as well as watering, feeding, and disposing of waste.

At the same time, the higher the level of development of scientific and technological progress, the more comfortable living

conditions of the population, the stronger the negative impact on the environment.

For the normal functioning of the city requires a large mass of various products and raw materials, clean water. The millionaire city consumes 470 million tons / year (or almost 0.5 km^3) of water. Most of this water leaves the city and enters natural watercourses, but in the form of wastewater contaminated with various impurities. The use of surface water within the city is carried out mainly for economic needs.

In recent decades, there has been a shortage of water resources of the required quality in the water supply, which necessitates the transportation of water for tens and even hundreds of kilometers. In addition, the deterioration and sanitation of water supply systems in some cities of Ukraine have reached a critical assessment.

One of the reasons for the shortage of water resources is their intensive and irrational use in some areas and industries. For most industries, the requirements for the quality of water used in technological processes are less demanding than the state standards for the quality of water discharged into water bodies or municipal sewers. In this regard, wastewater from an economic point of view is more profitable to reuse in circulating and sequential water supply systems.

The largest consumers of water in the regions are enterprises of housing and communal services, industry and agriculture. The most water-intensive industries are: chemical and petrochemical - 42.1%, food - 18%, engineering - 13.7%, energy - 12.2%, oil - 8%, meat and dairy - 4.8%.

Wastewater discharges of industrial enterprises are the most significant source of pollution of water bodies. The amount and composition of pollutants in industrial wastewater is very diverse. They depend on technological processes, raw materials used, and the state of treatment facilities. Recently, Ukraine's environmental policy has aimed to limit the discharge of industrial wastewater into water bodies up to the ban on the discharge of untreated wastewater within the city.

To reduce the anthropogenic impact on water bodies, it is necessary to implement basic organizational and technical measures: introduction of new production technologies, reuse of wastewater, wastewater treatment, and sanitation of cities.

No less significant environmental problem of urban areas is air pollution.

The main sources of emissions into the atmosphere are the technological processes of the following industries: thermal power, mining, construction, chemical and petrochemical, ferrous and nonferrous metallurgy, mechanical engineering, transport.

One of the characteristic features of urban areas with developed industry is smog - an atmospheric phenomenon that occurs when certain meteorological factors and significant air pollution.

To ensure the protection of atmospheric air in urban areas, it is necessary to carry out a set of measures that can be divided into areas:

- introduction of technological processes with the lowest level of pollutant emissions in production;

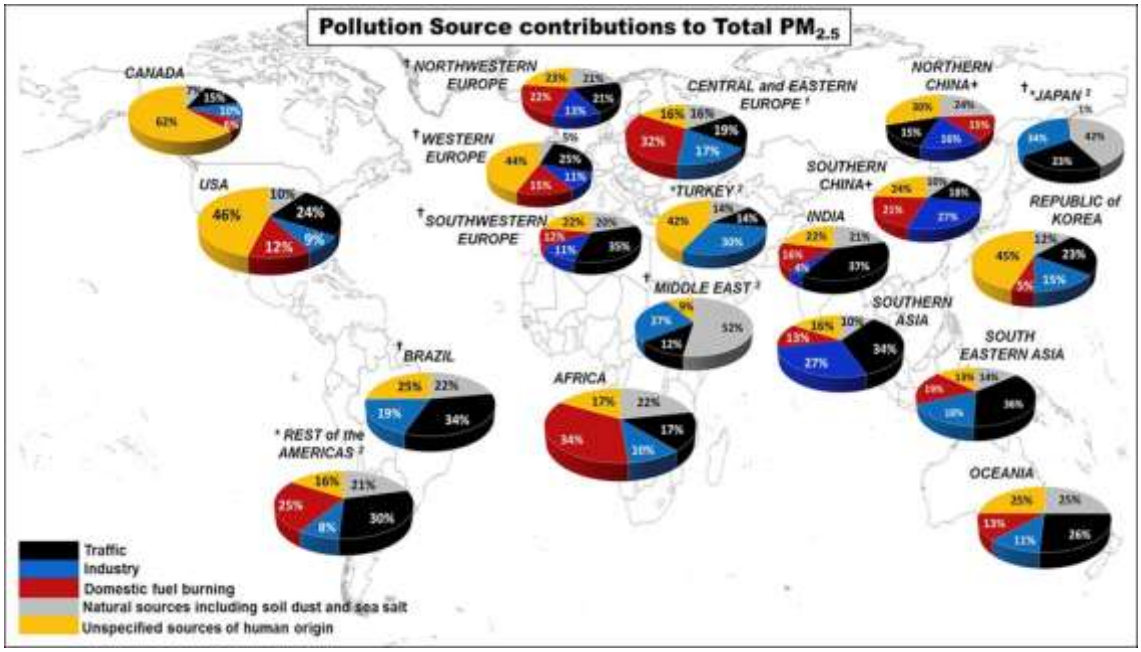

Fig. 7.9. Population-weighted averages for relative source contributions to total $PM_{2.5}$ in urban sites.

(Source: https://www.sciencedirect.com/science/article/pii/S1352231015303320)

- equipping sources of pollutant emissions with treatment facilities;

- organization of sanitary protection zones;

- architectural and planning decisions;

- engineering and organizational measures.

Thus, architectural and planning decisions include measures related to the choice of site for the construction of an industrial enterprise, taking into account the location of residential areas, wind roses, green areas.

During engineering and organizational measures, actions are taken to reduce the intensity and organization of traffic (construction of bypass roads near cities, intersections of roads at different levels,

organization of traffic on highways such as "green wave"), increase the height of pipes, etc.

An important problem for large cities is the generation of solid waste. Their volume depends on the improvement of the housing stock, the duration of the heating season, the number of storeys, the welfare of the population (the higher it is, the more waste is generated per capita).

In Ukraine, the collection of solid waste is carried out without dividing them into separate components (gross collection).

In the developed countries of the world, separate or selective collection of individual components of waste is widespread, which significantly reduces the amount of waste that is taken to landfills and landfills.

Recently, the destruction and recycling of solid waste is widespread throughout the world at waste processing and incineration plants. However, the incineration of municipal solid waste is associated with significant emissions into the atmosphere and the difficulty of cleaning it.

Ukraine has developed a large number of technologies for the utilization of industrial waste for various sectors of the economy; however, their implementation is hampered by the lack of funds in enterprises and low demand for manufactured products.

TOPIC 8.
NUTRITIONAL ECOLOGY

The essence of a good society is that every member, regardless of gender, race or ethnic origin, should have access to a rewarding life. This includes access to a sufficiency of clean and nutritious food.

Harmful factors in the social, population and environment are those that deprive populations of food through insufficient production or importation. Such situations arise from overpopulation relative to food supply from whatever cause: poverty, corruption, disease, bureaucratic sloth and war. The social and political consequences of famine continue for generations.

Malnutrition and poor water and sanitation contribute to 23% of the risk factors to the global disease pattern.

The frequency of natural disasters has been increasing during the twentieth century. These lead to a breakdown in social services, failure to distribute food and hence poor nutrition.

The reliable provision of food requires an organised society. The eminent epidemiologist Geoffrey Rose has written, ‘the primary determinants of disease are mainly economic and social, and therefore its remedy are mainly economic and social’.

A society that is disorganised through war, epidemics of infections or natural disaster is less able to produce or deliver food than a well-structured stable society with a sufficiency of healthy workers.

It is important that food is grown that is appropriate for the particular population’s social, cultural and religious beliefs.

The influences on nutrition include:

• food availability and intake • sufficient but not excessive suitable nutrients and chemicals, which will vary with age, gender, growth and health of the population;

• the provision and availability of a sufficiency of clean water;

• a nutrient intake that meets the requirements and constraints set by the individual's genetic constitution;

• a ready disposal of breakdown products of metabolism, urine and faeces;

• food that is tasty and meets with the cultural, social and religious requirements of the population.

8.1. Ecotrophology is the science of nutrition

Due to the connections of globalization, the individual of the XXI century is not only in a more complex ecological, social, professional environment than before, but also in a more controversial society.

At the same time, the ecological component is becoming increasingly important, because it is through ecology, which deals with objects of natural and natural nature and objects that have been anthropogenic, science and society are finally beginning to pay attention to the processes that take place between the elements of the system man-nature-society.

An important factor in the interaction of these components is nutrition. For a person, this is the main factor influencing the normal state of health, development, longevity, creativity.

Human consumes the gifts of nature, constantly changing, modifying them in the process of life.

The level of food production determines the quality of life of the community of people, their ability to work, affects the fate of entire nations.

Analysis of the dynamics of the nutrition structure of the population of Ukraine over the past 10-15 years reveals that the current parameters of national health require a system-integrated program approach to solving the problem of nutrition.

Close attention to this problem is obvious and justified, especially that even with sufficient food security in the long run, given the reduction of its energy needs and the complexity of the environmental situation, it will be impossible to completely and timely eliminate deficits in food status in the near future.

The problem of nutrition is quite complex and large-scale. It is a kind of reflection of the social welfare of the country and the population and is currently unresolved in Ukraine, as there is no single state policy in the field of nutrition.

However, it should be noted that the reason for the violation of the structure of nutrition of the population of Ukraine is not only low purchasing power, but also a low culture of consumption, ignorance in the field of nutrition.

In today's conditions there is a need not only for a new ideology of life, but also for a new system of knowledge built on a single theoretical basis, covering a number of issues that in the context of nutrition go beyond biology, ecology, medicine, economics.

The scientific direction, which proposed an interdisciplinary holistic approach to the study of human nutrition, is based on the achievements of natural, social and economic sciences.

It was called "***ecotrophology***" (from the Greek words *oikos* − place of residence, *trophy* − food, *logos* - doctrine). This trend was born in the intellectual space of Germany − at the Justus Liebig University Giessen in 1965.

Ecotrophology teaches how to create conditions that fully meet the needs of different segments of the population in a rational and balanced diet that is adequate to national traditions and habits, age, profession, health, economic status and environmental situation, as well as in accordance with the requirements of modern medical science.

Food ignorance has already led to a number of negative consequences (including demographic) in the country, and it has become clear that to ensure a balanced diet, to maintain health, all of us, not just doctors, technologists and nutritionists, must be aware of the field of human nutrition.

It can be seen that arriving at a definition of nutrition is far from straightforward. Two rather different definitions have been suggested, describing nutrition as:

- ‘the study of foods and nutrients vital to health and how the body uses these to promote and support growth, maintenance and reproduction of cells’ or

- ‘the study of the relationship between people and their food’.

The first definition deals only with the nutrients, what happens to them within the human body and what the results are if insufficient amounts are provided. However, people do not eat nutrients, they eat food. This definition ignores all the external factors that play a role in our approach to food and that are crucial in any study of what people are eating. These factors are different for each individual,

depending on cultural background and the circumstances of a person's life.

The second definition takes a much broader perspective, from the supply of food and all the influences thereon, to the individual's food selection and, finally, to the physiological and biochemical effects of the nutrients in the human body, and the consequences for health and survival.

Nutrition *is a set of processes that include intake, digestion, absorption and assimilation of nutrients.*

From these positions, *nutrition ecology* can be considered as an analysis of ecosystems in terms of metabolism and energy that occur in them.

Food ecology covers the entire food system, taking into account its impact on health, the environment, social and economic aspects of human life.

It includes the means of agricultural production - mechanization, energy, fertilizers, pesticides, and components of the food chain - production, cultivation, transportation, storage, processing, packaging, trade, preparation, consumption and disposal of waste, on which the qualitative structure not only of useful nutrients, but also hit of harmful substances (Fig. 8.1.) in foodstuff depends.

Concern about ***environmental contamination*** of foods is growing as the world becomes more populated and more industrialized. Industrial processes pollute the air, water, and soil. Plants absorb the contaminants, and people consume the plants (grains, vegetables, legumes, and fruits) or the meat and milk products from livestock that have eaten the plants.

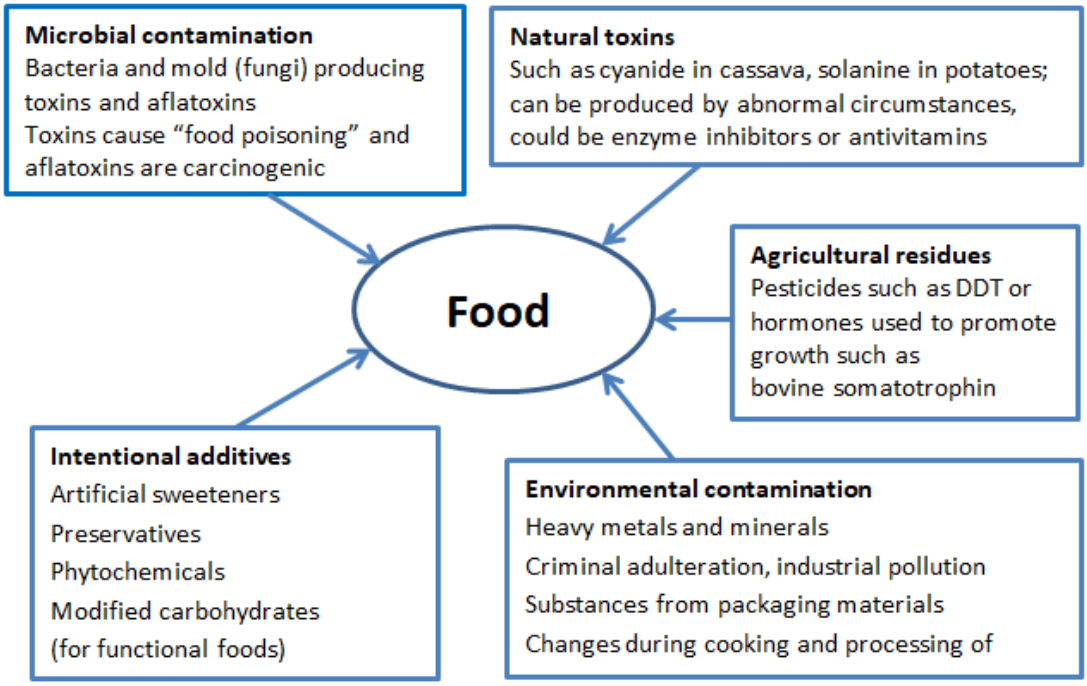

Fig. 8.1. Potential hazardous substances in food

(Source: https://www.nutritionsociety.org/publications/introduction-human-nutrition)

Similarly, polluted water contaminates the fish and other seafood that people eat. Environmental contaminants present in air, water, and foods find their way into our bodies and have the potential to cause numerous health problems.

The potential harmfulness of a contaminant depends in part on its persistence − the extent to which it lingers in the environment or in the body. Some contaminants, however, resist breakdown and can accumulate. Each level of the food chain, then, has a greater concentration than the one below (*bioaccumulation*).

Some ***natural toxins*** can be formed in food as defense mechanisms of plants, through their infestation with toxin-producing mould, or through ingestion by animals of toxin-producing

microorganisms. Natural toxins can cause a variety of adverse health effects and pose a serious health threat to both humans and livestock. Some of these toxins are extremely potent.

Natural toxicants include the goitrogens in cabbage, cyanogens in lima beans, and solanine in potatoes. For example, average solanine content: 8 mg/100 g potato, toxic solanine dose: 20 to 25 mg/100 g potato.

The use of pesticides in agriculture is controversial. They help to ensure the survival of crops, but they leave ***residues*** in the environment and on some of the foods we eat.

Pesticides applied in the field may linger on the foods. Health risks from pesticide exposure are probably small for healthy adults, but children, the elderly, and people with weakened immune systems may be vulnerable to some types of pesticide poisoning.

Alternative farming methods (organic farming) may allow farmers to grow crops with few or no pesticides.

Intentional additives confer many benefits on foods. Some reduce the risk of foodborne illness (for example, nitrites used in curing meat prevent poisoning from the botulinum toxin). Others enhance nutrient quality (as in vitamin D-fortified milk).

Most additives are preservatives that help prevent spoilage during the time it takes to deliver foods long distances to grocery stores and then to kitchens. Some additives simply make foods look and taste good.

Majority of the additives in the food may lead to headache, nausea, weakness and difficulty in breathing. The research on nerve

cells[3] has shown these chemicals to cause toxic effect on nerve cells. Although the toxicants cannot be avoided, but the level can be reduced by adopting or making use of organic, sustainable and less toxic options.

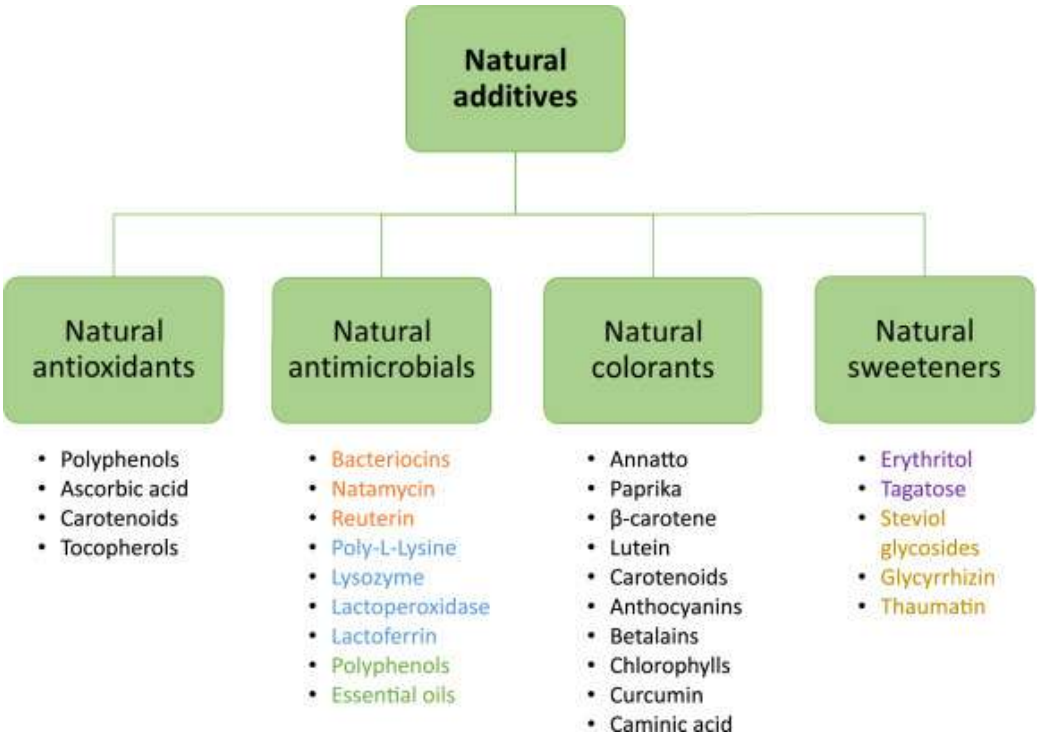

Fig. 8.2. Natural Food Additives

(Source: Natural food additives: Quo vadis? / Márcio Carocho, Patricia Morales, Isabel C.F.R. Ferreira, in Trends in Food Science & Technology, October 2015)

The ecological effect of food is manifested through ***biological, cultural and behavioral*** *mechanisms.*

First of all, food determines the important physiological processes of maintaining tissue integrity; it regulates the

[3] Sharma M, Rajput A, Rathod C, Sahu S. Food Chemicals Induces Toxic Effect on Health: Overview. 2018; 6(4): 33-37.

biochemical mechanisms of metabolism and is a major determinant of growth and development.

In turn, all this directly affects a person as a representative of society. Other biological effects of food are not so obvious, but determine the cultural and behavioral responses of populations, which is fully consistent with environmental principles.

In industrialized countries, in conditions of food surplus, the most pressing problem of society is the problem of food quality and safety.

In backward countries, in conditions of lack of food resources, it is a matter of life to ensure the minimum necessary amount of basic foodstuffs.

8.2. Energy consumption and mechanisms of their replenishment

The most important component of human energy expenditure is basal metabolism, or basic metabolism. This is the level of energy expenditure of the body, which is maintained at a neutral ambient temperature, at rest (but not sleep), after the digestion of food consumed.

The basic metabolism depends on age, sex, body size, functional state of the body.

Numerous researchers rightly believe that the average values of basal metabolism differ in the inhabitants of different climatic and ecological niches (however, this assumption has not been conclusively proven).

Even if this is the case, the range of differences in basal metabolism between the most "contrasting" groups (Indigenous

Arctic with "high" and inhabitants of the rainforest with "low" basic exchange), according to various estimates, is unlikely to exceed 15-20%.

In view of this, it can be assumed that in order to meet the needs associated with the basic metabolism of energy consumption, a person of modern physical type should receive about 1,800 kcal (7.5 MJ) [4] of energy per day with food[5].

It is worth noting that in accordance with the National Health Service (NHS), the United Kingdom, the recommended daily calorie intake is 2,000 calories a day for women and 2,500 for men. The United States Department of Agriculture (USDA) recommends of around 2100 kcal (8.79 MJ) per day person. Now the amount of energy incorporated in a typical American diet of 3628 kcal (15.18 MJ) per person and day to produce, transport, handle and process the foods is calculated and found to have approximately 39.92 GJ (9.54 Gcal) sequestered per person and year (FAOSTAT).

Estimated newly recommended calorie needs per day, by age, sex, and physical activity level you can find in Annex 2.

Energy consumption increases during manual labor.

Of great importance is the type of physical activity: for example, constant work outdoors in high latitudes for a long time increases

[4] Two different units of measurement have been used in nutrition to quantify energy, reflecting the development of understanding of this subject. Traditionally, energy was perceived as heat and measured in calories, where one calorie of heat raised the temperature of 1 mL of water through 1°C. Measurements of energy in nutrition were in units of 1000 Calories, or kilocalories (often shown as kcalories or Calories for simplicity).
The unit preferred by nutritionists today is the kilojoule (or megajoule for larger amounts of energy), which is the SI unit for the measurement of energy. The joule was originally defined as the amount of energy exerted when a force of 1 newton was moved through a distance of 1 metre. Like the calorie, it is a small unit (1 Calorie = 4.18 joules), and so normally appears as the kilojoule (kJ = 1000 joules), or the megajoule (MJ = 1000 kJ) in nutrition.

[5] According to the Food and Agriculture Organization of the United Nations (FAO)

the basic exchange by 10-16%. Performing work in heavy winter clothes further increases energy consumption by 7-25%.

As a result, taking into account the required energy expenditure (basal metabolism + physical labour), the daily energy requirement of a "conditional" person increases to 3000 kcal (12.5 MJ).

There is no reason to believe that the energy needs of food are fundamentally different for a resident of New York, Kiev or Tokyo, or that they were completely different from the ancient hunter on extinet buffalo in Kyivan Rus’.

However, it is obvious that different strategies of energy conservation and replenishment (nutrition) are desirable for each of them.

These strategies are based on long-term adaptations to the habitat: both biological (formation of adaptive types) and cultural and economic way (formation of different life support systems).

As a result of long-term biological adaptive reaction of human populations, an adaptive type is formed - the norm of reaction, which convergently occurs in such living conditions.

Researchers have described adaptive types of temperate climate, continental Arctic, highland, arid (desert), tropical climate.

The formation of the adaptive type includes the formation of specific anatomical and physiological mechanisms, which provide the best use of food resources provided by the ecological and climatic niche.

One of them is the centuries-old adaptation to different diets in representatives of different adaptive types.

This adaptation has led to the emergence of unique variants of gastric digestion in some groups.

Most human populations are characterized by digestion by the so-called wild boar type.

This option is most pronounced in omnivorous mammals (bear, wild boar), which eat meat along with plant foods. In them, the digestion of food bolus in the stomach occurs mainly near its walls, in close contact with the digestive glands. The acidity of gastric juice is relatively low. Its increase leads to irritation of the walls of the body, which threatens the development of gastritis and gastric ulcer.

Indigenous populations of the Arctic, whose diet contains a very large amount of protein and fat, are characterized by gastric digestion like a wolf − similar to the digestion of predators. In this case, the chemical processing of food takes place in the central part of the stomach, at high acidity of digestive juices. To protect the walls of the body from the effects of acid, its cells produce a huge amount of mucus. As a result, even very high acidity does not lead to the development of gastric ulcers.

In some cases, adaptive devices can be very unique. For example, some aboriginal groups in New Guinea have a permanent nitrogen-fixing microflora in their intestines. Periodic digestion of nitrogen-fixing bacteria can provide the body with additional nitrogen, which is lacking in protein- and amino acid-poor foods.

Cultural and economic adaptation determine the formation of specific life support systems − environmentally friendly forms of social behavior that provide a community of people living at the expense of the resources of a particular environment.

The efficiency of different life support systems can be assessed by comparing the energy value of products, received by a group of

people from their economic territory, with the amount of solar energy received in the same territory.

The efficiency of life support systems operating within such climatic and geographical regions can vary hundreds and even thousands of times.

The life support system is an interconnected set of features of production activity, demographic structure and resettlement, labour cooperation, traditions of consumption and division of "comfort goods".

The elements of this complex are interconnected. For example, lack of environmental resources can lead to customary deprivation of "extra mouths to feed" (resettlement of members of the sex-age or social group; direct elimination − killing of newborns or the elderly); to expand the diet through new foods (extreme example - cannibalism); to a tighter allocation of resources within the group.

8.3. The impact of socio-economic changes in society on quality of nourishment

In the population of highly developed countries, the nature of nutrition, on the contrary, is determined mainly by the level of income.

Economic factors significantly affect the nature of human nutrition.

In modern society, for example, the predominantly carbohydrate nature of the diet (and as a consequence - the general prevalence of overweight and obesity) is more common among the less affluent segments of the population.

This is primarily due to the relative cheapness of carbohydrate foods. Protein foods, on the other hand, are the most expensive. As a result, in the Andean shepherd population, for example, only 17.5% of the protein consumed is of animal origin.

As the history of different civilizations shows, socio-economic transformations cause not only short-term but also evolutionary changes in food types.

One of the important factors that motivates cuisine to experiment and expand its capabilities, is associated with the formation of large groups of people who have free time and resources (money, power) and are all out for something new.

An important indicator of the growing attention of most of society to cooking is the emergence of professional chefs. Professional cuisine, originally designed to serve a well-off part of society, uses whenever possible "more prestigious" food items.

The "prestige" of food can be determined by various factors: religious (as a purely vegetarian diet of the upper castes of India) or, more often, economic (this well reflects the well-known expression "richly set table").

With the increase in the level of welfare of society, the elements of "prestigious", "rich" cuisine can spread. In some cases, this leads to changes in traditional diets and can have serious consequences.

One example is the spread of fats in European cuisine. Their consumption was not typical for Europeans - inhabitants of the middle latitudes.

Before the spread of petroleum products and electricity (ie until the end of the XIX century.) Animal fats were the main source of light. Only with the advent of meat and fatty foods available to many

in Europe and North America did the tradition of the "rich (fattening) table" spread.

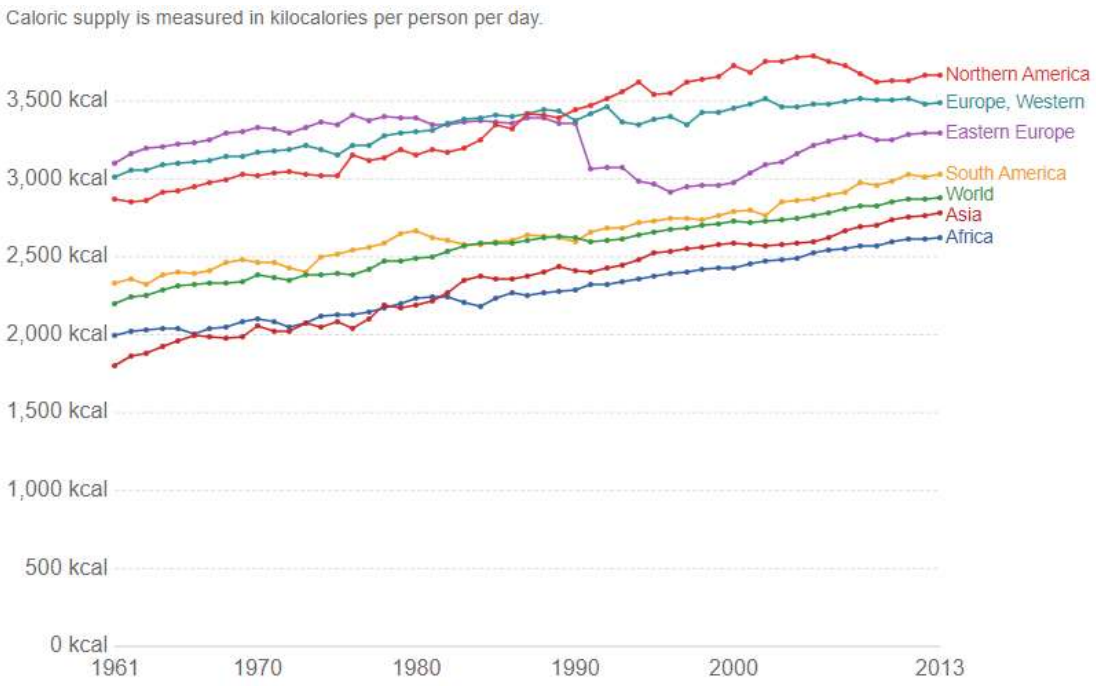

Fig. 8.3. Daily supply of calories

(Source: UN Food and Agricultural Organization)

Until the 60s of XX century, the food industry of all countries advertised high fat content in milk, cream, many types of meat (now the situation has changed radically).

Nutritional imbalance with a sharp increase in the proportion of animal fats in food has led to the spread of "diseases of civilization" − atherosclerosis and coronary heart disease.

The example of meat food can be traced to other aspects of the impact of social change in society on the nature of human nutrition.

By the end of the 19th century, cattle began to be fattened very late in Europe and America, at the age of 10-15; by that time the young animals were only growing. After slaughter, the animal's fat

was used for lightening, and very hard (according to modern imagination) meat for food. It took about five hours to cook such old beef.

As long as the husband was the sole breadwinner in the family and the women were engaged only in the household, such time was of no importance. However, when married women started working, the demand for meat that could be cooked quickly, that is, the meat of young animals, increased.

This has led to significant changes in breeding policy, anatomical and physiological nature of herds of meat animals: in modern industrialized countries, the age of animals at the time of slaughter does not exceed 30 months. During such a short life, the animal can not gain the necessary marketable weight in a natural way, so hormonal drugs and antibiotics began to be widely used in beef cattle breeding. Since up to 20% of the useful (commodity) weight of the animal is lost during transportation to the slaughterhouse due to stress, they end up the active use of sedatives.

All these substances are not always excreted from the animal's body or destroyed before the meat reaches the consumer. The problem of pharmacological and chemical safety of products in modern "technological" society remains very relevant and still far from being solved.

8.4. Overview of the nutrient classes

The six *essential nutrient classes* are carbohydrates, proteins, fats, vitamins, minerals, and water. Each group may contain a variety of different substances, but all substances within each class

share a basic chemistry or function that determines their classification.

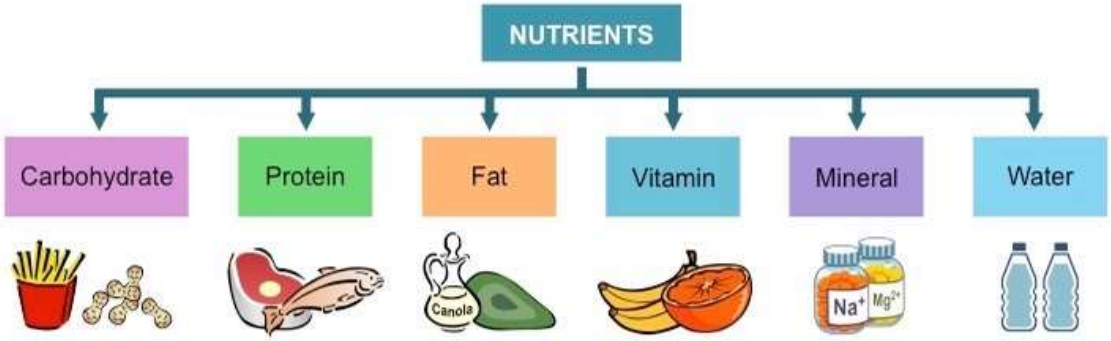

Fig. 8.4. Essential Nutrients

Carbohydrates, proteins, and fats are often referred to as the *macronutrients* because they are required in relatively large amounts in the diet. Another common feature of the macronutrients is their ability to provide the body with energy.

Vitamins and minerals are considered to be the *micronutrients* because they are needed in only small amounts. Contrary to popular belief, the micronutrients do not contain energy and provide no energy to the body. However, some micronutrients participate in the chemical reactions that release energy from the macronutrients and are therefore essential for proper energy metabolism.

Water is also an essential nutrient and, unlike the other nutrient classes, must be consumed daily to prevent water deficiency (dehydration).

Carbohydrates provide the bulk of most human diets and are the major sources of energy worldwide. Carbohydrates are a diverse family of substances that include sugars, starch, and fiber.

Sugars and starch provide energy, whereas most dietary fiber provides no energy because it passes through the digestive tract and is not absorbed by the body. When we use the term “sugar,” most people think of the refined white crystals commonly called “table” sugar.

However, there are many types of sugars found in nature such as fruit sugar and milk sugar. Foods naturally rich in sugars include fruits, vegetables, honey, milk, and other dairy products. Sugar beets and sugar cane are particularly rich in sugar and are the major sources of commercially refined table sugar.

Processed foods containing added sugars − such as candy and soft drinks − account for most of the sugar consumed in economically developed countries.

Starch is found naturally in grains and vegetables, and is the primary carbohydrate consumed throughout the world. It is the main ingredient in foods such as beans, rice, potatoes, pasta, and breads. Many people believe that eating foods containing starch and sugar are “fattening” and that sugar is more fattening than starch.

In truth, starch and sugar provide exactly the same amount of energy, so sugar is no more fattening than starch. Furthermore, excess body fat is the result of consuming too much food, not just carbohydrates.

The term “***fiber***” refers to any plant material that is resistant to digestion and passes through the digestive tract unaltered. In this way, dietary fiber helps to prevent constipation and may lower the risk of colon cancer by speeding up the passage of fecal matter and substances in food that may cause cancer. One caution is that fiber in the intestinal tract may interfere with the absorption of other

essential nutrients, although a wellbalanced diet including plenty of fluids helps to ensure that all essential nutrients are consumed in adequate amounts.

Protein seems to have a more positive image than the other macronutrients. Unlike carbohydrates and fats, protein is usually associated with promoting good health and increasing one's strength and vitality. Athletes often choose high-protein foods or take protein supplements with the promise of increasing muscle mass, strength, and endurance.

As an essential nutrient, protein is required in the diet to replace body proteins that are degraded as part of normal metabolism. Most people in developed countries consume about twice as much protein as the body needs.

Consuming high-protein diets does have some risks. The processing of protein in the body requires lots of water (about seven times more water than required for processing carbohydrates). An excess of dietary protein over time can overwhelm the kidneys and cause permanent damage. Like all nutrients, protein should be consumed as part of an overall balanced diet that contains adequate − but not excessive − amounts of protein. Overconsumption of protein can easily occur in economically developed countries where both animal and plant foods containing protein are readily available.

In contrast to protein, dietary ***fats*** have a negative reputation because of their link to heart disease and cancer. In some cases their negative reputation is justified, although the role of dietary fat in health and disease is very complicated and not fully understood by scientists.

On the one hand, we know that certain types of fat are required for proper growth and maintenance of health, and their absence in the diet causes specific deficiency diseases. On the other hand, too much of certain kinds of fat can increase the risk of chronic disease.

Part of the confusion is that several types of fat exist in nature and are present in the food we eat.

Another point of confusion is that many different names are used to describe the substances in food we commonly call “fat.” To a chemist, any molecule in food that does not dissolve in water belongs to a family of chemicals called lipids. The most important lipids in the food supply are triglycerides and cholesterol, which are chemically unrelated substances except for the fact that they do not dissolve in water.

Triglycerides are the lipids commonly known as fat, oil, grease, shortening, lard, tallow, suet, ghee, and a variety of other names around the world. A bottle of soybean oil, for example, is pure triglyceride.

We generally use the term “fat” to describe triglycerides that are solid at room temperature, and “oil” if they are liquid at room temperature. Fats and oils are actually mixtures of many different types of triglycerides with different chemical properties, which explains why some mixtures are solid and some are liquid.

Triglycerides provide energy to the body and are found throughout the food supply in both animal and plant products. Cholesterol is another dietary lipid, but it is found only in animal products − cholesterol does not exist in the plant kingdom.

Cholesterol is made in the body in adequate amounts and is therefore not considered an essential nutrient. Unlike triglycerides,

cholesterol provides no energy but it is a critical structural component of every cell in the body.

Mention the word ***vitamin***, and an almost magical image comes to mind. Vitamins have been purported to do everything from boosting one's energy level to increasing sexual prowess to curing disease.

While it is true that vitamins are required for a variety of metabolic functions, the restorative abilities attributed to them may be somewhat overstated.

From the scientific viewpoint, vitamins are essential dietary substances needed in small amounts to regulate chemical reactions in the body. In this sense, vitamins are important for proper growth and maintenance of good health, but they appear to possess no greater properties beyond their basic chemical function.

Vitamins do indeed participate in the chemical reactions that release energy from carbohydrates, proteins, and fats, but contain no inherent energy themselves.

Inclusion of vitamins in the diet will cure disease, but only the specific deficiency diseases that develop in their absence. Vitamins are generally found throughout the food supply in developed countries and are consumed in adequate amounts, so despite popular belief, a vitamin supplement is usually not needed.

Minerals are among the basic elements of the earth that cannot be created or broken down by natural forces.

Of the more than 100 earthly elements, the body requires at least 16 of them for a variety of functions such as conducting electricity, regulating chemical reactions, and providing structural components to the body.

The minerals have traditionally been grouped according to the amount found in the human body or by how much is needed in the diet.

The major minerals are those that comprise greater than 0.05% of total body weight, whereas the trace minerals are found in quantities less − usually much less − than 0.05% body weight. It is very likely that the body requires many more trace minerals than we currently believe, but they may be needed in such small amounts that current research methods are not sensitive enough to study their metabolic function.

Minerals are generally found throughout the food supply. Plants obtain minerals from the soil in which they are grown, and animals accumulate minerals by eating the plants.

Not surprisingly, the mineral content of foods is dependent on which minerals are present in the geographic region where the foods are produced. For example, there is a large region in China where the soil is deficient in selenium, and symptoms of selenium deficiency are common among the people that live in that region.

Mineral deficiencies are rare in populations living in developed countries where the found supply is abundant.

Water is often the forgotten nutrient, yet it is the major component of our diet and our bodies. In fact, water is perhaps the most critical of all essential nutrients in the sense that humans survive only a few days without water, but can survive several weeks or months without other essential nutrients.

The average adult consumes about 10 cups of water each day in the form of watercontaining foods and beverages.

While most water in the body comes from the diet, some water is generated from chemical reactions that occur during normal metabolism.

Water is distributed throughout the body, both inside and outside cells.

It provides several major functions in the body, such as lubricating joints, transporting nutrients in the blood, transporting waste products in the urine, regulating body temperature, and providing the medium for virtually every chemical reaction in the body. Physically active people require more water each day than inactive people because of increased water losses through sweat and evaporation.

8.5. Features of the composition of the human diet

The most rational in the diet is the ratio of proteins, fats and carbohydrates as 1:12:46.

The diet should include products of animal and plant origin (for example, vegetable fats must be at least 30% of the total fat).

It is necessary to include in the diet of fresh natural foods that are sources of vitamins, unsaturated fatty acids and minerals.

Although the division of the working population into groups according to the characteristics of labor activity is largely conditional, distinguish groups of persons engaged mainly in mental or physical labor.

At people mainly of mental work in the course of this activity the level of psychoemotional pressure inherent in the given individual, a hypokinesia develops, the body weight can increase. These conditions are risk factors for many diseases.

To prevent such complications, persons engaged mainly in mental work should perform a reasonable amount of physical activity and in case of weight gain moderately limit nutrition.

Dietary restriction should be based only on its energy value (mainly by reducing carbohydrate intake) and not to the detriment of its plastic value.

Moderate dietary restriction should be combined with the introduction of a wide range of plant foods in the diet.

When performing mainly physical labor in the diet, the ratio of proteins, fats and carbohydrates should be approximately 1:13:51.

The diet includes a variety of high-calorie foods; the proportion of animal protein is 55% of the daily norm of protein, and vegetable fats - 30% of the daily norm of fats. The harder and longer the work, the more fortified foods should be.

To restore health after illness, disease prevention, maintaining high efficiency, special regimes and diets of therapeutic and preventive nutrition have been developed. If necessary, they are recommended for employees of both physical and mental work.

Healthy eating is especially important to ensure a healthy life. In addition to increasing fruits and vegetables, whole grains and healthy fats, the daily diet should also take into account the safety of the products used.

In Ukraine, as in other countries around the world, there is a growing demand for environmentally friendly food that can provide organic production.

Council Regulation (EC) №834 / 2007[6], in particular, states that organic production is an integrated system of management and production of foodstuffs, which combines best practices in terms of environmental conservation, the level of biological diversity, conservation of natural resources, application of high standards of proper maintenance (welfare) of animals and method of production, which meets certain requirements for products manufactured using substances and processes of natural origin, which allows us to highlight not only its traditional (production) content, but also to consider organic farming in a qualitatively new social plane.

The idea of organic production (agriculture) is to completely abandon the use of GMOs, antibiotics, pesticides and fertilizers.

This leads to an increase in natural biological activity in the soil, restoring the balance of nutrients, enhancing regenerative properties, normalizes the work of living organisms, there is an increase in humus, and as a result − an increase in crop yields.

The result of organic production is environmentally friendly products, free of GMOs and non-food chemical elements.

It should be noted that organic products can be called, the production of which has passed the certification procedure in the prescribed manner, and they themselves meet the approved standards and are properly labelled.

The label of the organic product must bear the appropriate logo and information about the certification body. Only companies that have passed the certification of all stages of production, from water,

[6] Council Regulation (EC) No 834/2007 of 28 June 2007 on organic production and labelling of organic products and repealing Regulation (EEC) No 2092/91

air and soil to the condition of the finished product, can label their product as organic.

Product evaluation takes into account national and international standards, which take into account not only compliance with the standard of the product itself, but also all stages of its manufacture in terms of environmental impact.

The product must be fresh, because the shelf life of "organic" is short. This means that the delivery of products from their place of production to the counter must be lightning fast and the products must be sold out on time, otherwise they must be disposed of.

Healthy diet[7]

Recommendation of World Health Organization

Key facts

- A healthy diet helps to protect against malnutrition in all its forms, as well as noncommunicable diseases (NCDs) such as diabetes, heart disease, stroke and cancer.

- Unhealthy diet and lack of physical activity are leading global risks to health.

- Healthy dietary practices start early in life – breastfeeding fosters healthy growth and improves cognitive development, and may have longer term health benefits such as reducing the risk of becoming overweight or obese and developing NCDs later in life.

- Energy intake (calories) should be in balance with energy expenditure. To avoid unhealthy weight gain, total fat should not exceed 30% of total energy intake. Intake of saturated fats should

[7] https://www.who.int/publications/m/item/healthy-diet-factsheet394

be less than 10% of total energy intake, and intake of trans-fats less than 1% of total energy intake, with a shift in fat consumption away from saturated fats and trans-fats to unsaturated fats, and towards the goal of eliminating industrially produced trans-fats.

- Limiting intake of free sugars to less than 10% of total energy intake is part of a healthy diet. A further reduction to less than 5% of total energy intake is suggested for additional health benefits.

- Keeping salt intake to less than 5 g per day (equivalent to sodium intake of less than 2 g per day) helps to prevent hypertension, and reduces the risk of heart disease and stroke in the adult population.

- WHO Member States have agreed to reduce the global population's intake of salt by 30% by 2025; they have also agreed to halt the rise in diabetes and obesity in adults and adolescents as well as in childhood overweight by 2025.

Consuming a healthy diet throughout the life-course helps to prevent malnutrition in all its forms as well as a range of noncommunicable diseases (NCDs) and conditions. However, increased production of processed foods, rapid urbanization and changing lifestyles have led to a shift in dietary patterns. People are now consuming more foods high in energy, fats, free sugars and salt/sodium, and many people do not eat enough fruit, vegetables and other dietary fibre such as whole grains.

The exact make-up of a diversified, balanced and healthy diet will vary depending on individual characteristics (e.g. age, gender, lifestyle and degree of physical activity), cultural context, locally available foods and dietary customs. However, the basic principles of what constitutes a healthy diet remain the same.

For adults

A healthy diet includes the following:

- Fruit, vegetables, legumes (e.g. lentils and beans), nuts and whole grains (e.g. unprocessed maize, millet, oats, wheat and brown rice).

- At least 400 g (i.e. five portions) of fruit and vegetables per day, excluding potatoes, sweet potatoes, cassava and other starchy roots.

- Less than 10% of total energy intake from free sugars, which is equivalent to 50 g (or about 12 level teaspoons) for a person of healthy body weight consuming about 2000 calories per day, but ideally is less than 5% of total energy intake for additional health benefits. Free sugars are all sugars added to foods or drinks by the manufacturer, cook or consumer, as well as sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates.

- Less than 30% of total energy intake from fats. Unsaturated fats (found in fish, avocado and nuts, and in sunflower, soybean, canola and olive oils) are preferable to saturated fats (found in fatty meat, butter, palm and coconut oil, cream, cheese, ghee and lard) and trans-fats of all kinds, including both industrially-produced trans-fats (found in baked and fried foods, and pre-packaged snacks and foods, such as frozen pizza, pies, cookies, biscuits, wafers, and cooking oils and spreads) and ruminant trans-fats (found in meat and dairy foods from ruminant animals, such as cows, sheep, goats and camels). It is suggested that the intake of saturated fats be reduced to less than 10% of total energy intake and trans-fats to less than 1% of total energy intake. In particular, industrially-

produced trans-fats are not part of a healthy diet and should be avoided.

- Less than 5 g of salt (equivalent to about one teaspoon) intake per day. Salt should be iodized.

For infants and young children

In the first 2 years of a child's life, optimal nutrition fosters healthy growth and improves cognitive development. It also reduces the risk of becoming overweight or obese and developing NCDs later in life.

Advice on a healthy diet for infants and children is similar to that for adults, but the following elements are also important:

- Infants should be breastfed exclusively during the first 6 months of life.

- Infants should be breastfed continuously until 2 years of age and beyond.

- From 6 months of age, breast milk should be complemented with a variety of adequate, safe and nutrientdense foods. Salt and sugars should not be added to complementary foods.

Practical advice on maintaining a healthy diet

Fruit and vegetables

Eating at least 400 g, or five portions, of fruit and vegetables per day reduces the risk of NCDs and helps to ensure an adequate daily intake of dietary fibre. Fruit and vegetable intake can be improved by:

- always including vegetables in meals;

- eating fresh fruit and raw vegetables as snacks;

- eating fresh fruit and vegetables that are in season; and

- eating a variety of fruit and vegetables.

Fats

Reducing the amount of total fat intake to less than 30% of total energy intake helps to prevent unhealthy weight gain in the adult population. Also, the risk of developing NCDs is lowered by:

- reducing saturated fats to less than 10% of total energy intake;
- reducing trans-fats to less than 1% of total energy intake; and
- replacing both saturated fats and trans-fats with unsaturated fats – in particular, with polyunsaturated fats.

Fat intake, especially saturated fat and industrially-produced trans-fat intake, can be reduced by:

- steaming or boiling instead of frying when cooking;
- replacing butter, lard and ghee with oils rich in polyunsaturated fats, such as soybean, canola (rapeseed), corn, safflower and sunflower oils;
- eating reduced-fat dairy foods and lean meats, or trimming visible fat from meat; and
- limiting the consumption of baked and fried foods, and pre-packaged snacks and foods (e.g. doughnuts, cakes, pies, cookies, biscuits and wafers) that contain industrially-produced trans-fats.

Salt, sodium and potassium

Most people consume too much sodium through salt (consuming an average of 9–12 g of salt per day) and not enough potassium (less than 3.5 g). High sodium intake and insufficient potassium intake contribute to high blood pressure, which in turn increases the risk of heart disease and stroke.

Reducing salt intake to the recommended level of less than 5 g per day could prevent 1.7 million deaths each year.

People are often unaware of the amount of salt they consume. In many countries, most salt comes from processed foods (e.g. ready meals; processed meats such as bacon, ham and salami; cheese; and salty snacks) or from foods consumed frequently in large amounts (e.g. bread). Salt is also added to foods during cooking (e.g. bouillon, stock cubes, soy sauce and fish sauce) or at the point of consumption (e.g. table salt).

Salt intake can be reduced by:

- limiting the amount of salt and high-sodium condiments (e.g. soy sauce, fish sauce and bouillon) when cooking and preparing foods;
- not having salt or high-sodium sauces on the table;
- limiting the consumption of salty snacks; and
- choosing products with lower sodium content.

Some food manufacturers are reformulating recipes to reduce the sodium content of their products, and people should be encouraged to check nutrition labels to see how much sodium is in a product before purchasing or consuming it.

Potassium can mitigate the negative effects of elevated sodium consumption on blood pressure. Intake of potassium can be increased by consuming fresh fruit and vegetables.

Sugars

In both adults and children, the intake of free sugars should be reduced to less than 10% of total energy intake. A reduction to less than 5% of total energy intake would provide additional health benefits.

Consuming free sugars increases the risk of dental caries (tooth decay). Excess calories from foods and drinks high in free sugars

also contribute to unhealthy weight gain, which can lead to overweight and obesity. Recent evidence also shows that free sugars influence blood pressure and serum lipids, and suggests that a reduction in free sugars intake reduces risk factors for cardiovascular diseases.

Sugars intake can be reduced by:

- limiting the consumption of foods and drinks containing high amounts of sugars, such as sugary snacks, candies and sugar-sweetened beverages (i.e. all types of beverages containing free sugars – these include carbonated or non-carbonated soft drinks, fruit or vegetable juices and drinks, liquid and powder concentrates, flavoured water, energy and sports drinks, ready-to-drink tea, ready-to-drink coffee and flavoured milk drinks);

and

- eating fresh fruit and raw vegetables as snacks instead of sugary snacks.

INDEPENDENT WORK AND ORGANIZATION OF STUDENTS 'KNOWLEDGE CONTROL

Self-dependent work

Independent work of students in the discipline "Human Ecology" is determined by the work program and may include the following stages:

• preparation for practical and laboratory work;

• study of topics submitted for self-study;

• preparation for speeches at seminars, round tables, conferences;

• writing essays;

• preparation for final certification.

An indicative list of topics for individual tasks for independent work of students

Module 1. Theoretical and methodological aspects of human ecology

Aerospace monitoring.

The human phenomenon and the main interpretations of its origin.

Ecological isolation of man as a biological being.

Strategy and tactics of human survival. New trends in civilization.

Biological and social needs of man. Anthropo-ecological criteria of environmental quality.

Problems of quality of life and environmental safety. Methods of environmental risk assessment.

Problems of epidemiological information. International standards. Global environmental shocks, catastrophes, epidemics.

Environmental policy in various areas of legislative and economic activities. Principles and methods of human ecology in solving practical environmental and political problems.

Forms of participation of anthropoecologists in the analysis, assessment and elimination of systemic problem situations. Public participation in solving new construction issues.

The role of anthropoecologist in ecological expertise.

Human health in modern socio-ecological conditions.

Health prevention: healthy lifestyle, psychological training, balneology, tourism.

Risk factors: AIDS, sexually transmitted diseases, drug addiction, substance abuse, alcoholism, smoking as socio-environmental problems of today.

Health culture of Ukrainians: traditions, beliefs, rituals.

The spiritual crisis of mankind as a major factor in the ecological crisis.

Directions of preservation and development of the Ukrainian ethnos.

Environmental issues of marriage and family.

Diet and seasonality of food. Food bans, fasts, daily meals.

Ecology of food. Ukrainian cuisine and its traditions.

Cultural and geographical aspects of recreation. Public health organization in Ukraine.

Module 2. Impact of the environment on human health

Genetic adaptation, genetic manipulation, genetic engineering and biotechnology.

The role of genotypic and phenotypic features in the spread of pathologies.

Urbanization and human health. Hypodynamia.

Stress and other psychological problems. Smoking, alcoholism, drug addiction.

Human gene pool and aggressive environmental factors.

Geochemical natural environmental factors. Threshold concentrations of chemical elements. Natural endemic diseases. Interaction with biological objects. The doctrine of natural foci of disease.

History of global human epidemics. Wars and epidemics. Modern global and regional epidemiological features.

Classification of diseases and pathological conditions according to the degree and nature of dependence on environmental factors. The concept of natural preconditions of diseases.

Ecological and physiological mechanisms of thermoregulation in hot climates and features of human lifestyle.

Problems of thermoregulation in cold climates and cold effects on human health.

Impact of natural disaster. Extreme environmental conditions. Epidemiological consequences of various forms of transformation of nature: agriculture; forest operation and forestry works; creation of artificial reservoirs; reclamation works; intensification of animal husbandry; construction works.

General information about sanitary and hygienic rationing. Rationing during the planning of settlements and the development of the territorial organization of society.

Environmental quality control. Food quality standards. Standardization of physical environmental factors.

Assessment of students' knowledge

According to the "Regulation on exams and tests at the National University of Life and Environmental Sciences of Ukraine", approved by the Academic Council of NUBIP of Ukraine dated "27" December 2019, protocol № 5, after conducting intermediate certifications of meaningful modules and determining their ratings, the lecturer of the discipline determines the rating of the applicant for higher education in the educational work of $\mathbf{P_{НР}}$ (not more than 70 points) according to the formula:

$$R_{НР} = \frac{0{,}7 \cdot (R^{(1)}_{ЗМ} \cdot К^{(1)}_{ЗМ} + \ldots + R^{(n)}_{ЗМ} \cdot К^{(n)}_{ЗМ})}{К_{ДИС}}, \quad (1)$$

where $R^{(1)}_{ЗМ}, \ldots R^{(n)}_{ЗМ}$ − ratings from meaningful modules on a 100-point scale;

n – number of meaningful modules;

$К^{(1)}_{ЗМ}, \ldots К^{(n)}_{ЗМ}$ – number of credits ECTS, envisaged by a working curriculum for the relevant meaningful module;

$К_{ДИС} = К^{(1)}_{ЗМ} + \ldots + К^{(n)}_{ЗМ}$ − number of credits ECTS, envisaged by a working curriculum for the discipline in current semester.

The formula can be simplified if we take $K^{(1)}_{3M} = \ldots = K^{(n)}_{3M}$. Then it will look like

$$R_{HP} = \frac{0{,}7 \cdot (R^{(1)}_{3M} + \ldots + R^{(n)}_{3M})}{n} \quad (2)$$

The rating of the applicant for higher education in educational work is rounded to an integer.

Rating of additional work is added to R_{HP} and cannot exceed 20 points. It is determined by the lecturer and is given to students by the decision of the Department for work that is not covered by the curriculum, but enhances the knowledge of students in the discipline.

Penalty rating cannot less than 5 points and is subtracted from R_{HP}. It is determined by the lecturer and is administered by the decision of the Department to students who have learned the material of meaningful module late did not adhere to schedule, missed classes etc.

In accordance with the above Provisions applicants for higher education are allowed to take an exam or test in the discipline, if he has completed all types of work provided for in the curriculum and training programme in this discipline, and his rating for academic work in this discipline is not less than 42 points (60 points × 0.7 = 42 points).

On the test (exam) conducted by the method of testing, the rating of the applicant for higher education in the certification of R_{AT} (not more than 30 points) is determined by the formula:

$$R_{AT} = \frac{К\ прав}{К\ заг} \quad (3)$$

where **К прав** − the number of correct elements in the student's answer sheet;

К заг − the total number of elements in the form of reference answers

To determine the rating of the applicant for higher education in the discipline $R_{ДИС}$ (up to 100 points) the obtained rating for certification (up to 30 points) is added to the rating for educational work $R_{НР}$ (up to 70 points):

$$R_{ДИС} = R_{НР} + R_{АТ} \quad (4)$$

The rating of the applicant for mastering the discipline in points is translated into national grades according to table:

The relationship between the rating of the applicant for higher education and national assessments

Rating of the applicant for higher education, points	The assessment is national based on the results of passing	
	exams	tests
90−100	excellent	passed
74−89	good	
60−73	satisfactory	
0−59	poor	failed

Basic tests of discipline

1. The term "human ecology" is proposed:

a. American scientist Harlan Burroughs;

b. American researchers Robert Park and Ernest Burgess;

c. Russian ecologist Vlail Kaznacheyev;

d. Ukrainian naturalist Volodymyr Vernadsky.

2. The focus of research on human ecology as a science is:

a. environment;

b. man;

c. human life;

d. population health.

3. The object of study of human ecology is:

a. anthropoecosystem;

b. man;

c. environment;

d. atmosphere.

4. The purpose of human ecology is:

a. informing society about processes and phenomena in nature;

b. environmental protection;

c. harmonization of human interaction between themselves and the environment;

d. study of environmental aspects of nutrition.

5. Human ecology as a science performs the following functions:

a. educational and upbringing;

b. theoretical-cognitive and informational;

c. socio-economic control and practical transformation;

d. all the above answers are correct.

6. Ethology is the science of:

a. behavior of living beings, including humans;

b. the influence of environmental factors on the ethnic group;

c. the influence of environmental factors on the functioning of the human body;

d. poisonous, toxic and harmful substances.

7. Human ecology as a science is related to the following fields of knowledge:

a. demography and economics;

b. sociology and philosophy;

c. biology and medicine;

d. all the above answers are correct.

8. Anthropoecosystem is:

a. the set of organisms and conditions of their existence that form a system of interdependent phenomena and processes;

b. ecosystem in which human life, social group;

c. area of distribution of life on Earth;

d. the set of all environmental factors in the area, under which the existence of a particular species is possible.

9. Element that is not part of the anthropoecosystem:

a. demographic behavior;

b. environmental pollution;

c. political situation;

d. migratory pressure.

10. Levels of research of anthropoecosystems are:

a. local, regional, global;

b. local, national, international;

c. local, national;

d. planetary, continental, national.

11. The period of change in the territory of the anthropoecosystem is:

a. a few years;

b. several decades;

c. long historical period of time;

d. all the above answers are incorrect.

12. Correct formulation of one of the axioms of human ecology:

a. the main biological factor of human physical survival in changing conditions is adaptation;

b. the main biological factor of human physical survival in changing conditions is heredity;

c. the main biological factor of human physical survival in changing conditions is the state of health;

d. all the above answers are incorrect.

13. Choose an indicator that does not characterize the community of people:

a. population health;

b. level of environmental pollution;

c. average life expectancy;

d. mortality.

14. The main research methods of human ecology include:

a. engineering, model, expert, sociological;

b. questionnaires, extrapolations, interpolations, verifications;

c. assessment, modeling, anthropological taxation, forecasting;

d. thermophysical, sensory, organoleptic.

15. Average life expectancy is:

a. the number of future years of life of a group of people of a certain age;

b. the period during which the community of people effectively performs its functions;

c. the number of years that a certain population of people should live on average;

d. the number of years that a certain generation should live on average.

16. Humans (Homo sapiens) appeared in the arena of life:

a. 140-280 thousand years ago;

b. 100-150 thousand years ago;

c. 50-35 thousand years ago;

d. 0-10 thousand years ago.

17. According to molecular genetic research, the ancestral home of man is:

a. Northern China;

b. Southeastern Europe;

c. Africa;

d. South Asia.

18. The first ecological crisis in human history occurred:

a. in the Early Paleolithic era;

b. in the late Paleolithic era;

c. in the Mesolithic era;

d. in the Neolithic era.

19. The Neolithic revolution is a stage of development of human society, which characterizes:

a. transition from hunting and gathering to agriculture;

b. transition from harvesting to fishing;

c. transition from agriculture to economic activity;

d. transition from agriculture to livestock.

20. The main trends of hominization were:

a. walking upright;

b. increase in brain volume;

c. adaptation to work;

d. all the above factors.

21. The gene pool is:

a. encoded in DNA molecules genetic memory of the population, which is passed from generation to generation in the process of natural reproduction of the population;

b. the exact number of genes in humans;

c. inherent in all living organisms method of encoding the amino acid sequence of proteins using a nucleotide sequence;

d. natural resource on which the potential of society is based.

22. The average gene size in humans:

a. 0.5–1 thousand nucleotide pairs;

b. 1–3 thousand nucleotide pairs;

c. 5-10 thousand nucleotide pairs;

d. 100 thousand nucleotide pairs.

23. The approximate frequency of spontaneous mutations in human germ cells is:

a. 1×10^{-2}–1×10^{-3};

b. 1×10^{-3}–1×10^{-4};

c. 1×10^{-5}–1×10^{-6};

d. 1×10^{-7}–1×10^{-8}.

24. Protection of the gene pool from the adverse effects of a complex of social and environmental factors is:

a. genetic monitoring;

b. ecological safety;

c. genetic safety;

d. population security.

25. Factors that increase the frequency of mutations compared to the spontaneous level are called:

a. carcinogens;

b. mutagens;

c. allergens.

26. Constant monitoring of the dynamics of the parameters of genetic load, cancer, and other adaptive features are:

a. environmental monitoring;

b. medical monitoring;

c genetic monitoring;

d. sanitary monitoring.

27. Endoecological status is:

a. adaptation of the body for many generations to a certain set of foods;

b. human adaptation to environmental conditions that have evolved;

c. rate of biological response to a set of environmental conditions;

d. determination of compliance with environmental standards.

28. The science that teaches how to create conditions that fully meet the needs of different segments of the population in optimal nutrition, is called:

a. dietology;

b. ecotrophology;

c. ethnography.

29. A stable community of people, historically formed in a certain area, has relatively stable features of culture and psyche:

a. race;

b. national minority;

c. ethnos;

d. family.

30. The set of typical types of life of human communities:

a. standard of living;

b. mode of life;

c. quality of life;

d. lifestyle.

LIST OF RECOMMENDED LITERATURE

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DICTIONARY OF TERMS

Abiogenic process − a process not related to life (for example, evaporation of water under the action of heating by the sun).

Abiotic factors, also called abiotic components are non-living factors that impact an ecosystem. Abiotic factors are part of the ecosystem and can impact the associated living things, but they are not living. The term “abiotic” comes from the root parts “a-” meaning “without,” and “bio,” meaning “life.” The living parts of an ecosystem are called “biotic factors.”

Abscess is a painful collection of pus, usually caused by a bacterial infection. Abscesses can develop anywhere in the body. Bacteria, viruses, parasites and swallowed objects can all lead to abscesses. Skin abscesses are easy to detect. They are red, raised and painful. Abscesses inside human’s body may not be obvious and can damage organs, including the brain, lungs and others. Treatments include drainage and antibiotics.

Absorbed dose is a dose quantity which is the measure of the energy deposited in matter by ionizing radiation per unit mass. Absorbed dose is used in the calculation of dose uptake in living tissue in both radiation protection (reduction of harmful effects), and radiology (potential beneficial effects for example in cancer treatment). It is also used to directly compare the effect of radiation on inanimate matter such as in radiation hardening. The SI unit of measure is the gray (Gy), which is defined as one Joule of energy absorbed per kilogram of matter. The older, non-SI CGS unit rad, is sometimes also used, predominantly in the USA.

Acari (or Acarina) are a taxon of arachnids that contains mites and ticks. Most acarines are minute to small (for example, 0.08–1.00 mm or 0.003–0.039 in), but the largest (some ticks and red velvet mites) may reach lengths of 10–20 mm (0.4–0.8 in). Over 50,000 species have been described and an estimated million or more species may exist. Acarines live in practically every habitat, and include aquatic (freshwater and sea water) and terrestrial species.

Accident is an unplanned event that sometimes has inconvenient or undesirable consequences, other times being inconsequential. The occurrence of such an event may or may not have unrecognized or unaddressed risks contributing to its cause. Most scientists who study unintentional injury avoid using the term "accident" and focus on factors that increase risk of severe injury and that reduce injury incidence and severity.

Acclimatization, any of the numerous gradual, long-term responses of an organism to changes in its environment. Such responses are more or less habitual and reversible should environmental conditions revert to an earlier state. Acclimatization can be natural (migration of animals, transfer of plant seeds by animals to new places, etc.) and artificial (after the introduction of animals and plants). Acclimatized organisms can produce viable offspring in the new conditions. For humans, acclimatization is an adaptation to new climatic conditions.

Adaptation − the process in which a living thing changes slightly over time to be able to continue to exist in a particular environment, or a change like this: i) Evolution occurs as a result of adaptation to new environments; ii) It's these evolutionary adaptations that make aphids and other insects so destructive.

Adaptation syndromes (the general adaptation syndrome (GAS)) are a series of normal physiologic reactions of the organism that install a change in the functional equilibrium but which result in a return to the prior state of function once the demand is discontinued. The GAS consisted of three phases: (i) the alarm phase, (ii) the phase of adaptation, and (iii) the phase of exhaustion. Hans Selye held that the stress syndrome was always a nonspecific response of the body to any demand and included a triad of responses: enlargement of the adrenal cortex, decrease in size of the thymus and lymphatic tissue, and ulceration of the stomach and duodenum. Selye also promoted the concept of diseases of adaptation that were connected to stressful stimulation.

Adenocarcinoma − cancer that begins in glandular (secretory) cells. Glandular cells are found in tissue that lines certain internal organs and makes and releases substances in the body, such as mucus, digestive juices, or other fluids. Most cancers of the breast, pancreas, lung, prostate, and colon are adenocarcinomas.

Adenoids are a mass of soft tissue behind the nasal cavity. Like lymph nodes, adenoids are part of the immune system and are made of the same type of tissue (lymphoid tissue). White blood cells circulate through the adenoids and other lymphoid tissue, reacting to foreign invaders in the body.

Adenoma is a type of non-cancerous tumor or benign that may affect various organs. It is derived from the word “adeno” meaning 'pertaining to a gland'.

Adenovirus diseases are acute infectious diseases of humans and animals caused by adenoviruses. Run in the form of acute

respiratory diseases or with a predominant lesion of the mucous membranes of the eyes, intestines.

Adenoviruses are medium-sized (90–100 nm), non-enveloped (without an outer lipid bilayer) viruses with an icosahedral nucleocapsid containing a double stranded DNA genome. Their name derives from their initial isolation from human adenoids in 1953.

Adsorbents − finely ground, water-insoluble powders; used in skin diseases in the form of powders and inside for poisoning and some gastrointestinal diseases.

Adynamia means lack of strength or vigor due to a pathological condition. It is often associated with a range of neurological diseases such as multiple sclerosis and medial-frontal lobe lesions. It may be episodical, hereditary, or periodic

Agglomerate, large, coarse, rock fragments associated with lava flow that is ejected during explosive volcanic eruptions. Although they closely resemble sedimentary conglomerates, agglomerates are pyroclastic igneous rocks that consist almost wholly of angular or rounded lava fragments of varying size and shape. Fragments are usually poorly sorted in a tuffaceous matrix, or appear in lithified volcanic dust or ash.

Akinesia is a term for the loss of ability to move your muscles voluntarily. It’s most often described as a symptom of Parkinson’s disease (PD). It can appear as a symptom of other conditions, too.

Alimentary diseases of humans and animals are associated with improper - irregular, defective or unbalanced diet (e.g., alimentary dystrophy, kwashiorkor) or with the use of poor quality food (food poisoning).

Allelopathy is a biological phenomenon by which an organism produces one or more biochemicals that influence the germination, growth, survival, and reproduction of other organisms.

Allergy is an immune system response to a foreign substance that's not typically harmful to your body. These foreign substances are called allergens and are found in dust mites, pets, pollen, insects, ticks, moulds, foods and some medications.

Anemia occurs when there are not enough healthy red blood cells to carry oxygen to your body's organs. As a result, it's common to feel cold and symptoms of tiredness or weakness. There are many different types of anemia, but the most common type is iron-deficiency anemia. The most common causes of anaemia include nutritional deficiencies, particularly iron deficiency, though deficiencies in folate, vitamins B12 and A are also important causes; haemoglobinopathies; and infectious diseases, such as malaria, tuberculosis, HIV and parasitic infections. Anaemia is a serious global public health problem that particularly affects young children and pregnant women. WHO estimates that 42% of children less than 5 years of age and 40% of pregnant women worldwide are anaemic.

Anthropogenic cycle of substances – a complex process of ensuring the life of society through substances and energy extracted from nature. This cycle is still generally ecologically imperfect (as opposed to the biotic cycle), because it begins with the capture of natural resources and ends with the formation of a huge amount of hazardous waste (the main part of which is not capable of natural self-destruction for the original elements); it is open in most of its parts, and therefore does not have the "cycle of life" inherent in the biosphere in general, and can be called a cycle only conditionally. It

interferes with the structure of the natural cycle of substances, water movement, movement of soil and rock. The closedness of the anthropogenic cycle can be ensured only by balancing the process of synthesis of organic matter by the process of its decomposition into the original mineral elements, that is, by full utilization of industrial and household waste (in the chain "raw materials - production - product of labour - raw materials"), which requires conscious control and regulation by man in the system "production - natural resources".

Anthropogenic pollution is pollution that occurs as a result of human activity.

Antibody, also called immunoglobulin, a protective protein produced by the immune system in response to the presence of a foreign substance, called an antigen. Antibodies recognize and latch onto antigens in order to remove them from the body. A wide range of substances are regarded by the body as antigens, including disease-causing organisms and toxic materials such as insect venom.

Antiseptic is a chemical agent that slows or stops the growth of micro-organisms on external surfaces of the body and helps to prevent infections. Antiseptics should be distinguished from antibiotics that destroy micro-organisms inside the body, and from disinfectants, which destroy micro-organisms found on inanimate (non-living) objects. However, antiseptics are often referred to as skin disinfectants. Most chemical agents can be used as both an antiseptic and a disinfectant. The purpose for which it is used is determined by its concentration. For example, hydrogen peroxide

6% solution is used for cleansing wounds, while stronger solutions (> 30%) are used in industry as bleach and oxidising agent.

Anxiety − an emotion characterized by feelings of tension, worried thoughts and physical changes like increased blood pressure.

Assimilation: i) the process of becoming a part, or making someone become a part, of a group, country, society, etc.; ii) the process of absorbing food into the tissue of a living organism; iii) the process of becoming similar to others by taking in and using their customs and culture.

Autotrophic of humanity is the development of human energy directly from the Sun, without the use or even in the absence of other organisms. V.I. Vernadsky foresaw the possibility of transforming man as a socially heterotrophic being into an autotrophic being.

Avitaminosis is a group of diseases that is due to a lack of one or more than one vitamin. The diseases in the Avitaminosis group are pellagra, beriberi, scurvy, rickets, and night blindness. Pellagra is due to a lack of niacin or vitamin B3. Beriberi is a condition caused by a deficiency of vitamin B1. Scurvy is caused by a long-term deficiency of vitamin C or ascorbic acid. Rickets is due to a lack of vitamin D and night blindness is often caused by an insufficient amount of vitamin A. Avitaminosis is often due to a lack of nutrition or unavailability of food with certain vitamins.

Bifurcation – 1) the point or area at which something divides into two branches or parts; 2) the point at which bifurcating occurs.

Biologically active substance − any substance that stimulates or inhibits the processes of life, including regeneration and growth of

organisms. These include phytohormones, steroid (animal) hormones and a number of other substances, such as ethylene C_2H_4, carbon dioxide CO_2, synthetic growth inhibitors, flowering, etc., herbicides, etc.

Biorhythms are based on the idea that a person's life is on a cycle, with peaks and troughs. Using mathematical formulas, people can calculate and graph their cycles, thus determining good days (peaks) and bad days (troughs). Biorhythms can be broken down into three cycles: the physical, the emotional, and the intellectual. Today, some even go further and look at the spiritual, aesthetic, and intuitional cycles (although we will only focus on the main three). The physical cycle follows a 23-day period and focuses on stamina, health, and strength. The emotional cycle follows a 28-day period and is related to creativity, emotions, and intuition. Finally, the intellectual cycle lasts 33 days and is associated with thinking, judgment, and concentration. Cyclical variations in physiologic and biochemical function, level of activity and emotional state. Circadian biorhythms have a cycle of about 24 hrs; ultradian rhythms are < 1 day; infradian rhythms are greater than one day and may be up to weeks or months.

Biosphere is the layer of the planet Earth where life exists. This layer ranges from heights of up to ten kilometres above sea level, used by some birds in flight, to depths of the ocean at more than 8 kilometres deep. These are the extremes; however, in general the layer of the Earth containing life is thin: the upper atmosphere has little oxygen and very low temperatures, while ocean depths greater than 1000 m are dark and cold.

Burnout is a state of emotional, mental, and often physical exhaustion brought on by prolonged or repeated stress.

Carcinogen: a substance or agent that causes cancer. The International Agency for Research on Cancer has classified some 60 substances and processes as probably or definitely carcinogenic in humans. These substances and processes are divided into three categories -- agents and groups of agents, mixtures, and exposure circumstances.

Clinical death is the medical term for cessation of blood circulation and breathing, the two necessary criteria to sustain human and many other Living organisms. It is usually identified with the Stoppage of heart beat, pulse and breathing, though modern resuscitation methods and life-support systems have required the introduction of the alternative concept of brain death, but Most organs (eye, kidney) remain alive after clinical death (These organs are used for transplantation).

Coevolution 1) is the process of reciprocal evolutionary change that occurs between pairs of species or among groups of species as they interact with one another. 2) Coevolution is a parallel, joint development of humanity and nature (rather - adaptation)

Coli infection is an acute intestinal infectious disease mainly of young children caused by *Escherichia coli*. It occurs in the form of enteritis, enterocolitis. It is transmitted by the pathogen, as in dysentery.

Coli-titer − the minimum amount of material (water, soil, etc.), which contains one *Escherichia coli*; it is the indicator of fecal contamination of the studied environment.

Comfort zone − the optimal combination for the human body temperature, humidity, air velocity and radiant heat (for example, at rest or when performing light physical work: winter temperature 18-22°C, in the summer 23-25°C; air velocity 0.15 m in winter, 0.2-0.4 m/s in summer; relative humidity 40-60%).

Diet – 1) the kinds of food that a person, animal, or community habitually eats; 2) a special course of food to which a person restricts themselves, either to lose weight or for medical reasons.

Desynchronosis (or Jet Lag) is simply the desynchronization of one's body clock with the rest of the world. Desynchronosis is a kind of temporary disorder where the sufferer meets with symptoms like fatigue, anxiety, irregular bowel moments, stress, nausea etc. Such a condition is mostly seen in the frequent flight travelers who have their job of air traveling very often from one time zone to another. This sick condition of health is also known as flight fatigue or Desynchronosis or time zone change disorder.

Ecological crisis occurs when changes to the environment of a species or population destabilizes its continued survival.

Endemic is something that belongs to a particular people or country. Endemic diseases refer to the constant presence and/or usual prevalence of a disease or infectious agent in a population within a geographic area. Some examples of endemics include the chicken pox and malaria, where there are predictable numbers of cases every year in certain parts of the world.

Endocrine diseases can interfere with these organs, or the effect of the hormones they produce, to cause illness. Diabetes is a common endocrine disease.

Epidemic − an occurrence of disease that is temporarily of high prevalence. Epidemics occur when an agent and susceptible hosts are present in adequate numbers, and the agent can be effectively conveyed from a source to the susceptible hosts.

Essential nutrients. Some nutrients are essential in that these molecules cannot be synthesised within the body and can only be provided by the diet. Such essential nutrients provide for metabolic processes: vitamins, e.g. ascorbic acid, and trace elements, e.g. selenium; and for structure, e.g. proteins, essential amino acids, vitamins and trace elements.

Evolution – 1) the process by which different kinds of living organism are believed to have developed from earlier forms during the history of the earth; 2) the gradual development of something.

Fatigue − extreme tiredness resulting from mental or physical exertion or illness.

Frustration – 1) the feeling of being upset or annoyed as a result of being unable to change or achieve something; 2) the prevention of the progress, success, or fulfilment of something.

Gene pool is the set of all genes, or genetic information, in any population, usually of a particular species.

Global pollution − pollution that disrupts the natural physico-chemical, biological parameters of the entire biosphere, and is found anywhere on the surface of our planet.

Global security − any human activity that eliminates harmful effects on the environment. An unattainable ideal that can rule in the direction of joint efforts.

Health 1) is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. 2)

Health in humans, the extent of an individual's continuing physical, emotional, mental, and social ability to cope with his or her environment.

Heavy metals are defined as metallic elements that have a relatively high density compared to water. With the assumption that heaviness and toxicity are inter-related, heavy metals also include metalloids, such as arsenic, that are able to induce toxicity at low level of exposure. Some heavy metals are either essential nutrients (typically iron, cobalt, and zinc), or relatively harmless (such as ruthenium, silver, and indium), but can be toxic in larger amounts or certain forms. Other heavy metals, such as cadmium, mercury, and lead, are highly poisonous. Potential sources of heavy metal poisoning include mining, tailings, industrial waste, agricultural runoff, occupational exposure, paints and treated timber.

Hereditary disease − It is a disease or disorder that is inherited genetically. Hereditary diseases are passed on from one generation to another through defective genes. These diseases are transmitted in the same family. The chromosomes in the humans are responsible for passing the traits from the parent to the offspring.

Homeostasis, any self-regulating process by which biological systems tend to maintain stability while adjusting to conditions those are optimal for survival. If homeostasis is successful, life continues; if unsuccessful, disaster or death ensues. The stability attained is actually a dynamic equilibrium, in which continuous change occurs yet relatively uniform conditions prevail. Any system in dynamic equilibrium tends to reach a steady state, a balance that resists outside forces of change. When such a system is disturbed, built-in regulatory devices respond to the departures to establish a new

balance; such a process is one of feedback control. All processes of integration and coordination of function, whether mediated by electrical circuits or by nervous and hormonal systems, are examples of homeostatic regulation.

Hormones are chemical messengers that are secreted directly into the blood, which carries them to organs and tissues of the body to exert their functions. Hormones are secreted from the endocrine glands in the body. There are many types of hormones that act on different aspects of bodily functions and processes. Some of these include: development and growth; metabolism of food items; sexual function and reproductive growth and health; cognitive function and mood; maintenance of body temperature and thirst.

Human ecology is the study of the reciprocal inter-actions of humans with their environment. Key aspects of human ecology are demographics, resource use, environmental influences on health and society, and environmental impacts of human activities.

Human environment − a set of natural environment, quasi-natural environment ("second" nature), the environment of populated areas (infrastructure), indoor environment (housing), socio-psychological and socio-economic, that is, a set of natural, natural-anthropogenic and socio-economic factors that affect man.

Humanity − all human beings collectively; the human race; humankind.

Immunity can be defined as a complex biological system endowed with the capacity to recognize and tolerate whatever belongs to the self, and to recognize and reject what is foreign (non-self). Humans have three types of immunity — innate, adaptive, and passive. Everyone is born with innate (or natural) immunity, a type of

general protection. For example, the skin acts as a barrier to block germs from entering the body. And the immune system recognizes when certain invaders are foreign and could be dangerous. Adaptive (or active) immunity develops throughout our lives. We develop adaptive immunity when we're exposed to diseases or when we're immunized against them with vaccines. Passive immunity is "borrowed" from another source and it lasts for a short time. For example, antibodies in a mother's breast milk give a baby temporary immunity to diseases the mother has been exposed to.

Irritability − the quality or state of being irritable.

Kwashiorkor is a form of severe protein malnutrition characterized by edema and an enlarged liver with fatty infiltrates.

Life expectancy at birth is defined as how long, on average, a newborn can expect to live, if current death rates do not change.

LD_{50} is the amount of a material, given all at once, which causes the death of 50% (one half) of a group of test animals. The LD_{50} is one way to measure the short-term poisoning potential (acute toxicity) of a material. It is usually expressed as the amount of chemical administered (e.g., milligrams) per 100 grams (for smaller animals) or per kilogram (for bigger test subjects) of the body weight of the test animal.

Metabolites are intermediate products of metabolism in living cells. Many of them have a regulatory effect on biochemical and physiological processes in the body.

Mutagen − any factor (chemical, physical agent, etc.) that causes a mutation.

Noosphere 1) A postulated sphere or stage of evolutionary development dominated by consciousness, the mind, and

interpersonal relationships (frequently with reference to the writings of Teilhard de Chardin). 2) V.I. Vernadsky defined the noosphere as the new state of the biosphereand described as the planetary "sphere of reason". The noosphere represents the highest stage of biospheric development, its defining factor being the development of humankind's rational activities.

Nutrient is any chemical substance that can be used by an organism to sustain its metabolic activities. These metabolic activities in humans and other animals include the provision of energy, growth, renewal of tissues, reproduction and lactation. The status of some chemicals as nutrients is assured: amino acids, carbohydrates, essential fatty acids, vitamins and trace elements. Other chemicals, such as dietary fibre and secondary plant metabolites, are part of the food but may not so readily be classified as nutrients.

Nutrition − the process of providing or obtaining the food necessary for health and growth.

Nutritional ecology (or nutrition ecology) is an inter-disciplinary science, which examines all components of the food chain and evaluates their effects from four main points of view: human health, the environment, society and the economy. The concept of nutrition ecology has ancient roots, and came out of the need to evaluate the consequences of animal breeding, and of agriculture on a vast scale. But it was only at the end of the twentieth century that the concept of nutrition ecology was formalised. It should not however be confused with *econutrition*, which limits itself to studying the interactions between nutrition and the environment, or with *Ecology*

of Nutrition, restricted to the study of the eating habits of indigenous populations.

Ontogenesis − the development of an individual organism or anatomical or behavioural feature from the earliest stage to maturity. Ontogenesis is the period of realization of the genetic program of the organism's development under effects of exogenic factors, the period of growth and shaping of its main structure and functions, and the period of formation of its reproductive function.

Permissible residual amount of a substance is the maximum amount of a substance that, entering the body throughout life, does not cause any disturbances in the health of children and adults.

Phytoncides are antimicrobial allelochemic volatile organic compounds derived from plants. Medical definition of phytoncide: any of various bactericidal substances obtained from plants (as onion and garlic).

Poisoning − a group of diseases caused by the action on the body of poisons of various origins. Can be acute, chronic; production, food, medicine, etc.

Pollution rate − MPC of substances that enter or are already in the environment, allowed by regulations.

Population explosion – the rapid increase in numbers of a particular species, especially in the world's human population since the end of World War II, attributed to an accelerating birthrate, a decrease in infant mortality, and an increase in life expectancy. The rapid increase of human population is putting an incredible strain on our environment. While developed countries continue to pollute the environment and deplete its resources, developing countries are under increasing pressure to compete economically and their

industrial advancements are damaging as well. The demands that this growth places on our global environment are threatening the future of sustainable life on earth.

Radiation dose is created by the energy of ionizing radiation being absorbed by some substance, such as biological tissue.

Reproduction of the population refers to a change of a generation into a new one. Reproduction is measured by gross reproduction rates or net reproduction rates that generally indicate the ratio between the sizes of the daughter's and mother's generations. The fertility and mortality of the mother's generation before the end of the childbearing age is taken into account in the calculation of the net reproduction rate. In the gross reproduction rate this mortality is not taken into consideration. If the net reproduction rate calculated per one woman is less than one, the daughter's generation is smaller than the mother's generation and the mother's generation has not reproduced itself.

Respiration − a set of processes that ensure the entry of oxygen into the body and the removal of carbon dioxide (external respiration), as well as the use of oxygen by cells and tissues to oxidize organic matter with the release of energy necessary for their life (so-called cellular, or tissue respiration).

Sanitary and hygienic norm – a qualitative and quantitative indicator of a harmful and dangerous agent or action, the provision of which guarantees safe or optimal conditions for human existence.

Sanitary protection zone – the territory around the enterprise, where people are forbidden to live and the placement of sports facilities, parks, kindergartens, schools, treatment and prevention and health facilities is not allowed. In the territory of this zone the

concentration of harmful substances may not exceed 0.3 MPC for the working zone.

Sanitary protection zone is an area that separates special designation zones, industrial enterprises and other industrial, public utility and storage facilities from nearby residential areas, buildings and facilities to reduce exposure to adverse factors.

Settlement – 1) a community of people smaller than a town; 2) an area where a group of families live together.

Stimuli are things that provoke a response or activity, or that cause organs or tissues in the body to react in a certain way.

Sustainable development can be defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Toxic dose – quantity at which a solid, water-insoluble substance produces harmful effects in a specified test specie over a stated exposure period.

Urbanization − the process by which large numbers of people become permanently concentrated in relatively small areas, forming cities.

Vitamin is any of several organic substances that are necessary in small quantities for normal health and growth in higher forms of animal life. Vitamins are distinct in several ways from other biologically important compounds such as proteins, carbohydrates, and lipids. Although these latter substances also are indispensable for proper bodily functions, almost all of them can be synthesized by animals in adequate quantities. Vitamins, on the other hand, generally cannot be synthesized in amounts sufficient to meet bodily needs and therefore must be obtained from the diet or from some

synthetic source. For this reason, vitamins are called essential nutrients. Vitamins also differ from the other biological compounds in that relatively small quantities are needed to complete their functions. In general these functions are of a catalytic or regulatory nature, facilitating or controlling vital chemical reactions in the body's cells. If a vitamin is absent from the diet or is not properly absorbed by the body, a specific deficiency disease may develop.

Way of life – 1) the habits, customs, and beliefs of a particular person or group of people; 2) an important activity, job, etc., that affects all parts of someone's life.

Xenobiotics are chemicals found but not produced in organisms or the environment. Some naturally occurring chemicals (endobiotics) become xenobiotics when present in the environment at excessive concentrations. The "xeno" in "xenobiotics" comes from the Greek word *xenos* meaning guest, friend, or foreigner. Xenobiotics are mostly produced by human activities and excite public awareness due to their ability to interact with the living environment. Some organisms may also form them as a part of their defense system, e.g., mycotoxins, bacterial and herbal toxins, etc., and xenobiotics become harmful when entering the food chain. Contemporary human exposure to xenobiotics is unavoidable, as they are omnipresent. Exposure to some xenobiotics is voluntary because of their anticipated beneficiary effects on human health (e.g., drugs, antibiotics, dietary supplements like antioxidants, etc.).

Zoonosis: this is the spread of diseases over long distances as a consequence of travel. This includes AIDS, Lassa fever and Ebola, and animal diseases such as bovine spongiform encephalopathy (BSE), foot and mouth disease, and salmonella.

ANNEXES

Annex 1.

Ostrava Declaration[8]
DECLARATION OF THE SIXTH MINISTERIAL CONFERENCE ON ENVIRONMENT AND HEALTH

In the WHO European Region, environmental factors that could be avoided and/or eliminated cause 1.4 million deaths per year. The major health impacts of environmental determinants in the Region are related to noncommunicable diseases, disabilities and unintentional injuries, with growing concern about the impact of climate change and biodiversity loss on changing patterns of existing and emerging communicable diseases, and about adverse reproductive outcomes. Addressing the existing and emerging challenges requires additional, strong jointaction.

We, the ministers and representatives of Member States in the European Region of the World Health Organization (WHO) responsible for health and the environment, with the WHO Regional Director for Europe, in the presence of the Regional Director for Europe of the United Nations Environment Programme (UNEP) and of high-level representatives of the United Nations Economic Commission for Europe (UNECE) and of the European Union, other United Nations and intergovernmental organizations and nongovernmental organizations

Have come together at the Sixth Ministerial Conference on Environment and Health – generously hosted by the Czech Republic, jointly organized by the WHO Regional Office for Europe, UNECE and UNEP, and held on 13–15 June 2017 in Ostrava, Czech Republic – to shape future common actions to decrease the burden of diseases caused by environmental factors for current and

[8] https://www.euro.who.int/__data/assets/pdf_file/0003/360453/ostrava-report-eng.pdf?ua=1

the future generations and to promote synergies between our two sectors and stakeholders as the key to achieving health and well-being objectives of the United Nations 2030 Agenda for Sustainable Development.

We:

1. Recognize that the 2030 Agenda for Sustainable Development highlights critical and inseparable links between development, environment, human health and well-being, and the economy as central to the attainment of a wide range of human rights, including: the rights to life; the enjoyment of the highest attainable standard of physical and mental health; an adequate standard of living; safe food, drinking-water and sanitation; safety; and clean soil, waters and air, which are key to promoting just, peaceful, inclusive and prosperous societies today and in the future;

2. Acknowledge that sound environment and health policies have greatly contributed to the overall increase in life expectancy and well-being in the WHO European Region over the past decades, and that health gains are among the most socially and economically desirable benefits of adequate environmental protection;

3. Note with concern that environmental degradation and pollution, climate change, exposure to harmful chemicals and the destabilization of ecosystems threaten the right to health, and disproportionately affect socially disadvantaged and vulnerable population groups, thereby exacerbating inequalities;

4. Recognize the health benefits of addressing climate change, and support the Paris Agreement in its acknowledgment of the importance of the right to health in the actions to be taken to address climate change;

5. Emphasize that every government and public authority at all levels of governance shares the common responsibility for safeguarding the global environment through intersectoral

collaboration and citizens' participation, and for promoting and protecting human health for all from environmental hazards across generations and in all policies. For this reason, governments and public authorities should be aware that their decisions, actions and operations may affect environment and human health, both within and across the borders of each country;

6. Recognize that the 2030 Agenda for Sustainable Development and Health 2020, the European policy for health and well-being, commit us to coherent multisectoral strategies that emphasize system-wide and equitable preventive policies to improve environmental health conditions, and keep in mind the consequences for the social determinants of health, particularly amongst the least privileged in the Region;

7. Reaffirm the European Charter on Environment and Health of 1989, the principles laid down therein, and our decisions from previous ministerial conferences;

8. Note with concern that the three time-bound targets for 2015 and two targets for 2020 from the Fifth Ministerial Conference on Environment and Health have yet to be achieved;

9. We therefore resolve:

a. to protect and promote the health and well-being of all our people and to prevent premature deaths, diseases and inequalities related to environmental pollution and degradation;

b. to consider equity, social inclusion and gender equality in our policies on the environment and health, also with respect to access to natural resources and to the benefits of ecosystems;

c. to advocate the health benefits of sustainable production and consumption, a transition from fossil to renewable energy in an appropriate time frame, the use of clean and safe technologies, and a shift to low-emission and energy-efficient transport and mobility integrated with urban and spatial planning;

d. to work towards communities, infrastructures and health systems that are resilient, particularly to climate change;

e. to strive to fulfil the vision of a healthy planet and healthy people through our work in the WHO European Region, by working in partnership with all relevant sectors and stakeholders;

f. to strengthen the implementation of our existing international obligations and voluntary commitments related to promoting our environment and health agenda;

g. to maintain and further develop adequate mechanisms to gather and analyse relevant evidence on health and environment as a basis for our decisions, taking into account the precautionary principle;

h. to actively support open, transparent and relevant research on established and emerging environment and health risks in order to strengthen the evidence-base to guide policy-making and preventive action.

10. We will use the European environment and health process as an established intersectoral and inclusive process and platform for the implementation of the 2030 Agenda for Sustainable Development and for contributions to the strategic planning, coordination, implementation, monitoring and reporting of progress made towards the objectives of this Declaration.

11. In particular, while strengthening the public health functions of the health systems, we will expand our capacities to work across all sectors, levels of government and stakeholders to reduce environment-related health risks for our citizens, and will promote public participation, and access to information and justice on environment and health.

12. Through enhancing national implementation, we will strive to make a difference for our citizens. To this effect, we will develop national portfolios of actions on environment and health by the end of 2018, as stand-alone policy documents or parts of others, respecting differences in countries' circumstances, needs, priorities

and capacities. These portfolios will draw on Annex 1 to this Declaration, which is a compendium of possible actions to facilitate its implementation, focusing on the following areas:

a. improving indoor and outdoor air quality for all, as one of the most important environmental risk factors in the Region, through actions to meet the values of the WHO air quality guidelines in a continuous process of improvement;

b. ensuring universal, equitable and sustainable access to safe drinking-water, sanitation and hygiene for all and in all settings, while promoting integrated management of water resources and reuse of safely treated wastewater, where appropriate;

c. minimizing the adverse effects of chemicals on human health and the environment by:

- replacing hazardous chemicals with safer alternatives, including non-chemical ones;
- reducing the exposure of vulnerable groups to hazardous chemicals, particularly during the early stages of human development;
- strengthening capacities for risk assessment and research to secure a better understanding of human exposure to chemicals and the associated burden of disease;
- and applying the precautionary principle where appropriate;

d. preventing and eliminating the adverse environmental and health effects, costs and inequalities related to waste management and contaminated sites, by advancing towards the elimination of uncontrolled and illegal waste disposal and trafficking, and sound management of waste and contaminated sites in the context of transition to a circular economy;

e. strengthening adaptive capacity and resilience to health risks related to climate change and supporting measures to mitigate climate change and achieve health cobenefits in line with the Paris Agreement;

f. supporting the efforts of European cities and regions to become healthier and more inclusive, safe, resilient and sustainable through an integrated, smart and healthpromoting approach to urban and spatial planning, mobility management, the implementation of

effective and coherent policies across multiple levels of governance, stronger accountability mechanisms and the exchange of experience and best practices in line with the shared vision established by the New Urban Agenda;

g. building the environmental sustainability of health systems, and reducing their environmental impacts through such means as efficiency in the use of energy and resources, sound management of medical products and chemicals throughout their life-cycle and reduced pollution through safely managed waste and wastewater, without prejudice to the sanitary mission of health services.

13. Through our national portfolios for action, we will also pursue, until their achievement, the five time-bound targets of the Fifth Ministerial Conference on Environment and Health on: ensuring tobacco smoke-free environments for children, developing national programmes to eliminate asbestos-related diseases, and identifying the risks posed by exposures to harmful substances and preparations and eliminating them as far as possible by 2015; and addressing water, sanitation and hygiene in settings used by children, and safe environments that support physical activity of children by 2020.

14. To address those priorities effectively, we will:

a. engage in national implementation, sharing knowledge and providing a platform for collaboration and communication;

b. mobilize resources and build or pool capacities, which may include bilateral or multilateral international collaboration;

c. promote policy coherence and convergence between the European environment and health process, the “Environment for Europe” process, UNEP, the governing bodies of the relevant multilateral agreements on environment and health, and intersectoral programmes, processes and policies;

d. advance the implementation of existing commitments and instruments, particularly those resulting from the European environment and health process (the Protocol on Water and Health to the Convention on the Protection and Use of Transboundary

Watercourses and International Lakes, and the Transport, Health and Environment Pan-European Programme – THE PEP), relevant resolutions of the World Health Assembly and WHO Regional Committee for Europe, and conventions and related instruments jointly implemented by environment and health sectors;

e. strengthen the knowledge and capacity of health and environment professionals for health impact assessment through further education and training;

f. increase the role of formal and informal education in the public's understanding of complex environment and health issues and effective measures to address them;

g. continue and expand key strategic and institutional partnerships, while ensuring the appropriate participation of all relevant intergovernmental and non-State actors;

h. encourage the European Environment and Health Youth Coalition (EEHYC) to continue being an active partner in the European environment and health process, and commit ourselves to supporting the creation of national youth platforms in our countries and continuing to work with the EEHYC.

15. We will measure and report on progress towards the implementation of our commitments using national reporting on the achievement of the Sustainable Development Goals and their targets.

16. To sustain the European environment and health process, we will support and participate in the institutional arrangements that are necessary for the realization of the commitments of this Declaration, which are elaborated in Annex 2.

17. We call upon the governing bodies of WHO and UNECE to support these commitments, including by making every effort to mobilize the necessary resources.

18. We resolve to support the attainment of our commitments at the national and international levels, and the work of the WHO

Regional Office for Europe and UNECE in environment and health, in close collaboration with UNEP, according to our financial means and budgetary possibilities.

Signed on 15 June 2017 in Ostrava, Czech Republic

Annex 2

ESTIMATED CALORIE NEEDS PER DAY, BY AGE, SEX, AND PHYSICAL ACTIVITY LEVEL[9]

The total number of calories a person needs each day varies depending on a number of factors, including the person's age, sex, height, weight, and level of physical activity. In addition, a need to lose, maintain, or gain weight and other factors affect how many calories should be consumed.

Estimated amounts of calories needed to maintain calorie balance for various age and sex groups at three different levels of physical activity are provided in Table below.

These estimates are based on the Estimated Energy Requirements (EER) equations, using reference heights (average) and reference weights (healthy) for each age-sex group. For children and adolescents, reference height and weight vary. For adults, the reference man is 5 feet 10 inches tall and weighs 154 pounds. The reference woman is 5 feet 4 inches tall and weighs 126 pounds.

Estimates range from 1,600 to 2,400 calories per day for adult women and 2,000 to 3,000 calories per day for adult men. Within each age and sex category, the low end of the range is for sedentary individuals; the high end of the range is for active individuals. Due to reductions in basal metabolic rate that occur with aging, calorie needs generally decrease for adults as they age.

Estimated needs for young children range from 1,000 to 2,000 calories per day, and the range for older children and adolescents varies substantially from 1,400 to 3,200 calories per day, with boys generally having higher calorie needs than girls.

[9] U.S. Department of Health and Human Services and U.S. Department of Agriculture. 2015–2020 Dietary. Guidelines for Americans. 8th Edition. December 2015. Available at http://health.gov/dietaryguidelines/2015/guidelines/

MALES				FEMALES[4]			
AGE	**Sedentary[1]**	**Moderately Active[2]**	**Active[3]**	**AGE**	**Sedentary**	**Moderately active**	**Active**
2	1,000	1,000	1,000	2	1,000	1,000	1,000
5	1,200	1,400	1,600	5	1,200	1,400	1,600
10	1,600	1,800	2,200	10	1,400	1,800	2,000
11	1,800	2,000	2,200	11	1,600	1,800	2,000
12	1,800	2,200	2,400	12	1,600	2,000	2,200
13	2,000	2,200	2,600	13	1,600	2,000	2,200
14	2,000	2,400	2,800	14	1,800	2,000	2,400
15	2,200	2,600	3,000	15	1,800	2,000	2,400
16	2,400	2,600	3,200	16	1,800	2,000	2,400
17	2,400	2,800	3,200	17	1,800	2,000	2,400
18	2,400	2,800	3,200	18	1,800	2,000	2,400
19-20	2,600	2,800	3,000	19-20	2,000	2,200	2,400
21-25	2,400	2,800	3,000	21-25	2,000	2,200	2,400
26-30	2,400	2,600	3,000	26-30	1,800	2,000	2,400
31-35	2,400	2,600	3,000	31-35	1,800	2,000	2,200
36-40	2,400	2,600	2,800	36-40	1,800	2,000	2,200
41-45	2,200	2,600	2,800	41-45	1,800	2,000	2,200
46-50	2,200	2,400	2,800	46-50	1,800	2,000	2,200
51-55	2,200	2,400	2,800	51-55	1,600	1,800	2,200
56-60	2,200	2,400	2,600	56-60	1,600	1,800	2,200
61-65	2,000	2,400	2,600	61-65	1,600	1,800	2,000
66-70	2,000	2,200	2,600	66-70	1,600	1,800	2,000
71-75	2,000	2,200	2,600	71-75	1,600	1,800	2,000
76 and up	2,000	2,200	2,400	76 and up	1,600	1,800	2,000

[1] – *Sedentary* means a lifestyle that includes only the physical activity of independent living.

[2] – *Moderately Active* means a lifestyle that includes physical activity equivalent to walking about 1.5 to 3 miles per day at 3 to 4 miles per hour, in addition to the activities of independent living.

[3] − *Active* means a lifestyle that includes physical activity equivalent to walking more than 3 miles per day at 3 to 4 miles per hour, in addition to the activities of independent living.

[4] − Estimates for females do not include women who are pregnant or breastfeeding.