

System Approach to Determinants of Quality of Life within a Region

PAVEL JIRAVA¹, JAN MANDYS², MILOSLAVA KAŠPAROVÁ¹, JIŘÍ KŘUPKA¹

¹Institute of System Engineering and Informatics

²Institute of Public Administrations and Law

Faculty of Economics and Administration, University of Pardubice

Studentská 84, 532 10 Pardubice

CZECH REPUBLIC

pavel.jirava@upce.cz, jan.mandys@upce.cz, miloslava.kasparova@upce.cz, jiri.krupka@upce.cz

Abstract: The submitted article deals with the problematic of the quality of life and factors which can influence it. On the basis of previous research we know that this is a complex problem which is characterized by a huge number of components and connections among them. We focused on the main areas which influence the quality of life and tried to describe the connections among them. The goal of this paper was not the experimental examination based on real data; however, creation of a framework and a basis for the future quality of life research in a region which should cover – if possible – all the main indicators of the quality of life and link to our previously realized researches in this area.

Key-Words: Quality of life, environment, health, life style, region, human life.

1 Introduction

Quality of life is measured, evaluated and computed around the world from local level (community, region) to the country level [1,18,25]. Human satisfaction is one of the basic requirements which determine the quality of one's life. But it is a highly subjective and time-fluctuating value and the term satisfaction itself is very wide and uncertain. The quality of life as well as human's satisfaction is influenced by a number of further factors which we try to describe in this text and show their mutual connections.

The framework for this whole system is the environment in the widest meaning of this word. A human being spends his/her whole life in a certain environment and is significantly influenced by it (and he himself/she herself influences the environment as well). Another significant factor is health. Whether this word is understood as the health of an individual or as the health of the population, it has an important influence on the quality of life. Life style – i.e. a complex system of activities, connections which an individual uses to satisfy and evolve his/her needs. All these factors have an influence on the quality of life but they also influence each other, mutually. So that this is an open and dynamic system description of which is extremely difficult and needs understanding of many factors.

2 Problem Formulation

First, it is necessary to define the issues we deal with. This is essentially a quality of life, environment, health and life style.

2.1 Quality of life

The quality of life (satisfaction with life) is a term which can be defined only with difficulty, particularly because of two reasons:

- it is subjective, therefore, represents different things for each individual,
- there are many sorts of scientific branches which affect the definition and there is no universal generally acknowledged definition across all of them.

In spite of this, we can observe some parallel moments in various definitions. Perhaps, the most apposite definition of the quality of life is defined in [8] who sees it as one of the accessible possibilities from which a human being can choose while infilling his/her life and which must be seen as a subjective appraisal of own life situation.

This definition can be extended by means of the work of [7]. According to him, there is an objective and a subjective aspect of the quality of life (see Fig. 1). The objective dimension is related to the material securing, social conditions, social status and physical health. It is a complex of economic, social, health and environmental conditions which determine human's life. Social dimension of the quality of life refers to the fact that an individual perceives his/her position in the society in the framework of his/her culture and the system of values. The final satisfaction with life is in virtue of personal goals, expectations and interests of each individual.

Quality of life is a multidimensional magnitude which contains data about psychosocial state of an individual. It

is influenced by such factors as e.g. age, sex, education, social status, economic situation and individual value orientation.

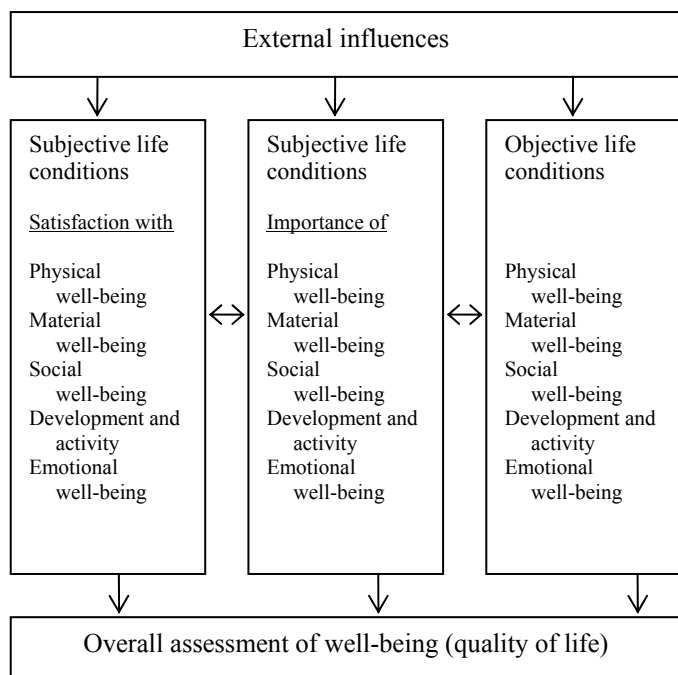


Fig. 1 Model of quality of life [10]

In [13], the quality of life is further determined as a magnitude which comprises in itself the fact how a human being perceives his/her position in society. Individual perception of each human being is basically influenced by:

- culture,
- system of values,
- relationship of an individual to his/her goals,
- expectations,
- standards and fears,
- psychosomatic state of an individual,
- social relationships,
- personal beliefs,
- relationship to key areas of the environment where individual lives.

These factors can be completed by social determinants of the quality of life [4], p. 67:

“... complex, optimal environment, adequate usage of activities and energy of a human being, overall quality of human relationships, developmental division of competences and conceptual focusing on further development of a human being, full respecting of one’s dignity as a bio-psychosocial personality, mutual contribution to the realization of higher values, to the fulfilment of human’s existence, of his/her transcendence.”

Attaching to the opinion consisting in the fact that the quality of life can be defined and trying to specify its basic determinants as well, we can try to deduce the

indicators which state whether the life is or is not quality. Many approaches deal with the indicators of the quality of life. As well as the look on the quality of life definition, also the individual theoretical approaches differ. In spite of the variety of conceptions and definitions, we can observe a certain line of concrete indicators which are similar throughout the whole opinion spectrum.

The publication [12] states 13 areas of human’s life: biological reproduction, health, work, participation on managing processes, incomes, housing, consumption, mobility in an area, education, culture, recreation, social communication, criminal social conduct.

Another division of indicators is shown in Halečka, T. [4] who considers them as a unity of economic, politic and cultural factors:

“The state of economic system with its consequences lying in the possibilities of the active work exercise of the society members consisting in the creation of material and spiritual values; the way of the work remuneration in accordance with the complex criteria of its exigency (physical and qualificational) and economic efficiency, as an economic basis for the life level securing and satisfaction of basic people needs; the employment status and social security in the case of possible unemployment; state of healthy nutrition security of inhabitants; level of health care of society members and the way of its securing in the case of illness; conditions for work and social exercise of people with health disablement and the possibilities of their self-realization as full-value inhabitants; level of conceptual environmental program of the society and its realization in practical protection of the environment – state of natural and social components of the environment; state and level of social care about family and children upbringing as well as the care about children without family background; educative conditions – basic, vocational, university and lifelong – and the possibilities for personal development; state of securing an adequate security of the elderly full-value life; possibility of people’s free, social activities and their participation in social life; level of democracy in social relationships and in political system, as well as the state of tolerance and possibility of multicultural society existence; state of securing life in peace, state of ensuring safeness and safety of human’s life protection against aggressiveness and violence; state of securing and protecting basic human rights; state of possibility for free time activities and the level of its utilization possibility in relaxation, strengths regeneration, culture and other valuable interests which lead to personal development; conditions for taking care about people who are reliant on various forms of social help; state of social morality and its influence on people’s solidarity; level of ensuring people’s social security and the state of

their reflection in the feelings of confidence and satisfaction.“

2.2 Environment

The term environment is very wide and there are a huge number of its definitions. For this paper, let us understand the term environment as a complex of physical, chemical, biological and social phenomena and processes which have (directly and also indirectly) influence on health and comfort of people (see Fig. 2), individuals as well as the whole population [16].

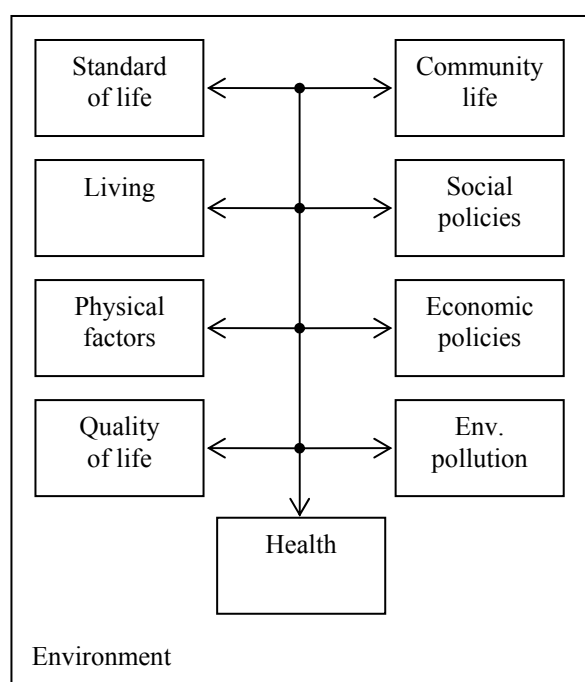


Fig. 2 System scheme of environment

Factors which have influence on humans can be divided according to their nature into biological, social, physical and chemical. Physical factors are determined by physical framework which is created by our world. Chemical environment and substance interchange is the basic condition for life existence. A human is influenced by nutrients supply in the positive meaning and further by harmful substances in the negative meaning. Biological factors come from the presumption that humanity as well as each individual is a part of the Earth ecosystem and the food chain which exist here. The interchange of substances and energy happens reciprocally and the influence of these factors on human's health is fundamental. Social factors have two levels. The first one is determined by the life level of inhabitants, i.e. by the economic state of a region (country). The second one is related to the social connections and interpersonal relationships which have a strong influence on human's health as well.

The environment has an influence on human's health, so that also on the quality of life. The influence of the environment on health is divided into influence caused by anthropogenic activities and influence caused by natural processes. Most known examples of anthropogenic influence on the environment are [15]: intercontinental transport of wind-borne dust and air pollutants, drinking water disinfection, increasing levels of anthropogenic pollutions into air, soil and groundwater or chemicals use. To evaluate the influence of the environment on people's health, it is necessary to divide the environment into particular components. The basic division is atmosphere, water, earth and other elements.

2.3 Health

The value of health belongs without any doubt to one of the highest values throughout all the human cultures. The influence of the environment and external effects on health has been described in many publications [17].

Generally, health is defined [14] as an abstract connected with integrity, good coordination and right functioning not only of all the human organs but of the whole organism. Health is thus normal functioning and illness represents an incomplete functioning, suppressed or atypical.

The World Health Organization (WHO) understands the term health as the state of complete physical, psychical and social comfort. Factors of the quality of life of an ill person are described in e.g. [11]. By means of this definition, the health problematic is seen not only as a biological question but also as a psycho-social.

The quality of life is often described as the state of personal comfort ("well-being"). It represents a long-time emotional state which expresses the individual satisfaction with his/her life. Personal comfort is distinguished by time-stability and consistence in various situations. This refers to positive and negative emotions, affections, moods and expectations [5].

The [14] publication shows on the basis of empiric researches eight health conceptions in which we can see the influence of individual life style and the influence of the quality of life:

- health as a non-illness: criterion of health is the absence of more serious illnesses (Fig. 3),
- health as a state of experiencing illness/health despite of illness: it is a concept of overcoming or coping with illness or a statement that healthy is the one who has never been taken to hospital,
- health as a reserve, resource, capacity of health: immunity, ability to cope with illness (quick recovery, one does not live healthily but does not become ill),

- health as a physical ability (fitness): this is related to the life style (yoga, regular exercising etc.),
- health as energy and vitality: healthy is the one who is active, tireless and lives fully,
- health as social relationships: health is defined by means of relationships, typical for women (voluntary organizations etc.),
- health as a function: connection of activity and energy. Ability to do something with a little emphasis on feelings and experiencing,
- health as a psychosocial comfort: healthy persons are physically, psychically and also mentally integrated, level-headed, and active.

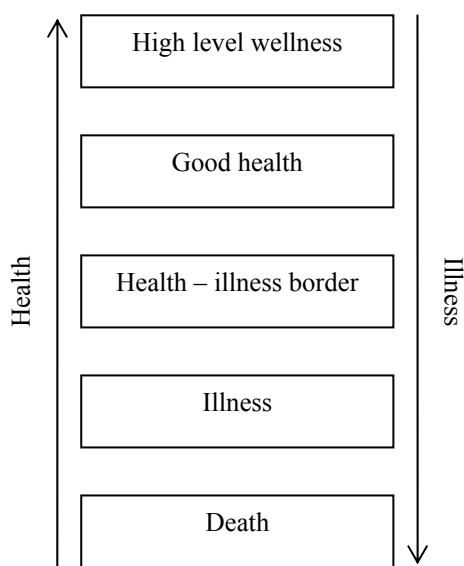


Fig. 3 Model of health conception

This concept complements Table 1, which describes the factors affecting the quality of life of the patient. From the complex of factors is evident that health must be seen as a non simple and functional model, in which individual factors are linked to each other's (by feedback), and a factor directly determines the other factor.

2.4 Relation Between the Quality of Life and Health

The quality of life in relation to health (health-related quality of life) is understood as such a part of life which is determined by the individual health and health care which can be affected by many interventions. This concept is used especially in the field of monitoring the effects and the cure of an illness of a human being. Health-related quality of life characterizes and measures what an individual lives through (experience) as the consequence of providing health care [9].

Table 1 Factors affecting the quality of life

Factor	Characteristic
Physical condition	Is determined by the occurrence of various symptoms of disease. May be affected by the adverse effects of applied therapy.
Functional fitness	Includes above all physical activity (performance status). His assessment is usually carried out by the WHO score (runs from 0 to 5, with 0 denoting perfect health and 5 denoting death) or score proposed Karnofsky. The Karnofsky score runs from 100 to 0, where 0 is death and 100 is "perfect" health. Another consideration is the ability to communicate with family, with colleagues, the ability to exercise at work, in family life, etc.
Psychological state	Is usually evaluated according to the prevailing mood, attitudes to life and disease, ways of coping with illness and treatment, followed by personal characteristics, experience of pain, etc.
Satisfaction with treatment	This is primarily a comprehensive assessment of the environment in which it is ill treated, technical skill of attending physician in the implementation of diagnostic and therapeutic procedures, attendants communicativeness, and finally the communication with the patient, including the furnish of objective information on the health status of the patient.
Social status	Evaluated on the basis of the patient's relationships to relatives, patient's role in the social groups, etc.

According to the WHO, there are four basic dimensions of human life which determine its quality. They are completely independent on factors like age, sex, ethnicity or disablement [7]:

Physical health [7] and the level of independence – energy, tiredness, pain, rest, mobility, everyday life, dependency on medical help etc;

Psychical health [7] and the mental aspect – self-actualization, negative and positive feelings, self-appraisal, thinking, learning, memory, concentration, belief, spiritualism, religion etc;

Social relationships [7] – personal relationships, social support, sexual activity etc;

Environment [7] – financial sources, freedom, safety, health and social care availability, home environment, possibilities for gaining new knowledge and abilities, physical environment (pollution, noise, traffic, climate) etc.

The influence of health on the quality of life can be observed in the [6] analysis. It relinquishes from the research of the subjective evaluation of satisfaction with respondents' health as they stated lower satisfaction in accordance with increasing age, in spite of the absence of more significant problems and, on the other hand, many respondents with serious problems stated that they do not have any health problems. In this context, a more serious parameter of the quality of life manifestation stood forth – the quality of sleep. The influence of illness on lower life's quality perception can be observed mainly among the middle-aged people. Here comes forth also the parameter of the economic situation. In the age from 30 to 39, the role of an ill person corresponds with the social role, while in the age from 39 to 50, people have the highest expectations.

2.5 Life style

From the above mentioned information, it is obvious that when we think of a human individual we must consider the quality of life in the context of human health. Both of these parameters are very closely connected with the individual life style (the way of life). All of these three factors are interconnected by a common feedback.

As well as the term quality of life also the concrete concept of life style can be defined only with difficulty. State three dimensions [3] which influence the definition of this term (see Fig. 4) is defined by the following way:

- 1) It is a very vast content area (without including the life style categories).
- 2) The term life style is a term often used in everyday language (various scientific approaches differ according to their own interpretation) and there is a collision between understanding of all of them in an empirical research.
- 3) The term life style evokes a number of associations and ideas (e.g. fashion, behavior, living etc.).

The problematic of the everydayness of human life and the life cycle is projected in the life style. In simple words, we can say that the way of life can be expressed as how an individual lives his/her life as well as with whom he/she is in contact. It is a complex system of activities, relationships by which an individual satisfies and evolves his/her needs. Norms, values and ideas are connected with these activities. The whole system is delimited by higher cultural regulations. The life style of

a concrete human individual depends – according to [2] – especially on:

- external factor (general, whole-society and group life conditions),
- subjective agent (individual personality).

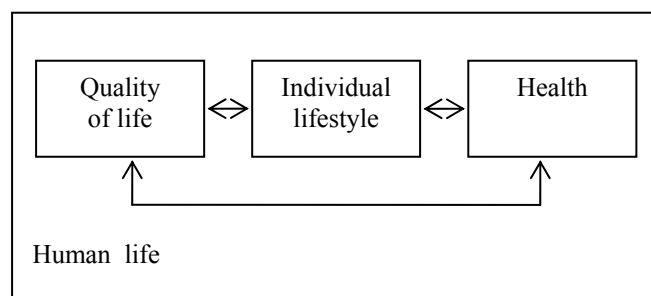


Fig. 4 Model of human life [3]

In brief, the way of life can be characterized as a system of significant activities, relationships and life manifestations which are typical for a certain subject (individual, group) who is the bearer of the way of life.

The way of life comprises in itself e.g.: the problematic of needs, life conditions (natural, social, individual), the level of life, problematic of everydayness (time – life rhythm).

Based on the facts mentioned above we can say, that as well as concept of quality of life also concept of lifestyle brings many dilemmas in determining the concrete meaning. A key feature of lifestyle is that it is a highly individual variable, but is influenced by various social, economic and other factors, especially by social group to which the individual is a member. The social group can then according to [23] defined as the sum of individualities. They act with regard to the conduct of others. Such conduct is defined by historical, spatial, cultural and social context in which individuals can only influence to some extent.

Nowadays, there is at least in Western countries a significant individualisation of life. People in different families (in past centuries) they were much more similar than they are today [24].

3 Problem Solution

How to measure and evaluate the quality of life? The result coming from the previous text is that it is influenced by many factors and they must be included into the input parameter model which will be modeling the quality of life. While projecting the procedure of the quality of life qualification we respected not only this fact but also the rules from the Data Mining area. The result is then the process leading step by step to the classification of the quality of life as can be seen in Fig. 5.

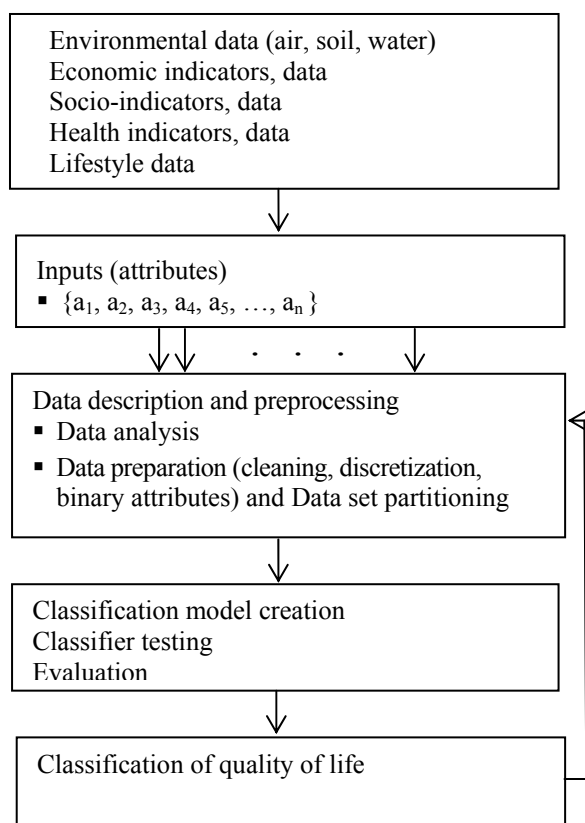


Fig. 5 Classification of the quality of life procedure

In this procedure is used term indicators so it is necessary explain this term. The whole range of indicators (economic, environmental, technical, health, production, ecological, social etc.) is used in the scientific papers. Generally we can say, that indicators are measurements selected to represent a larger phenomenon of interest and therefore they reflect the significance of their conceptual bases [19]. There are usually two sets of indicators “headline indicators” and “aggregate indicators”. To be usable, indicators must meet a number of criteria, primarily accuracy, relevance, reliability, comparability, simplicity and uniqueness.

According to [20] indicator is “a parameter, or a value derived from parameters, which points to, provides information about, describes the state of a phenomenon/environment/area, with a significance extending beyond that directly associated with a parameter value”.

3.1 Data sources

Sources for the data mentioned in the first step of Classification of the quality of life procedure are different. In our opinion, they can be divided as follows (this division is appropriate for the Czech Republic). Sources for environmental data are Czech statistical office, Czech Hydrometeorological Institute and regional geographic information systems.

Economic indicators are available on Czech statistical office. Socio and socio-economic data are processed in Public Opinion Research Centre of the Institute of Sociology of the Academy of Sciences (ISAS) of the Czech Republic. Sources for health indicators are National Institute of Public Health of Czech Republic and Czech statistical office. Sources for lifestyle data are Public Opinion Research Centre of ISAS and also carried questionnaire surveys.

We describe now more in detail particular data sources.

Economic indicators are a government issued statistical data that indicates economic conditions within a country or region. Common indicators include Consumer Price Index, employment rates, Gross Domestic Product, inflation, etc [21]. This problem is described for example in [21].

There are many resources for environmental data on regional level. But their correctness and quality varies. For our procedure (Fig. 5) were chosen certified data sources (they are government or regional offices or organizations). For our purpose are important data about environment pollution – air, soil and water. By OECD we can distinguish two major functions of environmental indicators :

- reduce the number of measurements and parameters that normally would be required to give an exact presentation of a situation.
- simplify the communication process by which the results of measurement are provided to the user.

Environmental indicators are also divided into several categories: core environmental indicators, key environmental indicators, sectoral environmental indicators, derived environmental indicators. They are shaped by the different models that scientists and policy makers use to understand the links. Indicators therefore reflect the significance of their conceptual bases.

Good example of indicators implementation is in program ENHIS (The European Environment and Health Information System) [27]. In accordance with ENHIS indicators aim at reflecting and communicating the status of environment and health issues in Europe. They are tools to monitor health and environment trends in countries, to evaluate the effectiveness of relevant policies and to make comparisons of countries’ progress towards the targets set in Europe-wide action programmes.

In our conditions the quality of life is generally examined by two statistical approaches for socio-indicators and lifestyle data: inquiring frequency of incidence and index of satisfaction – scale. Data, which are further discussed, are gained within a research of public opinion in the first approach and in the second approach within questionnaire survey concerning ECI (European Common Indicators). The object of our

interest is the indicator A1 – satisfaction of citizens with local community. It is not the aim of this contribution to discuss the approach of every single institution that investigates the quality of life, however, it tries to point out the problems connected with inquiring quality of life with regards to the fact that it does not cover all the accessible methods and approaches in this area. Most often it is ISAS that inquires the public opinions (here we speak about inquiring the incidence of frequency – concretely the results are presented as a relative frequency). The ECI [26] indicators are used by all sorts of citizen initiatives working on sustainable development of regions, municipalities etc.

Both approaches realize the inquiry of interviewees' individual attitudes. In both cases the instrument of data acquisition is a questionnaire. ISAS usually focuses, beside the question of life satisfaction or satisfaction with the place where the respondent lives, on the whole spectrum of questions from political, social or ecological field. The inquiry concerns a representative sample of population and is repeated regularly (which is important to increase the candour of the data as well as its interpretation). A standardized questionnaire exists for indicator A1, which is used in terms of local initiatives and is focused on noticing even a petty aspect of satisfaction within respondents. A questionnaire, thanks also to the attitude scale, reflects better opinions and attitudes of respondents. The questionnaire surveys focused on the indicator A1 are not, however, conducted in the particular localization repetitively, therefore it is not possible to verify, whether the respondents have reflected their long-lasting attitudes or whether they have acted just under the influence of a moment. Another weak point of the initiatives inquiring the A1 indicator is the dissimilarity of the final reports and insufficiency in methodology description (incomplete description, the way of reaching representatively of the experimental sample, how the research was conducted and so on).

Exploitation of the ECI indicators is advantageous as it takes specifics of the particular region in account and due to this fact it is a more suitable method for gaining input data (on which depends deciding of public politics) then a public opinion survey realized by ISAS. On the other hand, the method used by ISAS has an undeniable advantage for the validity and reliability of the gained data is high.

A questionnaire survey that would be conducted repeatedly appears as a suitable method of gaining data related to quality of life. It would embrace questions concerning not only frequency of incidence, but also index of satisfaction and will be carried out on a regional level, having in mind all the methodological appendages of a sociological survey. The content of a questionnaire should unwind from which dimensions of quality of life needs the submitter (regional management) to involve.

One of inspiring themes might be the WHOQOL 100 questionnaire. This questionnaire should be, in frames of usefulness for deciding process of public administration, modified, so that it would be apparent from the answers of the respondents what is the concrete cause of their satisfaction or dissatisfaction with their quality of life.

Authors of the WHOQOL questionnaire go out from the definition of quality of life which says that quality of life is the way how a person perceives his own position in life (in cultural context, in relation to his/her aims, expectations, interests). WHOQOL 100 contains 24 aspects that are compounded into six domains, such as physical health, living through, level of independence, social relations, environment, spiritualism and total quality of life. The questionnaire is designed for people under 65. For elderly people a modification called WHOQOL OLD is used. WHOQOL distinguishes among components of people with different level of health difficulties and it also distinguishes between men and women. Retested reliability of the domains of questionnaire WHOQOL-100 measured in intervals of two weeks shows the relative stability of statements in this interval. Usage of questionnaire WHOQOL-BREF could be an alternative. This questionnaire is compounded from 24 items categorized into four domains and two spare items evaluating the total quality of life and state of health (altogether 26 items). It is not eligible to use the questionnaire to underpin the influence of momentary state of mind or short-time changes [22].

Although both the approaches use other issues (regarding the quality of life of respondents) we can find the same moments of the two methods.

Indicators of sustainable urban development are indicators that help the regional management to evaluate the quality of life of its citizens. ECIs include the ten areas of sustainable development, which are complementary [26]. Their formation is involved in a number of experts from many European countries. If we focus directly on the indicator A1– satisfaction of citizens with local community, we can identify the socio - economic factors of quality of life, especially satisfaction with leisure time, satisfaction with public services in the municipality, satisfaction with the job, social connections, and participation on social life.

ISAS carries out regular measurements through the public opinion research. They deal with current social issues, which are the subject of the greatest media interest. At the same time there is a regular survey respondents satisfaction with their lives. As indicators of quality of life can be seen in particular satisfaction with social security, satisfaction with the state unemployment, quality of living (basic quantitative indicator of the quality of life), and satisfaction with the social policy of the state. Other factors (indicators) of quality of life are

examined with, as already mentioned, depend on the current socio-political situation. Such as operation of offices, satisfaction with the culture, political situation and issues of corruption and other issues.

In both approaches we can identify the identification of factors that are consistent with theoretical views on the quality of life. If the respondent in these attributes evaluate his/her live as happy, can be reasonably assumed that his view reflects reality, and his life can be considered good

3.2 Performed research and analysis

On the basis of practice and knowledge referred to in this article, we have made a number of research and analysis, dealing with quality of life, the collection of suitable data, their processing, classification and interpretation. In the article "Approaches for the Comparison of the Quality of Life Investigation" [28] was presented an analysis of two approaches (methods) in the quality of life research in the Czech Republic based on system approach. By approach based on data mining techniques we selected a group of attributes that describe monitored area by ISAS approach and on the algorithms of decision trees. By application three selected algorithms C&RT, C5.0 and C5.0 with boosting method classification models were created. In term of accuracy rate (quality of model) the best result was achieved by method C5.0 with boosting method by use of reduced number of inputs attributes.

Next work, entitled „Quality of Life Investigation Case Study in the Czech Republic“ [29] was focused on the possibilities of the decision theory that can be used in the modelling of the quality of life in a given city in the Czech Republic. Its goal was to classify citizens into classes by determination their satisfaction with quality of environment. Classification models on the basis of algorithms C5.0, CHAID, C&RT and C5.0 with boosting method were designed and tested. Based on the results we can say, that decision trees methods are suitable and that was achieved comparable results.

In other work, we focused on one of the inputs affecting the quality of life - environment. In the article entitled "Air Quality Modelling by Means of Rough and Fuzzy Sets" [30] data about air pollution in Pardubice district was used. These data was obtained as an output from system HORIBA measurements and then it was classified with the aim to classify individual parts of observed region to classes corresponding to air quality. In the article is proposed algorithm, which used rough-sets theory for rules generation (based on [31]), and this algorithm provides high-quality output.

4 Conclusion

In the submitted article, we tried to outline the complexity of the problematic lying in the research of connections among the environment, human's health, life style and the quality of life. We described the main components which figure in this "system" and we defined also some chosen connections (the environment-health, quality of life-health) among them. The outputs of this text can be used as a basis for the research of connections in the mentioned areas. Its goals would be to clearly identify the indicators of the people's quality of life whether in a region or in a state level.

The researched theme is according to our opinion very up-to-date and there is still a whole number of unanswered questions which are connected with it and which the future research should be focused on. Surely, it would be useful to be focused on the research of the interactions between the environment and population health on regional level with the goal of providing the regional government with tools for monitoring and managing these areas. Furthermore, it is necessary to include other external factors, indicators especially from the social and life style area in the environment-health connection model. Do we, however, realize that there is a problem in collecting and gaining these social indicators? Often, these are subjective indicators (e.g. satisfaction with the quality of life, satisfaction with the environment, etc.) which can usually be interpreted only with difficulty and easily distorted. Very actual is the problematic of global warming and its influence on the environment, people's health and the quality of life. This theme is moreover accepted by many governments as well as by the European Union.

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