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COGNITIVE MODEL OF SUSTAINABLE DEVELOPMENT

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ABSTRACT:

Discusses and analyses the cognitive model of sustainable development of the world in General. The cognitive model is based on statistical data. Shows the change of priorities of development of the world. The paper shows how to build a consistent peace of sustainable development.

Keywords: sustainable development, systems analysis, cognitive systems

INTRODCUTION

The present work is devoted to a question of society sustainable development. Author understands sustainable development as a continuous progressive development.

Solving a problem of operative management of society development it is necessary to estimate society condition, to define the purposes of its development, to reveal the best ways of development and to carry out a complex of measures on their realization. In order to estimate society condition, first of all, it is necessary to structure it. Thus, structurization should mention all components: economic, social and ecological.

The next idea consists of the fact that structurization is applicable to society of any size – beginning from a family and finishing at a planet as a whole. Thus, structurization should be unified. Using typology, blocks which are easily transformed for any level have been allocated.

We will show, as an example, the table of conformity of family indicators and regional indicators.

Table 1

Indicators of family condition	Regional indicators of condition
Family aggregate profit	Gross national product

	(GNP)
Family general expenditure	Budget
Family debt	Debt
Possibilities to borrow on development	Investments
Family poverty level	Poverty
Power stocks	Internal energy
Raw stocks	Raw materials extraction
Power stocks requirement	Power possibilities
Raw stocks requirement	Raw possibilities
Soil pollution level	Soil pollution level
Water pollution level	Volume of emissions in water
Air pollution level	Volume of emissions

	in air (pollution)
Achievements of family member	Infrastructure
Quantity of family members	Demography
Quantity of working people in a family	Working potential
Educational level	Education
Quality of life	Quality of life
Social disease	Social disease
Ecological disease	Pathologies
Safety level in a family	Not found
Education application level in a family	Scientists fee

It is necessary to notice that transformation of indicators does not mention their structural features and depends on scale of community under investigation.

It is possible to show that the purpose of all communities is their sustainable development. Therefore the mission of sustainable development management is unified also: unity of the purpose and unity of structure for each level of community. Such approach allows to build hierarchical system of the consistent purposes and to find the coordinated optimum strategic ways to achieve the objects in view.

Difference of the offered approach from a set of today existing approaches consists in the following: set of the parameters characterizing blocks is an open system that allows to define indicators system weight without use of expert estimations. The indicator system weight is understood as a degree of its emergent influence. Thus, the indicator system weight is calculated proceeding from objective statistical data without use of expert estimations. The main problem of existing methods is not plurality of ways of indicators choice, but impossibility of

definition of degree of their influence on system development. That forces to use expert estimations which, inherently, are subjective and essentially cannot guarantee adequacy of model and real system. The offered system approach, first, shows that indicators system weight for various sublevels of community are different (possibility of construction of development priorities hierarchy), and, secondly, finds out presence of a constant system error at use of expert methods by working out of strategic programs of development. To construct system it is necessary to choose any indicators (indices) characterizing condition of each community block.

As principles of system construction modeling community, we will take system laws of ecology in a form of sayings formulated by American ecologist B. Commoner in 1974:

- *Everything is connected with everything.* (It is a law on general communication of things and phenomena in the nature and in a human society).
- *Everything should disappear somewhere.* (These are the laws of preservation).
- *Nothing is given by gift.* (It is a law on the price of development).
- *The nature knows better.* (It is a law on the main criterion of evolutionary selection).
- *On all will not suffice.* (This law was formulated by V.I. Vernadsky in the form of a law of Constance of alive substance quantities).

The basic concepts and principles of designing of system are described in the book [1].

We will stop only on some base moments.

It is inherent to a system:

- Integrity and division ability; Division ability means that system can be broken into elements. Integrity means that system is considered as a unit consisting of the interconnected parts;
- Presence of steady communications;
- Presence of integration properties inherent to system as a whole, but not inherent to its elements separately;

- Organization of developing systems, i.e. a set of its properties strengthening preservation and development of integrity.

Choice of indicators. In view of complexity of construction of system, the decision to characterize each block by unique indicator was accepted. From the point of view of mathematics the choice of the concrete indicator is not basic. On the other hand, the choice of indicators is defined by their presence in the available statistical databases characterizing society condition. Thus, expert estimations of condition are not considered and only fact data are used. One more aspect of choice of indicators is that indicators of various blocks should not duplicate each other (for example, GNP and national riches). Blocks and their indicators have been chosen by principles:

- Universality, i.e. applicability of a uniform technique of calculations to have estimation of society condition located in various territories,

- Possibility to have numerical statistical data,

- Completeness of covering of all making (economic, social, resource and ecological) characteristics of society condition,

- Minimization of a set of indicators (the choice was limited by integrated indicators).

Influence of indicators against each other can be direct and mediated. We will consider an example. Whether the industry influences population health? The answer will be ambiguous: if we consider only these two indicators and we have statistical data, that, using methods of regressive analysis, we can find such dependence. If we take into consideration three indicators – industry, emissions and health - we will receive an influence chain. The industry influences emissions, and emissions, in turn, influences health. This chain describes more precisely influence because the industry can affect professional disease, and emissions affect already health of all population. Communication "industry – emissions" or "emissions – health" is *a direct communication*, and communication "industry – emissions – health" is *mediated* one. Such approach to division of communications into direct and mediated is necessary for system designing.

Construction technique of a system modeling society condition [2].

The construction technique is based on the system analysis and on the theory of oriented graphs.

Stages of system construction:

1. We will collect a database on each indicator.

2. We will standardize each column of a database and we will make a matrix of standardized values.

3. We will calculate consistently: a matrix of correlations between columns, a matrix of errors of correlation, a matrix of regresses and a matrix of errors of regresses.

4. We will reveal correlation communications between the columns which error does not exceed 0.1 (90 % reliability of essential communication).

5. We will find factors of regresses of essential communications from matrix of regresses.

6**.** Using factors of regresses of essential communications, we make an orgraph of systems which describes mutual influence of one indicator on others. Thus the direction of communications is defined by logic (change of one indicator should mention any another in the constructed system).
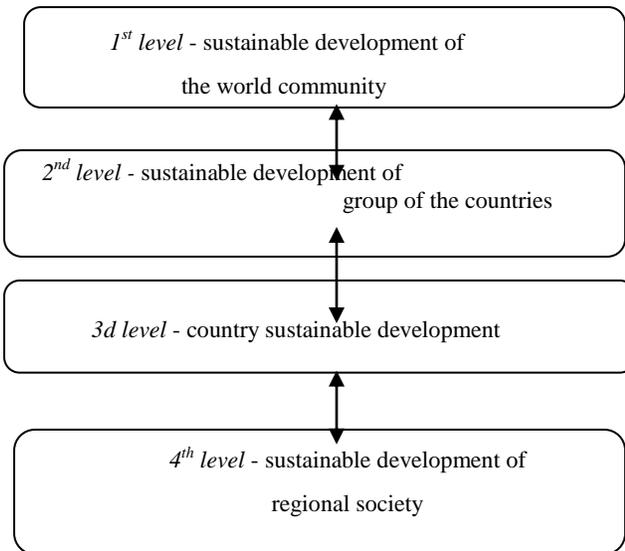
The system is exposed to pulse influence after construction. Using work methods [1] system reaction is defined, i.e. system weight of indicators should be found. The received weight values can be used to:

- ❖ Define strategic priorities of community development under consideration;

- ❖ Range elements of the previous hierarchical level (if the world analysis is carried out - the countries are ranged, if the country analysis is carried out – the regions are ranged etc.);

- ❖ Define optimum strategy of the coordinated development of elements of the previous hierarchical level using the device of linear programming;

- ❖ Control over efficiency of decision-making and calculate the price of errors at decision-making;

- ❖ Define crisis and precritical situations and possible ways of overcoming of crisis as well;
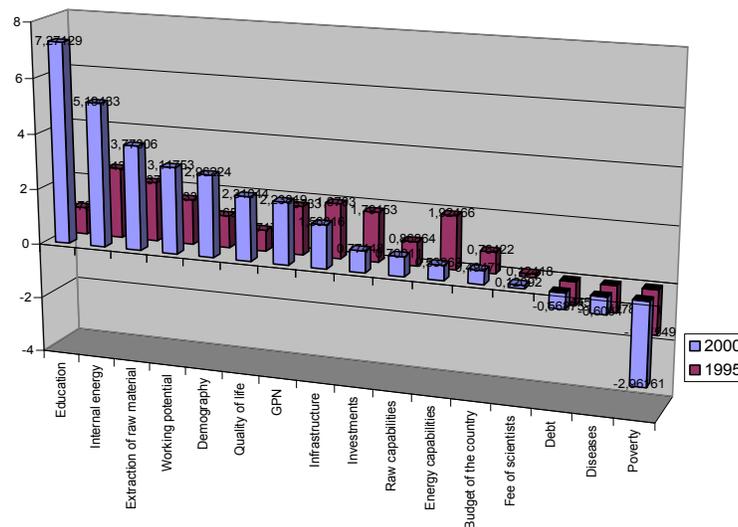
❖ Construct complete system of the coordinated priorities of sustainable development.

Levels of the coordinated realization of an effective sustainable development are as follows:

1st level - sustainable development of

the world community

2nd level - sustainable development of

group of the countries

3d level - country sustainable development

4th level - sustainable development of

regional society

❖ Do intermediate term forecasting.

The offered technique assumes permanent research of system since the system condition constantly changes and the optimum and most effective decision will be unique, corresponding to this system condition, for each moment of time.

Let's consider example.

Example: World   community research in 1995 and 2000.

Model construction was carried out on 2000 and 1995 statistical base of the World Bank. 133 countries with the fullest information on indicators have been selected from statistical bases to research tendencies of development of the world community and to check adequacy of model. Besides of that, groups of the countries – power donors and recipients - were considered.

As a result, the following system weights, not taking into consideration influence of pollution, have been received:

Fig. 1. Comparison of development priorities of the entire world

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Fig. 2. Comparison of development priorities of the countries possessing energy and raw materials resources
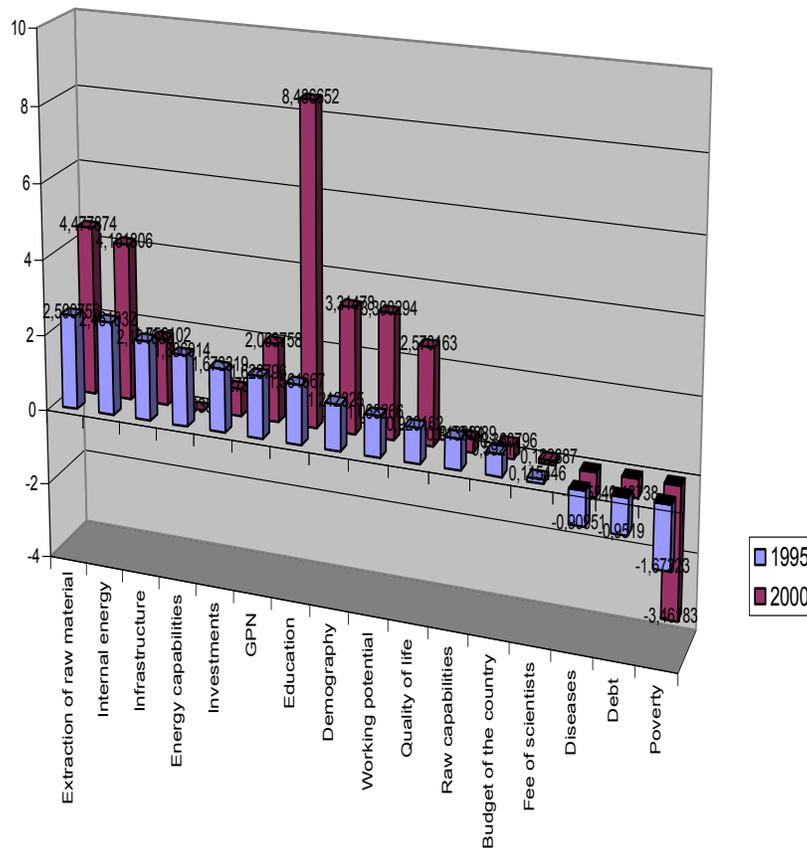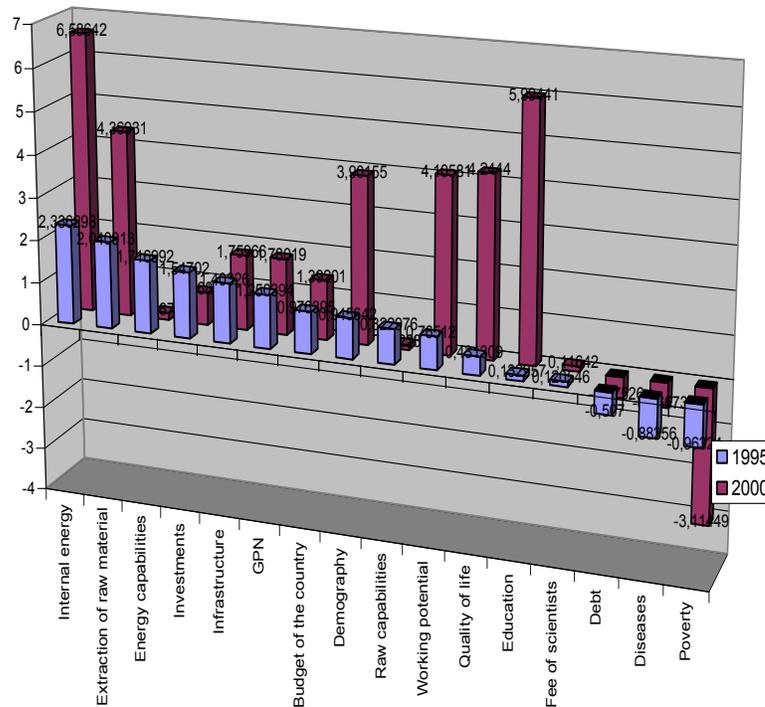
Fig. 3. Comparison of development priorities of the countries importing energy and raw materials resources (recipients)

It is admissible to tell that in 1995 the world community lived under the technology proved by centuries. There was a stock of power and raw possibilities for development, there were enough raw materials and electric power, society stratification did not cause serious indignations, the larger society stratification in the countries – power and raw recipients - was counterbalanced by the big attention to quality of life. In the countries - power donors - society stratification was rather insignificant and the general poverty did not put a question on improvement of quality of life. The world accurately shared on rich and poor countries and the poor countries had very small their own possibilities of development.

The situation has sharply varied by 2000. Principal causes of transformations were availability of information and interests of transnational corporations. They went to underdeveloped countries searching for decreasing of the cost price of made production. They needed qualified personnel there. Resource streams in the world and image and quality of life in developing countries began to vary. A number of developing countries have apprehended

this approach and have also started to develop actively. It is possible to note growth in the majority of the Asian countries, and the Muslim countries and the majority of the countries of Africa are late. Result of this disproportion was the massive migration from the African and Muslim countries that has generated the problems touching today the entire world.

Fast development of new technologies, consumption increase, and availability of information in the world has led to qualitative changes of society. Comparing the tables one can see that system influence of the main criteria has increased almost three times. It is possible to assert with confidence that the world community is in a system crisis. System crisis mentions three components:

- Economic. Crisis is caused here by rupture between the incomes received from use of knowledge that is characteristic for the developed countries and incomes from sale of power and raw materials in the countries – power donors;

- Social. Crisis in this sphere is caused by growing inequality in a quality level of life in different countries and by aspiration of the developed countries to keep their leading position;

- Ecological. The reasons of ecological crisis are obvious enough: thoughtless and escalating use of not renewed natural resources and uncontrollable growth of the waste which quantity has exceeded a threshold boundary.

Peace overcoming of this crisis is possible only by carrying out co-ordinated policy of sustainable development of the entire world community. Otherwise crisis will result in:

- ❖ Opposition of the developed countries and the countries possessing raw and power stocks: military conflicts (a present situation in the Middle East), development destabilization of the

countries possessing raw and power stocks (elements of Antimissile Defense in Europe). Today, unfortunately, we see attempts to solve the problem by military conflicts which can develop into world war.

- ❖ World economic crisis. This crisis is objective and it is a reaction of universal system to infringement of balance of development speeds and resources limitations. Misbalance demands redistribution of raw and financial streams. Crisis will begin most likely in the USA as a country which have spent many means to restrain existing position and then it will be thrown on the countries of Europe.

- ❖ Global ecological accident. We produce new services and goods. Manufacturing waste, old goods go into soil, World Ocean and atmosphere. The preliminary analysis shows a sharpness of problem of pollution influence on human life. Circulation is made in all atmospheres, in all hydrosphere, becoming isolated in the territory it is impossible to escape from it, as it is impossible to protect surrounding environment in a separately taken country. *It is impossible to live in oasis on a dump.* It is possible to delay the moment of approach of ecological accident only. Today it is necessary to pay very big attention to ecology; complex planetary nation-wide programs are necessary, uniform scientific ecological space for preservation of the Earth is necessary. It is vital to be engaged in decision of environmental problems by creation and realization of planetary-wide programs.

A new ideology, new style of a corporate management of society both in the world as a whole and in any territory is necessary.

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