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«Metrological Support of Innovative Technologies» ICMSIT-2020

«Features of processing of measuring information for an assessment of human ecological wellbeing»

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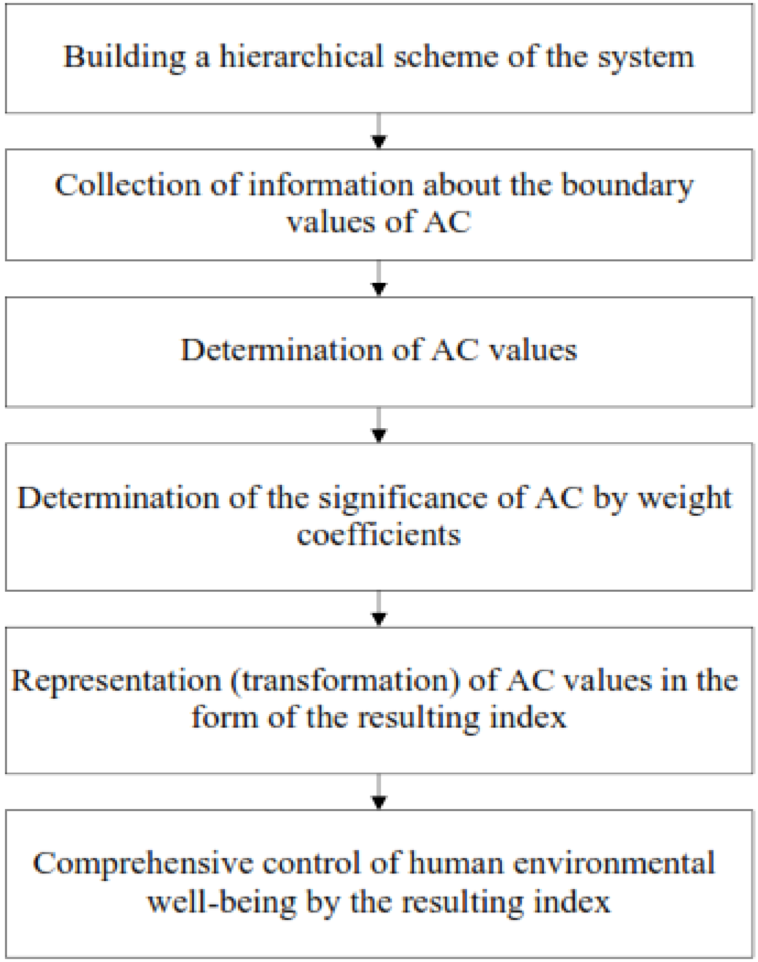
Problem statement

from https://yandex.ru/collections/card/5cb75e18874e97e3f7a007e2/

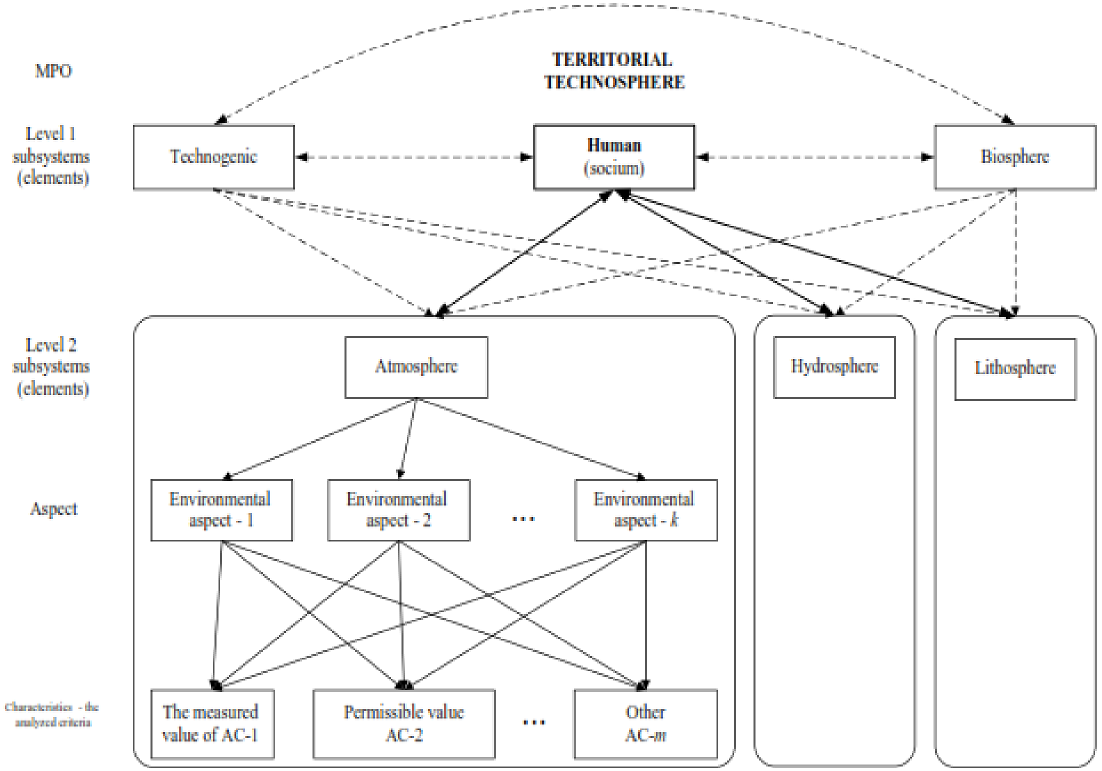
- Today the need for control and evaluation of the condition of the territorial technosphere (TT) as a complex of subsystems (SSs) on different levels, for example biosphere, the society and technogenic, is not in doubt.
- The authors see the evaluation of the danger level of the modified biosphere to the normal human life as the TT and its subordinate SSs condition evaluation. In accordance with, the environmental situation is ranked in ascending order of environmental ill-being in the following way: relatively satisfactory; precarious; critical; crisis; emergency.
- The following criteria form the basis of this classification: condition of the environment: biosphere, health, integrity of natural ecosystems.

Solution methods

The authors propose a new method of information processing (measuring information, laws and regulation, etc.) for the purposes of TT assessment. The developed method involves an algorithm shown in figure 1.



The hierarchical structure of the system (HSS) (figure 2) is a graphical representation of the system in the form of an inverted tree.



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Initial data for calculation and analysis

AC/EA	noise (X_1)	ammonia (X_2)	hydrogen chloride (X_3)	acetic acid (X_4)
actual AC values in the medium, $C_{m\,act}$, (dBA*, mg/m^{3}**)	54*	0.16**	0.05**	0.07**
permissible AC values in the medium (PL*, $PC_{average\ daily}$**), $C_{m\ PV}$, (dBA*, mg/m^{3}**)	50*	0.04**	0.02**	0.06**
δ_m	1.08	4	2.5	1.17
class (labour conditions*, PS danger class in the medium** (I, II, III, IV)), K_k	III*	IV**	II**	III**
AC upper threshold, $C_{m\,max\,PV}$, (dBA*, mg/m^{3}**)	35	0.028	0.014	0.042
AC lower threshold, $C_{m\,min\,PV}$, (dBA*, mg/m^{3}**)	0	0	0	0

Result of calculation

EA/WC	W_i^1	W_i^2	W_k	$WC_{priority}$
X_1	0.005	0.19	0.0975	3
X_2	0.86	0.59	0.725	1
X_3	0.13	0.03	0.08	4
X_4	0.006	0.19	0.098	2
$\sum$	1	1	1	-

Conclusions

- Applying the hierarchy analysis method to assess the environmental well-being of a person allows us to assess the contribution of each aspect to the final index of folding.
- The weight coefficients characterize the significance of the aspects taking into account the analyzed criteria and the contribution of each to the formation of the ecological state of a person.
- The peculiarity of the proposed implementation of the method is the absence of subjectivity in ranking the analyzed criteria by using as a basis for comparison not subjective expert assessments, but quantitative values fixed in normative legal acts.
- The results of this analysis are important for setting priorities in the implementation of environmental protection measures and ensure environmental well-being of the person.

Contacts

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