

GLOBAL PROBLEMS OF THE NATURE- SOCIETY SYSTEM

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ABSTRACT

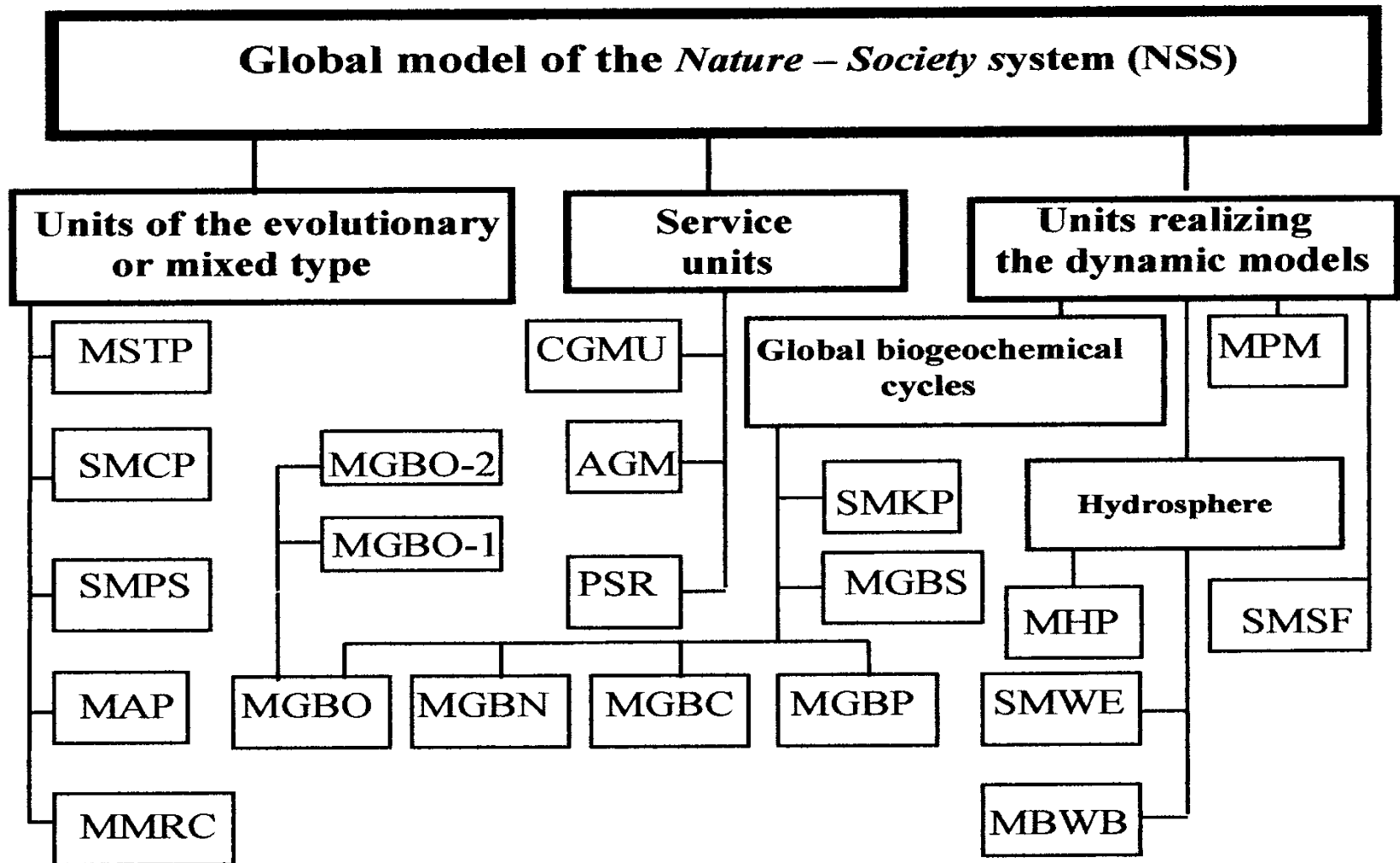
The basic global problems of the nature-society system (NSS) dynamics are considered. Analyzing the present trends of civilization development and assessing the global ecodynamics, the paper considers the problem of the global environmental change as an interdisciplinary problem of many scientific disciplines. The complex approach to solving this problem is based on information-modeling technology, and its use is connected with selection in the NSS of information levels as well as the choice of criteria for assessment of its state.

INTRODUCTION

Key problems of the current civilization development is the investigation for a compromise between the increasing needs of the growing global population and nature, whose food and energy resources are limited. A constructive approach to the solution of these problems is the study of nature-society system dynamics taking into account the interactions between natural and anthropogenic parametrical description which take part to the principal laws of nature and human society. In the present study a global model of the nature-society system is proposed, which may be used for the study of energy balance in the world. To this end, the energy balance equations for the nature-society system are presented and then these are employed in various scenarios that reflect past and present tendencies in the civilization development. In addition, the principal questions that are connected with the reliability of conclusions about the role of hydrocarbon sources of energy are analyzed and multidimensional analysis of global ecodynamics is accomplished.

Furthermore, the basic global problems of the nature-society system dynamics are considered as well as the analysis of the significance of ecological, socio-economic, and political factors in the formation of global changes of the environment is made. The problems of modeling global ecodynamics are discussed and a new concept of the synthesis of geo-information monitoring systems is suggested based on the technology of evolutionary eco-informatics and open systems. Finally, the problem of transition of the nature-society system to long-range sustainable development is studied.

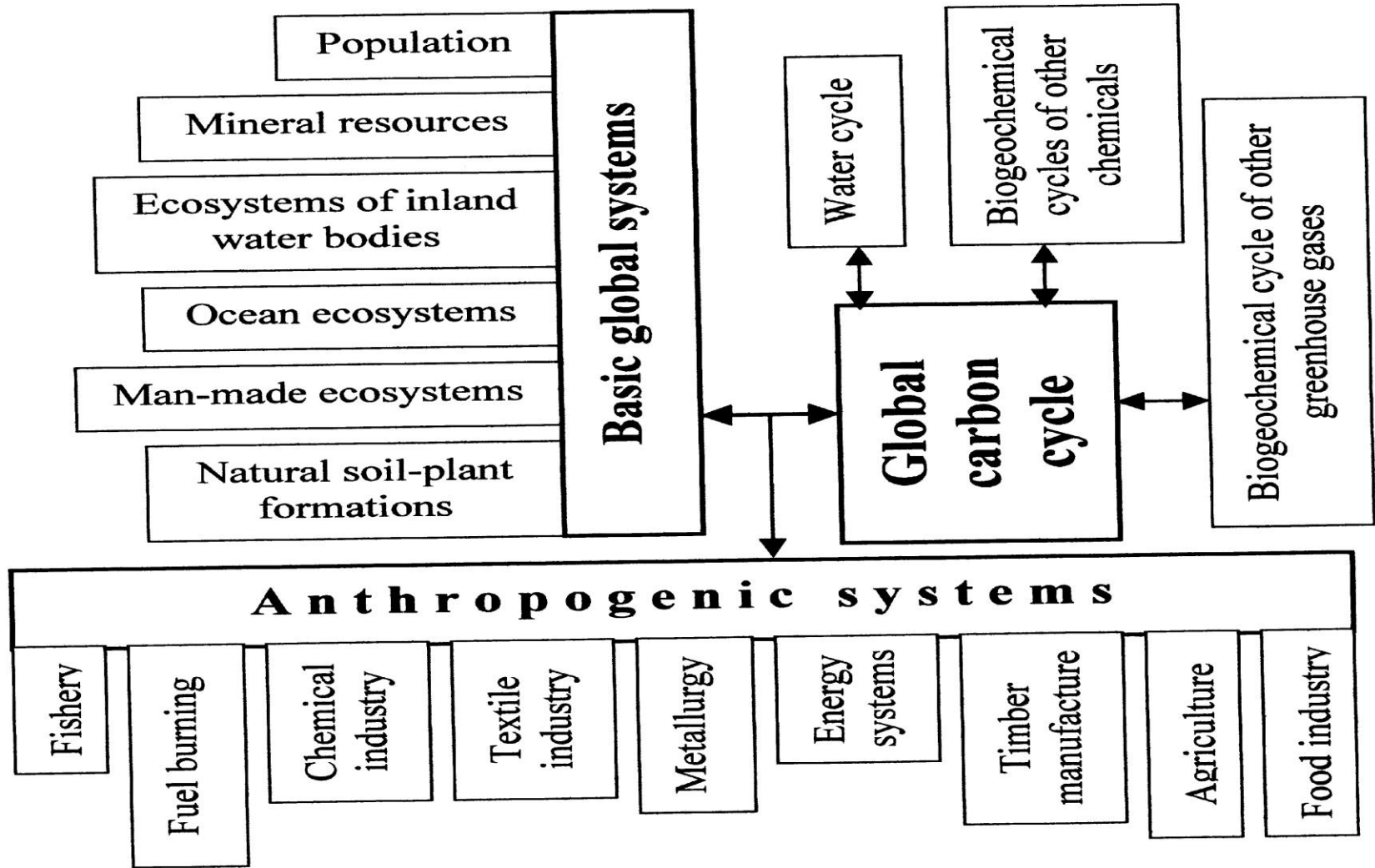
GLOBAL MODEL OF THE NATURE-SOCIETY SYSTEM (GMNSS)

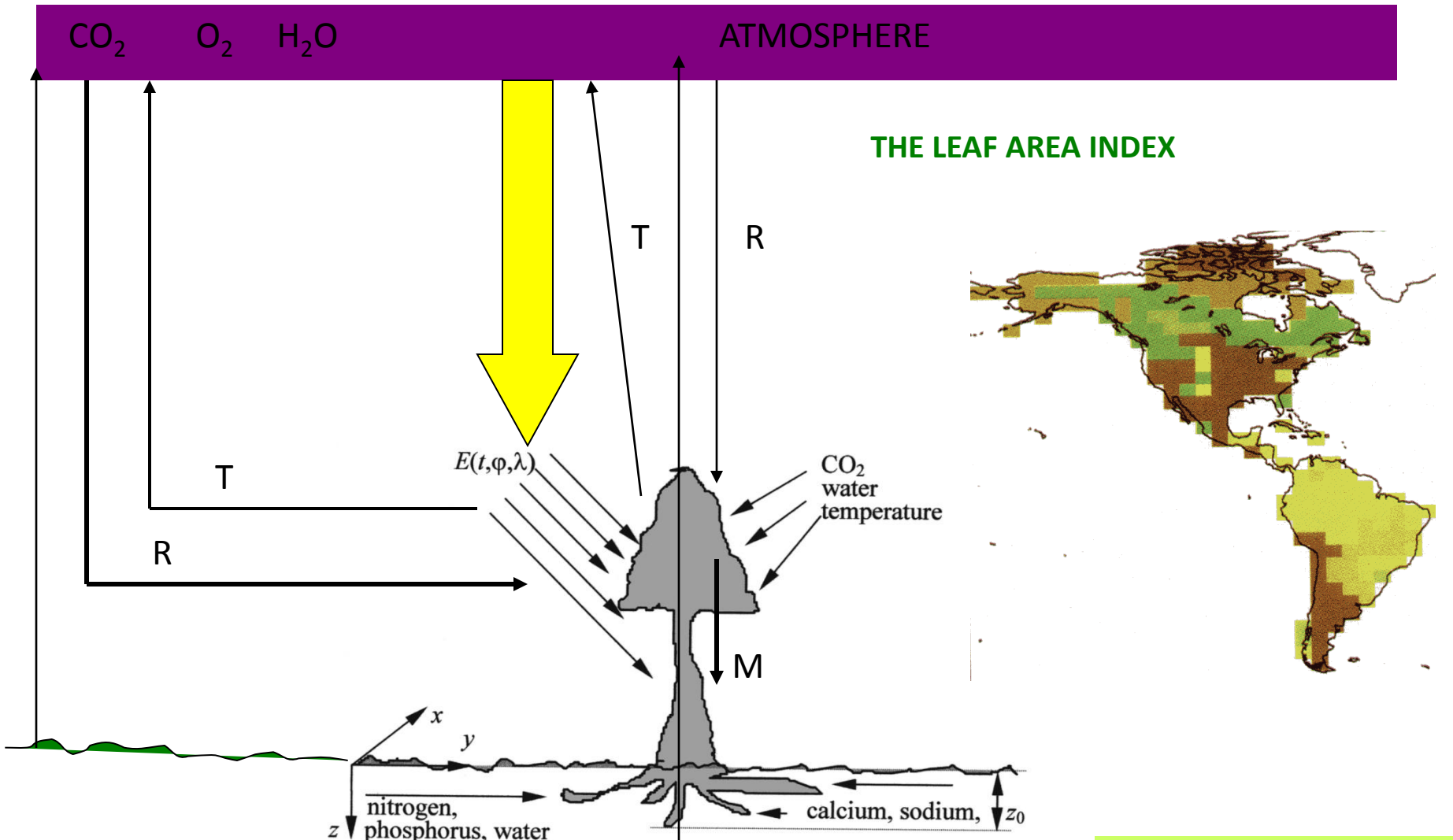


CHARACTERISTIC OF THE GMNSS UNITS

Identifier of the unit	Characteristic of the unit's functions
SMPS	A set of models of the population size dynamics with regard for the age structure.
SMCP	A set of models of climatic processes with differently detailed consideration of parameters and their correlations.
MMRC	Model of the mineral resources control.
MAP	Model of agricultural production.
MSTP	Model of scientific-technical progress.
CGMU	Control of the global model units and database interface.
AGM	Adjustment of the global model to simulation experiment conditions and its control.
PSR	Preparation of simulation results to visualization or other forms of account.
MBWB	Model of the biospheric water balance.
MGBC	Model of the global biogeochemical cycle of carbon dioxide.
MGBS	Model of the global biogeochemical cycle of sulphur compounds.
MGBO	Model of the global biogeochemical cycle of oxygen and ozone.
MGBN	Model of the global biogeochemical cycle of nitrogen.
MGBP	Model of the global biogeochemical cycle of phosphorus.
SMKP	A set of models of kinetics of some types of pollutants in different media.
SMWE	A set of models of water ecosystems in different climatic zones..
MHP	Model of hydrodynamic processes.
SMSF	A set of models of soil-plant formations.
MPM	Model of processes in magnetosphere.

The Conceptual Scheme of the Carbon Cycle in the Environment



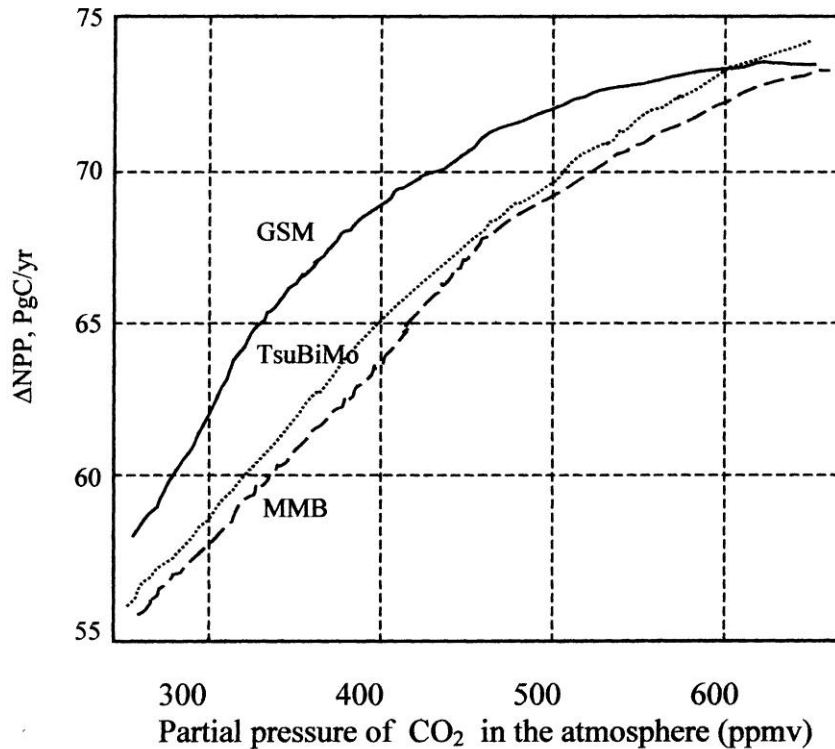


THE LEAF AREA INDEX

$$dB/dt = R - M - T$$

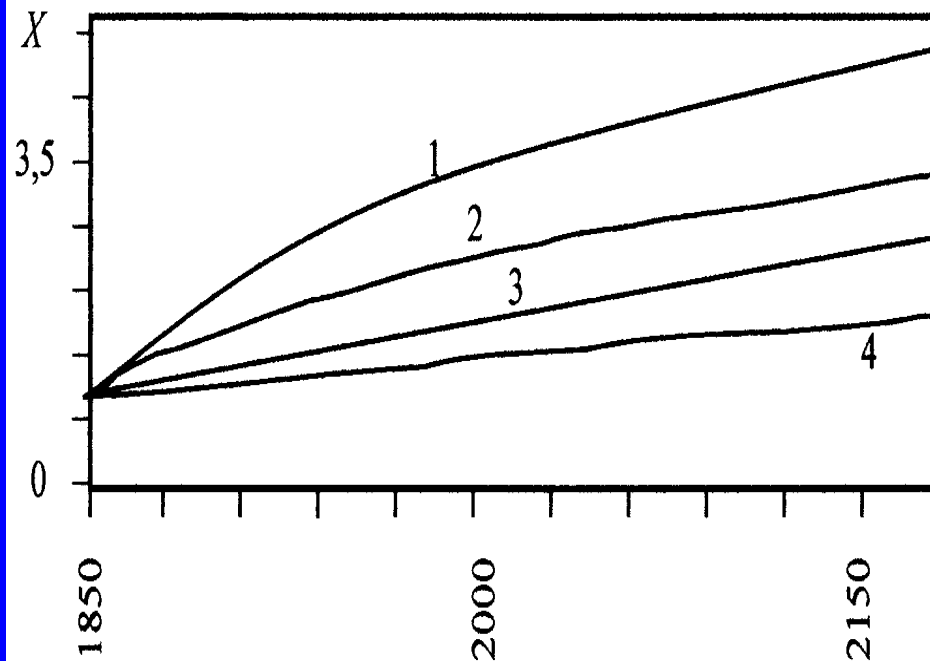
CO_2	+	H_2O	+675	kcal	\rightarrow	$C_6H_{12}O_6$	+	O_2	+	H_2O	
moles	6	moles	12	sun energy		mol	1	moles	6	moles	6
246	g	216	g			180	g	192	g	108	g

SIMULATION RESULTS



Comparison of three models of the global carbon cycle to assess the response of net primary production of vegetation to changing concentrations of atmospheric CO₂. Notation: TsuBiMo – Tsukaba Biosphere Model.

Model results for scenario IS92a with different spatial resolution in the SVS distribution ($\Delta\phi, \Delta\lambda$): 1-(10°,10°), 2-(7.2°,9.0°), 3-(4°,5°), 4-(4°,5°) with the correction of soil moisture. The ordinate $X=C_a(t)/C_a(1850)$.



CONCLUSION

Solution of the most important problem of the 21st century concerning the ways of civilization development and making decisions on a global level, aimed at sustainable development with achieving the living conditions acceptable for global population, is the subject of many international and national programs on the environmental studies. The observed civilization – nature collision has moved from spontaneous development of humankind to deliberate control of resources whose scantiness has become apparent. The ecological problems appearing everywhere on a planetary scale make humankind to move to the strategy of agreeing their actions with the laws of nature. It is clear that first of all, the humans' development should be agreed with the laws of distribution and transformation of energy fluxes in the biosphere, which determines the boundaries of the corridor of ecologically no-problem civilization development. Realization of the fact that civilization is in the state of a system crisis and practically does not have any clear behavioral strategy, and does not remove the problems of its survival.

To use the above-considered approach to a search of constructive technology to study the process of the NSS global development, it is necessary to organize on an international level a special scientific center, which could develop the GMNSS, taking into account the available database and accumulated knowledge. One of the global goals if this center could be to work out algorithms, methods, and models which would reduce the level of uncertainty in assessments of civilization development in the future.