Integral ecophytoindication as an essential technique of evaluation of the state of natural geosystems and their transformation due to multifunctional human activity

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Methodological statements of the integral ecophytoindication are based on results of investigations that have been performed by the author and her students of the chair of botanical geography, St.-Petersburg (Leningrad) University, in different regions of Russia since the year of 1951 (Skarlygina, 1954).

This research area has passed several stages in its development according to changes of paradigms used to solve the hot problems that appeared in ecological and geographical investigations in the particular time periods. The main nascent stages and the corresponding structural blocks of integral ecophytoindication are as follows:

1. Phytoindication of the landscape components (soil types and their properties, the state of ground waters; geological conditions, such as geological structures, rock types and lithology, etc.) by different phytocenoses types, species composition and the species ecological groups in particular.

2. Phytoindication in mapping and photo interpretation.

3. Phytoindication of the dynamics of ecological regimes on the basis of the analysis of ecological phytocenotic lines showing the increasing pressing of the leading ecological factors.

4. Phytogeochemical analysis of the natural and urbo-geosystems (the ecological state of the urban areas and industrial agglomerations) based on chemical composition and abnormal reactions in vegetation (the intensity of chlorosis, necrosis, formation of terates). This block of integral phytoindication is widespread in different fields of applied science (phytogeochemical prospecting for minerals, evaluation of composition of geophysical anomalies, analysis of the rate of contamination in urbogeosystems, etc.).

5. Phytogeochemical analysis of natural and urbo-geosystems enables finally to reveal the phytoindication criteria for prediction of different shifts in human health because toxicological effect may be identified at the lower concentration levels of chemical elements in plants earlier than in man. This enables to organize the corresponding monitoring system of early warning of contamination and optimization of the environment state for human health. The concept of integral phytoindication presents therefore a highly sensitive, rapid test and cost-effective approach towards evaluation of modern ecological state of the environment and its monitoring (Ufimtseva-Skarlygina, 1992; Ufimtseva, Terekhina, 1996) et al.