



Valuation of ecosystem services in the Chernobyl Exclusion Zone and adjacent territories

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By size of the contaminated areas and levels of negative social, ecological and economic consequences, the accident at the Chernobyl Nuclear Power Plant is considered as the biggest anthropogenic catastrophe in human history. Ecosystem services of contaminated terrestrial and water ecosystems are substantially altered. Biophysical and economic valuation of ecosystem services in the impacted territories requires accounting for a number of specific features of disturbances, including inter alia 1) large, diverse and heterogeneously impacted areas of the exposure; 2) need of consideration of contaminated areas and adjacent landscapes beyond the Exclusion Zone; 3) accounting for the dynamic character of levels of contamination and corresponding impacts, responses and feedbacks in a systems approach “environment – ecosystems – exposure – contamination”; 4) need to consider interactions between ecosystem services (i.e. benefit for people, Costanza et al. 2017) and “dis-services” (e.g., Shapiro and Baldi 2014); 5) profound forecasting over the coming decades. These and other features makes searching for “optimal” valuation methods complicated and ambiguous. This presentation considers methodological and modeling backgrounds of biophysical and economic valuation of ecosystem services suitable for impacted areas with a special emphasis on the Chernobyl Exclusion Zone. The presented comprehensive approach is following the principles of applied systems analysis, taking into account that studied objects are in essence underspecified (fuzzy) systems (Shvidenko et al. 2015). The information background is presented in the form of an Integrated Land Information System (multi-layer and multi-scale GIS approach), combining hybrid land cover information with corresponding attributive datasets and the highest spatial resolution (at 3-5 m) for the Exclusion Zone for 2006-2015. The portfolio of ecosystem services and their classification are based on the widely used recommendations of MEA (2005) with modifications related to specific ecosystem services of radioactively contaminated areas. The selection of the services is based on a principle of “equivalent value – different price” (Sheingauz, Sapozhnikov 1983, 1988). As an example, we present a detailed description of biophysical and economic valuation of full and verified carbon accounting of forest ecosystems and water-protective and water-regulating groups of ecosystem services.