



Territorial Productivity of Nature-Resource Potential of Ukrainian Regions: Cartographic Analysis

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Abstract: Territorial specificities of productivity of aggregate nature-resource potential (NRP) and its basic components—mineral, water, land, forest, fauna and natural recreation potentials are disclosed in the aspect of natural regions of Ukraine. The NRP territorial productivity is mapped for 57 natural (physic-geographical) oblasts, 14 krays, 4 zones and 3 natural countries of Ukraine. Territorial differentiation in efficiency of use of the most essential mineral, land and aggregate NRPs of Ukrainian natural regions is cartographically assessed. It turns out that mountainous regions show higher NRP return if compared to lowland territories of Ukraine; potential efficiency within the East-European Plain grows from the north and the center of the country to its southern west and south—from the Zone of Mixed Forests and the Forest-Steppe Zone towards the Zone of Deciduous Forests and the Steppe Zone.

Key words: Ukraine, nature resources, productivity (efficiency) of nature resources, resources mapping.

1. Introduction

Nature-resource potential (NRP) of Ukraine is characterized by the aggregate productivity (efficiency, return) of mineral, water, land, forest, fauna and natural recreation resources expressed in national and world prices. Quantitative expression of the potential of nature resources is defined as its total value in every aspect of its use. It is a sum of products of valued resource unit's use value by the resource productivity on the whole territory, suitable for exploitation in every aspect of resource use, with consideration of quality coefficients. The resource unit's use value estimate is presented in cost indices obtained with the method of ranking of nature resources whose assimilation takes place in "worse" conditions and which require additional but socially justified labor costs.

The NRP integral assessment carried out on the basis of total national economic effect from the resource use is considered to be methodological approach that meets the present-day state of economic

development of the problem.

The problem of NRP productivity (efficiency) analysis was highlighted in the works by N. Lee [1], W. March [2], C. Williams [3] and others. At the same time, the problem is still insufficiently developed with regard to natural regions of Ukraine. This is why the present work aims at the analysis of NRP territorial productivity in Ukrainian natural regions through development of its cartographic models.

2. Research Methods and Areas

Methodical approaches to cost estimation of Ukrainian NRP were in detail presented in our latest publications in *Natural Resources* [4, 5], *Geography and Natural Resources* [6], and *Journal of Settlements and Spatial Planning* [7].

To our opinion, land as the principal element of national wealth and the key sector of Ukrainian nature-resource complex should be put in the center of estimation. In the variety of approaches to determine the potential of agricultural lands, publications by I. R.

Yukhnovskyy and G. M. Loboda deserve particular attention. The authors' dominant idea is that "the natural yielding capacity of Ukrainian lands, i.e. such capacity achieved by adhering to crop rotation and only mechanical soil cultivation with no fertilization should be taken as an assessment standard" [8].

The Ukrainian NRP value in yearly dimension as of present day amounts to USD 53,953 milliard.

Territorial productivity (efficiency) of NRP is in our case presented as a proportion of the value of natural region potential and its (region's) area. Developing corresponding map schemes, we've made use of the so called estimation open scales when the NRP territorial productivity average index for Ukraine is set to be 100 points. For the purpose of completeness and multifold analysis, the map models presented hereunder (Figs. 1-3) also characterize, by way of chart-diagrams, the NRP economic productivity, i.e., the indices of provision of population inhabiting the natural region with corresponding nature resources.

3. Results and Discussion

The results of the assessment of Ukrainian natural regions' NRP territorial productivity were for the first time counted on the level of 57 physic-geographical oblasts of the country [9], and showed geographical specificities as follows:

The natural country of the Crimean Mountains takes leading positions in territorial productivity of the aggregate (integral) NRP of Ukraine followed by the countries of Ukrainian Carpathians and the East-European Plain (Fig. 1 and Table 1).

The Steppe Zone followed by the Zone of Deciduous Forests-Forest-Steppe Zone and the Zone of Mixed Forest are the leaders in the same with respect to natural zones.

The Donetsk Uplands, West-Donetsk Slope Uplands, Crimean South Coast, Crimean-Mountain, Central Crimea Uplands, Prut-Dniester Uplands, Orilsk-Samara Lowlands, Starobilsk Slope Uplands,

Pre-Mountain Crimea, Zakarpattia Lowlands are the top ten natural oblasts with the highest productivity of Ukrainian aggregate NRP. Their leadership is in the first place conditioned by joint effect of mineral, land and natural recreation resources.

The Nyzhnodniprovska Terrace-Delta Lowlands, Kyiv Polissia, Zhytomyr Polissia, South Podillia Slope Uplands and Volyn Polissia are the natural oblasts representing the lowest (56-39 points correspondingly) productivity of the same which is in the first place connected with low productivity of the potential of land resources.

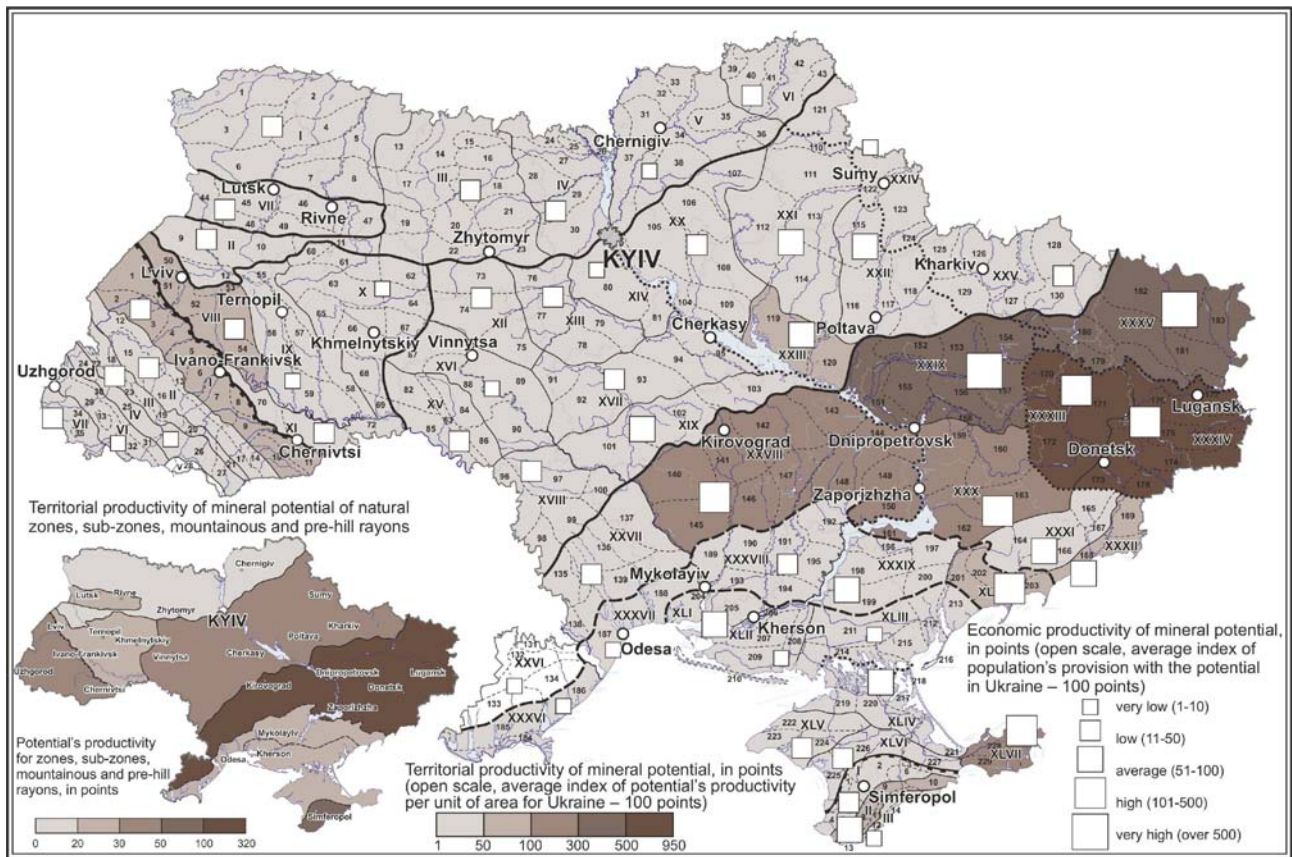
The Zone of Deciduous Forest that origins from the Forest-Steppe Zone of Ukraine is characterized by closeness and similarity of indices of territorial productivity of both integral potential and the potential of separate types of nature resources. The decrease in water and forest resources' return is expectedly noted from northern west towards southern east. Meanwhile, the Forest-Steppe Zone shows productivity of the fauna potential to be twice higher than the same in the Zone of Deciduous Forest (the effect of nectar-bearing and fish resources).

Territorial productivity of the potential of different types of nature resources has its own geographical specificities (Figs. 2-3).

Mineral potential is most efficient in eastern and central-eastern natural regions, whereas it is lowest efficient in Northern Polissia та Prychornomorsko-Pryazovskiy Krays. The Donetsk Uplands Oblast, Donetsk Kray, West-Donetsk Slope Uplands Oblast, and Zadonsk-Don Kray show the most productive mineral potential (947-312 points, Fig. 2).

On the opposite, the return of mineral potential in Volyn Polissia, South Podillia Slope Uplands, Nyzhnodniprovska Terrace-Delta Lowlands, Prysylvasko-Pryazovska Lowlands and Marmaros Oblasts decreases to 5 points and lower.

Water potential with respect to indices of its territorial productivity is defined by clear effect of



100 points of Ukrainian aggregate NRP territorial productivity are equivalent to 894 \$/hectare

Fig. 2 Productivity (efficiency) of mineral potential of Ukrainian natural regions.

transitional flow actively engaged into irrigation of agricultural lands of the South. It is due to this that the southern oblasts, namely, Central Crimea Uplands, Vododilno-Verkhovynska, Marmoros, Peredkarpattia Uplands and Zakarpattia Lowlands (431-179 points) are included into the list of physic-geographical oblasts of the country that show the highest productivity of water potential among all mountainous and north-western regions.

The lowest indices of water potential's territorial productivity are observed in Pryazovska Uplands, Prydnistrovsko-East-Podillia Uplands, South-Podillia Uplands and Kerch Hilly-Ridge Oblasts (50-20 points correspondingly).

Allocation of indices of land potential's territorial productivity is a vivid characteristic of latitudinal-zonal effects upon soil fertility. The return of agricultural lands decreases from the Forest-Steppe Zone,

Deciduous Forests Zone, the Crimean Mountains and the East-European Plain towards the Steppe Zone, Mixed Forests Zone and the Ukrainian Carpathians with the indices varying within the range of 135-49 points.

Land potential is most efficient in the Prut-Dniester Uplands (245 points), South Coast-Crimean, North-Eastern Prydniprovskia Uplands, Prydniprovskia-East-Podillia Uplands (163 points) Oblasts, whereas the potential's indices are the lowest in north-western and Carpathian regions—Oblasts of Volyn Polissia, Outer-Carpathians and the Marmoros (38-9 points, Fig. 3).

Territorial productivity of forest potential vividly mirrors major geographical regularities in its development. The Ukrainian Carpathians, Crimean Mountains and the Zone of Mixed Forests take here leading positions (447-174 points), while the indices decrease to 20 points in the Steppe Zone.

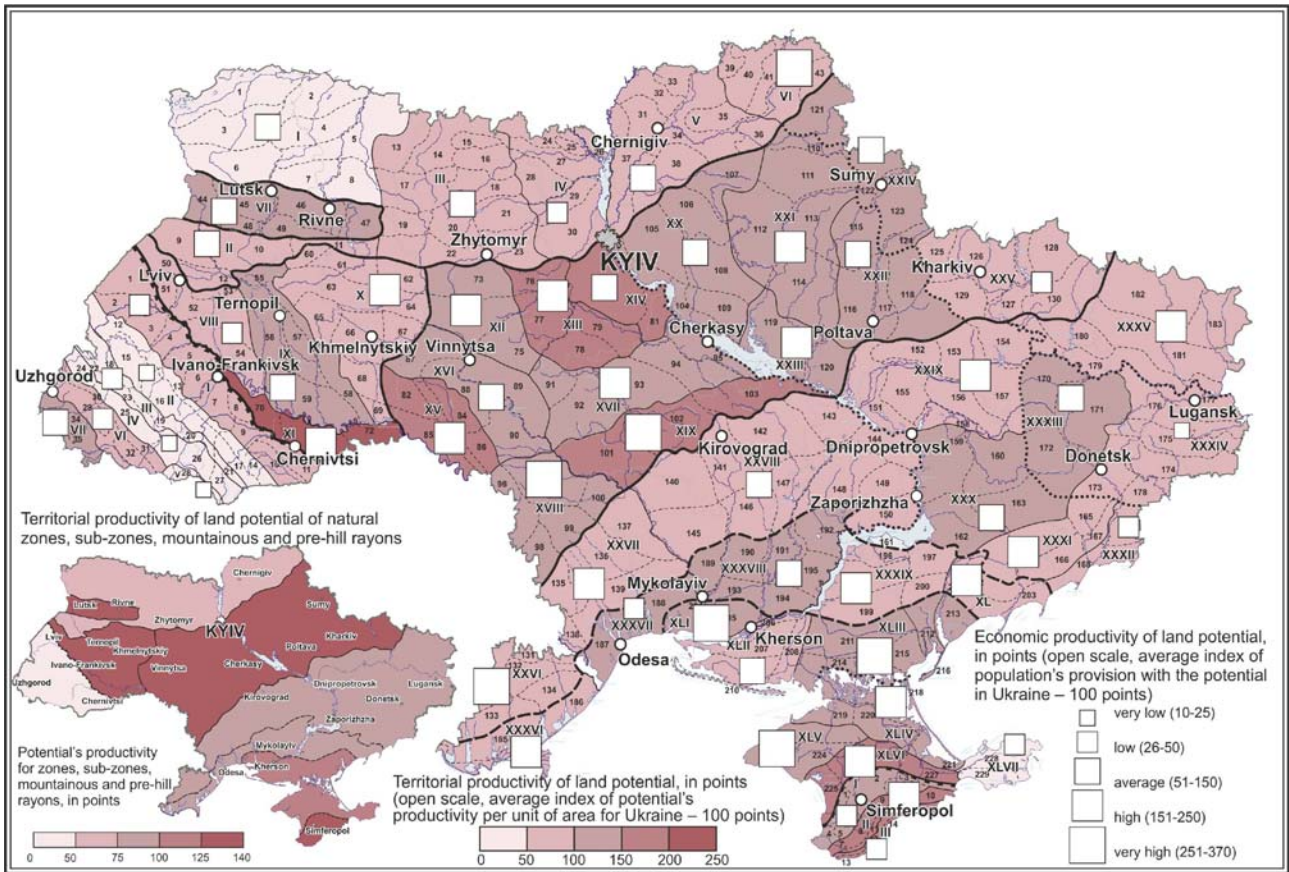


Fig. 3 Productivity (efficiency) of land potential of Ukrainian natural regions.

The Maramaros Oblast, Vododilno-Verkhovynska, Polonynsko-Chornohirska, Outer-Carpathian, Roztotsko-Opilna Hilly-Mountainous Oblasts and the Oblast of Volyn Polissia are reckoned among the cohort of Ukrainian physic-geographical regions with the most valuable forest potential (871-209 points), whereas the South Moldavian Slope Uplands, Zadnistrovsko-Prychornomorska Lowlands, Tarkhankutska Uplands are the oblasts with the lowest potentials (5-1 points).

Unlike the same with forest resources, territorial productivity of fauna potential is considerably higher in plain rayons that show wealthy nectar-bearing and fish parks. East European Plain—the Crimean Mountains and the Ukrainian Carpathians, Forest-Steppe Zone, Steppe Zone, the Zones of Deciduous Forests Mixed Forests—these are the biggest physic-geographical taxonomic units of zoning from biggest to lowest territorial return of

Ukrainian fauna potential.

It is interesting to trace territorial differences in efficiency of natural recreation potential of Ukrainian physic-geographical regions, since its component of “recreation lands (territories)” is directly linked with population of communities and recreation zones transport accessibility.

The leadership of the Crimean Mountains (755 points) and the Ukrainian Carpathians (222 points) is only logical in comparison with East-European Plain (84 points). The Steppe Zone that faces the Black and the Azov Seas (97 points) gets ahead of the Zones of Deciduous and Mixed Forests as well as of the Steppe Zone (78 points).

It is also only natural that three Ukrainian physic-geographical oblasts of the Crimean Mountainous Kray, namely, the South Coast Crimean (1,065 points), Mountainous Crimean and Peredhirmo-Crimean Oblasts (682 points) are the

leaders in territorial productivity of natural recreation potential. These are followed by the oblasts of Central Crimean Uplands, Zakarpattia Lowlands, Volcanic-Crevise-Hollow and Pryazovska Lowlands (280 points).

Natural recreation potential is the least territorially productive in the Oblast of Volyn Polissia (38 points), the Oblasts of Prydnistrovsko-East-Podilla Uplands, and Dniprovsko-Molochanska Lowlands (15 points).

3.1 Debatable Issues

Further evaluation research of Ukrainian natural regions' NRP territorial productivity will emphasize upon as follows:

Firstly, on cognition of decade-long NRP development dynamics (e.g., 1991-2000, 2001-2010, 2011-2020);

Secondly, on disclosure of additional hidden reserves and the most perspective directions of the country's nature-resource development;

Thirdly, on clarification of Ukrainian NRP's place and role in the world's nature-resource potential;

Fourthly, on forecasting of NRP development and its future effect upon functioning of state's economics [10].

4. Conclusions

Our summarizing conclusions are as follows:

The Northern Steppe Sub-Zone takes the leadership in territorial productivity of mineral potential. It is followed by the Crimean Mountains and the Ukrainian Carpathians, whereas the Zone of Mixed Forests is an obvious outsider;

The Ukrainian Carpathians, the South Steppe (Dry-Steppe) Sub-Zone (the Dnieper transitional flow), the Crimean Mountains and the Zone of Deciduous Forests are the most efficient Ukrainian regions with respect to territorial return of water potential;

The Crimean Mountains, the Forest-Steppe Zone, the Zone of Deciduous Forests and the South Steppe (Dry-Steppe) Sub-Zone are the state's determinative

regions where territorial productivity of land potential is concerned;

Ukrainian forest potential is represented by corresponding assessment map models that vividly characterize geographical regularities in its development, where territorial productivity decreases from the Ukrainian Carpathians, the Crimean Mountains, the Zones of Mixed and Deciduous Forests towards the Forest-Steppe and Steppe Zones;

According to the results of cartographic assessment, the Forest-Steppe Zone, South Steppe (Dry-Steppe) Sub-Zone, North Steppe Sub-Zone represent Ukrainian physic-geographical regions with the most perspective development of fauna potential;

The materials of mapping of natural recreation potential territorial return are the convincing evidence of the fact that the indices of its territorial efficiency consistently increase from the Zone of Mixed Forests, Mid-Steppe Sub-Zone, Forest-Steppe Zone and North Steppe Sub-Zone towards the Zone of Deciduous Forests, South Steppe (Dry-Steppe) Sub-Zone, Ukrainian Carpathians and Crimean Mountains;

And, at last, the general (summarizing) map scheme of the higher taxonomic level assessing territorial productivity of Ukrainian regions' integral NRP clearly witnesses that the Crimean Mountains, North Steppe Sub-Zone, Ukrainian Carpathians, South Steppe (Dry-Steppe) Sub-Zone are significantly advantageous if the efficiency of development of natural productive forces is compared to the Zone of Mixed Forests, Mid-Steppe Sub-Zone, Forest-Steppe Zone and the Zone of Deciduous Forests.

In general, the increased NRP return in mountainous regions if compared to plain regions should be noted in the first place; secondly, the potential's efficiency within the limits of the East European Plain increases from the north and the center of Ukraine towards its southern west and south, i.e., from the Zone of Mixed Forests and Forest-Steppe Zone towards the Zone of Deciduous Forests and Steppe Zone.

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