Map bases used for ecological stability assessment of land

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Abstract. The interest of land stability and its calculation due to the ecological stability and long term use of land as an entity is under pressure not only from ecological activists but the whole society at all. To calculate these kind of unknown values, which are interpreting many land possibilities and characters needed for many others calculations. That is the reason to find effective way to calculate the ecological stability index. The calculation of this index directly depends on character of area and its size. In Slovakia, there are many map bases with possible use for this purpose on whole territory. This paper is focused on the map base and their possibilities to be used.

1. Introduction
An ecological stability as an ecological systems’ stability to offset the external disturbances by their own functional mechanisms without an additional energy input (means for example without a human activity by using so called biological automation) has become part of many dialogues of political parties and hand in hand with the laws focused on this kind of interest, although an basic research of the stabilizing mechanisms will still remain under investigation for a long time. [4] An assessment of the landscapes’ ecological stability is considered to be the basis for the assessment of all conditions and assumptions of land use. This paper will focus on the possibilities of map selection for ecological stability assessing.

2. Land adaptations
The land adaptations are carried out in accordance with act 330/1991 of land adaptations, land ownership arrangements, land offices, land fund and about land associations. The content of the land adaptations is a rational spatial arrangement of the land ownership in a certain area and other immovable agricultural and forest property and property associated with it; carried out in the public interest accordance with the requirements and conditions of environmental protection and the creation of ecological stability system, landscape functionality and operational aspects of a modern agriculture and forestry hand in hand with the support of the rural development. [1]

Land adaptations include:
- an identification and a reorganization of the ownership and the conditions of use as well as related other material rights in the area of land adaptation and a redistribution of the land like merging, separation or other land readjustments;
- technical, biological, environmental, economic and legal measures related to the reorganization of the legal relations.
From a procedural point of view, land adaptation has 4 main stages. The main stages are proceedings for the commencement of land adaptation; proceeding of land adaptation; implementation of the land adaptation project; realisation of the project. The geodetic activities are necessary in the individual stages of the land adaptation. There are activities such as the establishment of a minor control, setting out of the perimeter of land adaptation area, a measurement of the focused area topography. In the other activities in the cooperation with the landscaping designers, there is focus on the ecological stability of the landscape. When the assessing the landscape ecological stability, unambiguous results can be achieved on the basis of a coefficient of ecological stability calculation (KES), which is based on a map on which the cultures’ individual areas can be defined.

3. Map basis
The degrees of the ecological stability can be ascertained from the projects of the regional territorial systems of the ecological stability in the scale of 1:50000 (or scale 1:25000) which is processed for the whole territory of Slovakia. [5] At the present, the products of GKÚ, such as orthophotomaps or orthophotomosaics can be used. Nowadays, the foresters and cartographers of Slovakia have connected to create an active orthophotomosaic, which can be used and is available to everyone for free online. In Slovakia, for the whole territory, there is possibility of digital cadastral map use. For the land adaptation, and to calculate the ecological stability coefficient, there is necessity to know not only the value of whole area, but the value of area hand in hand with the category of ecological stability. There is a requirement to divide the focused area due to its character (such as wood, water areas, meadow, urban area etc.), and to know the value of these areas. As it is obvious from the content of VKM, it is impossible to get to know the needed information, in this format it is impossible to use this kind of map.

Figure 1. Example of digital cadastral map on chosen area available online

The other possibility is use of digital base map, prepared for the whole territory of Slovakia as well. The character of area in meaning of use is better than in VKM. One example is, that one parcel
(parcela) can obtain areas with other characters, but the ownership has priority before the character, the situation is different of digital base map. There is no focus on the ownership, and also better space to display the character of areas. The problem of the map is that the division of areas by the character is insufficient, and the question of map accuracy is also the theme needed to be focused on. The solution can be defining of new values of area character applicable for already created type of map. It means that there is way in reindexing of ecological quality coefficients due to used kind of characters, used in digital base map. Like it is possible to see on figure 2, the meadows or arable land are displayed the same, index of these two characters in regular used law is different. The question of reindexing of areas has to be theme of a professional discussion.

![Example of digital base map available online](image)

**Figure 2.** Example of digital base map available online

For the first time in national history, the National Forestry Center (NLC) in Zvolen and Geodetic and Cartographic Institute in Bratislava (GKÚ) have created the ortophotomosaic of the entire territory of Slovakia. This work, prepared in accordance with the rules of European Commission and available to the general public will significantly contribute to the streamlining of a public administration. As the NLC spokesman Ján Lichý informed for TASR, the creation schedule was divided in three years (2017-2019) so during each year in the growing season, data were collected and processed from one third of whole Slovak Republic territory (approximately 17,000 square kilometres). For the first time in history, ortophotomosaics were processed with cyclical update of the agricultural production blocks register. It was ensured in time, thus eliminating the payment of support for ineligible land and subsequently preventing the possibilities of European funds shortening for the Slovak Republic. Another, equally important fact is that for the first time in forever, orthophotomosaics in a significant part of the territory were created from processed aerial laser scanning data. A new generation of the digital terrain relief model was used in the creation, which had a significant impact on achieving the accuracy of focused orthophotomosaics. Colour orthophotomosaics are available through a web application, hereinafter referred to the so-called web services and is available for free to all users, including commercial entities, also for download in the form of georeferenced raster images.
According to Lichý, approximately 80% of decisions made in public administration have a spatial aspect.

The products are used to create and update topographic map data, the so-called basic database for geographic information systems. Subsequently, all state organisations, state budget organizations especially, municipalities and higher territorial units are able to build their thematic geographical information systems over these reference data.

**Figure 3.** Example of digital orthophotomosaic available online [3]

Theoretically, there is possibility to compare the outputs with actual Google Maps data to check the accuracy. The difference is that the data given from the system are guaranteed and are able to be used for legal purposes, such as administrative proceedings for the purpose of issuing decisions. The system will also be used to control the payment of subsidies in the agricultural sector, as prevention against fraud—there is possibility for easier control of the land use not only for the owners but for everyone. Other uses are things, such as dispute prevention, control of ownership relations, preparation of project documentation for civil engineering constructions, preparation of project documentation, preparation of classification and delimitation of protected areas, simplification of construction procedures in cities, suburb areas, towns and villages, support of spatial planning, easier possibilities of map creation focused on tourism etc. For example, there was applied a formula to calculate the different data base on chosen sample. On each and every base type was applied the same formula in shape:

\[ KES = \frac{\sum S_i \cdot P_i}{P_z} \]  

where \( KES \) means coefficient of ecological stability of land, \( S_i \) is the value of ecological stability of the land type (e.g. garden index is 3, wood with index 4, rural area with index 1 or water areas with index 2) [6].

The value of the \( KES \) index for focused area was 1.31 for calculation from digital cadastral map, 1.64 for digital map and 2.18 for orthophotomosaic. The different values present the extreme necessity of precise area characterization, because the qualification of area can be incorrectly classified due to incorrect classification of given data.
4. Conclusion

The question of the ecological stability index increase on its’ importance due to the pressure on improving ecological stability of land as a complex. Next question is the question of index accuracy and its’ precision. There are many map bases possible to be used in this kind of calculations, the way of calculation and indexing of categories goes hand in hand with used base.

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