

Research the dynamics of landscape spatial patterns of urban-rural ecotone

using multi-temporal remote sensing image

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Abstract:

In this study, dynamics of Landscape spatial patterns in east part of Beijing are discussed. The study area covers about 108km², extends from the center of city to Tongzhou district, about 18km length and 6km width. Patterns of case area are acquired using SPOT images of 1986(SPOT1), 1996(SPOT2) and 2002(SPOT5). Landscape index of each three year is calculated based on a classification of landscape types, then based on those indices we compare and analysis dynamics of landscape spatial pattern in that area. The possible driven factors are investigated in order to found the relationship between landscape changes and urban development.

Firstly with a reference of landuse classification, landscape is dividing into 5 types and 11 subtypes. The top 5 types are residential-industrial area, traffic land, green space, water area and uncultivated area. After being georeferenced and fused of different bands, SPOT images are interpreted to get landscape patches in subtypes. All those patches include necessary attributes, such as perimeter, area and type, and multi-temporal landscape spatial pattern maps of study area are generated. Furthermore, with a series of landscape indices, landscape dynamics are examined from structure, characters and diversities, considering total regional landscape changes as well as changes of single landscape type. The analysis indices of landscape pattern include fragmentation index, diversity index, and evenness index for total characters, and fractal dimension index, nearest neighbor index, mean patch nearest distance, proportion of patch area and patch density for single landscape patch measuring.

As a whole, we found that with the rapid urbanization process of Beijing city between 1986 and 2002, landscape pattern changed dramatically as a result of the fast urbanization. The landscape development appeared in a pattern represented by low density, widespread distribution, and grew along the main road and river channel, in the direction of straight east. This can be attributed to the parallel linearly aggregation of Metro Line 1, Jianguo Road, Jingtong Express Way and Tonghui River in the middle of study area. Besides that the diversity indices were gradually added for the 16 year period, which is brought forward by increasing of heterogeneous landscape. All those globe features are testified with accurate information from SPOT images.

Moreover dynamics of single landscape type are discussed separately. The fragmentation of residential-industrial patches increased continuously, and the nearest neighbor index of factory warehouse increased too, while this type

becomes the predominant landscape type in study area. During the period of case study, the area ratio and the fragmentation degree of farmland, garden plot and woodland reduced remarkably. Although the proportion of farmland was maintained to support the demanding of the city, the density decreased. On other side, water patch was faced with reduction of area and number, especially dynamics of its fractal dimension symbolized rivers and lakes had experienced heavily artificial modification, in context of simplified shapes. The changes of water patch could be found on public green space to a certain extent, whose patch size, distribution could impact it's own ecological functions. Tables and paragraphs are employed to present those separate dynamics clearly.

It is clear that urban-rural ecotone is the most notably influenced region of urbanization process. And some conclusions are reached through above analysis. Firstly at the different state of urbanization, the landscape dynamic take different forms. In the long run, urbanization would cause the decreasing of landscape diversity, and generate preponderate landscape types which would replace other types and reduce the total fragmentation. It is in inverse situation of initial stage of urban development. The study area was facing accelerated urbanization from 1986 to 2002, so we can observe the former situation. Secondly according to the changing patterns of the landscapes, their self-organized evolutionary series was defined, for example, "natural landscape →rural landscape →urban-rural dual landscape →urban-rural integrated landscape →urban landscape". It is the temporal characteristic of landscape dynamics. Lastly according to landscape patterns, the urban-rural ecotone can be divided into three zones, namely quasi urban zone, transition zone, and quasi rural zone. This could be seemed as the spatial characteristic of landscape. Following above analysis of landscape indices, we found similar spatial and temporal instances in the study area.

At last, suggestions are given out for adjusting landscape pattern to maintain over health and ecological diversity in urban-rural ecotone.

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