

The Role of Anthropogenic Factors in the Transformation of Lankaran Zone Biomes

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Abstract: Understanding the nature and the amount of land cover change are important issues among land use planners and environmental scientists, because these changes are one notable source of global environmental problems, with deep and disturbing impacts on ecological, hydrological, soil evolution, and on society at large. These changes usually have an obvious anthropogenic source, but several ecological and geographic variables such as industry, fossil fuels, and transportation also influence the nature and magnitude of these changes. Land transformation, habitat degradation, and fragmentation are typical processes that cause the transformation of biomes in this region. From this perspective, the study of the problem anthropogenic landscape transformation is necessary and practical.

Key words: Landscape, Lankaran Province, ecosystems, transformation, anthropogenic factors, biomes, land-use

1. Introduction

The given paper describes the role of anthropogenic factors in the transformation of biomes of the Lankaran region (southern Azerbaijan). The formation and differentiation of the modern biomes of the studied region are influenced by anthropogenic factors. The landscape differentiation features were identified taking into account the morphometric elements of the studied region relief, features of the mountainous ranges, climate change, and human activities. Finally, the article emphasizes the importance of realization for the transformation of natural biomes and evidence-based recommendations are given.

2. Material and Methods

The present study concerns the Azerbaijani region of Lankaran, which is on the coast of the Caspian Sea, near the southern border with Iran. A peculiar, semi-subtropical climate with prolonged summer draughts and heavy precipitation in other seasons of the year is typical for this region. The annual average temperature is +14°C, and precipitation ranges from 1000-1600 mm increasing from south to north. The region is home to the Hyrcan National Park, where a variety of fauna and flora are preserved. It is also home to some of Azerbaijan's most important agricultural products: 59% of domestic vegetables and almost 100% of domestic tea and citrus plants are produced in Lankaran.

The landscape of the Lankaran can be divided into two parts: Lankaran plain and Talish Mountains. 26% of the territory of the region is covered with forest. The province is also characterized by its richness of the natural features. A suitable geographical location, climate-relief conditions, as well as picturesque mountain landscape complexes and Caspian beaches create great opportunities for the local development of agriculture and tourism. In this regard the natural landscape has been considerably altered for agriculture, principally citrus fruits and early vegetables, as well as for livestock (cattle). Due to its location on the Caspian Sea just 40km from Iran, Lankaran was an important point on the caravan routes between Europe and Asia for a long time. Therefore, the utilization of the region's natural resources has a long history.

Recent decades have been witness to dramatic increases in population, intensive activities in the land-use capability, changes to forests and anthropogenic landscape transformation in the study area. Croplands, pastures, plantations, and urban areas have expanded in recent decades, accompanied by large increases in

energy, water, and fertilizer consumption, along with considerable losses of biodiversity. Since the mid-twentieth century, anthropogenic influences have intensified the transformation of natural landscapes in the province. One consequence of world population growth is an alarming increase in land-use in the global environment, including the conversion of rich ecological areas into cropland, and fertile lands into urban areas (Al-sharif and Pradhan, 2014).

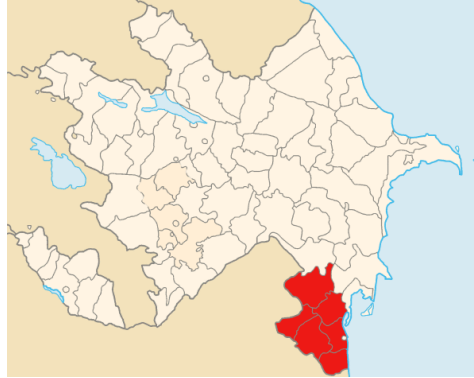


Figure 1. Geographic position of Lankaran Province.

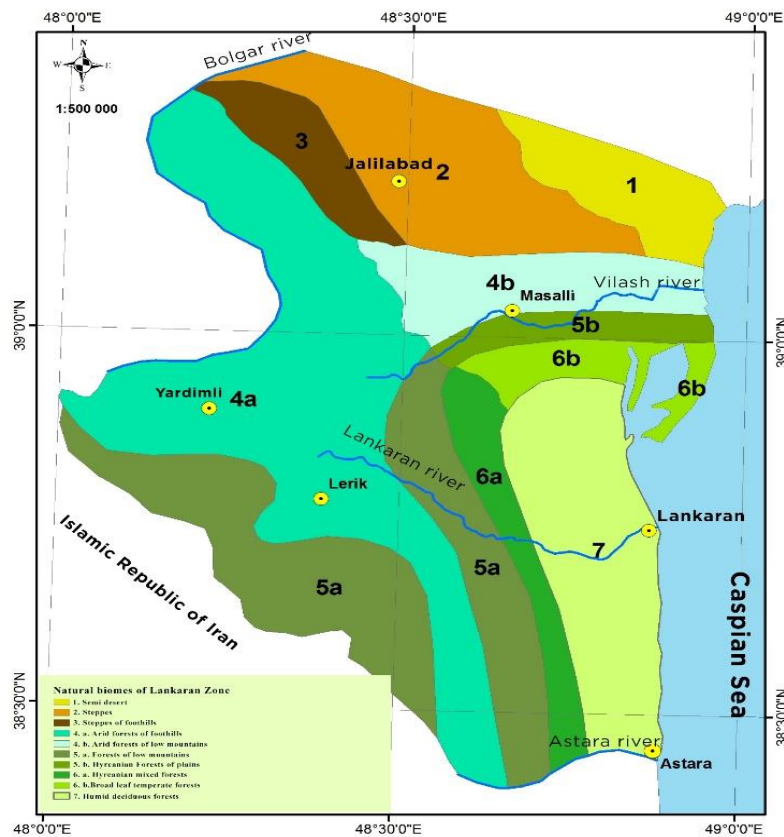


Figure 2. Natural biomes of Lankaran Province.

Azerbaijan experienced two periods of deforestation that reduced the forest area from 2.6 million ha, or 30 per cent of the land area, to 1.14 million ha by 2015. The first period was from 1861 to 1921, when wood was needed for construction for oil exploitation. The second, was after independence from the Soviet Union (FAO and Forestry Department of the Ministry of Ecology and Natural Resources of Azerbaijan, 2017). In the 1924-2018 period, an absolute number of people in the study area increased 3-4 times. Overpopulation and demand natural resources increased the tension between landscapes with limited natural resources and

ecological potential, and leads to the disruption of the ecological balance. Such changes in land use have enabled humans to face the challenge of managing trade-offs between immediate human needs and maintaining the capacity of the biosphere to provide goods and services in the long term. This process further intensified the anthropogenic transformation. At the same time, anthropogenic processes such as terracing, irrigation, melioration, construction of hydrotechnical installations and roads have led to the formation of new urban landscapes. At present, in the province, there is almost no land not influenced by human activity. Population, agriculture, transport, and tourism are the most important factors driving the anthropogenic transformation of landscapes in the studied area. The study of the anthropogenic factors of the transformation of the natural biomes of the region is necessary for determining how to mitigate damage to local biomes.

3. Dynamics of biome transformation

Specific species of vegetation in the province, including numerous endemic and relict plants, are widely spread in the studied area. The foothills of the region, low and middle mountainous areas were once covered with forests (Figure 2). During the Soviet period, the use of the Talysh Mountain forests of Azerbaijan was centrally organised. After 1980s, when the Soviet socio-economic system collapsed, the local people in the Talysh Mountains turned increasingly toward subsistence farming, using wood for heating, cooking and building, both for personal use and for sale. The unregulated collection of this wood, together with an increasing use of the forest for pastureland, led to the degradation and loss of large numbers of trees. As result local ecosystems have been completely changed: anthropogenic activity has diminished the area of the forests, drastically changing their boundaries. The decline is closely linked to an increase in populations and settlements, the expansion of agriculture in the area, unplanned forest felling, and grazing. One of the anthropogenic factors affecting the landscape of the natural region is also due to the increase in the construction of facilities for tourism and recreation.



Figure 3. Cutting down trees in Masalli, Lankaran Province.

Other plant species are widely spread in the Lankaran Province as well. These include mosses, grasses, small-leaved shrubs, and dwarf trees. These areas were also subjected to transformation, and the wetlands were dried up at the same time. In addition to the demolition of forests on smooth mountain slopes and the widening of river valleys to make way for fertile sown areas, other forests are transformed into bush areas. Summer

grazing of high-mountain pastures impacts the forests at the upper timberline. During the 1990s and early 2000s, summer pasture at higher altitudes was grazed less intensively than during the Soviet period due to a breakdown of infrastructure. Since 2010, work to restore infrastructure, such as repairing or renewing bridges, and the availability of better vehicles for equipment transport, have led to a sharp rise in grazing pressure. Climate change may be expected to result in lower timberlines moving up mountain slopes. At the higher altitudes, regular grazing prevents forest species recruitment and means that the upper timberline cannot move higher. Climate change will most likely result in a reduction in forest area e.g. in Azerbaijan (UNDP, 2011).

The severity of the anthropogenic transformation fluctuates depending on the geomorphological conditions, climatic conditions and local economic activity. For the effective preservation of biodiversity at any level, including rare species and a component of unique communities, urgent protection of local habitats must be imperative (Suleymanov, 2005). Conservation of this area for future generations requires targeted action to prevent detrimental human activity. The most important protected areas in this part of Azerbaijan are: the Gizil-Agach National Park (88,400 ha wetlands and marine area, designated to protect waterfowl), the Zuvand conservation area (15,000 ha, mountain meadows and forests, designated to protect game birds, bear, leopard, and rare reptiles), and the the Hyrcan National Park (3,000 ha, humid thermophilous Hyrcanian forests, designated to protect the unique plant communities rich in relic and endemic species). At present, the economic activity of people intensifying in the area has led to substantial change and reconstruction of landscape components, degradation of the sensitive ecosystems of the area, and the emergence of re-derivative complexes on the spot (Figure 4). Therefore the distance from settlements affects the neighboring forest area significantly. The biodiversity and density of the species composition of forests are higher the further one moves away from settlements. In other words, as a distance from the urban area increased, forest degradation decreased.

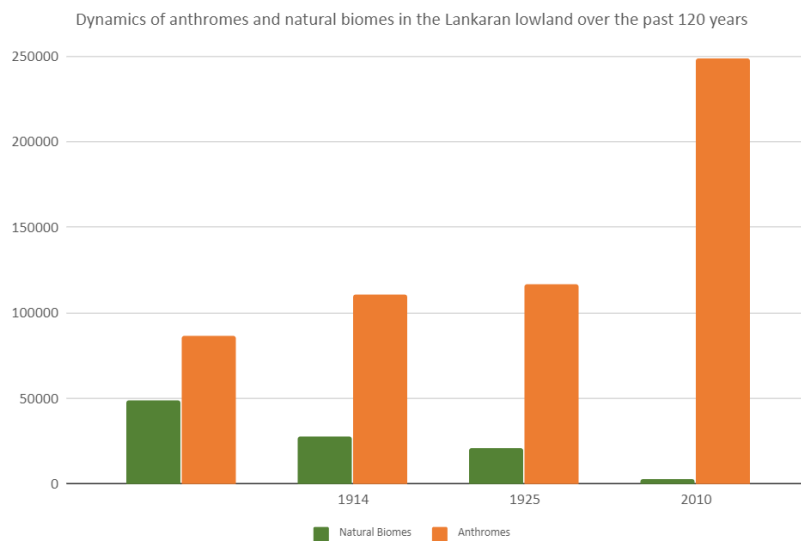


Figure 4. Dynamics of changes in anthromes and natural biomes in Lankaran Province between 1890–2010.

4. Conclusions

The study indicated that forest disturbance was related to distance to urban areas and human activities. Natural ecosystems are almost completely lost because of significant anthropogenous transformation. The ecological imbalance of landscapes is directly related to anthropogenic effects, which is manifested in the rapid destruction of ecosystems, the reduction of biodiversity, the decline of biological productivity. The richness and intensity of the species composition of forests grow as they move away from settlements. The main factors limiting the restoration of natural biomes are the pastoral activities of cattle, the cutting down of trees, and the ongoing draining of marsh and meadow land. In order to solve the problems arising from the anthropogenic impacts of natural landscapes in the Lankaran province further regulation, management, and planning of the existing anthropogenic influences is necessary. For effective preservation of the whole biodiversity of the plant

and animal species, including rare species and a component of unique communities it is necessary to ensure urgent protection of habitats. The challenge now is to provide good economic options for the local population, while preserving long-term the Hyrcanian Forest ecosystem. Farming should be planned purposefully, with human impact limited to certain frameworks. At the same time, environmental diversity and the natural features of the study area should be taken seriously in the optimizing of any conservation plans.

Without doubt, one of the greatest challenges facing natural ecosystems is to help in the creation of the cognitive basis for the transformation of the biomes and its noneconomic richness into workable parameters in educational and decision-making processes and at the same time to create the affective basis for not only understanding but also loving nature.

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