

ASSESSMENT & CARTOGRAPHY ON URBAN ECOLOGIC ENVIRONMENT UNDER THE CONCEPT OF THE SYSTEM

Liu Yanfang, Liu Yaolin

Department of Land Resources & Cartography
Wuhan Technical University of Surveying & Mapping
Wuhan, 430070
P. R. China

Abstract

Urban ecologic environment is regarded as a complex system. It will be presented in the paper that we should make comprehensive assessment and map compilation on it as viewed from not only environment pollution, but also extensive interaction and coordinated development between human activities and urban ecologic environment, which is most important. And under the concept of the system, urban ecologic environment can be assessed and mapped at 3 different levels.

1 Introduction

Before we discuss how to make assessment and map compilation on urban ecologic Environment, we should be clearly aware that what the importance of the work is. If you want to do this work, you have to know "how to do". The problem "how to do" can be decomposed into several sub-problems which concern analysing aspects, evaluating standards, evaluating methods and the result representation etc. The above problems are the key points for the work.

1.1 Importance

In the city ecologic system, its two components, urban environment and citizens, interact each other and make progress together. Is urban environment suitable to the need of human beings or advantageous to the development of human beings and all kinds of its activities? This is a very important problem concerning whether human society can healthily and steady develop or not. We should pay more attention to it. Therefore, we should make systematic and comprehensive survey on urban environment, and find the advantages to the urban environment construction and the problems, disadvantages in the urban environment, which hinder the development of human beings, so that we may have a definite object in view to make urban construction and bring about a wonderful environment to the residents of city. We are sure that cartographers can play a very important role in the assessment on urban ecologic environment.

1.2 *Analysing Aspects*

From which angles and aspects to analyse and assess the urban environment? This is the first problem when we start the work. In the common way, we look at the structure of the environment at first. Urban environment consists of physical (e. g. landform, soil) elements and artificial (e. g. building, road) elements, and thereby is influenced by physical factors, such as landform, soil, water etc. , and social-economic factors, such as industry, population, traffic etc. So, we should look into the problem from all physical and social-economic aspects. But from different angles, these will be involved more or less, or paid different emphases. "From different angles" means that we should centre on a certain activity to discuss all influencing factors on it. For example, centring on coordinated development, which almostly involve all activities, we can make general assessment on the environment (at the city level or at the level of Adm. divisions in the city), and centring on a certain activity such as residence and industrial production, we can make particular assessments on residential environment and industrial environment (at the level of the function quarters in the city). In the process of analyses, we should make sure which factor is major one, which is favourable and which is disadvantageous, so that we may have the correct results. Thus it can be seen, "making a concrete analysis of concrete conditions" and "gripping the major factors based on a overall and comprehensive analysis" are the two principles for this.

1.3 *Standards*

The next problem is "According what standard to analyse?" As we all know, the optimum state of coordinated development between human beings and environment can be described by "Happiness and Health". And "Happiness and Health" can be further more described by 3 good benefits i. e. , economic benefits, social benefits and ecologic benefits. Therefore, the factors which can bring about these 3 good benefits are regarded as favourable ones, and vice versa. According to the 3 benefits, we can make assessment on all factors and aspects of the environment (This process of assessment is usually known as index or data quantifying).

1.4 *Methods and Basic Processes*

We can apply a lot of means such as remote sensing, mathematics, computer and map analysis to the whole process of the assessment.

Whether the assessment is done qualitatively or quantitatively, the following steps are included as the basic processes; a) selecting evaluating units, such as administrative units, land use units and grids; b) determining the evaluating factors; c) single factor assessment (data quantifying); d) comprehensive assessment of multi-factors, based on the AHP method and mathematic models.

1.5 Result Representation

There are many representing forms for assessment results. Among them, the most important and visual one is map representation. Map representation and map use are throughout the whole process. The assessment work starts with the maps (selecting factors and quantifying data on the maps such as land-use map, topographic map, engineering geologic map and population map etc.), and ends with the result maps from middle results to final results.

2 Assessment at the city Level

At this level, a city is regarded as a part of the higher regional system. In this case, we always make general and comprehensive assessment on the quality of the urban environment from all aspects in the ecologic viewpoint, being able to be compared with those of other cities in the region (see Fig. 1).

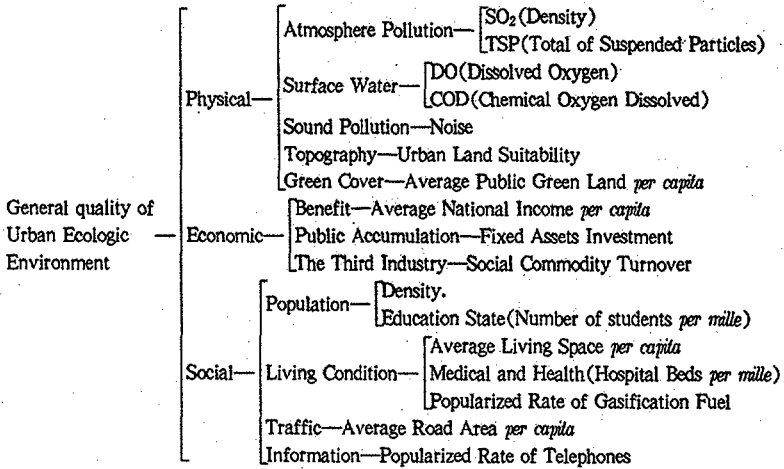


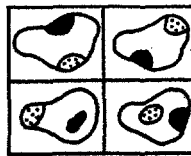
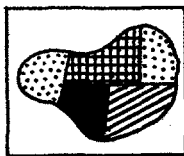
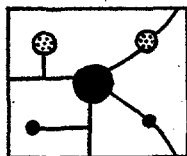
Fig. 1 General Assessment System of Urban Ecologic Environment

According to the local situation of our country, we can determine different standards at different level for each factor. For example, at the higher level, the average living space per person can be 10 m^2 ; at the middle level, it can be 8 m^2 ; and at the lower level, it can be 6 m^2 . According to these standards, we can make data quantifying for each factor and comprehensive assessment on general quality of urban environment. The final results can be represented by using symbols at fixed positions in the regional map (see Fig. 2(a)).

City of the region

Admi. divisions in the city

Function quarters in the city



(a)

(b)

(c)

Fig. 2 Models of Assessment & Cartography on Urban Ecologic Environment at 3 different levels.

3 Assessment at the Level of the Function Quarters in the City

After general assessment on urban environment, we need to look into the inside of the city. We should discuss the environment qualities in different function quarters aiming at different activities, such as residence, industrial production, traffic, commerce, tourism and investment etc. For different activities, we need to select different factors and use different assessment system. Two examples as shown in Fig. 3 and Fig. 4.

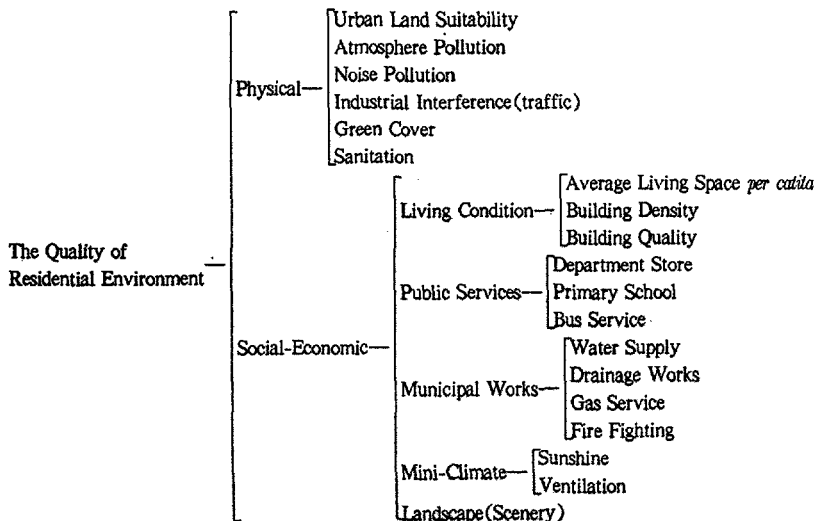


Fig. 3 Assessment System of Urban Residential Environment

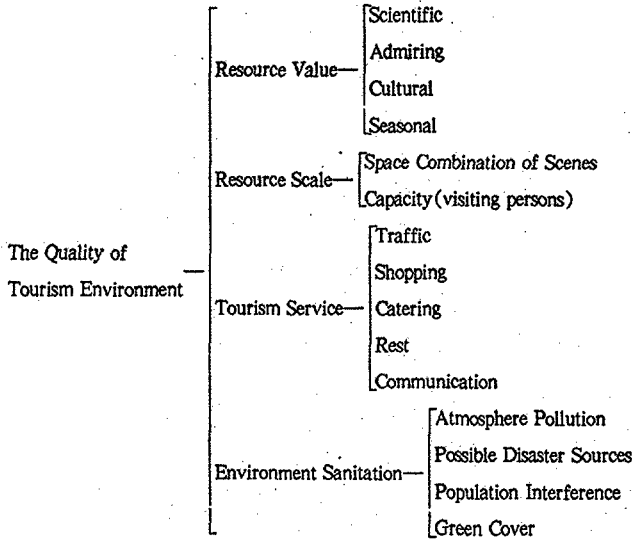


Fig. 4 Assessment System of Urban Tourism Environment

At this level, final results can be represented by using colours or patterns at the function quarters in a series of city maps, as shown in Fig. 2(b).

4 Assessment at level of the Administration Divisions in the City

In order to strengthen administrative management and implementation of various constructions in the city, we need to make further assessment on the ecologic environment in the administration divisions generally or functionally. Statistical indexes are usually used, e.g. average value *per capita*, average value *per m²*, density and average distance etc., see Fig. 5. At this level, final results can be represented by using colours or patterns in the administrative divisions on maps, as shown in Fig. 2(c).

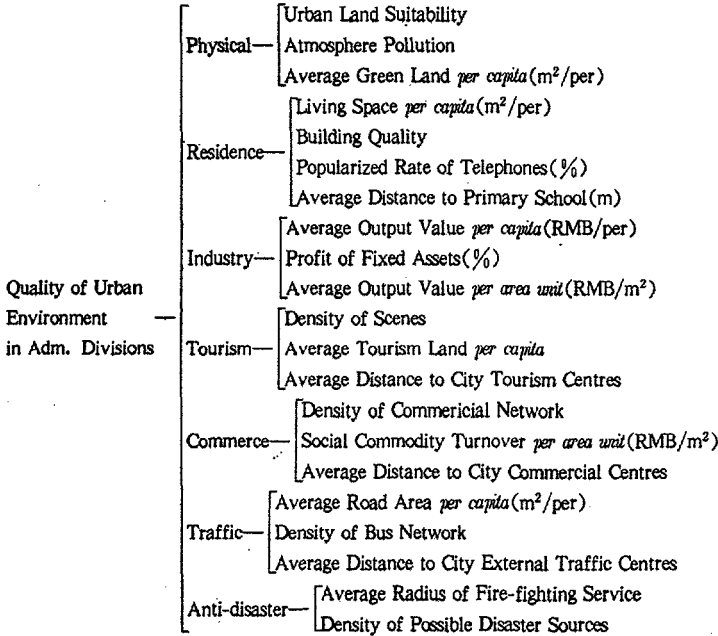


Fig. 5 Assessment System of Urban Environment in Adm. Divisions

5 Conclusions

- Assessment on urban ecologic environment is the important basis for urban planning and construction, which must be based on awareness of the advantages and problems in the city.
- Assessment on urban ecologic environment should be viewed from coordinated development between human beings and environment besides environment pollution.
- All factors mentioned above at 3 levels and their evaluating results can be represented on maps, which describe all factors qualitatively, quantitatively and in fixed position. Through the integrate design and logic arrangement, we can compile the atlas of urban ecologic environment
- Map use and map representation run through the whole process of the assessment on urban ecologic environment. Cartographers play a very important role in the assessment work.