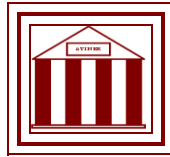


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**CIV2014-0952**

**Mobility Study in the Metropolitan  
Area of Cluj-Napoca**

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## **Mobility Study in the Metropolitan Area of Cluj-Napoca**

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### **Abstract**

The urban mobility studies require a laborious process but they provide the necessary data for a sound planning process. The Romanian urban centres which do not have recent mobility studies may be excused to some extent on the account of the subject's novelty and complexity. In the present context, when there is an increased need to improve the urban mobility, the authorities face a multitude of deficiencies in resolving this problem. In this respect the paper presents the assessment of the mobility in the metropolitan area of Cluj-Napoca and highlights the issues in the data collection task. In order to improve the urban mobility assessment process for further studies a new methodology is proposed. Thus, the lack of knowledge regarding the urban mobility faced at the moment in the urban centres of Romania could be overcome.

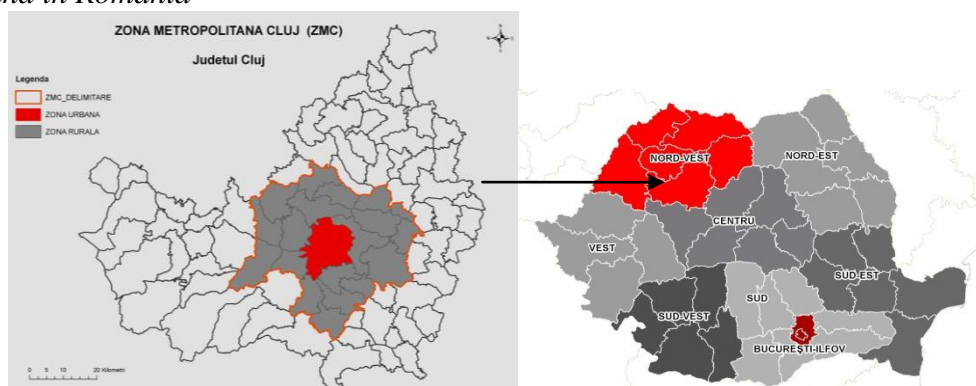
**Keywords:** urban mobility, data collection, integrated planning

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## Introduction

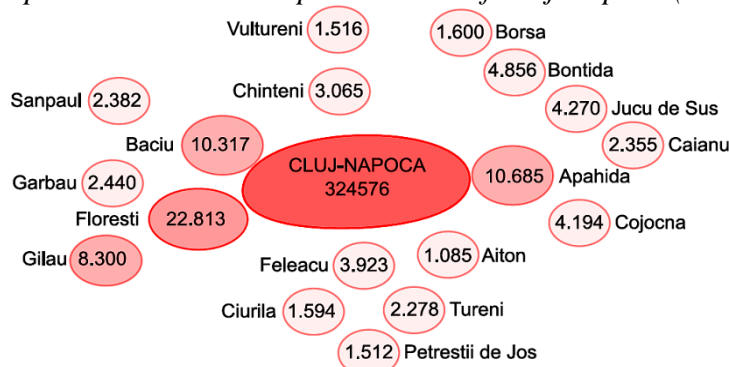
The metropolitan area of Cluj-Napoca is located in the North-West Region of Romania, in the Cluj County (see Figure 1). This is considered the heart of the historical region of Transylvania.

**Figure 1.** Location of the Metropolitan Area of Cluj-Napoca in Cluj County and in Romania



The metropolitan area of Cluj-Napoca accounts a total of 18 communes around the urban centre with more than 411,300 inhabitants [1] (see Figure 2). The metropolitan area covers 1.510 square km representing 23% of the Cluj county area [2].

**Figure 2.** Population in the Metropolitan Area of Cluj-Napoca (2011)

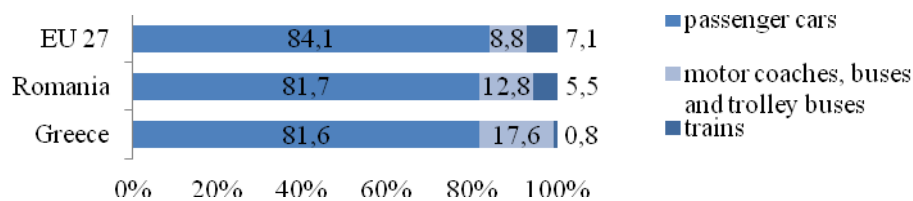


With a strong urban centre, the metropolitan area of Cluj-Napoca is constantly developing and despite the fact that none of the Pan-European corridors are crossing the area, in 2010 it registered the highest average daily traffic in the North-Western half of the country [3]. The road traffic prognosis for 2010 was exceeded with thousands of motorized vehicles per day. Although the volume of passenger transport relative to GDP in Romania shows a decreasing trend from 2009, the prognosis for 2015 predicts an increasing annual average daily traffic of more than 16,000 vehicles per day on the main roads in Cluj-Napoca metropolitan area [4].

In Romania 82% of the passengers are carried by road and only 18% by railway while the passenger-kilometres travelled by road represent 79% and by railway 21% [5].

The number of passenger cars increased almost constantly since 2000 from 139 to 203 passenger cars per 1000 people in 2011 [6]. Since 2006, the share of passenger car usage in the modal split has increased with more than 5% at the expense of public transport - train, motor coaches, buses and trolley buses, against the 2011 data [7].

**Figure 3. Modal Split of Passenger Transport in Romania (2011)**



## Objective

The main objective of this paper is to create an overall image of the urban mobility in the metropolitan area of Cluj-Napoca, Romania, in order to establish which data are needed in the planning process. Furthermore an improvement of the present stage of practice in the field of urban planning is aimed by developing a new methodology for the urban mobility assessment which would ensure the uniformity of the databases at different administrative levels.

## Methodology and Data

The new entity hasn't yet presented the studies on this subject so the assessment of the urban mobility in the metropolitan area of Cluj-Napoca conducted in this paper was based on a consistent data collection process. All available sources were interrogated, beginning with the administrative databases of:

- Local authorities – City Hall, Local Council, County Council,
- North-West Regional Development Agency,
- National Institute of Statistics,
- European Commission databases.

Then the companies in the transportation fields as well as the academic research were investigated.

## Results

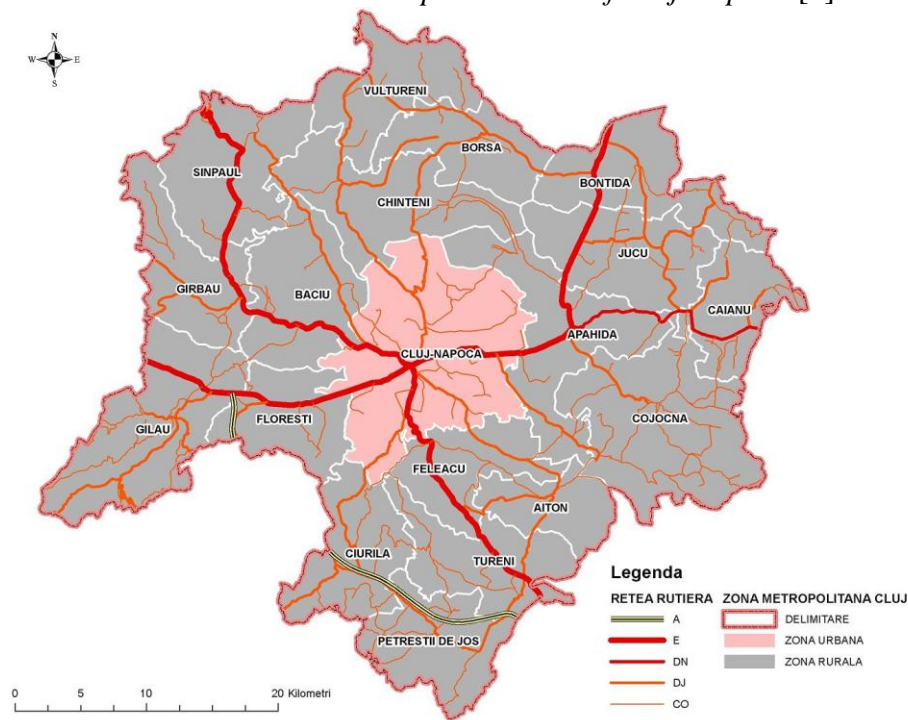
The urban mobility data provided by the local authorities are concentrated in a map of the metropolitan area of Cluj-Napoca (Figure 4) in which the transportation system infrastructure is presented - air lines, roads and railways [8]. Figure 4 reveals certain improvements needed for the transport infrastructure in order to support the increasing mobility of the ongoing developing area.

First, the road infrastructure is insufficiently developed although in the metropolitan area of Cluj-Napoca the roads' density of 0.36 km per square km is comparable to the national and county level [2].

**Figure 4. Urban Mobility and Accessibility** [8]

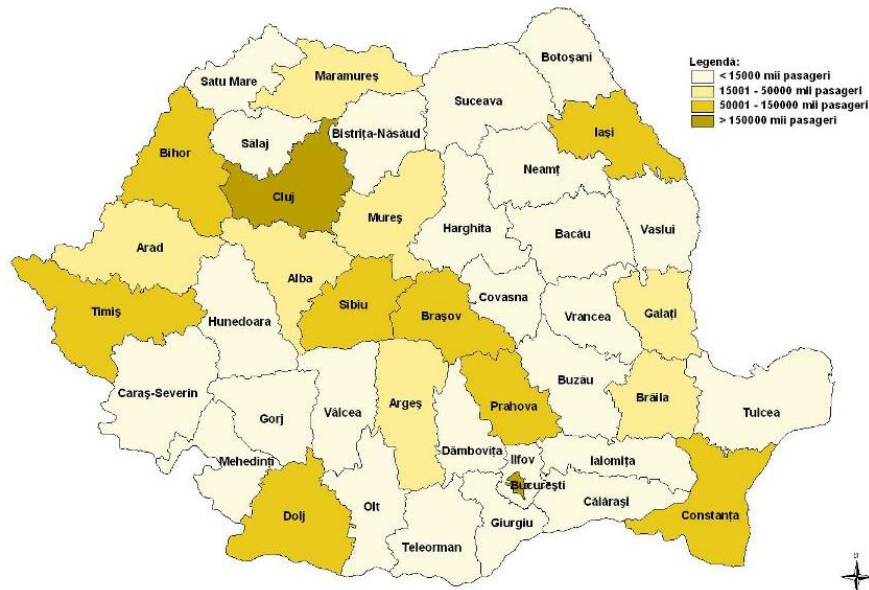


**Figure 5.** Road Network in the Metropolitan Area of Cluj-Napoca [9]



The A3 Motorway (A in Figure 5, the red line - existent section of the Transylvanian Motorway in Figure 4) is just tangent to the boundary of the metropolitan area and considered more like a ring road. Important investments need to be done in order to continue the motorway construction up north (red line spotted with yellow dots, in Figure 4) and the ring road around the urban centre. The main roads, European (E) and National (DN) routes trespass the centre of the municipalities they transit. The county roads (DJ) and the municipal ones (CO) need to be upgraded. Furthermore, the airport is located within the city, bordering a residential area which makes the expansion very difficult. The railway location in the northern side of the urban area doesn't serve the travel demand on the busiest route which is the Cluj-Napoca – Floreşti – Gilău corridor, in the western side of the metropolitan area.

**Figure 6.** *Local Public Passenger Transport in Romanian Counties (2010)* [10]



The public transport in the metropolitan area is provided by different companies that are licensed by the Romanian Road Authority. In 2008, there were 101 routes in the county and 27 routes connecting Cluj to other counties [2]. Recently, the Public Transport Company which is located and operates in Cluj-Napoca municipality has extended its services to the communes in the first ring of the metropolitan area (blue lines, see Figure 4). Further plans of the company are to continue the expansion to all municipalities in the Cluj metropolitan area. Within the urban centre, the Public Transport Company runs busses, trolleybuses and trams. The new expansion of the services is based on busses but it is expected that electrical busses and trolleybuses would replace them to some extent. Along with the implementation of the electronic ticketing system this fall, and other improvements dedicated to users and environment the company's goal is to promote a friendly environmental development in order to help the achievement of a more sustainable urban transportation in the metropolitan area of Cluj-Napoca. [Eng. Laura Lupșa, the Public Transport Company, Technical Department – Investments, personal communication]

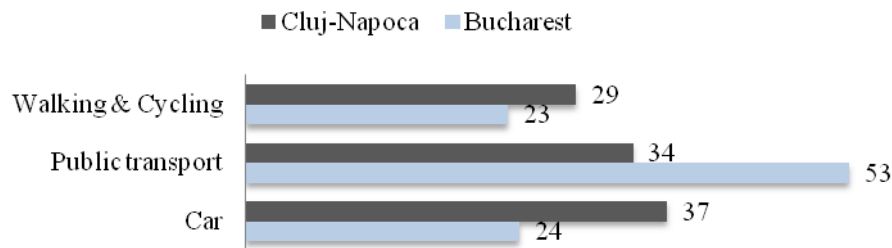
In 2010, Cluj was ranked second among the Romanian counties with a total of 165,718 thousand passengers (see Figure 6) [10].

The share of passenger public transport, 34% by road and 12% by train is surpassed by the private car usage which totalizes a share of 51% in the modal split, as a recent survey conducted by the local authorities has shown. The respondents considered that major improvements are needed in the public services sector and that they should focus mainly on the expansion and modernization of the public passenger transport [11].

The modal share in the Romanian urban centres is in general unavailable but a recent study presents the situation of Cluj-Napoca municipality compared to the capital city [12].



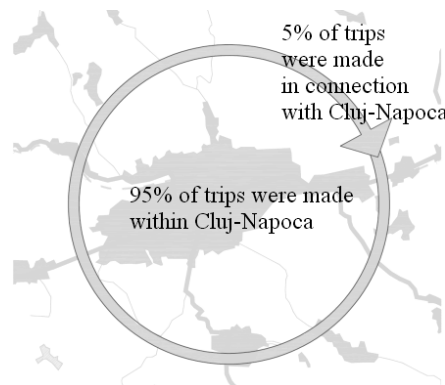
**Figure 7. Modal Split in Bucharest and Cluj-Napoca**



The motorization rate is not available for the Romanian municipalities but in Cluj-Napoca it was recently determined to be around 315 vehicles per 1,000 inhabitants [13].

According to the traffic study conducted by the local authorities in 2005 in Cluj-Napoca [14], an average mobility index of 2.32 trips per person was determined. The destination of the first trip was the city centre for 31.3% of respondents and the morning peak between 7:00 - 8:00 a.m. A more recent study was conducted in 2013 by means of internet survey. The mobility index of 3.56 trips per day classified the travel behaviour among the average ones, but with a higher value compared to the 2005 data. 95% of trips were made within the boundaries of the urban centre. The trips were made in order to complete basic activities such as work 34%, school 20%, shopping or services 24% and others 22%. The modal share was as follows: 37% of trips were made by car, 34% by public transport and 29% by using a sustainable mode such as walking or cycling.

**Figure 8. Share of Trips Taken in and Outside the Urban Centre of Cluj-Napoca**



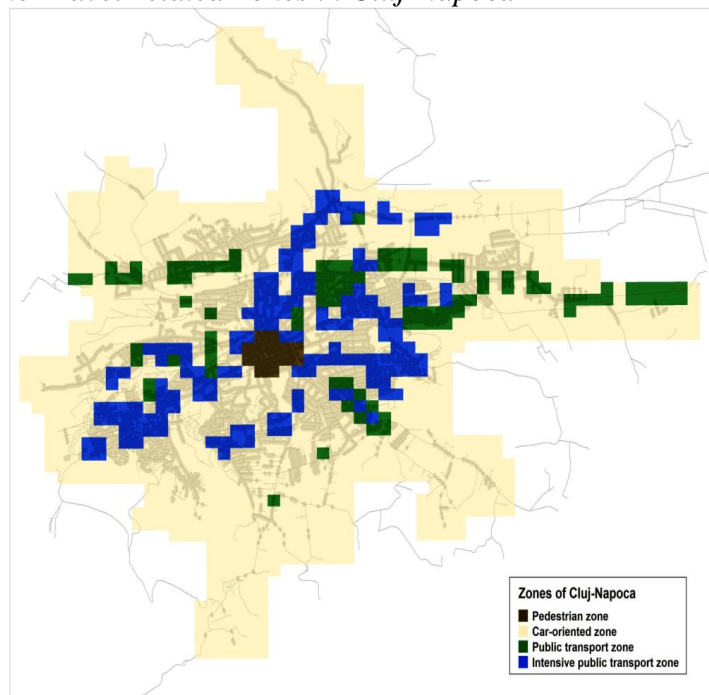
Compared to the county statistics, the public transport availability and the shorter distances to be travelled in the urban centre have shaped the modal split within its administrative borders towards less car usage. In general, men showed the tendency to avoid ecological modes of transport and used the car even for the short trips. With 30% of women who declared that they chose the non-motorized modes and 37% who used the public transport, it resulted that only 33% of women used the private car, mainly as passengers. The peak

periods were as it follows: in the morning between 8:00 - 10:00 a.m. and in the evening, longer and more dispersed, between 15:00 - 19:00 p.m. A major share of 86% of the respondents declared that they have spent in average up to 30 minutes per trip. While travelling with the public transport, people spend on average 26 minutes when they use one line, 36 minutes when they use two lines and 49 minutes when they use three lines of public transport. Since Cluj metropolitan area extends on a 30 km radius around the urban centre, the main focus of the mobility investigation is set on the motorized transportation. Sustainable means of transport are not very popular for the inhabitants or in the planning process.

After the socialist era, the planning process has been car oriented as the authorities have struggled to accommodate the constantly increasing number of motorized vehicles in the area. In this respect, their main goal was to provide funding for the road infrastructure projects. Moreover, the rapid and complex residential projects conducted in the outskirts of Cluj-Napoca and in the neighbouring municipalities were usually built on good agricultural land where there was no accessibility to public transport. The rapid development and land-use shift, accompanied by an insufficient planning process has led to urban sprawl and nevertheless, in very close connection, to a dysfunctional urban mobility.

The planning process for the metropolitan area of Cluj-Napoca is mainly focused on the urban centre for which more data are available. Beside the land-use map of Cluj-Napoca [15], the Finnish travel-related zones were also developed for the singular case of the urban centre (see Figure 9) [12].

**Figure 9.** *The Travel-related Zones in Cluj-Napoca*



In the zoning process the urban area is defined on the basis of on the main mode of mobility. Thus, it is essential to study smaller areas in order to create an accurate image of the mobility. This new approach gave the Finnish researchers the ability not only to highlight the interconnectivity of transport system, land-use and urban form but also to elaborate scenarios for a more sustainable urban development targeting lower energy consumption of transport and potential reductions in emissions [16].

## Discussion

During this study it was found that the urban mobility in the metropolitan area of Cluj-Napoca is based on the road transportation and the passenger transport is mainly served by the private car. Furthermore, the car usage is increasing at the expense of public transport. This is favouring congestion and urban sprawl leading to dysfunctional mobility. The vicious circle may be broken by an improved planning process that considers the urban mobility as real means to achieve the urban sustainability. In conclusion the urban mobility assessment is the first step in planning the development of the metropolitan area since it provides the input data.

The common practice in Romania, considers as input data for the mobility analysis patterns such as transport infrastructure – network, facilities and services availability, which are regularly used in the supply models. The information regarding transportation demand, the mobility patterns such as mobility index, modal share, travel behaviour, travel matrices, etc., are scarce. This aspect has to be improved for further substantial analysis in the planning process.

On the other hand, there is also a gap regarding the legal framework or guidelines in the urban planning field. Under these circumstances, the optimum solution is to identify European best practices which are suitable and may be adapted in order to assess the urban mobility in the Romanian metropolitan areas. In this regard a future direction of study is to develop the Finnish zoning process for all localities in the metropolitan area of Cluj-Napoca, according to the zoning criteria identified and presented in table 1.

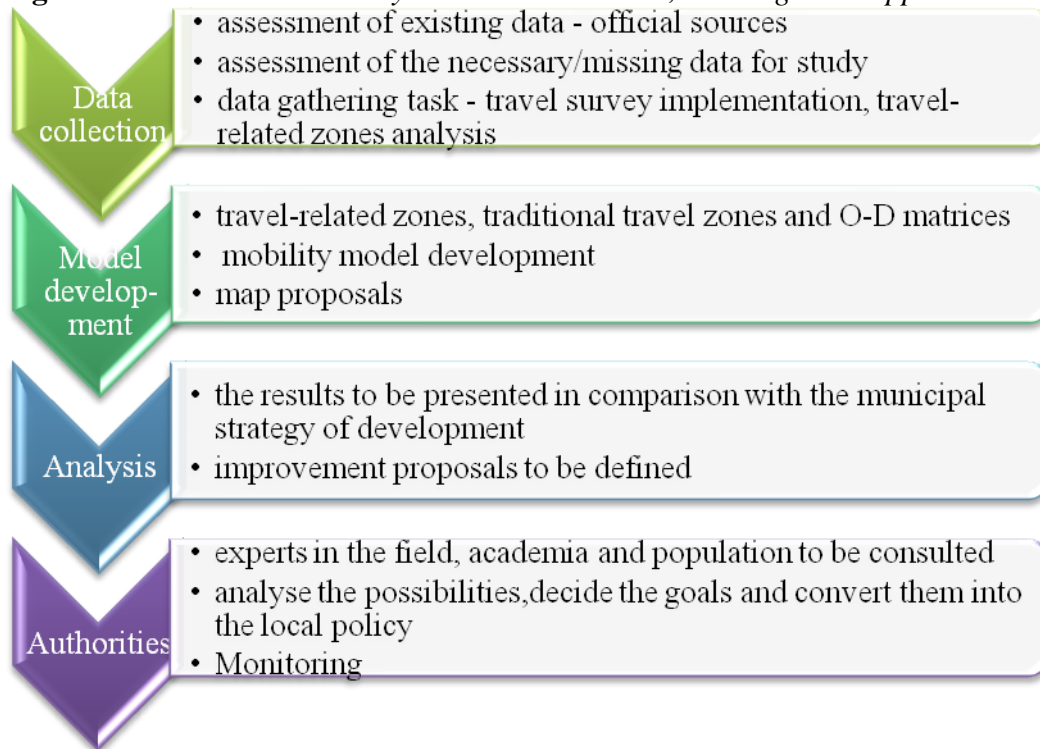
**Table 1.** *Criteria for Travel-related Zones Applicable in the Metropolitan Area of Cluj-Napoca* [17]

Zone	Criteria	
	Urban areas	Suburban areas
intensive/good public transport zone	grid cells wherein the headway for buses is at minimum 5 min and for rail-based public transport at least 10 min at peak hours and for which the walking distance to a bus stop is	1) grid cells for which the headway for local public transport is at least 30 min at peak hours and the walking distance to a bus stop is at minimum 250 m (400 m to a train station). 2) grid cells for which the headway for regional public transport is at minimum 30 min at peak hours and walking distance to a

	at minimum 250 m (400 m to a train station)	bus stop is at least 500 m (1.000 m to a train station)
public transport zone	grid cells for which the headway for public transport is at minimum 15 min at peak hours and walking distance to a bus stop is at least 250 m (400 m to a train station)	grid cells for which the headway for public transport is 60 min at minimum at peak hours and walking distance to a bus stop at least 500 m (1,000 m to a train station)
car-oriented zone	densely built areas that do not conform to public transport zone criteria	

The urban mobility assessment is based on a burdensome data collection process that need to be conducted in order to prepare and provide sufficient and sound input data in the urban planning process. In the metropolitan area of Cluj-Napoca the missing data has to be supplied by further studies such as the zoning process. Then the aggregation of collected data is recommended to be conducted in order to create an integrated model of the urban mobility in the metropolitan area. The model analysis and different scenarios of improvement should be considered in comparison with the local strategy of development. These tasks are aggregated in a methodology which is proposed in the respect of urban mobility assessment.

**Figure 10.** *The Urban Mobility Assessment Process, an Integrated Approach*



This methodology was developed in order to supply the state of practice in the field. By analyzing data in this way offers the opportunity to identify more possibilities to improve the urban mobility. In case that singular localities are studied then it is recommended that the general patterns of infrastructure and land-use, vehicles and economical aspects, or population and travel behaviour to be organized in similar databases in order to provide a uniform basic layer in the mobility assessment at all levels – metropolitan, county, region or national. But for more effective results the assessment should not be promoted for singular municipalities. It is of great importance to study, analyze and plan for larger communities. By overcoming the administrative boundaries, the local authorities could merge their experience in order to achieve the very important goal of sustainable development and environmental protection.

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