

## The city and its dynamics

The accelerated growth of the cities with over a million of inhabitants has ceased in the last fifty years. However, in the last decade those ones with less than hundred thousand (inhabitants), and the ones that range between 500 thousand and a million inhabitants, have grown and face new challenges related to the population growth, the unplanned urban expansion, the lack in coverage of public services, the urban pollution and in general to the dynamics of the economic and demographic relationships that settle there (Stren R, 1995; Borja J, 2003; UN, 2010). In the regional context, Colombia is one of the most populated countries and with higher urban concentration in the continent, with a population of 47.661.368, according to 2005 census projections, 30% of which congregate among five cities, with a 2,3% of expectative of population growth (DANE, 2010). In 2009, the country was classified as the third most populated country of Latin America, fifth in urban population growth rate and third in South America on having the higher amount of cities of over a million inhabitants (Ordoñez M, 2009).

One of these growing cities is Villavicencio, there gather a new setting of the economic geography of the country, mobility challenges, mining and energy development, construction of roadway infrastructure and a high support to the agricultural activity in the high plains (altillanura), as it is defined in the CONPES document 3797 from 2013 (DNP, 2013), without leaving aside the urban population growth of the city, which is estimated in 473718 inhabitants in 2014, with an average growth rate of 2,3% (DANE, 2010).

The social and economic dynamics of the cities, the growth model and its design based on the preference of the private and public vehicle as mode of transportation, as well as the disarticulation of the urban and the rural, have contributed to the increase of a self problem such as the congestion of transport, both load and people transportation (Montezuma R, 2003), all of which has led to pressures on the environment and a steady increase of the demand for services and of waste generation. This overload on the mobility has turned the roadways into major recipients of pollutant compounds that are mostly related to the transportation activity (exhaust gases, lubricating oils, fuel, diesel fuel, brake pads particles, tire particles), which in the rainy seasons, and in general, cause accumulation problems and wear in the dynamics of the natural systems (Murakami *et al.*, 2005; Brown y Peake, 2006). In the highly urbanized river basins, roadways may represent 22% of their area and contribute with approximately 26% of the total runoff (Davis y Birch, 2010). A local example is observed in the basin of the Ocoa River in the city of Villavicencio. Among, the most representative pollutants in urban basins there have been found some heavy metal such as Cu, Pb and Zn (Rissler *et al.*, 2012), which also may be present at high levels on the soils surrounding main roads (Hewitt y Rashed, 1991).

This environmental problematic belonging to the cities and that begins to be a reality in Villavicencio should be addressed by the local authorities; also should lead to develop in a joint manner with university research centers plans and projects that assess the presence of heavy metals in the urban area and that also allow to generate, among others, tools that ease actions in order to prevent, mitigate and restore the sectors that might be affected by this dynamics inherent to the human activity concentrated in the city.