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ENVIRONMENTAL SCIENCE IN THE URBAN AND RURAL ENVIRONMENT

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Environmental science is an interdisciplinary study on how humans interact with the living and non-living parts of their environment. Its interdisciplinary integrates knowledge and information of ideas of the natural sciences, such as biology, chemistry and geology; Social sciences, geography, economics and political science; and the humanities, philosophy and ethics. Works with three main goals: learn how nature works, understand how we interact with the environment and find ways to deal with environmental problems and live in a more sustainable way.

The society of the 21 century, in developed countries and emerging, is distributed in the urban environment, to the majority, and in the rural environment, this increasingly shrouded in agribusiness with management, technology and modern logistics. This condition imposes on the environmental science its growing involvement with these companies.

In the urban environment occurs the heat island phenomenon. Analyze examples of Manaus and Belém ingrown in the vast, warm wet tropical forest, they begin to introduce climate change typical of large cities. Between 1961 and 2010, the average temperature of the Amazonian capital increased by 0.7 degrees Celsius (°C) and reached 26.5° C, according to a survey from the Instituto Nacional de Pesquisas Espaciais (Inpe). In the same period, the average temperature of the paraense capital climbed 1.51° C and reached 26.3° c. In both cases, the increase is mainly due to the growth of the urbanized area of cities, a process that accelerated in the last two decades, although more global effects, linked to large-scale climate change, also may

have had some impact on this index. In 1973, the urban areas of Manaus and Belém metropolitan region were respectively 91 and 76 km². In 2008, those numbers had risen to 242 and 270 km².

With more buildings, concrete and asphalt taking the place of native vegetation, the so-called urban heat island effect phenomenon known for ages for paulistanos and cariocas, also appeared with strength in the two main cities in the North. In the same time of day, temperature in the areas of these cities more densely populated and occupied by buildings and buildings is consistently greater than in rural areas, where the forest remains preserved. The data about heat islands are sharper in the case of Manaus, today the seventh most populous Brazilian city, with 1,982,177 inhabitants, ahead of Belem with (1,425,922), Recife (1,599,513), Porto Alegre (1,467,816) and Curitiba (1,848,946). The temperature difference between the more urbanized parts of the metropolis amazonense and a distant forest area about 30 kilometers, the Cuieiras biological reserve reaches peaks of more than 3° C in five of the 12 months of the year.

These results are based on information collected every hour for four meteorological stations between 2000 and 2008 and listed in a scientific paper published on the website of the magazine Meteorological Applications by Diego Souza and Regina Alvalá, researchers at the Inpe.

The work also indicates that the atmosphere of the urbanized areas of Manaus became drier than the surrounding forests. During the period under examination, the relative humidity of the air in the central zones of the Amazonian capital was on average 1.7% lower than in adjacent forests. This distinction reached its maximum level in February, in the middle of a rainy station, when the city came to be 3.5% drier than the forest. "These data clearly show the heat island effect in Manaus," says Regina, cartographic engineer specializing in mapping of land cover and uses for meteorological modeling.

However, an important aspect is the existence, in the cities of Belém and Manaus, of ecological reserves to its continuous urban areas, which provide them with the possibility of easing the effects of these heat islands, mainly from urban occupation of the future.

In the city of Belém, as well as the Botanical Garden "Rodrigues Alves" and the Zoo-Botanical Park of the Museu Paraense "Emílio Goeldi", there is a conservation area known as Parque Ambiental de Belém. The latter is an ecological reserve of 13.80

km² legally protected by State Decree nº 1,151 of May 3, 1993, and which is relatively well preserved. The work "Environmental Park of Belém: a study of local wildlife conservation and the interaction of this activity with the surrounding community", published in the journal of the UFPA, v. 04, April 2004, features a good description of this area and its role in terms of biodiversity and its influence on the urban population in its surroundings.

In the city of Manaus the ecological reserves of the *campus* of the Federal University of Amazonas approximately 7 km² and the conservation unit known as environmental reserve "Adolfo Ducke", with 100 km², contains a botanical garden with an area that corresponds to 5% of the total area of the reserve. In these two Amazonian cities these examples of preservation should be copied by other State capitals. These drives beyond recreation that can provide their inhabitants make a meaningful and substantial progress in ecological studies and will play a significant role as thermal system regulatory areas of these cities.

Add the areas of the armed forces reserves, of Embrapa Amazônia Oriental and the Universidade Federal Rural da Amazônia (UFRA) in Belém; the, Embrapa Amazônia Ocidental, the Instituto Nacional de Pesquisa da Amazônia (INPA), in Manaus, which added to the other here mentioned give important contribution to easing the climate in those two cities.

The heat island is not present only in major urban centres, she also appears in medium and small cities. This is because the construction of cities changes radically the soil occupation pattern and creates an environment where his occurrence becomes almost a natural law, due to the lack of arboreal vegetation and undergrowth that create shade zones able to reduce the temperature of the soil, which, in turn, leads to decreased atmospheric temperature. The green areas also contribute to freshen up the atmosphere of a place through evapotranspiration. This mechanism makes the plants and soil release water into the air in order to dissipate the heat from the environment. Hence the need for correct and planned urban forest. She represents for the daily life of the population an "air conditioning" public and democratic.

Another aspect which is reason of research concerns the biodiversity in urban and rural areas. This matter was the subject of the Conference Cycle Biota-FAPESP 2013 Education in 21 November, in the city of São Paulo, by researchers Elizabeth Hofling, Instituto de Biociências da Universidade de São Paulo (USP), Luciano Martins Verdade, from Centro de Energia Nuclear na Agricultura da Escola Superior de

Agricultura "Luiz de Queiroz", USP, and Roseli Buzanelli Torres, of the Instituto Agronômico de Campinas (IAC), reviewing urban and rural biodiversity in the State of São Paulo in Brazil. Is an initiative of the Biota-FAPESP Program in partnership with the Research FAPESP magazine.

Working this conflict from the point of view of conservation, without ideological bias or purely economical, inserted in the dynamics of agricultural production may be the best way to assign to productive segment a multifunctional mission, which maintains its character and at the same time promote environmental conservation. The most important in conservation, would be first of all, understand what generates the complexity of these processes, what is the role of science. As for the population, should be aware of the importance of environmental science by encouraging the formulation of policies and actions that promote in all environments.

As practical and immediate action society must encourage urban forest, contributing to strengthen the conservation strategies, create environments with mild temperatures, more enjoyable both for people and for wildlife. Trees with denser canopy retains up to 98% of the solar radiation, and still contribute to the reduction of the speed of the flash flooding – tipuana (*Tipuana tipu*) and sibipiruna (*Caesalpinia peltophoroides*), for example, can retain up to 60% of the water in the first two hours of rain, decreasing the intensity of floods.

All these strategies, actions, policies etc. will be increasingly used if environmental education is prioritized on the agenda of the urban and rural society. Environmental Science and Environmental Education are sisters, in town and in the field.