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Climate Change Mitigation: some reflections for Colombia

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Before trying the topic of climate change mitigation, it is necessary to understand the difference between climate change and climate variability, corresponding first to long-term and global-scale alterations, whose causes may be of natural or anthropogenic origin; while climate variability refers to short-term fluctuations and associated with natural weather conditions specific to each region (Hageback *et al.*, 2005). However, it is recognized the influence that climate change has on climate variability, so it is not possible to establish differentiated impacts at the local scale (Bansha Dulal and Akbar, 2013). Now, in this essay beyond dispute, the analysis focused on identifying mitigation measures established globally and who's of them have been implemented in Colombia.

International concern about climate change, led to the United Nations Framework Convention on Climate Change (UNFCCC), signed in 1992 in Rio de Janeiro and in the context of it, the Kyoto Protocol in 1997. Both instruments constitute the first steps towards a collective and progressive solution for the mitigation of this problem. The Kyoto Protocol committed a modest reduction in emissions from developed countries from 2008 to 2012. Thus, mitigation refers to measures to reduce greenhouse gas emissions by source and/or increase carbon removal through sinks (PNUD, 2007, Björnberg, 2013).

At global level, among the numerous control and mitigation measures, the following have been proposed : the application of public policies, the enactment of specific laws, the adoption of incentives, soil and water conservation practices, rainwater harvesting, reforestation, as well as the introduction of appropriate production schemes and drought early warning systems (Sahnoune *et al.* , 20 13; Kyle *et al.,* 2013). According PNUD (2007) and Björnberg (2013) there are three basic principles to achieve mitigation:

1. Set a price for greenhouse gas emissions.
2. Change the behavior in the broadest sense, i.e., mitigation can only be achieved if consumers and investors supplement their current energy demand through energy sources with low carbon emissions.
3. International Cooperation.

Although some authors suggest that existing institutions in developing countries are unlikely to be able to deal efficiently and equitably with climate change, because in general, decisions are made at the national level (Bansha Dulal and Akbar, 2013). In this sense, it is clear that climate change has a strong institutional dimension, since it is the State institutions that are responsible for executing policies, enforcing regulations and promoting mitigation measures (Björnberg, 2013).

For its part, in the Colombia environmental context there is still much to be done, especially when there are deficiencies in urban planning and land use, and in the conservation of rivers and forests. Although , it is rescued that in April 2004, in order to support the different sectors in the management of projects to reduce greenhouse gas emissions the Ministry of Environment and Sustainable Development, constituted the Climate Change Mitigation Group (Comstock *et al.* , 2012) . In this same order of ideas, in the National Development Plans, online objectives have been proposed, such as:

1. Implement the National Climate Change Policy, create the National Climate Change System, and incorporate the climate change variables in the policy instruments.
2. Adopt mitigation or risk reduction measures for the effects of climate change due to sea level rise and coastal erosion. (Atlántico, La Guajira, Magdalena, Bolívar, Córdoba, Sucre, San Andrés and Providencia, Chocó, Valle del Cauca, Nariño, Cauca).
3. Advance/Successfully complete major works-roads, ports, airports and railways; and start the execution of the contemplated long-term works of the Transport Master Plan, considering the impacts of climate change.
4. Implement clean technologies (hybrid, gas or electric vehicles) in public and private transport vehicles, and incorporate climate change variables in the structuring of projects.

However, in the development local plans weaknesses are identified because adaptation or mitigation strategies still not include yet and doesn't integrate the climate change in these policies. But as a society we do recognize the direct impact of

climate change on socio-economic activities and development. This suggests, among other actions, the reduction of local air pollution, the application of greater energy efficiency, and the improvement of urban transport. For this purpose, the Mitigation Group on Climate Change agreed to work plans in the Clean Development Mechanism (CDM) with several entities since 2002 (Comstock *et al.* , 2012), like this:

1. **Energy Mining Planning Unit:** joint work was coordinated in various activities related to the CDM, such as the identification of potential CDM projects in various subsectors of the industry and the development of tools to facilitate their formulation.
2. **Planning and Promotion of Energy Solutions Institute:** a strategy was developed for the promotion of CDM projects for energy supply in Non-Interconnected Zones (NIZ). In this work plan, a diagnosis of greenhouse gas emissions was generated by the generation of energy with ACPM and fuel oil, the identification of project opportunities in NIZ and the joint execution of a CDM project in a locality of these regions.
3. **Ministry of Transportation:** the articulation of the CDM was sought for transportation projects, with special emphasis on massive urban transport projects. In addition, the PNUD (2007) mentions that among the most important elements of a long-term strategy for mitigating greenhouse gases in the transport sector must include all changes in urban infrastructure and transport, reduce the need for motorized transport and displace the demand to means of transport that require less energy, obtaining with this broad social and environmental benefits.
4. **Forestry Sector:** brought together different actors of the sector such as: the Ministries of Agriculture and Rural Development, Ministry of Environment and Sustainable Development, and Foreign Trade, National Planning Department, IDEAM, National Forestry Research and Development Corporation (CONIF), Association of Regional Autonomous Corporations and Sustainable Development (ASOCARS), foundations and research centers, universities and private companies. The proposed activities included the identification of indicative areas and potential forest species to develop projects and the development of tools for their formulation.

In spite of above, Colombia has positioned itself as a leader in the development of adaptation and mitigation actions of climate change (Comstock *et al.*, 2012). However, it is necessary to manage the scarcity of the capacity of the earth to absorb greenhouse gases, a situation that would lead to thinking about sustainable systems and joint actions, through the reduction of population growth, energy saving, alternative energies, which implies a profound change in energy policies, as well as an increase in international cooperation, to effectively mitigate climate change (PNUD, 2007, Björnberg, 2013, Kyle *et al.,* 2013).

The developed countries will have to be at the forefront in the fight against climate change, since they are the ones that will have to carry out the deepest and most expeditious reductions. However, any international regulatory framework that does not define goals for all countries that emit the most greenhouse gases will be destined to fail. Developing countries should also make the transition to lower carbon dioxide emissions to avoid climate change. Seen this way, the underlying problem corresponds to a lack of politic will, for example for a president of the United States, China or India take mitigation measures would slow its economy.

In any case, it is suggested that for the formulation of policies to adapt to climate change, more solid institutions are needed that respect worldwide initiatives established. In addition, any fundamental change will require a rapid acceleration of the commercialization energy alternatives process that remain in a primary stage of experimentation (Yáñez-Arancibia *et al*., 2010). Thus, the dynamics of this reflection leads to two questions: What would be the solution? And what could be done from the academy?

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