Nr management in current Brazilian policies

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Abstract

Emissions of reactive nitrogen (N_r) have increased in Brazil from 1990 to 2015, mainly due to the enhancement of nitrogen input from human activities in the country. In this paper, we present a survey of existing nitrogen management policies and examine its adequacy and effectiveness. There are no specific and exclusive policies to regulate N_r emissions at federal level. However, we found some standards, resolutions and decrees that include nitrogen among the established regulations. As a result, we conclude that Brazil has the potential to adapt its policies for better nitrogen management practices in the future.

Keywords: nitrogen pollution, management policies, Brazil

1. Background

The rapid growth of the world population in recent decades has resulted in increased human activities related to food and energy production; as a result, the N_r emission rate has more than doubled (Galloway and Cowling 2002; Galloway et al. 2004). Therefore, the conversion of N_2 to N_r was mainly caused by anthropogenic activities linked to agricultural intensification, excessive use of fertilizers and burning of fossil fuels (Galloway et al. 2008; Fowler et al. 2013), including in Brazil (Austin et al. 2013; Bustamante et al. 2014). The need for policies is based on the risks and impacts on human health and the environment, related to the increase of nitrogen pollution in various ecosystems. The fundamental purpose of these instruments and measures is to enhance nitrogen use gains while limiting their deleterious effects (Mosier et al. 2001).

2. Nitrogen emissions in Brazil

According to the Brazil´s Third National Communication to the UNFCCC (MCTI 2016) and its update report (MRE and MCTIC 2019), nitrogen input from human activities escalated significantly from 1990 to 2015: N_2O and NOx emissions have increased 64% and 57%, respectively, in the period (Figure 1). Previous studies indicate that anthropogenic emissions have been occuring mainly in the Brazilian Cerrado (Midwest, North, and Northeast) via agricultural intensification; in the Southeast, through burning of fossil fuels and inefficient use of nitrogen fertilizers; and in the Amazon region, by continuous conversion of natural forests into pasture and agriculture areas (Filoso et al. 2006; Martinelli et al. 2006).

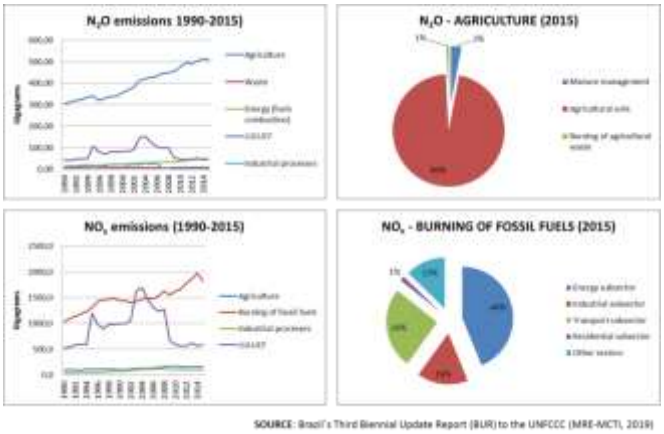

Figure 1: N_2O and NO_x emissions in Brazil

3. National nitrogen-related public policies

The number of policy instruments specific for nitrogen is actually limited worldwide, in contrast with the huge diversity in N_r emission sources and pathways (Oenema et al.

2011; Sutton et al. 2011). To date, there are no specific and exclusive policies in Brazil to regulate N_r emissions at federal level. However, through an extensive survey, we found some standards, resolutions and decrees that include nitrogen among the established regulations, and analysed the scope, adequacy, and effectiveness of these measures. One example is the National Plan for Low Carbon Emission in Agriculture (ABC Plan), which is a credit initiative to encourage a series of sustainable agriculture practices, including biological nitrogen fixation (BNF).

4. Concluding remarks

With world population expansion and growing demand for food and energy, N_r emissions could increase significantly in several regions of the world. The impact of this projection will certainly affect N_2O emissions in Brazil, considering the importance of the agricultural sector not only internally but also in the global economy (Oita et al. 2016; FAO 2018). In addition, the energy subsector is the largest source of NO_x emissions in the country, and the use of alternative and renewable energies is conditional on favorable climate factors (de Lucena et al. 2009). However, when dealing with nitrogen issues, even indirectly in its management policies, it can be stated that Brazil has the potential to advance the discussion and, in the future, to adapt its policies to current needs with a view to sustainable development.

Acknowledgements

This study was funded by the Nitrogen Cycling in Latin America: Drivers, Impacts and Vulnerabilities (Nnet Project) (IAI/CRN 3005) and by the Coordination for the Improvement of Higher Education Personnel (CAPES) (88887.308408/2018-00).

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