Short communication

# Policy in Brazil (2016–2019) threaten conservation of the Amazon rainforest

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## ARTICLE INFO

## ABSTRACT

This article aims to analyze the influence of recent Brazilian political change demonstrating like the measures taken by former President Meichel Temer and those promised in presidential campaign by the current president Jair Bolsonaro threaten on the conservation of the Amazonian forest, both in the short and long term. In order to do so, it will be discussed the adoption of political instruments, which reduce investment in the Ministry of the Environment during a period of twenty years, making it difficult to supervise and monitor the entire Amazon forest. As a result, a debate will be presented in the current situation of the forest and the possibility of re-conciling agricultural production with environmental preservation.

## 1. Introduction

Conservation of the Amazon rainforest is essential for the planet because it contains more than half of the world's rainforests and a quarter of all fauna, and it is essential for controlling climate change (Malhi et al., 2008). Despite the drop in deforestation between 2004 and 2012 as a result of federal control (Freitas et al., 2016; Souza et al., 2016), there was an unprecedented increase in 2015 and 2016. At the same time, Brazil is experiencing the greatest economic crisis in its recent history and a serious political crisis.

The approved of the Constitutional Amendment Proposal PEC 241, which has frozen the Ministry of the Environment MMA budget for a period of 20 years, threatens the functioning, in both the short and long term, of national institutes that directly control the Amazon, such as the Brazilian Institute of Environment and Renewable Natural Resources IBAMA and the Chico Mendes Institute for Biodiversity Conservation ICMBio. Moreover, other political and economic measures, such as PEC 65 and the increase in the exchange rate, threaten the lack of control of deforestation.

Another factor that may threaten the sustainability of the forest is the election of candidate Jair Bolsonaro in November 2018, as he has promised several measures that affect the conservation of the Amazon rainforest and has left, from the first day he took over as president of the republic, in January 2019, environmental issues aside from the debate in his government. For these reasons, this article proposes to show some measures that were taken in the Michel Temer government that could undermine the sustainability of the forest and argue that should the Bolsonaro government maintain its position, when it was a candidate for president of the republic, the Amazon could be affected and at the end some solutions will be proposed to reconcile economic recovery with preservation. Fig. 1 describes the methodology used in the paper. We started the work identifying the problem under analysis and making a literature review consistent with that problem. After that, we collected data about the Amazon rainforest and for different Brazilian presidents. We made a critical analysis and draw the final conclusions.

## 2. Amazon rainforest

The Amazon contains more than half of the world's rainforests and is home to about a quarter of the planet's animal and plant species. It is of vital importance because the global consequences of deforestation and burning affect biodiversity, the water cycle, and $CO_2$ and greenhouse gas emissions (Houghton, 2005). Deforestation in the Amazon

## Methodological approach used in the research

**Phase 1**
**Research preparation**

- Identification of the problem

- Literature review

**Phase 2**
**Data collection**

- Data collection about Amazon rainforest

- Data collection on different Brazilian presidencies

**Phase 3**
**Analysis and conclusions**

- Critical analysis of the presented events
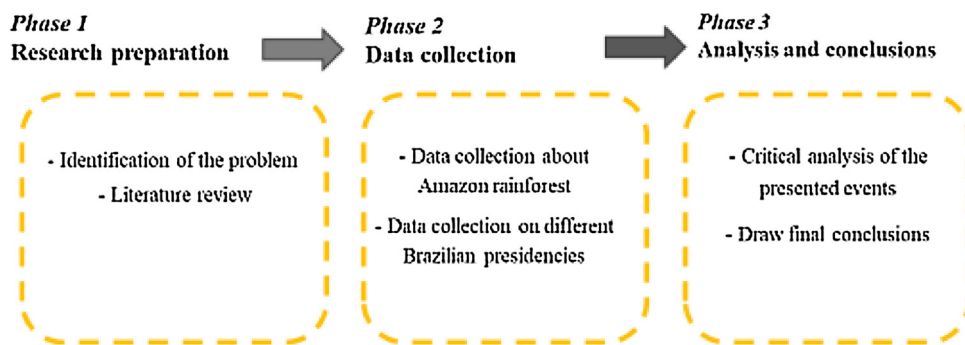
- Draw final conclusions

**Fig. 1.** Methodological approach used in the research.
Source: Own elaboration based on CGE simulations.

contributes significantly to the intensification of greenhouse gas emissions as a consequence of the release of carbon from forest biomass and soil (Fearnside, 2006; Huntingford et al., 2004). Excess greenhouse gases act as insulators by absorbing radiated energy, forming a kind of 'thermal blanket' around the earth, retaining a greater amount of heat, and preventing it from returning to space. The advance of deforestation could increase temperatures in the Amazon by up to 14 degrees by 2100; this is catastrophic for the planet, resulting in the death not only of the forest but also mankind (Fearnside, 2006; Hegerl, 2006).

Brazil has been the world leader in tropical deforestation, clearing an average of $19,500 \, km^2$/year from 1996 to 2005. This forest conversion to pasture and farmland released 0.7 to 1.4 Gt $CO_2$eq billion tonnes of $CO_2$ equivalent per year to the atmosphere (Fearnside and Laurance, 2004). In order to reduce deforestation in the Amazon, in 2004 the Plan of Action for the Prevention and Control of Deforestation in the Legal Amazon was launched in Brazil, by which the government committed itself to control and reducing deforestation, at least until the year 2020 (Ministério do Meio Ambiente, 2013). In 2012, significant results were achieved, the main one being the reduction of deforestation to the lowest historical level (Nepstad et al., 2009). According to Fearnside (2017), the decline in deforestation between 2004 and 2012 was due to factors other than improved governance. However, the relative variation in deforestation in the Legal Amazon was 24% between 2104 and 2015 and 26% between 2015 and 2016, reaching 6000 $km^2$ of deforested land in 2015 and 8000 $km^2$ in 2016 (INPE, 2017).

Historically, Amazon rainforest became increasingly fragmented by the generalized and rapid intensification of anthropogenic activities, and if the deforestation situation remains, it could have as consequence changes in the use and management of the land (Peres et al., 2010), but it is also important in issues like landscape management and planning. According with Antrop (2005, 2006), the production and conservation in agricultural landscapes is one of the main challenges posed by sustainable development in a landscape. Tress and Tress (2001) propose the concept of landscape in five dimensions: landscape as a spatial entity, landscape as a mental entity, landscape as a temporal dimension, landscape as a nexus of nature and culture and landscape as a how to complex systems. In addition, Loures (2019) emphasizes the need of land use planning, reinforcing the need that only the environmental use of land is not sufficient, but also that the contribution of each pillar is equally important, offering complementary development opportunities by allowing the multiple roles in an integrated way, underlining the relevance of multifunctionality to promote sustainable land use, planning strategies and policies. Furthermore, Loures et al. (2015) analyzed the sustainability of the landscape on different metrics regarding land uses, ecosystems at different scales over time, allowing the realization of planning. In this way, the accelerated growth of deforestation in the Amazon can profoundly alter its agricultural, economic, social,

landscape and environmental dynamics.

An interesting exercise was conducted by Carvalho et al. (2017) using a dynamic and inter-regional Computable General Equilibrium Model (CGE) built for the Amazon region. These authors simulated an 80% reduction in deforestation by 2020 and a 100% decrease for the period 2021–2030 based on government policies. Their results show the small economic cost small decrease in Amazon GDP, for example of that policy to control deforestation in the Amazon.

The increase in deforestation rates in recent years may be related to the economic crisis. With fewer resources to control the Amazon region, the present situation facilitates the activity of loggers in the region, in addition to generating greater pressure on natural resources, with the objectives of increasing commodities exports and higher income earning.

### 3. Government Temer and spending cuts

In June 2016, Michel Temer was appointed president and together with conservative politicians known as "ruralists" - is composed of politicians linked to the production of agricultural commodities or financed by agribusiness groups in Brazil, they approved some measures that go against the reduction in deforestation. The Senate approved the PEC 65, in April 2016, which guarantees freedom to build with only a previous study of environmental impact, an environmental license is no longer necessary. In addition to eliminating the need for environmental licensing for construction, PEC 65, has also reduced the public prosecutor's power to supervise constructors and may only apply administrative and non-legal punitive measures. PEC 65 still has the potential to stimulate the construction of highways and dams in the Amazon region, which could probably increase deforestation (Tófoli et al., 2017). Moreover, PEC 65 could stimulate land speculation, money laundering, and the establishment of land tenure. Another measure of Temer was the approved of constitutional amendment 241 PEC-241 in December 2016. This established a cap for public spending growth over a 20-year period, with revision in the first 10 years. In order to illustrate, Fig. 2 shows the simulation results from a CGE model[1] that takes into account a federal public spending cut of 0.6% in 2017 and 1% per year in the period 2018–2020.

These results should be interpreted in terms of accumulated deviation related to the baseline scenario annual growth rate of 3% per year in the period 2019–2035. The accumulated impact on real GDP in 2035, for instance, would be -28.21%, which means that Brazilian GDP would be 28.21 lower when compared to the baseline scenario. It is important to highlight that Fig. 2 shows the isolated effect of cuts in public expenditure.

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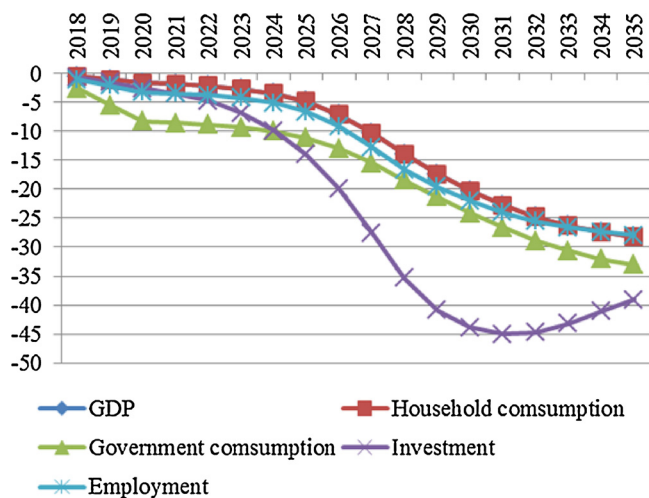[1] The main features of the model are in Appendix A.

**Fig. 2.** Long-run economic impacts of the Brazilian public expenditures' cut on macroeconomic variables, 2018–2035 %.
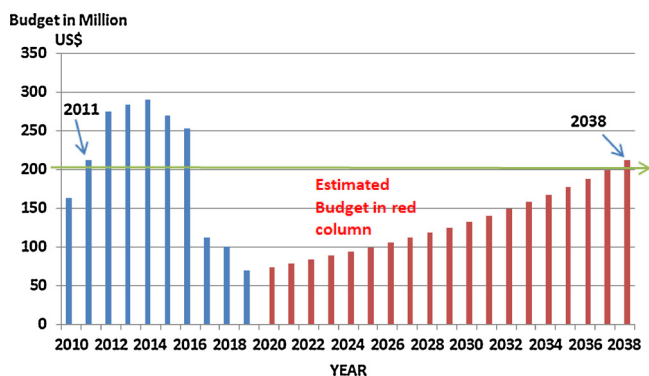Source: Own elaboration based on CGE simulations.



**Fig. 3.** Budget of the Ministry of the Environment. This budget is in USD and corresponds to discretionary expenditure.
Source: IPEA, 2017.

Public expenditure cannot increase above the previous year's rate of inflation, that is, there will be no real growth over the next 20 years affecting both the MMA and the Ministry of Science and Technology, Innovation and Communication, which is committed to research in the areas of biodiversity, conservation, and sustainability (Crouzeilles et al., 2017). The MMA´s budget for 2018 will be the same as the previous year plus the official rate of inflation of 2017. That year, the MMA´s budget was reduced by 56% compared to 2016. This means that this ministry's budget will be frozen for the next 20 years at a value of less than half of the budget for 2016. As can be seen in Fig. 3, the MMA budget, after PEC 241, would return to the maximum value which was achieved between 2011 and 2016 but it will be reached again only in 2038.

The MMA is responsible for important national institutes, such as IBAMA and ICMBio. The MMA lost the equivalent of $100 million of its discretionary spending budget in 2017. These funds allow public managers the flexibility of expenses and may even be used for the purchase of fuel for cars used by the inspection teams of the various environmental reserves (INESC, 2017). ICMBio is responsible for 327 units of federal conservation, corresponding to 75.9 million hectares of land with various problems, such as land regulation.

In addition, the Norwegian government has announced that it would reduce its aid to combat deforestation in the Amazon if it continues to rise. Since 2008, Norway has already transferred R$ 2.8 billion to the Amazon Fund. This fund currently carries out 89 direct actions to prevent, monitor, and combat deforestation in order to promote the

conservation and sustainable use of the Legal Amazon. The problem is that the transfer of funds from the Norwegian government is conditional on the reduction of deforestation in the Legal Amazon, and since deforestation increased in 2015 and 2016, the Norwegian government decided to halve the stock financing in the region in 2017, cut to US$ 61.3 million.[2]

## 4. President Bolsonaro and environment risk

On January 1st, 2019, the right-wing candidate, Jair Bolsonaro, has taken office as President of Brazil, promising in the campaign several measures that are contrary to a policy of environmental conservation. He promised to "facilitate" access to the environmental license, reducing restrictions on large investment projects (Ascema, 2018; Borges, 2018). However, it has already been shown that investment projects in the Amazon, such as the construction of dams or roads, can have damaging effects on the environment (Fearnside, 2016a, 2016b, 2016c, 2018). Another controversial measure of the new president was to try to end the Ministry of the Environment (Bragança, 2018), which is responsible for institutions such as Brazilian Institute of Environment and Renewable Natural Resources (Ibama) and Chico Mendes Institute for Biodiversity Conservation (ICMBio). Only the ICMBio is responsible for 327 units of Federal Conservation, corresponding to 75.9 million hectares with various problems such as land regularization and low management effectiveness, but amid many criticisms two days later, Bolsonaro returned in his decision and said the MMA would be maintained. Another proposal of Bolsonaro, during the campaign, was to remove Brazil from the agreement of Paris, a movement that the candidate returned, temporarily behind (Gaier, 2018). If Bolsonaro does all that it promised during the campaign, deforestation could increase by 25.6 million km2 per year and carbon dioxide emission would average 1.31 GtCO2e per year between 2021 and 2030 (Soterroni et al., 2018).

In Decree No. 9471, dated from March 2019, the actual government cut 46.36 million USD from the Ministry of the Environment (Brasil, 2019). The program with a higher relative cute was the National Policy on Climate Change, with a cut corresponding to 95% of the program budget (a total of 2.72 million USD). Other important cuts were made for the following programs: Management and Implementation of Federal Conservation, which suffered a cut of 11.15 million USD (26% of its total resources); Control and Inspection of IBAMA, with a cut of 6.14 million USD (24% of the total budget); Environmental Inspection and Forest Fire Prevention and Control of the Chico Mendes Institute, with a cut of 1.33 million USD (about 20% of the program). These cuts make difficult the situation of two of the main agencies (IBAMA and Instituto Chico Mendes) that are fundamental in the preservation of the Amazon forest, and may lack resources for primary actions of monitoring and supervision.

## 5. Conclusion

In the current context of Brazilian politics with the election of Jair Bolsonaro, it is noticeable that environmental issues are outside the political debate. Both in the short and in the long term, the Amazon could suffer serious consequences if the posture of the current Brazilian rulers is not rethought and the environmental risk tends to increase bringing harmful damages to society, since the diverse systems of societies like economy, politics and environment are increasingly interconnected and risks (Helbing, 2013). With regard to the political situation, it must be ensured that the politic does not affect forest conservation. The future of the Amazon forest cannot serve as a bargaining tool for the various Brazilian political interests.

Despite the scarcity of the public resources, reversing the increase in deforestation rates will require greater surveillance. Private agents, in

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[2] This value corresponds to the dollar/real exchange rate of 3.26.

this case, should play a fundamental role in ensuring that deforestation rates in the region do not return to the 1990 levels. To do this, they must act as conscious consumers, always demanding origin certification of products produced in the Amazon region. In addition, public or private institutions can contribute through increasing research on land productivity. In this context, several studies, such as (Carvalho et al., 2017; Assunção et al., 2016; Koch et al., 2017; Cerri et al., 2018), have pointed out that there is potential for growing production in the region to meet the higher demand for commodities without additional deforestation, especially in livestock areas. A debate about new forms of financing for the Amazon Fund and even of financial support to IBAMA and ICMBio is essential because according to Hargrave and Kis-Katos (2013), these bodies are essential in the fight against deforestation.

In addition, the fourth phase of the PPCDAm Plan of Action for the Prevention and Control of Deforestation in Amazon, for 2016–2020 recognizes the recent increase in the deforestation rates and one of its goals is the reduction from 7000 to 4000 ha by 2020. Moreover, the Fines Conversion Program will be discussed in 2018, which allows the application of resources in environmental services, and the soybean moratorium, whose goal is to prohibit the commercialization of this crop produced in deforested areas. It is extremely important that society continues these projects.

## Acknowledgments

## Appendix A. CGE Model

For the simulation we used a regional recursive dynamic CGE model following the theoretical structure of the Australian TERM (Horridge et al., 2005). It is a Johansen bottom-up multi-regional CGE model that is derived from the development of the ORANI (Dixon et al., 1982).

Briefly, the model has relationships between supply and demand defined by blocks of equations according to optimization assumptions and market-clearing conditions. The productive sectors minimize costs subject to a technology of constant returns to scale in which the combinations of intermediate inputs and primary factors (aggregated) are determined by fixed coefficients (Leontief). There is substitution (via prices) between domestic and imported goods in the composition of inputs according to a function of the constant elasticity of substitution (CES). A CES specification also drives the allocation of a domestic compound among the various regions and the allocation between capital and labor in the composition of the primary factors (Carvalho et al., 2017).

There is a representative household for each region that consumes domestic goods (of the region) and imported goods. The choice between domestic and imported goods (from other countries) is driven by a CES specification (Armington assumption, considering that products of different origins are treated as imperfect substitutes). The treatment of household demand is based on a combined system of preferences and the utility derived from consumption is maximized according to a CES/Klein-Rubin function. The Klein-Rubin specification gives the linear expenditure system (LES), which means that the share of expenditure above the subsistence level for each good represents a constant proportion of the total subsistence expenditure of each family. The model has also a recursive dynamic specification with investment and capital stock following mechanisms of accumulation and intersectoral shift from pre-established rules related to the depreciation and rates of return. Government expenditure is exogenous allowing the simulation of a federal public spending cut. Ultimately, the model operates with market equilibrium for all goods, both domestic and imported, as well

as the market factors (capital, land and labor) in each region (Carvalho et al., 2017).

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