

Financiamento de sistemas de inovação amazônicos orientados à sustentabilidade: uma abordagem neo-Schumpeteriana-Hirschmaniana-Pós-Keynesiana

Financing amazon innovation systems oriented to sustainability: a neo-schumpeterian-hirschmanian-post-keynesian approach

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Resumo: Este artigo se concentra em um aspecto específico do sistema de inovação, que é o financiamento da transição justa da Amazônia para a sustentabilidade. A hipótese dos autores é que os bancos de desenvolvimento podem desempenhar um papel crucial para essa transição, em vez de depender apenas de soluções de financiamento baseadas no mercado. Este artigo é uma pesquisa qualitativa com uma abordagem interdisciplinar. A primeira perspectiva é a neo-schumpeteriana, a fim de caracterizar o conceito de sistema de inovação e o papel das finanças no processo de inovação. A segunda está relacionada à perspectiva de Hirschman sobre o desenvolvimento desequilibrado. O terceiro diz respeito à perspectiva pós-keynesiana sobre financiamento, que ajuda a enquadrar o papel dos bancos de desenvolvimento dentro das funcionalidades do sistema financeiro. Este artigo mostra que há necessidade de estruturar um novo paradigma de desenvolvimento para a região da Amazônia Legal, em que os territórios amazônicos sejam concebidos como sistemas de inovação, que

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identifiquem soluções de acordo com as características locais reais (abordagem de baixo para cima) para obter níveis desejáveis de desenvolvimento sustentável. Para realizar uma "Transição Amazônica Justa", a questão do financiamento seria abordada com maior ênfase no papel dos bancos de desenvolvimento, devido aos altos níveis de recursos necessários para essa transição e às dificuldades de financiamento de projetos de inovação sustentável com maior nível de incerteza.

Palavras- chave: financiamento climático, bancos de desenvolvimento, inovação, Amazonia Legal.

Abstract: This paper focuses on a specific aspect of the innovation system, which is, the financing of the Amazon just transition towards sustainability. The authors' hypothesis is that development banks could perform a crucial role for this transition vis-à-vis relying only on market-based financing solutions. This paper is a qualitative research with an interdisciplinary approach. This first perspective is the neo-Schumpeterian one, in order to characterize the innovation system concept and the role of finance in the innovation process. The second one, is related to the Hirschman perspective on unbalanced development. The third one, regards the post-Keynesian perspective on financing, which helps to frame the role of development banks within the functionalities of financial system. This paper shows that there is a need to frame a new development paradigm for the Legal Amazon region, where Amazonian territories are conceived as innovation systems, that identify solutions according to the real local characteristics (bottom-up approach) to obtain desirable levels of sustainable development. To carry out an "Amazon Just Transition", the funding issue would be tackled by giving a greater emphasis to the role of development banks, due to the high levels of resources required for this transition and the difficulties of financing sustainable innovation projects that has greater levels of uncertainty.

Key-words: climate finance, development banks, innovation, Legal Amazon

Introduction

Between 1985 and 2021, according to Mapbiomas (2022), the Brazilian Amazon biome suffered a significant loss, diminishing from 473Mha to 411Mha. In the same period, anthropic land use (cattle-ranching, agriculture, mining and infrastructure) increased from 36,4Mha to 98,4Mha. In relative terms, in 2021, the Amazon land mosaic is distributed by forest (79%), non-forest natural formation (3,84%), agriculture and pasture (14,78%), water surface (2,58%) and non-vegetated area (0,14%). Thus, in the last 36 years (1985-2021) Brazilian amazon forest deforestation reached 20% of the total biome land. These data depict to the so called "Amazon Forest dieback hypothesis", that foresight Amazon savannization, due to deforestation and climate change (Leme, 2021). Moreover, within the period of 1990 to 2021, SEEG Brasil data show an annual average of greenhouse gas emission (GHG) of 55%

that stems from “Land-use Change and Forestry”, 23% from “Agriculture and Pasture”, 15% from “Energy”, 4% from “Industrial Processes” and 3% from “Waste”. Therefore, 78% of Brazil GHG generation, stems from “Land-use Change and Forestry” and “Agriculture and Pasture”.

In order to effectively contribute to reach global climate goals – Paris Agreement and Sustainable Development Goals – and, simultaneously, offer sustainable economic opportunities for the amazon population, Brazil, and particularly the Legal Amazon Region³, needs to change – in a structuring and transformative manner – the development paradigms for their territories. So, it is possible to think about an “Amazon Just Transition” oriented to sustainability.

Given such scenario, innovation is key aspect for paradigms transformations of development. Based on the systemic innovation concept (Dosi 1992; Freeman 1994) and innovation systems (Mazzucato & Penna, 2016), it is possible to think the amazon territories as innovation systems oriented to sustainability. Accordingly, it is required to leverage and strengthen public policies, regulation, production systems, research and innovation, as well as financing tools, so as social actors might take decisions in favor of a diversified economic matrix, with social inclusion and within ecological boundaries.

This article focuses on a specific item of the innovation system, which is, the financing of the amazon just transition towards sustainability. The hypothesis that the authors work, is that, development banks could perform a crucial role for this transition vis-à-vis relying only on market-based financing solutions. For this purpose, we do a qualitative research with an interdisciplinary approach. This first perspective is the neo-Schumpeterian one, in order to characterize the innovation system concept and the role of finance in the innovation process. The second one, is related to the Hirschman perspective on unbalanced development. The third one, regards the post-Keynesian perspective on financing, that helps to frame the role of development banks within financial system functionalities.

³ The term Legal Amazon was only incorporated in the most recent legislation, such as Law no. 11,952, of June 25, 2009, and the Forestry Code (Law no. 12,651, of May 25, 2012), and it is not explicitly included in the laws that established the Brazilian Amazon area for the purpose of public policies in the previous decades. The use of the adjective "legal" is to distinguish the division of the Amazon region by biome or river basin established by legislation, as well as of the International Amazon. The Legal Amazon is divided into two parts: Western Amazon, comprising the states of Amazonas, Acre, Rondônia and Roraima, and Eastern Amazon, comprising the states of Pará, Maranhão, Amapá, Tocantins and Mato Grosso. In order to get more information, please access the following link: <https://www.ibge.gov.br/en/geosciences/maps/regional-maps/17927-legal-amazon.html?=&t=saiba-mais>

2. Financing and innovation system of Amazonia

Systemic innovation concept conceives innovation as dependent on national innovation systems. These systems encompass several features, such as scientific, technology, economic, social and institutional ones, belonging to each specific country. The systemic innovation approach takes into account the heterogeneity of external and internal learning processes of the firms (Freeman, 1994), tacit and codified knowledge, as well as economic strengths, social and institutional factors; according with Dosi (1982) such aspects play a crucial role for technology paradigm selection and innovation diffusion. In that regard, Freeman (1994) points out the relationship between the introduction, implementation and diffusion of innovations with the complex process of institutional and infrastructures change, that could differ from country to country.

National innovation systems (NIS) are defined by Mazzucato and Penna (2016) as the ones made of four sub-systems: production and innovation; research and education; finance and funding; public policies and regulation. Market and State relationship in the NIS is cooperative, where the State plays a relevant role in designing and formulating innovation public policies that “have the role to identify and shape new challenges able to foster new production, distribution and consumption standards among diverse industrial sectors (idem)”. The authors pinpoint the need of the State to design and implement “mission-oriented” policies, which are defined as “systemic public policies at the knowledge edge to achieve specific goals” or “big science to deal with big problems”.

Grounded on such theoretical framework, it is possible to think about Legal Amazon territories as innovation systems oriented by missions, such as, reduction of deforestation rates, fight against climate change, decrease of biodiversity loss, ecological restauration of degraded areas, among others. Accordingly, Nobre and Nobre (2020) highlight the necessity for a “big acceleration” towards sustainability through innovation too (4.0 industry) and, the cooperation among several international and national social actors (public, private and civil society sectors), in order to leverage and unlock socioeconomic potentials of the amazon region, within ecological boundaries.

Under a public policy perspective, it is relevant to conceive, design and implement solutions that take into account Amazon territories specific characteristics, in the quest to shape a developmental state that “enhance individual capabilities” to create “collective goods” (Evans, 2010). Concerning innovation and production sub-system, it urges the challenge to search for a new development paradigm for the Amazon region, according to Nobre and

Nobre (2020) conception of “Amazon third way”. Such understanding goes beyond the conflict between the “first way” – within which it is highlighted only the relevance of nature conservation – and the “second way” that only support intensive developmental systems, though “sustainable”. To do that, it is critical to think diversification strategies of the local economic matrixes by identifying key sectors (i.e., bioeconomy) that can generate and redistribute wealth “by design”.

Inversely to CEPAL (2023) thought, that advocate the “Big Push” approach to sustainability in Brazil, the authors here embrace the Hirschman approach of unbalanced development. According to this, unequal development of diverse sectors usually creates conditions for a fast development: more advanced sectors foster other sectors growth. Such complementarity allows that investments in a sector, spur investments in other sectors, triggering a series of subsequent events, besides generating externalities in the economy (Hirschmann, 1984). This approach seems more promising for a sustainable development project of the Amazon, given the difficulties to implement a large-scale project, carefully planned on many simultaneous fronts. It would be necessary to identify which sectors and productive market segments, to be spurred by public policies, that are able to create a strong value in the region.

Finally, with respect the sub-system of finance to foster the amazon innovation system, it must be considered the financial system role – in the post-Keynesian finance-funding circuit – to support innovation processes, and consequently the sustainable development (Paula, 2013). The key issue here, is to what extent the financial system is either “functional” or not to support sustainable development. A “functional” system is the one that performs in the best possible manner the functions of finance (creation of liquidity to sustain investment decisions by agents) and funding (creation of financing tools compatible with investment project needs), and the one that has the lowest possible financial fragility.

Carney (2015) pinpoints the “tragedy of the horizon” by depicting the mismatch of long-term liabilities needs to fund long-term assets: there is a divergence between a sustainable project maturity and the period within which, investors require the project’ profits. Indeed, the literature on green finance suggests that only market-based solutions (i.e., carbon market, green bonds) are insufficient to achieve sustainable goals settled in the Paris Agreement or in the United Nations Sustainable Development Goals (CEPAL, 2023). Thus, leading with investments related to the sustainable transition, requires an orientation that private financial markets are not able to deliver, due to the high uncertainty levels linked to innovation sustainable projects’ results. In this scenario that development banks can play a

crucial role to fund sustainable development trajectories, due to the fact that these banks are able to mobilize a massive amount of financial resources for longer-term projects. It is not a mere role to correct market failures, but it is an active role of the banks, operating as a public policy financial arm, orienting resources towards sustainable transition processes (Feil and Feijo, 2021); or according to Mazzucato and Penna (2016), development banks are enablers of a “mission-oriented innovation policy”.

Therefore, in the Amazon context, development banks – at the federal (BNDES) and regional (Banco da Amazonia) levels – can play a crucial role in setting the pace and direction of sustainable innovation investments. Such banks can support projects that are conceived, elaborated and implemented by the amazon innovation systems, based on territories needs and specific characteristics, supporting the structuring of sustainable value chains (i.e., bioeconomy).

Development banks can also operate as a public policy financial arm. In that regard, funding sustainable innovation projects must be aligned with the planning of the state, public institutions and macroeconomic policies, being such banks conceived as “Big Smart Government Bank” (Feil and Feijo, 2021). Another relevant issue is the development of public sector dynamic capabilities to conceive, elaborate and implement public policies according to society needs (Kattel et al., 2022). Thus, beside the financing role of the development banks, such institutions can foster and support public entities or social actors that might have some degree of fragilities to design and structure projects, in order to turn them bankable and sustainable.

This discussion paper shows that there is the need to frame a new development paradigm for the Legal Amazon region, where Amazonian territories are conceived as innovation systems, that identify solutions according to the real local characteristics (bottom-up approach) to obtain desirable levels of sustainable development. To carry out an “Amazon Just Transition”, the funding issue would be tackled by giving a greater emphasis to the role of development banks, due to high the high levels of resources required for this transition and the difficulties to finance sustainable innovation projects that has greater levels of results’ uncertainty.

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