

A sustainable path – innovating towards a circular bioeconomy (CBE) in the Amazon region

Patricia Prado¹

Track: Innovation

Abstract: The transition to a sustainable circular bioeconomy (CBE) poses complex challenges to firms especially as natural resources are mainly located in regions with lower levels of socioeconomic development and more vulnerable, traditional communities such as the Amazon region in South America. Despite the challenges, the Brazilian Amazon has developed on-the-ground initiatives involving individuals and groups (e.g., rural communities and family farmers, associations, cooperatives), organisations and businesses, which have grown in relevance to promote a CBE. Although often overlooked, these initiatives are a source of local innovations and alternative solutions, including agroecological production, value-aggregation, and market access. This developmental paper will contribute to this debate by setting the ground to discuss *how innovation can support the transition to a CBE in the Amazon region* from the perspective that not only disruptive innovations are needed. What is required are far-reaching changes in prevailing paradigms and *disruptive ways of thinking about innovation*. This work in progress introduces the concept of CBE and how innovation plays a crucial role for a CBE. The last section suggests a tentative research agenda that can shed light to the emergent field of CBE focusing on the Amazon region.

Keywords: innovation; sustainability; bioeconomy; circular economy; Amazon region.

¹ Northumbria University. patricia.prado@northumbria.ac.uk

A sustainable path – innovating towards a circular bioeconomy (CBE) in the Amazon region

1. Introduction

The transition to a sustainable circular bioeconomy (CBE) poses complex challenges to firms especially as natural resources are mainly located in regions with lower levels of socioeconomic development and more vulnerable, traditional communities such as the Amazon region in South America. The Amazon is the largest tropical forest in the world, providing a huge diversity of foods and resources, ecosystem services, fresh air, and clean water. However, the Amazon is being deforested at a rapid pace, largely driven by food production for global markets (Lambin & Meyfroidt, 2011; Fuchs, 2020). The interest in these markets have recently turned into Amazonian products such as açaí, bacuri and copaiba whose value have increased particularly due to health claims. As learned from previous cases (like soy) though, agrifood commodities are directly associated with various social and environmental conflicts such as deforestation, labour, and community rights, and change in land use (Heron, Prado & West, 2018). These relate to the conditions of productive activities in global value chains, with the non-core activities outsourced to developing countries. With the additional impacts of the COVID-19 pandemic, the region is facing renewed environmental pressures, increasing social inequalities, and reduced local incomes (Brondizio et al., 2021).

Although the use of these food products brings social and environmental risks to the region, they are also a source of opportunities for a CBE, where the role of firms is crucial (Mendes & Barros, 2021; Denny et al., 2022). Evidence from previous exploratory research has shown that alternative governance modes, built upon local knowledge of stakeholders in the region can support the development of innovation. Despite the challenges, the Brazilian Amazon has developed on-the-ground initiatives involving individuals and groups (e.g., rural communities and family farmers, associations, cooperatives), organisations and businesses, which have grown in relevance to promote a CBE. Although often overlooked, these initiatives are a source of local innovations and alternative solutions, including agroecological production, value-aggregation, and market access.

Against this background, this developmental paper will contribute to this debate by setting the ground to discuss *how innovation can support the transition to a CBE in the Amazon region*. It answers to BAM 2023 Conference call to help explain the link between sustainability and innovation. However, what underpins the discussions is the perspective that not only disruptive innovations are needed. What is required are far-reaching changes in prevailing paradigms and *disruptive ways of thinking about innovation*. This work in progress introduces the concept of CBE and how innovation plays a crucial role for a CBE. The last section suggests a tentative research agenda that can shed light to the emergent field of CBE focusing on the Amazon region.

2. Understanding the concept of Circular Bioeconomy (CBE)

The term 'circular bioeconomy' (CBE) results from the convergence of circular economy and bioeconomy agendas. While both concepts have received increased attention since the 1990s and 2000s from academics and practitioners, their definitions are still debated (D'Amato et al., 2017; Lazarevic & Valve, 2017; Korhonen, Honkasalo & Seppälä, 2018; Inigo & Blok, 2019; Kershaw et al., 2021). Ellen MacArthur Foundation, one of the most influential organisations to promote circular economy initiatives in Europe and around the world, defines circular economy as "one that is regenerative by design and aims to keep products, components, and materials at their highest utility and value at all times, distinguishing between technical and biological cycles. This new economic model seeks to ultimately decouple global economic development from finite resource consumption" (Ellen MacArthur Foundation (EMF) 2015). This definition presents circular economy in opposition to the current linear 'take-make-waste' model of production and consumption by reincorporating resources into the system, minimising negative environmental impacts and promoting regeneration (D'Amato et al., 2017; Hetemäki et al., 2017). One of the most well-known definitions of bioeconomy is promoted by the European Union (EU) as comprising "those parts of the economy that use renewable biological resources from land and sea – such crops, forest, fish, animals and micro-organisms – to produce food, materials and energy" (European Commission Research and Innovation, n.d.). Bioeconomy has been broadly used to refer to the production and use of natural resources, products, and processes as a sustainable way to provide goods and services, especially when replacing fossil resources (Hetemäki et al., 2017; Kershaw et al., 2021). The links between circular economy and bioeconomy started to be consolidated in the last decade, especially after the publication of the EU Circular Economy Action Plan in 2015 and the update of the Bioeconomy Strategy of the European Commission, which makes explicit reference to a "sustainable, circular bioeconomy" (European Commission, 2018). Recent policy reports propose the CBE as essential in achieving several global sustainability targets, such as the Paris Climate Agreement, the UN Sustainable Development Goals, and the post-COVID-19 pandemic recovery (Hetemäki et al., 2017; Fund et al., 2018; Stegmann, Londo & Junginger, 2020).

Since its emergence in the mid-2010s, CBE has increasingly appeared in policy and scientific literature. Despite gaining recent relevance, specific definitions have not often been clearly stated such as D'Amato and colleagues' who described CBE as "more efficient resource management of bio-based renewable resources by integrating circular economy principles into the bioeconomy" (D'Amato et al., 2020, p.1). Due to the ambiguities and controversies inherited from circular economy and bioeconomy, the concept of CBE can have different definitions. However, most of these multiple interpretations emphasise the use of innovation at different levels, particularly biotechnology, as a means to promote CBE, for example through the use of waste and greenhouse gas, and the production of biobased materials (Mohan et al., 2016). As examined by Kershaw and colleagues (2021), the current discussions on CBE can be organised in two broad groups with different approaches to CBE. One tends to follow a

“delimiting path” which prioritises economic value, where few groups of actors are the decision-makers, thus presenting a narrow range of solutions. The other group tends to follow a “sustainable path”, which offers to deliver social, environmental and economic value, while including a broad and diverse range of stakeholders to identify multiple, ample solutions. The sustainable path underpins the discussions developed in this paper.

3. Innovation and CBE in the Amazon region

Innovation has long been promoted as essential for the sustainability of any business organisation – but this understanding usually refers to the survival and expansion of the business in the long term, considering only the economic dimension of sustainability. Innovating to achieve ‘competitive advantage’ has become a mantra among all types of firms (Tidd & Bessant, 2009; Maynard-Atem, 2018;). Within this landscape, innovation is very often considered the same as technological change in a high-tech context, thus the ‘only best way’ to innovate (Giurca & Befort, 2023). However, this perspective simply ignores the essential social character of innovation, which includes their related capacity of supporting fair and equitable societies (Papaioannou, 2018; Pansera & Fressoli, 2021; Wittmayer et al., 2022). Similarly, innovation has also often been associated with the solutions to the current ecological crisis, while usually been overlooked as part of the problem (Adams et al., 2016; Veiga & Issberner, 2012). Notwithstanding, if innovation will support the transition to a CBE in the Amazon region, it needs to be set in a new context that values the social and environmental dimension of innovation (Motta, Issberner & Prado, 2018). From this perspective, innovation needs to address issues related to its relationship with nature and the division of labour (Giampietro et al., 2011; Giampietro and Ramos-Martin, 2005), as well as societal benefits and inclusive knowledge (Van Lancker et al., 2016). Efforts of multi-stakeholders from all societal levels are required to come together to allow these issues to be addressed from an innovation perspective (Herrfahrdt-P’ahle et al., 2020).

In the Amazon region, this new context seems to have been happening through on-the-ground, alternative bottom-up initiatives with the support of different organisational forms, challenging more mainstream perspectives of innovation (Pansera & Fresoli, 2021). Several examples of these initiatives have been implemented by local communities and indigenous people (Bianchini 2006; Di Giano et al., 2018), as well as small and medium-scale farmers (Futemma, Castro & Brondizio, 2020), especially in agro-forestry systems. This type of system reproduces or keeps the natural structure of the forest and involves the coexistence of crop diversity interactions of soil and plants and ecological services (Brondizio et al., 2020). This innovative production system supports a CBE as an alternative to deforestation, while connecting local communities and small producers to different markets, increasing their income and providing employment (Porro et al., 2012; Nobre & Nobre, 2018). Probably one of the most well-known products of the Amazon region, the açai berry and its production have contributed to the local CBE employing a huge number of people in the different stages of the value chain while ‘keeping

the forest standing'. Several types of associations, grassroots cooperatives and small industries have emerged to support smallholder communities in the process of adding value and accessing markets (Brondizio et al., 2020). However, the growth of this market has increased problems such as the accumulation of residues from the process, usually seeds and fibres after the pulping of the fruit, demanding innovative strategies. A CBE model could potentially address this and other issues to leverage new routes for the recovery of waste, minimising or eliminating environmental impacts and increasing the value of the açaí production chain (Barbosa & Carvalho, 2022).

4. Final remarks and further paper development

The theme for the BAM 2023 conference has invited its members to think “Towards Disruptive Sustainability: New Business Opportunities and Challenges”. Among other issues, the links between sustainability and innovation could be addressed. This developmental paper started a journey into looking at *how innovation can support the transition to a CBE focusing on the Amazon region*, from the perspective that it requires *disruptive ways of thinking about innovation*. This is the beginning of a work in progress which has raised the following questions for a tentative research agenda to the emergent field of CBE:

- How can innovative business initiatives in the Amazon region point towards a more inclusive governance and transformative CBE, with spaces for social actors to connect to firms at multiple levels?
- How can firms manage CBE transitions to build partnerships and collaborations and promote sustainable value chains?
- How can traditional community knowledge be leveraged while using renewable rainforest ingredients and conserving the Amazon tropical rainforest?
- What are the current challenges facing firms transitioning to a CBE in the Amazon region, and how can these challenges be addressed through innovative strategies?
- How can existing CBE initiatives in the Amazon region foster the development of a CBE ecosystem, including innovation and capacity building?

Until the conference in September, the author will have selected a case study and started data collection with a qualitative approach, including document analysis and (potentially) interviews. Feedback will be welcomed in any area of this paper, especially in relation to the next steps.

References

- Brondizio, E. S., Andersson, K., de Castro, F., Fudemma, C., Salk, C., Tengö, M., ... & Siani, S. M. (2021). Making place-based sustainability initiatives visible in the Brazilian Amazon. *Current Opinion in Environmental Sustainability*, 49, 66-78.
- D'Amato, D., Droste, N., Allen, B., Kettunen, M., Lähtinen, K., Korhonen, J., ... & Toppinen, A. (2017). Green, circular, bio economy: A comparative analysis of sustainability avenues. *Journal of cleaner production*, 168, 716-734.
- Denny, D. M. T., Martins, M. M. V., & Burnquist, H. L. (2022). From extractivism and illegalities to a circular bioeconomy in the Amazon region. *Revista Tempo do Mundo*, 27.
- Ellen MacArthur Foundation (EMF), 2015. *Towards a Circular Economy: Business Rationale for an Accelerated Transition*.
- European Commission Research and Innovation Bioeconomy. [Online]. Available. <http://ec.europa.eu/research/bioeconomy/index.cfm?pg=policy> , Accessed date: 20 January 2023.
- Fuchs, V. B. (2020). Chinese-driven frontier expansion in the Amazon: four axes of pressure caused by the growing demand for soy trade. *Civitas-Revista de Ciências Sociais*, 20, 16-31.
- Fund, C. et al. (2018). *Bioeconomy Policy (Part III): Update Report of National Strategies around the World*, German Bioeconomy Council.
- Georgescu-Roegen, N. (1975). Energy and economic myths. *Southern economic journal*, 347-381.
- Georgescu-Roegen, N. (1977). Bioeconomics: a new look at the nature of economic activity. *The political economy of food and energy*, 105-134.
- Gordon, H. S. (1954). The economic theory of a common-property resource: the fishery. *Journal of political economy*, 62(2), 124-142.
- Heron, T., Prado, P., & West, C. (2018). Global value chains and the governance of 'embedded' food commodities: the case of soy. *Global Policy*, 9, 29-37.
- Hetemäki, L., Hanewinkel, M., Muys, B., Ollikainen, M., Palahí, M., Trasobares, A., ... & Potočník, J. (2017). Leading the way to a European circular bioeconomy strategy (Vol. 5, p. 52). Joensuu, Finland: European Forest Institute.
- Inigo, E. A., & Blok, V. (2019). Strengthening the socio-ethical foundations of the circular economy: Lessons from responsible research and innovation. *Journal of cleaner production*, 233, 280-291.
- Kershaw, E. H., Hartley, S., McLeod, C., & Polson, P. (2021). The sustainable path to a circular bioeconomy. *Trends in Biotechnology*, 39(6), 542-545.
- Korhonen, J., Honkasalo, A., & Seppälä, J. (2018). Circular economy: the concept and its limitations. *Ecological economics*, 143, 37-46.
- Lambin, E. F., & Meyfroidt, P. (2011). Global land use change, economic globalization, and the looming land scarcity. *Proceedings of the National Academy of Sciences*, 108(9), 3465-3472.
- Lazarevic, D., & Valve, H. (2017). Narrating expectations for the circular economy: Towards a common and contested European transition. *Energy Research & Social Science*, 31, 60-69.
- Mendes, F. B., & Barros, J. H. T. (2021). Bioenergy and bio-based products from the Brazilian Amazon: social, economic, and environmental aspects. In *Transactions on Engineering Technologies: World Congress on Engineering and Computer Science 2019* (pp. 33-46). Springer Singapore.
- Mohan, S. V., Modestra, J. A., Amulya, K., Butti, S. K., & Velvizhi, G. (2016). A circular bioeconomy with biobased products from CO2 sequestration. *Trends in Biotechnology*, 34(6), 506-519.
- Stegmann, P., Londo, M., & Junginger, M. (2020). The circular bioeconomy: Its elements and role in European bioeconomy clusters. *Resources, Conservation & Recycling: X*, 6, 100029.