# INPLASY PROTOCOL

To cite: Possidónio et al. Exploring supply-side barriers for commercialization of new biopolymer production technologies: A systematic review. Inplasy protocol 202350076. doi: 10.37766/inplasy2023.5.0076

Received: 19 May 2023

Published: 19 May 2023

**Corresponding author:**
**Catarina Possidónio**

**catarina.possidonio@ulusofona.pt**

**Author Affiliation:**
**HEI-Lab: Digital Human-Environment Interaction Lab, Universidade Lusófona.**

**Review Stage at time of this submission:** **Preliminary searches.**

**Conflicts of interest:**
**None declared.**

# Exploring supply-side barriers for commercialization of new biopolymer production technologies: A systematic review

Possidónio, C[1]; Farias, AR[2]; Domingos, S[3]; Cruz, B[4]; Luís, S[5]; Loureiro, A[6].

**Review question / Objective:** **What are the multi-level supply-side barriers to the commercialization of new biopolymer production technologies?**
**Condition being studied:** **Biopolymers are sustainable and environmentally friendly alternatives to traditional petroleum-based polymers, and their use is becoming increasingly important for reducing the negative impact of plastic waste on the environment.**
**Despite the potential benefits of biopolymers, their commercialization might face several supply-side barriers. This systematic review aims the identification and characterization of these barriers. The focus is on understanding the challenges involved in the commercialization of new biopolymer production technologies, which may include technological, economic, regulatory, and social factors that can affect the adoption and use of biopolymers in various industries.**
**The question studied in this systematic review is relevant to a broad range of stakeholders, including researchers, policymakers, and industry professionals involved in the development, production, and commercialization of new biopolymer technologies. By providing a comprehensive synthesis of the existing literature on the multi-level supply-side barriers that can hinder the commercialization of new biopolymer production technologies, this systematic review aims to inform future research, policy, and practice to facilitate the successful implementation of these technologies.**

**INPLASY registration number:** This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 19 May 2023 and was last updated on 19 May 2023 (registration number INPLASY202350076).

## INTRODUCTION

**Review question / Objective:** **What are the multi-level supply-side barriers to the commercialization of new biopolymer production technologies?**

**Rationale:** **The rationale for this systematic review is to identify and characterize the**

multi-level supply-side barriers that can hinder the commercialization of new biopolymer production technologies. This systematic review aims to provide a comprehensive synthesis of the existing literature on the multi-level supply-side barriers on this regard, such as technological barriers, regulatory barriers (including pre-market approval but also related to e.g., environmental protection), financial barriers, supply-stability barriers & other barriers (e.g., a lack of education or available information on rearing/farming techniques). By identifying and characterizing these barriers, this review will help researchers, policymakers, and industry professionals to better understand the challenges involved in developing and commercializing new biopolymer production technologies. The findings of this systematic review will provide evidence-based information for the development of strategies to address these barriers and facilitate the successful implementation of new biopolymer production technologies.

Overall, this systematic review is necessary to advance our understanding of the supply-side barriers to the commercialization of new biopolymer production technologies and to inform future research, policy making, and interventions in this area.

**Condition being studied:** Biopolymers are sustainable and environmentally friendly alternatives to traditional petroleum-based polymers, and their use is becoming increasingly important for reducing the negative impact of plastic waste on the environment.

Despite the potential benefits of biopolymers, their commercialization might face several supply-side barriers. This systematic review aims the identification and characterization of these barriers. The focus is on understanding the challenges involved in the commercialization of new biopolymer production technologies, which may include technological, economic, regulatory, and social factors that can affect the adoption and use of biopolymers in various industries.

The question studied in this systematic review is relevant to a broad range of stakeholders, including researchers, policymakers, and industry professionals involved in the development, production, and commercialization of new biopolymer technologies. By providing a comprehensive synthesis of the existing literature on the multi-level supply-side barriers that can hinder the commercialization of new biopolymer production technologies, this systematic review aims to inform future research, policy, and practice to facilitate the successful implementation of these technologies.

## METHODS

**Search strategy:** Terms: Supply-side, Supply-chain, Supply, Stakeholder*, Shareholder*, Producer*, Manufacter*, Industry Biopolymer*, Bioplastic*, Biobased polymer*, Biodegradable polymer*, Sustainable polymer*, Renewable polymer*, Green polymer*, Biomaterial*, Bioproduct*, Bio-based material*, Biodegradable material*, Sustainable material*, Green material*, Commerciali* Market, Entry, Market penetration, Industry, Business, Barrier*, Obstacle*, Challenge*, Difficult*, Problem*, Impediment*, Limitation*, Constraint* Electronic databases: Web of Science, SCOPUS, SciELO, PubMed, Google Scholar, IEEE Xplore Additionally, industry reports and publications from organizations: Biotechnology Innovation Organization (BIO), European Bioplastics, and the United Nations Industrial Development Organization (UNIDO).

**Participant or population:** Researchers, policymakers, industry professionals and any stakeholders involved in the development and commercialization of biopolymer production technologies. No restrictions will be introduced concerning the studies samples/participants individual/group characteristics.

**Intervention:** Studies will include questionnaires, interviews and data in which the samples/participants were asked about the main barriers to the

commercialization of (new) biopolymer production technologies.

**Comparator:** There is no specific comparison group for this question.

**Study designs to be included:** There will be no restrictions on the types of studies to be included.

**Eligibility criteria:** Only publications between 2010-2023 will be considered in this systematic review.

**Information sources:** Electronic databases, industry reports.

**Main outcome(s):** By identifying and characterizing the multi-level supply-side barriers for commercialization of new biopolymer production technologies, this systematic review will help inform the development of strategies to address these barriers and facilitate the successful implementation of new biopolymer production technologies. Qualitative and quantitative insights on supply-side barriers to the commercialization of new biopolymer production technologies, and on recommendations for best practice, and lessons learned to overcome such barriers.

**Data management:** Title and abstract screening

1. First, three independent reviewers will apply an initial set of criteria to 10% of articles obtained from the database search, for training and definition of screening criteria. This screening will focus at title and abstract level. Similar to the search string, the initial set of criteria will reflect each of the PICO elements previously defined. Cohens kappa will be used as a measure of interrater agreement.
2. After this, the defined criteria will be applied to another 10% of randomly selected articles, followed by Cohens kappa interrater agreement.
3. After this training and criteria refining process, the remaining papers will be screened by the three team members at title and abstract level.
4. Lasty, two team members will screen the selected articles at full text level and perform the critical appraisal. At each stage, inconsistencies will be solved through discussion between the members. Any discrepancies between the reviewers will be resolved through discussion and consensus, and a third reviewer will be consulted if necessary.

Full text screening

First, three independent reviewers will apply an initial set of criteria to 10% of articles obtained from the database search, for training and definition of screening criteria. This screening will focus at title and abstract level. Similar to the search string, the initial set of criteria will reflect each of the PICO elements previously defined. Cohens kappa will be used as a measure of interrater agreement. After this, the defined criteria will be applied to another 10% of randomly selected articles, followed by Cohens kappa interrater agreement. After this training and criteria refining process, the remaining papers will be screened by the three team members at title and abstract level. Lasty, both team members will screen the selected articles at full text level. At each stage, inconsistencies will be solved through discussion between the members. Any discrepancies between the reviewers will be resolved through discussion and consensus, and a fourth reviewer will be consulted if necessary.

**Quality assessment / Risk of bias analysis:** We will perform a critical appraisal regarding both internal as well as external validity of studies. We will assess internal validity by examining sample size, methodological rigor, and suitability of data and statistics reported. We will assess external validity by examining the type of samples studied in each study, as well as how far the studies reflect actual supply-side barriers to commercializing new biopolymer products. Critical appraisal will be first performed by two team members on a subset of randomly selected studies (10%). This will serve for training and refining the initial set of critical appraisal criteria. After this, two raters will critically appraise the remaining studies. Then, 50% will be randomly selected and coded by both raters to assess interrater agreement.

The CADIMA free web tool for systematic reviews (https://www.cadima.info/) will be used for this process. We will perform a critical appraisal regarding both internal as well as external validity of studies. We will assess internal validity by examining sample size, methodological rigor, and suitability of data and statistics reported. We will assess external validity by examining the type of samples studied in each study, as well as how far the studies reflect actual supply-side barriers to commercializing new biopolymer products. Critical appraisal will be first performed by three team members on a subset of randomly selected studies. This will serve for training and refining the initial set of critical appraisal criteria. After this, the three raters will critically appraise the remaining studies. From these 25%, will be randomly selected and coded by the three raters to assess interrater agreement.

**Strategy of data synthesis:** Papers content will be coded by three team members. This will follow a PICO (like) structure and include quantitative and qualitative information on topics such as sample, country, business area, identified barriers, recommendations to overcome barriers. The results will be reported following the PRISMA checklist (Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097; http://prisma-statement.org/).

**Subgroup analysis:** n/a.

**Sensitivity analysis:** n/a.

**Language restriction:** English.

**Country(ies) involved:** Portugal.

**Keywords:** supply-side, barriers, commercialization, biopolymers.

**Contributions of each author:**

Author 1 - Catarina Possidónio.
Email: catarina.possidonio@ulosofona.pt
Author 2 - Ana Rita Farias.
Email: ana.rita.farias@ulusofona.pt
Author 3 - Samuel Domingos.
Email: samuel.domingos@ulusofona.pt
Author 4 - Bernardo Cruz.
Email: a221057812@alunos.ulht.pt
Author 5 - Sílvia Luís.
Email: silvia.luis@ulusofona.pt
Author 6 - Ana Loureiro.
Email: ana.loureiro@ulusofona.pt

**Support:** Project BioLaMer, HORIZON-EIC-2022-PATHFINDEROPEN-01, Grant ID 101099487; https://cordis.europa.eu/project/id/101099487 Foundation for Science and Technology – FCT (Portuguese Ministry of Science, Technology and Higher Education), under the grant UIDB/05380/2020.