



# Sustainable Development and Health: The Regulation of Nanomaterials in Brazil

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## Abstract

This article aims to correlate nanoelement technologies and legal regulation in the use and disposal of such materials. With the purpose of supporting a critical reflection on the economic development model, added by the arguments derived from the area of Research, Development and Innovation (PD&I), the precautionary principle is a beacon of corporate management and sustainability instruments for the protection of the environment and human health. Through the qualitative approach, bibliographic procedures were adopted, with a survey of theoretical references published by electronic and documentary forms. As a result, the persistent lack of regulation was found, emphasizing the need for business management tools, which are being carried out through standard technical standards, in the guise of no regulations. Opening legal and technical loopholes for improper application of nanomaterials that may have harmful impact on human health or the environment.

**Keywords:** Economic Development; Environment; Nanotechnology; Precautionary Principle; Regulation

**Abbreviations:** OECD: Organization for Economic Cooperation and Development; UNEP: United Nations Environment Program; ILO: International Labour Organization; EPA: Environmental Protection Agency; FET: Future and Emerging Technology; BSI: British Standards Institution.

## Introduction

Socially sustainable development was initially anchored to the social, economic and environmental tripod. Sustainability refers to the guarantee of survival of the Earth's natural resources, in which strategies are implemented that enable ecological development solutions.

This abstract aims to relate the development of new materials formatted in a nanoscale, and its regulation (un) regulation in the Brazilian legal system. Therefore, we used the bibliographic and documentary research methodology in order to verify the legal framework of nanotechnology

products in the Brazilian legal system, resulting in the persistent absence of regulation, emphasizing the need for business management tools through standardizing technical standards.

## Economic Development and the Expansion of Technology: The Precautionary Principle and Nanomaterials

Globalized economic development was provided by the technological development of industrialized countries, based on massive investments in research [1]. According to Mihail RC, et al. [2], from 1999, the U.S. led the research and development initiative through Research & Development & Innovation (PD&I) programs.

This resulted in the development of more advanced nanomaterial production techniques and can be used in a myriad of high technology products, with physical and chemical properties of a unique nature when compared to

conventional materials other countries have also started to promote government projects and programs [3].

The initial expectation in relation to these numerous materials is due, initially, to the need to replace the human labor in tasks that the acuity and dexterity of the human being does not reach. The nanoscale, according to the British Standards Institution (BSI), such materials must be sized below 100 nanometers for classification as nano.

And its importance is established in the potentiality and variability of applications that transit, from the energy area to information technology, and human health [2]. It is the result of the observation of the alterations of physical, chemical and electrical property of particles that are around one hundred nanometers. With the deepening of research, it has been shown that nanomaterials tend to have better performance in numerous applications, compared to conventional materials, or play, and/or have unique properties, that no conventional material could have.

They have applications in almost all economic sectors primary, secondary, tertiary and quaternary. Its diffusion among sectors, in the production and commercialization of agricultural, human and industrial remediation, is a worldwide concern due to human and environmental exposure to such materials. Because precisely because of its greatest characteristic, it also reveals to be the greatest concern, which is the size of the particles, since they are elements outside of any human perception, and they can be inhaled, ingested, or even absorbed by the skin, which can trigger a series of diseases or effects still unknown to health [4].

At this point, the best known material and proven mortality stand out: asbestos Chenut KM, et al. [5]. Depending on the size of the inhaled particulate, this material is deposited in the human respiratory system, generating chronic inflammations in the tissue and fibrosis.

A new nanomaterial that has also aroused concern is graphene. As a relatively new nanomaterial, it comes from chemical synthesis the physical u, from graphite or by chemical vapor deposition from graphite. Looking at the ongoing studies on safety for its use, the Graphene Flagship Project ([www.graphene-flagship.eu](http://www.graphene-flagship.eu)) project of the European Commission Future and Emerging Technology (FET), launched in 2013 for a period of 10 years, whose objective is to evaluate safety in the environment and human health, with no results on its effects are known [6].

It is a nanomaterial manufactured, still on a small scale, without conclusive knowledge about its effects on human health, and with little efforts to regulate, classify and

standardize. The concern would be the systematic inhalation of graphene nanoparticles, which could occur in the thesis with the workers of these industries, or with people who did the recycling of the material.

Niobium is also being used in various products for tooth whitening, cosmetics, seed protection for agriculture, fungicide that fights Asian rust. All made with niobium nanoparticles. Tests should be carried out to assess the effects on humans in the ingestion, inhalation or other means of contagion of these nanoparticles, even in small amounts.

Thus, it is imperative that the tests advance, and that the manufacture and marketing of these nanomaterials are better analyzed. New technologies must be the subject of exhaustive research and testing to reduce uncertainty as to their safety, both for humans and the environment, before they are put into circulation.

### The Regulation of Nanomaterials and Sustainable Development

In this context, the safety and restrictions on the use of any product that uses nanoparticles comes from research on this type of product, to be carried out by certified producers or outsourced companies, and at the end, are and verified through various agencies that regulate the sector, and that will ensure minimum safety to the population.

In the field of regulation, the Federal Constitution of Brazil of 1988 establishes in article 225 [7], items II, IV and V § 1, the environment raised the status of fundamental law. Having been maintained as the attribution of the State the supervision and control of biosecurity areas and the like.

The National Environment Policy Act, Law No. 6,938 of August 31, 1981, gave the State the duty to regulate the management of these materials, requiring environmental licensing to protect and compensate the environment and its workers from harmful actions still unknown by science. In this sense, Dallari SG, et al. [8], affirm:

[...] In a context of scientific uncertainties and the risk of serious and irreversible damage, it induces the formation of the precautionary principle. It is also clear that this principle aims to contain innovation by reorienting unlimited scientific progress and revaluing the search for those who are genuinely responsible for reckless behavior.

As can be seen, the constitutional link between the development and safety of any activity that produces environmental and/or human impact, such as nanotechnology, is situated in the principle of human dignity, inclusions in art.1 and 170 of CF/88 [9]. It should be noted that the economic order is based on sustainable and socially

responsible economic policies.

Since 2010, the International Labour Organization (ILO) has been issuing warning reports that indicate the risks arising from the work environment due to the production processes of new technologies. The Environmental Protection Agency (EPA), the U.S. agency, and the European Parliament [10], maintain a mapping of the destination of these materials and which are also used by the final consumer.

Included in this list are cosmetics, food packaging (which can be food contaminants by simple contact, (e.g., the well-known “plastic pots” that go to refrigerator on a day-to-day basis), etc. And are used daily worldwide, with little or no control as to production, supply and disposal.

In the wake of sustainable economic development, the United Nations Environment Program (UNEP) has developed from 2008 the definition of the green economy as “and economy of human well-being and social equity, while significantly reducing environmental risks and ecological scarcity” (UNEP, p. 16) [11].

This definition translates into the initial framework of transition to an ecological economy, which proposed new regulatory frameworks aligned with the change in consumption. It became necessary to implement the Green Growth Strategy, opting for the terms of the proposal of the Organization for Economic Cooperation and Development (OECD) [12].

## Conclusion

From 2020, a new definition of sustainability was proposed as this:[...] meeting the interdependent needs of living beings, while increasing the capacity of future generations of all species to meet their own needs [...], and the title ‘multispecies sustainability’ [13].

And it designates the interdependence of living beings, increasing multispecies ethnography and cybernetic perceptions, that is, sustainability is meeting the interdependent needs of living beings, while increasing the capacity of future generations of all species to meet their own needs and they are potentially applicable to allow human-wildlife coexistence, and to rethink the structure of urban and rural green space, and in public health perceptions.

The point highlighted is not to curb the PD & I, or even demonize nanomaterials but to emphasize the need to establish minimum criteria and regulation for the production and use of these materials, so that they comply with the positive purpose of development the law regulating such materials. The Nano technological Act has been paralyzed in

the Brazilian’s congress since 2015, awaiting regulation.

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