ENVIRONMENTAL SCIENCES: INSIGHT AND INFLUENCE ON SUSTAINABLE DEVELOPMENT GOALS WITHIN THE 2030 AGENDA

CIÊNCIAS AMBIENTAIS: PERCEPÇÕES E INFLUÊNCIA NOS OBJETIVOS DE DESENVOLVIMENTO SUSTENTÁVEL DENTRO DA AGENDA 2030

João Vitor Barbosa Calvelli[1], Thaina Menegheti Nehme[1], Gabriela Ezequiel Costa Martins[1], Arthur Arnoni Occhiutto[1], Jamile Maria Figueiredo Furtado Bastos Calvelli[1], Vinicius Venturini Ferreira[1], Anelise Vieira Rosa Fernandes da Silva[1], Nicole de Andrade Guedes Ribeiro[1], Antonio Rodrigues da Cunha Neto[1], Breno Régis Santos[1], Geraldo Alves da Silva[2], Sandro Barbosa[1*]

Universidade Federal de Alfenas, Instituto de Ciências da Natureza[1]. Universidade Federal de Alfenas, Faculdade de Ciências Farmacêuticas. Alfenas/Minas Gerais[2].
sandro.barbosa@unifal-mg.edu.br

ABSTRACT

Environmental sciences play a central role in a wide array of fronts, encompassing research and innovation in areas that include natural resource management, environmental impact assessment, biodiversity conservation, adoption of precision agriculture practices, effective agricultural waste management, and adaptation to climate change. Furthermore, these areas are pivotal in promoting environmental education, aiming to disseminate sustainable practices effectively. Given the collaboration among different experts, environmental sciences, due to their interdisciplinary nature, take a leading role in mitigating adverse environmental impacts caused by human activities, becoming essential for the achievement of the Sustainable Development Goals (SDGs).

KEYWORDS: Sustainable Development, Climate Change Mitigation, Global Cooperation

RESUMO

As ciências ambientais desempenham um papel central em diversas frentes, abrangendo pesquisa e inovação em áreas que incluem gestão de recursos naturais, avaliação de impacto ambiental, conservação da biodiversidade, adoção de práticas de agricultura de precisão, gestão eficaz de resíduos agrícolas e adaptação às mudanças climáticas. Além disso, essas áreas são cruciais para promover a educação ambiental, visando disseminar práticas sustentáveis de forma eficaz. Devido à colaboração entre diferentes especialistas e à sua natureza interdisciplinar, as ciências ambientais desempenham um papel de destaque na mitigação dos impactos ambientais adversos causados pelas atividades humanas, tornando-se essenciais para alcançar os Objetivos de Desenvolvimento Sustentável (ODS).

PALAVRAS-CHAVE: Desenvolvimento Sustentável, Mitigação das Mudanças Climáticas, Cooperação Global

INTRODUCTION

There is an urgent priority for the concern about sustainability and global equity in recent decades as the environmental and social challenges are evidently increasing. In this context, the United Nations 2030 Agenda created a guideline, outlining a roadmap for actions aiming at various spheres of the environmental and social challenges that ahead of us in the next decades. That agenda (Transforming Our World: The 2030 Agenda for Sustainable Development), establishes a set of 17 Sustainable Development Goals (SDGs) to be achieved by the year 2030[1]. Each of these SDGs addresses critical issues, including the eradication of poverty, environmental protection, promotion of gender equality, and combating climate change.

The 2030 Agenda also established a comprehensive plan to achieve sustainable development goals, and environmental sciences play a crucial role in promoting these objectives[2]. Emphasizing the need to address environmental challenges such as climate change, pollution, and biodiversity loss while still promoting economic growth, social inclusion, and human well-being. In that context, environmental sciences and technologies are essential tools to achieve these goals, providing knowledge, methods, and innovations to understand, monitor, and manage natural systems and human activities.

Given the present deep threats of climate change for the environment, the SDGs are crucial to ensuring that the future is not compromised[3]. By promoting a responsible production system, sustainable infrastructure, and ecosystem conservation, we can create a healthier world that meets the needs of present and future generations[4]. Through education and awareness about the SDGs, current perspectives can be shifted[5]. Thus, environmental sciences are also crucial to ensuring a sustainable future, addressing issues related to water and sanitation[6]. By utilizing innovative technologies, we could ensure that everyone has access to clean water and proper sanitation, promoting public health and well-being.

However, to make these goals achievable, it is essential to ensure investment in infrastructure and monitoring to guarantee quality[5].

In this sense, this work aims to explore the role of environmental sciences in the implementation of the 2030 Agenda. By examining these interconnections, it seeks to provide insights for researchers, policymakers, academics, and all those involved in the pursuit of SDG implementation and global sustainability. As science and technology continue to evolve, it is imperative that we are aware of their vital role in achieving the SDGs of the 2030 Agenda.

METHODOLOGY

Building upon the construction of Table 1, results from the collaboration among professionals from diverse fields, including biology, geography, sociology, biotechnology, agronomy, pharmaceutical sciences and environmental sciences, this study explored the interconnections between environmental sciences and the Sustainable Development Goals (SDGs), highlighting key targets that are intrinsically related to those multidisciplinary field. Once identified, these focal areas are crucial for addressing specific challenges.

While direct connections between specific professions and the SDGs exists, it is important to emphasize that the authors do not intend to make the implementation of the SDGs a closed and exclusive domain of a particular knowledge areas. On the contrary, the effective achievement of the SDGs requires an interdisciplinary approach, with a crucial need for communication and collaboration across various fields and specialties. By those presented aspects it is reliable to say that the issues addressed by the SDGs are complex and interconnected, involving a wide range of professionals, from environmental scientists, agronomists, and engineers to economists, policymakers, educators, healthcare professionals, and many other sectors of general industry. Interaction and synergy among these diverse areas are essential to meet the challenges and

goals set by the SDGs, thus promoting a truly comprehensive and effective sustainable development.

Table 1. Presentation of the SDGs (Sustainable Development Goals), their objectives, and their relationship with areas of study.

	SDG	RELATED AREAS OF STUDY	GOAL
1	Eradication of Poverty	Economics, Political Science, and Social Development.	End poverty in all its forms everywhere
2	Zero Hunger and Sustainable Agriculture	Environmental Sciences, Biology, Agronomy, and Agriculture	End hunger, achieve food security and improved nutrition and promote sustainable agriculture
3	Health and Well-being	Medicine, Nursing, Public Health, Health Sciences, and Epidemiology.	Ensure healthy lives and promote well-being for all at all ages
4	Quality Education	Education, Pedagogy, Educational Psychology, and Educational Sciences.	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
5	Gender Equality	Gender Studies, Sociology, Law, and Gender Psychology.	Achieve gender equality and empower all women and girls
6	Clean Water and Sanitation	Environmental Engineering, Environmental Sciences, Hydrology, and Water Resources Management.	Ensure availability and sustainable management of water and sanitation for all
7	Affordable and Clean Energy	Energy Engineering, Environmental Sciences, Physics, and Energy Technology.	Ensure access to affordable, reliable, sustainable and modern energy for all
8	Decent Work and Economic Growth	Economics, Management, Human Resources, and Social Sciences.	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
9	Industry, Innovation, and Infrastructure	Engineering, Information Technology, Innovation Management, and Computer Science.	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
10	Reduced Inequalities	Economics, Sociology, Inequality Studies, and Social Policy.	Reduce inequality within and among countries
11	Sustainable Cities and Communities	Urban Planning, Architecture, Civil Engineering, Urban Development Studies, and Environmental Sciences.	Make cities and human settlements inclusive, safe, resilient and sustainable
12	Responsible Consumption and Production	Environmental Sciences, Ecological Economics, Sustainable Design, and Systems Engineering.	Ensure sustainable consumption and production patterns
13	Climate Action	Climate Sciences, Meteorology, Environmental Engineering, Energy, and Environmental Sciences.	Take urgent action to combat climate change and its impacts
14	Life Below Water	Marine Biology, Oceanography, Marine Ecology, and Environmental Sciences.	Conserve and sustainably use the oceans, seas and marine resources for sustainable development
15	Life on Land	Conservation Biology, Terrestrial Ecology, Forestry, Zoology, and Environmental Sciences.	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
16	Peace, Justice, and Strong Institutions	Law, Political Science, Criminology, and International Relations.	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
17	Partnerships for	International Relations, Diplomacy,	Strengthen the means of implementation and

	the Goals	Project Management, and International Economics.	revitalize the Global Partnership for Sustainable Development

RESULTS AND DISCUSSION

From Table 1, we identified 8 Sustainable Development Goals (SDGs) that strongly interconnect with environmental sciences. These SDGs are: SDG 2 (Zero Hunger and Sustainable Agriculture), SDG 6 (Clean Water and Sanitation), SDG 7 (Affordable and Clean Energy), SDG 11 (Sustainable Cities and Communities), SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), SDG 14 (Life Below Water), and SDG 15 (Life on Land).

It is noteworthy that SDG 17 (Partnerships for the Goals) has an interdisciplinary nature, involving areas such as International Relations, International Economics, Project Management, and Diplomacy, with the purpose of promoting global cooperation. This global cooperation is crucial for addressing specific environmental challenges tackled by environmental sciences, such as collaborating in combating climate change, sharing knowledge and technology, sustainable management of natural resources, responding to natural disasters, biodiversity conservation, development of environmental policies and international agreements, as well as fostering sustainable development and environmental preservation.

In the face of current global challenges, including climate change, the need for access to clean energy, and ensuring adequate clean water and sanitation, it is evident that the pursuit of innovative solutions requires the application of environmental sciences and their respective technologies[1]. These disciplines play an essential role in promoting sustainable development, mitigating negative environmental impacts, and building a more equitable and resilient future according to SDGs goals.

MAIN FOCUS AREAS FOR ENVIRONMENTAL SCIENCES AND TECHNOLOGIES

For SDG 2, "Zero Hunger and Sustainable Agriculture," which aims to eradicate hunger, ensure food security, and promote sustainable agricultural practices, Environmental Sciences provide knowledge, methodologies and technical innovations for the sustainable management of natural resources such as soil and water. This includes the promotion of precision agriculture, biodiversity conservation, proper management of agricultural waste, development of agricultural bio-defensives, and adaptation to climate change, thus contributing to sustainable food production and global hunger mitigation.

SDG 7, titled "Affordable and Clean Energy," sets the goal of ensuring universal access to sustainable, reliable, and affordable energy sources by 2030[7]. Beyond its intrinsic importance, this goal plays a key role in achieving other sustainable development objectives, as its fulfillment is crucial for advancing towards targets related to clean water, life below water, life on land, and climate action[3]. Therefore, investing in clean energy and addressing climate change are significant contributions from environmental sciences to achieving the goals of the 2030 Agenda[4].

Conservation and restoration of natural ecosystems are critical areas of focus for environmental sciences in general and are aligned with SDG 15, titled "Life on Land," which aims to protect, restore, and promote the sustainable use of terrestrial ecosystems. The area addresses issues such as combating desertification, sustainable forest management, and preventing biodiversity loss. Achieving these goals is crucial for the overall health of both humanity and the planet. Environmental sciences provide the knowledge and practices needed to protect biodiversity, sustainably manage forests, and restore degraded ecosystems, thus contributing to the health of the planet and human communities.

The goal of SDG 6 titled "Clean Water and Sanitation," is closely related to issues such as water and sanitation management and as outlined in this goal establishes the target of ensuring, by 2030, the availability and sustainable management of water and sanitation for all, recognizing access to clean water and sanitation as a fundamental human right[5]. Environmental sciences significantly

contribute by developing and implementing sustainable water management practices, improving water treatment technologies, and promoting responsible water use and conservation of water resources[4]. Additionally, raising awareness among the public about environmental issues and analyzing current environmental challenges are crucial. Using the advances of information technology, precision agriculture, water usage monitoring, and bioremediation, environmental sciences can be greatly useful for finding solutions to those emerging problems and for environmental education.

STRATEGIES TO ACHIEVE THE SDGS THROUGH ENVIRONMENTAL SCIENCES AND TECHNOLOGIES

One of the key strategies to attain sustainable development goals through Environmental Sciences is to promote responsible production and consumption[1]. This involves waste reduction, enhanced resource efficiency, and the adoption of sustainable consumption patterns. Implementing sustainable production and consumption practices can mitigate the environmental impact of economic activities and foster long-term sustainability. Innovative technologies, such as recycling and renewable energy, can be employed to minimize waste and greenhouse gas emissions.

Another relevant strategy for achieving the sustainable development goals planned is the sustainable development of infrastructure. Infrastructure construction should be guided by sustainability principles, considering aspects of social inclusion and economic viability. This includes the use of renewable energy, sustainable transportation systems, and the preservation of natural ecosystems. Investing in sustainable infrastructure can drive economic growth, reduce poverty, and protect the environment[4].

Contributing to the attainment of these goals involves analyzing and addressing current environmental issues[8] and understanding the current environmental situation by managing human impact on the environment[9]. Public awareness of environmental issues can be promoted through information

technology, while precision agriculture and water usage monitoring can also contribute to achieving these goals. Bioremediation proves effective and economical in treating wastewater, and Geographic Information System (GIS) technology can be used to monitor and detect sources of pollution and areas that has been more damaged by anthropic activity. Technological advances resulting from applied research in Environmental Sciences can significantly contribute to achieving these goals[10]. Research in engines, fuel efficiency, and clean energy has contributed to reducing carbon emissions and other pollutants in the atmosphere, while computational technology has enabled extensive data collection and analysis[9].

Building partnerships for sustainable development, as promoted by SDG 17 of the 2030 Agenda, plays a crucial role in achieving these goals[1]. This approach involves collaboration between governments, civil society, the private sector, and other stakeholders to address common challenges, achieve shared objectives, and promote sustainable development. By working together, we can leverage resources and skills from different sectors to foster innovation, share knowledge and expertise, mobilize financial resources to support sustainable development initiatives, and address environmental challenges in a coordinated and effective manner[2,3,5].

Thus, Environmental Sciences play a fundamental role in promoting the SDGs established in the United Nations' 2030 Agenda. Analyzing the interactions between Environmental Sciences and the SDGs reveals that various goals and objectives of this global agenda are intrinsically linked to research, innovation, and practices developed in the field of Environmental Sciences.

FINAL CONSIDERATIONS

It is important to note that, although the Sustainable Development Goals (SDGs) mentioned in the context of Environmental Sciences have direct and evident connections with this discipline, other SDGs of the 2030 Agenda may also

have equally important and specific connections with the study areas and practices of Environmental Sciences. Each SDG addresses unique aspects related to sustainable development, and Environmental Sciences play a comprehensive role in contributing to a wide range of goals, not limited to those mentioned earlier. Therefore, it is crucial to recognize that Environmental Sciences have tools and resources to address challenges in various sectors, offering solutions that promote sustainability throughout the 2030 Agenda, whether directly or indirectly.

Environmental Sciences also play a multifaceted and interdisciplinary role in promoting the SDGs, contributing to the pursuit of sustainable solutions that address the most pressing environmental challenges of our time. Through research, technology, and collaboration, Environmental Sciences are a key element in realizing the vision of the 2030 Agenda for a more sustainable, equitable, and resilient world.

ACKNOWLEDGMENTS

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