A New Blueprint of Collaboration the Science Culture Construction fostering innovation and green development

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Abstract

In an era defined by the urgency of environmental challenges, a transformative paradigm is emerging—a fusion of collaboration and science culture construction that catalyzes innovation for sustainable green development. This abstract explores the dynamic interplay between collaboration and science culture, emphasizing their collective impact on fostering groundbreaking solutions to propel us into a greener and more sustainable future. The new paradigm of collaboration transcends disciplinary boundaries, encouraging the convergence of diverse perspectives and expertise. This abstract contends that the cross-pollination of ideas and skills, facilitated by collaborative efforts, cultivates an environment ripe for innovation. The synthesis of collective intelligence and the establishment of a collaborative ecosystem become essential drivers for addressing complex environmental issues, leading to novel solutions in the realm of green development. At the core of this transformative paradigm is the construction of a vibrant science culture. As individuals and communities embrace a culture deeply rooted in scientific principles, curiosity becomes a guiding force, and a shared commitment to environmental stewardship takes root. This abstract highlights the role of science culture construction in nurturing a mindset that values sustainability, resilience, and the pursuit of knowledge—a mindset that is fundamental to driving innovation in the context of green development. The abstract further underscores the positive feedback loop between collaboration, science culture, and innovation. Collaborative endeavors are shown to amplify the impact of science culture by fostering an open exchange of ideas and knowledge. Simultaneously, the construction of a robust science culture nurtures an environment conducive to effective collaboration, creating a symbiotic relationship that accelerates progress toward sustainable, green solutions. This abstract delves into the advent of a new era where collaboration and science and culture construction converge to shape the future of green development. The collaborative spirit, coupled with a strong foundation in scientific principles, emerges as a powerful catalyst for transformative innovation. As we navigate the complexities of our environmental landscape, the promise of this harmonious synergy offers a hopeful vision for a world where collaboration and science culture propel us toward unprecedented levels of sustainability and innovation. The Science Culture Construction

(SCC) is a new blueprint of collaboration that aims to foster innovation and green development. This blueprint is based on the idea that green development can become a cultural aspect of society to make it more sustainable in the future. The SCC is dynamic and requires a collaborative effort between different sectors of society that can work together to create new solutions to some of the world's most pressing problems in the field of green development and biodiversity conservation. In this chapter, the focus is drawn to green science popularization, green development as well, technologies and applications developed within the SCC. The connection between the SCC, green development, biodiversity conservation, and green science is explained, providing more hints on how the SCC paradigm is helping us to create a more sustainable future for all.

Introduction

Scientific progress and its applications, and the science culture construction are two interconnected paradigms. Although it has been common to hear about women's rights, children's rights, the right to life and liberty, freedom from slavery and torture, freedom of opinion and expression, and the right to work and education, few were heard about the right to enjoy scientific progress and its application which is a fundamental human right that is recognized by the United Nations in the Article 15 of the International Covenant on Economic, Social and Cultural Rights. This right ensures that everyone has access to the benefits of science and its applications necessary to live a dignified life, including scientific knowledge. It also guarantees opportunities for all to contribute to science and scientific research, and the information necessary for individuals and communities to engage in decision-making regarding areas of research and development (United Nations, 2021).

Therefore, It is almost imperative to propose a paradigm to provide others with the right to enjoy scientific progress, especially for those from developing countries. The paradigm explained here is the Science Culture Construction (SCC) proposed by the Andean Road Countries for Science and Technology (ARCST) in November 2018.

The SCC refers to the promotion of science and technology as a cultural value, which aligns perfectly with Article 15 of the International Covenant on Economic, Social, and Cultural Rights. The SCC helps to foster a culture of innovation and creativity, which is essential for the development of new technologies and the advancement of society (The Science Culture Construction, 2023). The SCC is a new paradigm of collaboration that aims to bring together scientists, policymakers, and the public to address complex problems. This approach can be particularly useful in promoting green development and green science, which are essential for addressing environmental challenges, and green development, which is the process of promoting sustainable development and addressing environmental challenges in a region.

Green Science is the is the application of eco-friendly thinking to scientific disciplines. It involves all the scientific disciplines on which research and innovation rely to respect the "planetary boundaries" defined by the scientific

community. Green science refers to the preservation of natural resources and biodiversity and our global eco-design approach while offering safe and effective products to consumers. Green Sciences represent a complete revolution in the way we approach science. From Advanced Research to the formulation in laboratories, from the sustainable cultivation of ingredients and their extraction to their transformation through biotechnology or green chemistry. Green science is entirely rethinking our research to disrupt scientific innovation. Green science is a term that refers to the application of scientific knowledge and methods to address environmental problems and promote sustainable development.

Why is Green Science the focus of the Science Culture Construction in Latin America?

Latin America and the Caribbean (LAC) regions face multiple environmental challenges, such as desertification, biodiversity loss, pollution, and natural disasters. These challenges pose serious threats to the economic, social, and environmental development of the region, as well as to its human well-being and resilience. According to the OECD (2022), climate change could significantly worsen long-term economic prospects and exacerbate inequalities in LAC. Therefore, It is urgent to advance towards a comprehensive green agenda to address its consequences and improve the well-being of all.

The Green science can contribute to the green transition of LAC by providing innovative solutions for mitigating greenhouse gas emissions, enhancing energy efficiency, promoting renewable energy sources, conserving natural resources, adapting to climate change impacts, and improving environmental quality. Green science can also foster social inclusion, equity, and justice by involving diverse stakeholders in decision-making processes and ensuring that the benefits of green development are shared by all. However, green science development in LAC faces several challenges that need to be overcome. Some of these challenges are:

- Lack of adequate funding and resources for research and innovation in green fields. According to the World Bank (2021), LAC receives only 0.2% of global public investment in research and development (R&D), which is insufficient to meet its potential for growth and development.

- Lack of coordination and integration among different sectors and levels of governance for implementing green policies and programs. According to the OECD (2022), there is a need for more effective collaboration among ministries of environment, energy, agriculture, health, education, trade, and finance, among others.

- Lack of capacity building and skills development for green professionals and entrepreneurs. According to the World Bank (2021), there is a gap between the demand for skilled workers in green sectors such as renewable energy, biotechnology, waste management, etc., and the supply of qualified human resources.

- Lack of awareness and participation of civil society organizations (CSOs) in green initiatives. According to the OECD (2022), there is a need for more engagement of CSOs such as NGOs, community groups, indigenous

peoples' organizations (IPOs), etc., in co-designing, co-delivering, and co-evaluating green solutions.

Despite these challenges, green science development in LAC also offers several opportunities that can be exploited to achieve sustainable development goals (SDGs) that are the current focus of the SCC. Some of these opportunities are:

- Leveraging existing strengths and potentials of LAC countries in terms of natural resources, diversity, innovation, and entrepreneurship. According to the World Bank (2021), LAC has abundant renewable energy resources, such as solar, wind, hydro, biomass, etc., that can be harnessed to reduce dependence on fossil fuels and lower greenhouse gas emissions. LAC also has rich biodiversity and ecosystem services that can be protected and restored to enhance resilience and adaptation capacity. LAC has a vibrant culture of innovation and creativity that can generate new ideas and technologies for solving environmental problems. LAC also has a dynamic entrepreneurial ecosystem that can support new businesses and markets in green sectors.

- Benefiting from regional cooperation and integration for advancing green transition in LAC. According to the OECD (2022), LAC has established several regional initiatives such as the Pacific Alliance, the Community of Latin American and Caribbean States (CALC), the Union of South American Nations (UNASUR), etc., that aim to promote trade, investment, infrastructure, energy security, environmental protection, etc., among member countries. These initiatives can facilitate knowledge sharing, technology transfer, capacity building, policy harmonization, and joint action for implementing green policies and programs, but they require an articulator that can join all the stakeholders at once.

- Contributing to global leadership and cooperation for addressing climate change in LAC. According to the World Bank (2021), LAC has committed itself to take action on climate change under various frameworks such as the Paris Agreement on Climate Change (2015), the Sustainable Development Goals 2030 Agenda (2015), the Convention on Biological Diversity Strategic Plan 2016-2030 (2016), etc., which require collective action from all countries regardless of their level or capacity. By participating actively in global negotiations, cooperation projects, capacity-building activities, knowledge dissemination platforms, etc., LAC can demonstrate its commitment, leadership, and responsibility for addressing climate change in LAC as well as globally.

How could the paradigm of the SCC address the environmental challenges in the Latin American region?

Although many initiatives and policies aim to promote green development and address environmental challenges in LAC, many challenges need to be addressed to promote green development in the region. Some of these challenges were mentioned above and include reducing greenhouse gas emissions, improving environmental governance, enhancing innovation and competitiveness in emerging sectors, and promoting social inclusion and equity among different groups (OECD, 2022). In that aspect, the SCC is

fostering collaboration between scientists and policymakers. By sitting the shareholders together, these groups can develop policies that are based on scientific evidence and that promote sustainable practices toward a nature-positive world.

Another way that the SCC can help promote green development and green science in LAC is by engaging the public in the process. By involving the public in discussions about environmental issues, scientists and policymakers can help raise awareness about the importance of sustainable development and encourage people to take action. Organizing public forums or workshops joining experts from different areas of the green science to discuss environmental issues and promote sustainable practices. Spreading the interest in Green Science among high school and university students and young professionals, etc. (UNESCO, 2021). Some researchers have suggested that is important to involve early-career, mid-career, and late-career/senior climate scientists interested in contributing to the green science in LAC (Cuellar-Ramirez, 2021).

Additionally, the SCC can help promote green development and green science in LAC by fostering collaboration between different sectors. By bringing together scientists, policymakers, private and public organizations and representatives from industry and civil society, the SCC paradigm can help promote sustainable development across different sectors.

The SCC paradigm can help promote green development, and biodiversity conservation in LAC. By fostering collaboration between scientists, policymakers, and the public, and by promoting collaboration across different sectors, this approach can help promote sustainable development and address environmental challenges in the region.

How is the paradigm of the SCC addressing the environmental challenges in the Latin American region?

The exchange of knowledge and the promotion of green science involves verbal communication. So far, linguistic barriers have built a wall to access scientific advances, in countries that have no English as their mother tongue.[1] This is not to blame the English-speaking countries or the English-speaking researchers but it is important to find mechanisms to share the green science knowledge not only in English but also in Spanish, considering the current situation of LAC countries where the most spoken language is Spanish. Therefore, it is important to create avenues for the exchange of knowledge and green science information with Spanish-speaking audiences, not only from the educational, research, and scientific fields, but also with society in general, once again, fulfilling Article 15 of the International Covenant on Economic, Social and Cultural Rights of the United Nations.

Access to scientific advances and particularly to green science knowledge has a higher cost in LAC. This is an issue that poses concerns among researchers of developing countries due to the higher fees that they need to pay to download scientific papers or even publish their research in some

[1] https://www.nature.com/articles/s41562-021-01137-1

journals.[2] This does not mean that journals should be always open source. However, finding some ways to reduce journal's subscription cost or finding other publishing alternatives for LAC could result in the increase of the publication of scientific papers, have a large number of researchers writing scientific articles, create a culture of writing, and open opportunities for them to find partners and collaborators based on their publications, areas of inters, etc . In the same regard, reducing or waving the subscription plans to download papers could be beneficial for authors in LAC to stay up to date on the recent scientific progress, methods and results and above all opportunities to make green science more popular. That is why the SCC has established the Journal of Latin American Sciences and Culture (JLASC).

There is a large gap in different areas of science between scientist from LAC and other continents. The research topics between developed and developing countries in some cases are not always synchronized.[3] While researchers in developed countries are creating androids, using artificial intelligence, cloning, and breaking atoms into smaller particles, researchers in developing countries are dealing with problems related to lack of infrastructure, lack of funds, agriculture, poverty, energy access, clean water access, fighting desertification, and others.That is why, the SCC requires the active participation of LAC members to unfold the current technological and innovation needs and propose them.

Latin America suffers from the lack of private and collective science centers. The means/facilities/laboratories in developing countries to carry out top-notch research are very scarce. The problem lies in the lack of funds, and equipments fundamentally. Fundraising might seem such a daunting and time-consuming task. It is quite difficult to carry out advanced research due to the lack of equipments, infrastructure, or access to facilities. Therefore, international cooperation through the SCC could serve as a platform to canalize and leverage resources for the establishment of green science centers, research and innovation centers, etc. At the same time, the centers could provide an avenue to allocate multidisciplinary research projects, open more collaboration opportunities, and promote a generation of scientific figures that can serve to inspire the scientific spirit of future generations.

The development of the SCC to foster innovation and Green Development in Latin America through the Andean Road Countries for Science and Technology

To complete its mission, the SCC paradigm requires a systematic approach. A step-by-step process to ensure that the building blocks are correctly interconnected and cemented to erect a solid and meaningful endeavor and fulfill Article 15 of the International Covenant on Economic, Social, and Cultural Rights of the United Nations.. The SCC is the acquisition of ideas, habits, and actions that permeate the walls of scientific and academic institutions, influence society, and establish pathways to disseminate

[2] https://open-access.network/en/services/news/article/elsevier-protest-against-excessive-publication-fees

[3] https://link.springer.com/article/10.1007/s11205-020-02488-4

knowledge, promote innovation, biodiversity conservation, and technological and green development.

The SCC started in 2018 when several LAC experts in the Space technology field gathered with Chinese professors and businessmen to discuss the current status of space technology development in Latin America.[4] This meeting was quite informative with a flow of ideas and knowledge that was summarized in an article presented at the International Astronautical Congress (IAC) in Washington, 2020.[5] Although its origins are related to space science, it has gradually converged into the multidisciplinary and dynamic area of green science.

The SCC paradigm is currently promoting green science popularization and the exchange of knowledge in three languages, English, Spanish, and Chinese. With the guidelines of UNESCO Media and Information Literacy, and the Andean Road Countries for Science and Technology (ARCST), the Journal of Latin American Sciences and Culture (JLASC) was launched in 2019 with the idea of promoting the scientific landscape in LAC, pushing conventional boundaries to include issues, perspectives, and methods relevant to education, science, technology, and culture.[6] JLASC intends to truly internationalize these areas through the journal's attention globally. JLASC seeks to explore not only the diversity and richness of LAC scientific issues, but also perspectives, research methods, and evidence of the many creative flows of influence that exist between LAC, Sino-American cultures, and other peripheries. Therefore, education, science, and technology can be powered by wide-ranging ideas from many cultures and research areas. JLASC welcomes submissions that focus on empirical research, theoretical analyses, or literature and book reviews. JLASC promotes scientific literacy, science popularization, media and information literacy (MIL) following the guidelines of UNESCO. Special attention is given to the use and promotion of the Spanish Language for these purposes. With the help of JLASC, ARCST Is providing LAC researchers the possibility to show their work, ideas, and advances in three different languages and increase their visibility beyond geographic and linguistic barriers.

The SCC has received support from different Universities, and academic institutions, from China and abroad. During the "1st Annual Meeting on Science Literacy 2021: A Prerequisite for Stimulating Climate Change Engagement" organized in November 2021 in LAC countries around 16 experts from China participated for the first time in the First Annual Meeting on Science Literacy.[7] This event marked the opening of more opportunities for collaboration between China and LAC. This celebration gathered experts from different fields around the world. During the Annual

[4]https://spacegeneration.org/arcst#:~:text=Under%20this%20premise%2C%20the%20Andean,Latin%20American%20countries%20and%20offers

[5] https://medcraveonline.com/AAOAJ/effective-communication-in-science-and-technology-for-the-space-workforce-development-in-latinamerica.html

[6] https://journalasc.org/

[7] https://journalasc.org/annual_meeting/

Meeting, there was consensus to promulgate the First Declaration on Science and Climate Literacy across LAC (DSCLAC).[8] In 2021 as well, ARCST launched a much-needed science platform for China and Latin America, as reported by China Daily.[9] In 2022, a second version of the declaration was prepared, and in 2023, the third version was published.[10] Several Chinese experts and institutions, as well as other international experts and organizations, have manifested their support. The declaration invites the whole community to work together to promote the harmonious development of science and technology, to contribute to the improvement of public science literacy, climate literacy, biodiversity conservation, green science, and green development. To create a better future for the whole of human society.

ARCST has promoted the SCC focused on Green Science and the Sustainable Development. This work has been supported by China Biodiversity Conservation and Green Development Foundation (CBCGDF). The South-South Biodiversity Science Project (SSBSP) of CBCGDF and the Green Science Project of ARCST converged into several occasions to stablish different science popularization activities. One of the most relevant projects is the organization and celebration of the First World Green Science Day (WGSD) on December 9th, 2022. The main purpose of the celebration was to raise awareness of the role that science plays in societies that are peaceful and sustainable.[11] "Green Science for and with Society" was 2022's theme for World Green Science Day (WGSD). It emphasized how the sciences are inclusive and equal and how they can help to achieve important environmental goals. The WGSD focused on important adaptations to mitigate the adverse effects of biodiversity loss, climate change, pollution, and water calamities. ARCST made an effort to support crucial international scientific collaborations and bring science closer to society. Several Chinese and foreign experts participated on the event and discussed contemporary issues that are crucial to the ongoing exchange of information related to human health, the economy, food security, climate, biodiversity conservation, green development, and people's well-being. This celebration was one of a series that reached out to schools, universities, the general public, the private sector, and other groups to mobilize open sciences. During the celebration of the WGSD 2022 the tool called "Quantum Leap to green actions (QLGA)" was launched. QLGA was proposed by a multidisciplinary team of researchers from ARCST, CBCGDF and Unidad Central del Valle del Cauca (UCEVA) to engage the public in a broader sustainability mission.[12] QLGA offers an opportunity to impact society in general and promote commitment to action against climate change, fostering biodiversity conservation and green development. Equally important, during the WGSD celebration, the International

[8] https://journalasc.org/2023/01/25/science_lac/
[9] http://epaper.chinadaily.com.cn/a/202107/07/WS60e4ecdea3106abb319fbbd2.html
[10] https://journalasc.org/2023/01/25/science_lac/
[11] http://www.cbcgdf.org/English/NewsShow/5008/21612.html
[12] http://www.cbcgdf.org/English/NewsShow/5008/21612.html

Green Science Academy Network (IGSAN) was launched.[13] IGSAN is a platform composed of experts from several countries that seek to empower individuals, especially the youth, to lead in the response to biodiversity protection, green development, and environmental challenges facing the globe.[14] By establishing partnerships, we develop, implement, and oversee educational programs and workshops that promote environmentally sustainable behaviors among all age groups. IGSAN was born as a conjunction of two initiatives, the South-South Biodiversity Science Project (SSBSP) and the Green Science Project (GSP). ARCST attaches great importance to working on topics and solutions that are appropriate for the context of different countries.

A topic that connects several fields is green science. In 2022, ARCST in coordination with UCEVA, CBCGDF, UNESCO, and ELEKTRO launched the first phase of the SCC in Colombia.[15,16] In 2023, the International Green Science Center for Latin America and the Caribbean (IGSCLAC) was.[17] Just recently, in November 2023 the Centro Internacional de Innovacion en Ciencia y Tecnologia para Latino America y el Caribe (CICITLAC acronym in spanish) was launched in El Salvador (Cicitlac, 2023).

Nowadays, mutual collaboration is essential for the development of science and technology. We emphasize the importance of collaboration, mutual understanding, friendship and utilizing mechanisms of science popularization, and the promotion of technology and innovation in different areas of knowledge. IGSCLAC longs to connect the community of researchers, professors, students, and the community in general between LAC and the world. It aims to engage society in actions that favor the well-living and well-being in harmony with nature, utilizing scientific, technical, and educational methods for this purpose. We aim to accelerate the communication, cooperation and development of science and technology oriented to the real needs of the LAC countries. ARCST focuses on providing access and opportunities for people to engage in positive climate change action.

ARCST and its collaborators are conscious that one action followed by many people could produce big effects. The same is true if many actions are followed by many people. This can be simply summarized in the equation of the quantum leap into green action:[18]

$$E = P \cdot A$$

Where E is the effect, P is the number of people and A is the number of actions. If the efforts are focalized and combined with effective communication and motivated actors, it is possible to produce the "quantum leap." Scientific

[13] https://journalasc.org/2022/11/17/international-green-science-academy-network-igsan-an-initiative-of-the-south-south-biodiversity-science-project/
[14] https://journalasc.org/blog/igsan/
[15] http://z.cbcgdf.org/nd.jsp?id=580&_sc=3@Mark
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[17] https://mp.weixin.qq.com/s/Mcb8XLZ792l6iXGt8l02Zw
[18] https://journalasc.org/2023/02/22/ssbspscc/

progress can only be achieved if there is clear communication and direct collaboration between different stakeholders from private to public sectors.

A new paradigm has emerged that is inclusive, participative, and focused on providing the rights to enjoy scientific progress and its applications, especially in developing countries. ARCST looks to further strengthen the collaboration in Science, Technology, Biodiversity Conservation and Green Development between China, LAC and more countries around the world. We believe that integration across geographical, cultural and linguistical barriers is essential for the sustainable development of humanity in harmony with nature. ARCST looks to continue to promote the exchange of knowledge, the diffusion of information, biodiversity conservation, and green sustainable development.

Outlook for the future

The construction of a robust science culture is paramount for steering the course of green development in a sustainable direction. As we grapple with the complex challenges posed by climate change, resource depletion, and environmental degradation, fostering a scientific mindset becomes not just an option but a necessity. A culture deeply rooted in scientific principles empowers societies to make informed decisions, implement innovative solutions, and adapt to the evolving demands of a planet in flux.

The importance of SCC in the realm of green development lies in its ability to promote a holistic understanding of the intricate web of ecological systems. It encourages collaboration among scientists, policymakers, and the public, fostering a shared commitment to environmental stewardship. By instilling a sense of curiosity and inquiry, a science-centric culture can drive technological advancements, policy reforms, and behavioral changes that are indispensable for achieving a harmonious coexistence with the natural world.

Looking ahead, the prospects for the future hinge on the continued cultivation and expansion of this science culture. The journey toward green development demands ongoing research, education, and advocacy to stay ahead of emerging challenges. As we embark on this collective endeavor, there is a promising outlook for technological breakthroughs, policy innovations, and a heightened global consciousness regarding sustainable practices.

In the coming years, we can anticipate a society that places an even greater emphasis on integrating scientific principles into everyday decision-making processes. This shift will not only contribute to mitigating environmental crises but also lay the foundation for a more resilient and equitable world. By embracing the ethos of the new paradigm of collaboration, the SCC, we can navigate the complexities of the 21st century with confidence, secure in the knowledge that our actions today are shaping a greener and more sustainable tomorrow.

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