

**Sustentabilidade e interdisciplinaridade: inovações e desafios dos programas de pós-graduação em Ambiente e Sociedade. O caso do Centro de Desenvolvimento Sustentável da Universidade de Brasília**

**Sustainability and interdisciplinarity: innovations and challenges for postgraduate programmes on the Environment and Society. The case of the Centre for Sustainable Development at the University of Brasilia**

**La sostenibilidad y la interdisciplinariedad: innovaciones y retos de los programas de posgrado en Medio Ambiente y Sociedad. El caso del Centro para el Desarrollo Sostenible de la Universidad de Brasilia**

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## Resumo

Realizada pela ONU em 1992, a Conferência sobre Desenvolvimento e Meio Ambiente consagra a noção de Desenvolvimento Sustentável, nascida na década anterior. Três anos depois, surge o Centre for Sustainable Development da Universidade de Brasília (CDS/UnB), que antecede o boom dos programas de pós-graduação interdisciplinares e se insere no crescimento de programas voltados à relação entre ambiente e sociedade. O presente artigo reflete acerca de algumas das inovações e desafios desse centro, que construiu sua identidade no binômio sustentabilidade e interdisciplinaridade. Portanto, aborda essas duas noções antes de adentrar a trajetória específica do centro em seus componentes de inovação e desafios. Como considerações finais, o artigo apresenta uma reflexão acerca do novo desenho do campo da sustentabilidade e os desafios para os programas de pós-graduação que lidam com o tema.

**Palavras-chave:** Sustentabilidade. Interdisciplinaridade. Pesquisa. Inovação.

## Abstract

Held by the UN in 1992, the Conference on Environment and Development reinforced the concept of Sustainable Development, which was originated in the preceding decade. Three years later the Centre for Sustainable Development was established at the Universidade de Brasília (CDS/UnB), which has witnessed a boom in interdisciplinary postgraduate programmes as part of a growing trend among other academic units dealing with the relationship between the environment and society. This article reflects on some of the innovations and challenges faced by the CDS, which proclaims its identity built on the binomial “sustainability and interdisciplinarity”. It therefore addresses both notions before discussing the specific path of the Centre with respect to its innovative components and challenges. As concluding remarks, the article presents thoughts on the new design of the field of sustainability and on the challenges for postgraduate programmes that deal with this matter.

**Keywords:** Sustainability. Interdisciplinarity. Research. Innovation.

## Resumen

Realizada por las Naciones Unidas en 1992, la Conferencia sobre el Medio Ambiente y el Desarrollo consagra el concepto de desarrollo sostenible, nacido en la década anterior. Tres años más tarde nace el Centro para el Desarrollo Sostenible de la Universidad de Brasilia (CDS/UNB), antes del boom de los programas de posgrado interdisciplinarios y se inserta en la ampliación del número de programas dirigidos a la relación entre el medio ambiente y la sociedad. Este artículo reflexiona sobre algunas de las innovaciones y los retos de este centro, que ha construido su identidad basada en el binomio sostenibilidad y interdisciplinaria. Por lo tanto, se refiere a estos dos conceptos antes de tratar de la trayectoria específica del centro en sus componentes de innovación y retos. Como conclusión, el artículo presenta una reflexión sobre el nuevo diseño del campo de la sostenibilidad y los retos para los programas de posgrado que tienen que ver con el tema.

**Palabras clave:** Sostenibilidad. Interdisciplinaria. Investigación. Innovación.

## Introduction

Sustainable Development has become a unique reference in the political, corporate and academic world in the past twenty-five years. Governments and multilateral organizations have chosen it as a reference and a parameter for their actions, in view of the growing environmental awareness of their voters; companies have elected it as a trademark for their activities, due to consumers' pressing claims; and academia has adopted the idea by creating journals, research programmes, and high-level training.

In the third sector, there is a growing number of organizations fighting for a new kind of development, devoted to defending the environment, fighting the negative impacts of economic growth, and

fostering socio-environmental equality. Simultaneous movements, even when they emerge in different spaces, have gradually become articulated in awareness which is threefold: that of the shortage of natural resources, the exhaustion of the development model adopted in the postwar period, and the potentiality of new ways of producing knowledge. Although it was possible to notice the presence of signs of such awareness in the 1950s and 1960s, it was only in the following two decades that its configurations became clear, and it began to spread in society. Therefore, at the end of the 20<sup>th</sup> and beginning of the 21<sup>st</sup> century, two concepts gained prominence: sustainability and interdisciplinarity.

It was in this context that the proposal of Sustainable Development (SD) emerged in the 1980s, replacing its predecessor, Eco-Development, although keeping its three structural dimensions: the economic, social, and environmental dimensions. Such formulation assumes that Sustainable Development may be implemented as long as economic eco-efficiency, social equity, and environmental conservation are present. The idea of SD becomes more concrete with the problems caused by using fossil fuels on a large scale, the growing difficulty in collecting and disposing of urban waste, and the harmful interference of humans in the natural nitrogen cycle. Further problems are caused by the scarcity and loss of quality of water resources, the risks of nuclear proliferation, the thawing of polar ice caps, and the rise in sea levels, the advance of desertification, and the constant loss of biodiversity, among others. Thus, the theoretical debate is articulated to the monitoring of the environment and the search for practical solutions: productive dematerialization, renewable energy, green economy, material recycling and reuse, lengthening the life cycle of products and decarbonisation of the economy, to mention a few.

The Centre for Sustainable Development was created at Universidade de Brasília in 1995, in the decade that the UN validated the idea of Sustainable Development, at Rio 92. This article addresses the innovative elements of its trajectory, grounded on sustainability and interdisciplinarity. First, it broaches the field of sustainability and its multiple connotations, and next it addresses the experience of

interdisciplinarity to discuss the specific trajectory of the Centre, pointing out its innovative components and challenges and the obstacles to be overcome. It ends with a reflection on the possible future of the sustainability field and its challenges.

## **Development and Sustainability**

In the 18<sup>th</sup> century, the bourgeois and Enlightenment thinking together with the English Agricultural and Industrial Revolutions gave birth to the capitalist order based on the commercialization of labour force and land ownership. In such a context, Economic Science arose as a new field of knowledge that, in harmony with the naturalism of sciences and of the Enlightenment concept of natural law, considered that the economic world as well as its processes and laws arise from the natural world.

Classical economics, with Smith and Ricardo, when directing its focus of interest to industrial economic life and work as a generator of value and richness, does so by preserving a view of the naturalness of economic laws, especially in connection with land. To this effect, the role played by Malthus when he anchors his analysis of economic laws on population and land yielding laws is remarkable. Gradually, however, this new science sees the split between the natural world and the economic world. After Marx and his successors, the “nature” of capitalism became increasingly evident as something not natural, but a social construction capable of subjugating and disfiguring the natural world. The neoclassic marginal revolution contributed to reducing the understanding of the relationship between these two worlds, launching economic science to a level of formal abstraction that ended up by reducing nature to variables of mathematic equations.

Nevertheless, it was after the Industrial Revolution II, at the beginning of the 20<sup>th</sup> century, that the economic order was effectively dissociated from the natural order as a value. Ever since, the new socio-technical paradigm has been supporting itself on industrial mass production (Fordism) and on oil as an energy source, enabling unprecedented economic growth. The expansion of such a development model to peripheral countries

has contributed to increasing the asymmetry and inequalities both between countries and within countries (FURTADO, 1974). At the same time, it has produced an intense destruction of the environment. Since the Hiroshima bomb, the danger of economic, political, and military domination and of ecological destruction has become one and has acquired universal proportions.

For no other reason the social criticism that has been gradually built and which climaxed in the 1960s, as in the counter-culture or in the May 68 Movement, is at the same time anti-capitalist, anti-imperialist, freedom-centred, pacifist and ecological. It is in such a context that environmentalism has entered the political agenda. If the movements that defended nature had hitherto been typified more towards a preservationist policy or towards protection of ecosystems and species, as in the 1960s, environmentalism emerged by identifying the destruction of nature as intrinsic to the current model of economic growth.

Works such “Silent Spring”, by Rachel Carson (1962), criticizing the effects of the Green Revolution; “The Population Bomb”, by Paul Ehrlich (1968), pointing out the dangers of demographic explosion; and, especially, the “The Limits of Growth”, by Meadows et al. (1972), establish the proposition of an idea: the incompatibility between economic growth and ecological equilibrium, i.e., the structural non-sustainability of the economic system.

This idea was next approached in a different and more consistent way by Georgescu-Roegen (2012). The economic mainstream, reacting against the emergence of the environmental issue, defends the compatibility between economic growth and natural and environmental resources. With such an intention, it proposes the incorporation of natural and environmental elements into the price system, in order to prevent them from being negative externalities, therefore deeming them positive externalities. He believes that technological progress has potential to provide a more efficient use of natural resources and a replacement of natural capital by other forms of capital. This is an argument that was made famous by Robert Solow, in 1974, in the American Economic Review, which is currently known as “Weak Sustainability”. Further, the

period gave birth to a “third way”. The idea of Eco-development launched by Maurice Strong at the Stockholm meeting in 1972 and developed as a concept by Ignacy Sachs (1986), sought to break with the ideal of economic growth at any cost, and with the Neomalthusian ideal of zero growth, defending the necessary interdependence between economic growth and ecological balance. By breaking with the assumption, common to both antagonistic positions, that development and environmental preservation are intrinsically incompatible (NOBRE; AMAZONAS, 2002), Eco-development represented an epistemic break and a new path for development based on the meeting of the socioeconomic and the natural worlds.

The evolution of this process culminated in the conception of the idea of Sustainable Development, focused not on ecological issues, but rather on social justice. As presented in the Brundtland Report, published in 1987, Sustainable Development is defined as development capable of meeting “the needs of the present without compromising the ability of future generations to meet their needs” (CMMAD, 1991, p. 46).

The concept is established with this broad and generic definition. From the epistemic viewpoint, it establishes a general ethical framework, to which economic and ecological aspects must submit. From the concrete and political points of view, it opens up a larger category which houses the most diverse currents of thought and actions. In both cases, this is only possible to the extent that the term remains flexible and general, allowing the most different meanings to be assigned to it. Thus, its conceptual weakness is precisely what gives it historical and political strength, allowing for the contemporary debate core to be organized under and within it (NOBRE; AMAZONAS, 2002).

Sustainable Development becomes, thus, a reference landmark for several agendas, a paradigmatic principle of values, concepts, policies, tools, techniques, and actions. Its high level of generality, associated to its social relevance and historical policy, highlights both the need for the scientific development of the concept and of the area of knowledge associated with it, as well the human training to act.

Facing this issue is groundbreaking for scientific thought. More than recognizing the existence of a new field of knowledge, requiring disciplinary and specific treatment, based on the interdisciplinary integration of other areas of knowledge, Sustainable Development places the issue of interdisciplinarity at its broadest level of requirement. The object of study being interdisciplinarily addressed consists of the development, i.e., the dynamic process by which humanity progresses and prospers, with all its contradictions, and in the interactive relationships of this process with the reality that sustains and limits it, i.e., sustainability. Hence, development and sustainability require interdisciplinary expertise to be understood and addressed.

Development, more than bare economic growth, consists of the dynamic process referred to as the ability of a society to perform its capacities with fullness and freedom. Although it is an economic process, it is not limited to the economic dimension. It comprises multiple social, political, institutional, cognitive (cultural, scientific, technological), spatial-territorial, and temporal dimensions. According to Furtado,

[...] economic growth, as we know it, has been grounded on the preservation of the privileges of the elites that satisfy their desire for modernization. On the other hand, development is characterized by its underlying social project. Having the resources to invest is far from being a sufficient condition to prepare a better future for the population. But when the social project prioritizes the effective improvement of the living conditions of this population, growth becomes development (2004, p. 484).

On the other hand, sustainability must be seen as a broader concept than merely maintaining the levels of activity within the support to ecosystems. After all, the idea of sustainability cannot be restricted only to environmental or ecological variables, but it must consider all natural and human conditions, which support the development process. And, as this development process is evolutionary and dynamic, it thus also becomes sustainability, seen in terms of how the conditions for support of the development process are (or are not) able to transform dynamically in order to ensure resilience. Holling, one of the main formulators under that perspective, while developing his conceptualization of the evolutionary dynamics of systems, shows how



[...] this process can serve the purpose of clarifying the meaning of “sustainable development.” Sustainability is the ability to create, test, and maintain the adaptive capacity. Development is the process of creating, testing, and maintaining opportunities. Therefore, the term that combines the two, “sustainable development”, refers to the goal of fostering adaptive capabilities, while simultaneously creating opportunities. Therefore, it is not an oxymoron, but rather a term that describes a logical partnership (2001, p. 399).

Thus, the straightforward interdisciplinary nature of the phenomenon defined as Sustainable Development displays the enormous need for and challenge to scientific development and the interdisciplinary human training to address it.

### **The challenge of interdisciplinarity**

Human knowledge was organized as a discipline since the Greeks, with Plato (3<sup>rd</sup> century), the Nalanda School in India (4<sup>th</sup> century BC) and the Jāmi’at al-Qarawiyyin (19<sup>th</sup> century BC)<sup>1</sup>, in the Muslim world, more precisely in Morocco.

This fragmentation of knowledge spread in European universities as of the 11<sup>th</sup> century, and became known with the modern university inspired by Kant (13<sup>th</sup> century) and von Humboldt (19<sup>th</sup> century). Created to give order and systematize knowledge about the soul, the human body, and Nature, it remained sovereign for about two centuries (SANTOS; ALMEIDA FILHO, 2012). Thus, disciplines are understood as organizational categories of scientific knowledge or social, professional and epistemological identities of different specialized knowledge (MORIN, 2003). They have at least two basic characteristics. The first, logic, refers to a unified theoretical and intelligible body; the second, functional, enables organizing the diversity of the objects of knowledge (PENA VEGA, 2008).

Attempts at completing, overcoming, or even breaking with disciplinary categories led to the formulation of interdisciplinarity and transdisciplinary ideas a little over half a century ago. The notion of interdisciplinarity

<sup>1</sup> Incidentally, it was created by a woman, Fatima al-Fihri.

proposes to occupy the vast emptiness separating different disciplines. On the other hand, transdisciplinarity is placed in a position of rupture and, thus, of overcoming disciplinary knowledge.

Organizing and working with scientific knowledge in a non-disciplinary manner began to occur systematically from the 1960s, and mainly from the 1970s, after the work of Piaget at the 1972 Seminar, in France; the works of the National Centre for Scientific Research of France (CNRS); and UNESCO worldwide (APOSTEL et al., 1972).

In this respect, reflections and initiatives were particularly fertile in the decades that followed, resulting in an increase in postgraduate programmes, research laboratories, publications, but also a change in teaching practices everywhere in the world.

Since then, four central movements have occurred in the academic environment:

1. steadfast criticism of the disciplinary knowledge, accusing it of being reductionist and limited, without contact with the complexity of the real world (MORIN, 1973; 2005; MATURANA; VARELA, 1995);
2. new research and teaching practices of interdisciplinary and, more recently, transdisciplinary nature (PHILIPPI JR; SILVA NETO, 2011);
3. the inclusion of cross-cutting issues, inherently inter- or transdisciplinary, such as climate change, sustainability and nanobiotechnology, in the curricular and power structure of educational and applied research institutions (KLEIN, 1990);
4. reflections on these practices to formulate a propositional theoretical structure (REPKO, 2008; RIBEIRO, 2010).

Although there is almost a consensus that disciplinary knowledge is useful, and even indispensable, it may be noted that it is limited when dealing with new phenomena, problems, and challenges arising from the higher complexity of our societies and capacity to generate information (FAZENDA, 1994; LEIS, 2001; 2005). Interdisciplinarity emerges, then, as an invitation to the production of new knowledge, as a dialogue with several disciplines. As shown by Costa and Nascimento (2012),

in the study of the reference practices at universities in Brazil, Chile, Germany and the United States, there are many possibilities to adopt interdisciplinary practices within universities.

In some cases, the practice of interdisciplinarity brings more players into the debate, because the expansion of perspectives includes new perspectives. This is a design that goes beyond the collection of disciplines themselves, which promotes the link between scientific knowledge and popular knowledge, and thus provides the magnification of worldviews (DUARTE et al., 2011).

In part, the criticism to the organization of knowledge into stagnant disciplines and the search for interdisciplinarity are due to recent transformations in society. First, they came from processes occurring in the 1960s, such as the student protests in May 1968, the feminist revolution, the Hippie movement and the cultural revolution, which diversified the morality of customs, spread mass consumption, stressed individualism, valued the culture of the body and the incitement of immediate pleasure (FREIRE, 2004), therefore placing behavioural and cognitive diversity at the centre of our concerns.

Interdisciplinarity is a central topic in the debate about the crisis and the future of the University. Although it is not a new issue, it remains highly relevant. Specialization divided the academic world into hundreds of isolated and self-centred fields over the past century. This process was supported and reinforced by the proliferation of specialized journals and by the institutional structure set up for the accreditation, evaluation, and funding of research projects and degree courses. In the wake of this process, interdisciplinarity claims to integrate parts that seem to stay away from each other (BURSZTYN; DRUMMOND, 2013, p. 3).

But the new field of production and transmission of knowledge emerged especially with the changes that began in the 1970s: the victory of neoliberalism, the apogee of the scientific-technological revolution (computing, communications, robotics) and the rebirth of globalization, which are the basis of new knowledge societies (UNESCO, 2005), networked societies (CASTELLS, 1998) and risk societies (BECK, 2001).

The speed of social transformations and innovations are remarkable in

this process.

Also in this context, globalization and environmental consciousness gained force in the 1980s. Global environmental awareness widened with the UN International Conference in Rio de Janeiro (ECO-92) and with the report of the Intergovernmental Panel on Climate Change (IPCC) in 1997.

Society, therefore, empirically demands the development of interdisciplinarity. There is also an epistemological demand, which was born with the systems theory of the 19<sup>th</sup> century, but spread in the second half of the 20<sup>th</sup> century. It has gained momentum more recently, with the Complexity Theory and the Chaos Theory (PRIGOGINE; STERGERS, 1986; PRIGOGINE, 1996).

The excessive specialization that disciplinary knowledge has brought and encouraged over the past 40 years also contributes to the expansion of interdisciplinarity. This overspecialization has made the dialogue difficult, even within disciplines, and has caused harmful effects, perceived since the 1960s (ILLICH, 2005).

With that, mainly postgraduate programmes and multidisciplinary, interdisciplinary and even transdisciplinary research spread all over the world in the 1980s and 1990s. A field of knowledge which particularly lends itself to interdisciplinarity is the one that studies the relationships between man and nature and between the biological and social sciences (including environmental sciences), due to the complexity of the relationships involved. Such a field is called "Human Space" by Jolivet (1992).

Much of the creation and the development of teaching and research programmes are done at the confluence between what has been lived and the theories or epistemology. It is in the dialogue between the two that new knowledge is built and new pedagogical practices are developed. Such a dialogue makes it possible to avoid the monopoly of a single point of view. There is not "the" theory of interdisciplinarity or transdisciplinarity.

Nor is there a globally dominant and consensually accepted paradigm, but several propositions coming from different authors such as Morin (2005), Maturana and Varela (1995), Leff (2002)... New pedagogical practices require a nondogmatic stance in relation to theories, concepts, schools and authors. They require willingness to break boundaries, the audacity to seek the new, to want to invent and innovate. After all, theories are ideas that arise from human reflection on contexts and practices. In the field of science, they are not sacred. They are mainly, but not only, instrumental, and are used to produce new and consistent knowledge from the empirical and argumentative viewpoints.

The most interesting possibility that interdisciplinarity offers, available to a wider conceptual and instrumental amplitude, is to face the inexhaustible ability to question more and in a more qualified fashion.

### **The profile of CDS<sup>2</sup>**

The Centre for Sustainable Development at Universidade de Brasília (CDS/UnB) is an academic space that aims to develop skills and produce new knowledge in the field of sustainability. Its mission is to promote the ethics of sustainability by means of a dialogue between forms of knowledge, building new knowledge and training competencies.

Created in December 1995, influenced by Professor Cristovam Buarque, as an interdisciplinary centre reporting directly to the Dean of Universidade de Brasilia, it is today recognized as a unit of teaching, research and extension with an emphasis on postgraduate education.

The teaching activities of the CDS began in 1996, with the creation of its postgraduate programme (PPG-CDS). It started with a doctoral course and then expanded to academic and professional master's courses, and specialization in sustainable development. Five years later, master's courses were created as collaboration between institutions. In 2009, the centre expanded its academic performance, creating an undergraduate programme in Environmental Sciences together with the Department of

<sup>2</sup> This item and the following were inspired in Drummond and Nascimento (2010a; 2010b).

Economics and the Institutes of Chemistry, Geosciences and Biology at UnB. In 2010, the Post-doctoral Programme in Sustainable Development was created. In short, the CDS is currently present in the teaching activities from the undergraduate level to post-doctorate.

One of the pioneers in the area of sustainability, the PPG-CDS had qualified, by June 2013, approximately 200 students in its specialization courses, 495 masters, and 145 doctors. Moreover, it has granted six post-doctoral certifications.

The selection to enter these courses always featured fierce competition, inter alia because of the academic recognition of the CDS (with grade 5 in Capes since 2004), the growth of the environmental issue in Brazilian society, the emergence of specific labour markets that require highly qualified personnel, the lack of similar courses in Brazil and, finally, the acceptance of candidates trained in all areas of knowledge. As it is located in the federal capital, the CDS also attracts more students from all Brazilian regions. Two specific actions have contributed to the great demand on the CDS by candidates for masters and doctoral degrees: the flow of special students in optional disciplines and “Sustainable Wednesdays”, a cycle of lectures open to the general public.

Currently, the CDS and its postgraduate programme have 15 ongoing research projects, with the participation of students and post-doctoral candidates. These projects are developed in the context of Networks, Laboratories and Observatories that deal with climate change, public policies, conservation units, alternative energy, sustainability and social inclusion in construction and tourism, social technology and complexity. Some of these units have an international nature.

In the field of scientific consolidation of the Sustainability area, in 2010 the CDS released the Sustainability in Debate magazine, which coordinates and is acquiring fast recognition due to the quality of its articles, its regularity, and its wide circulation.

After 12 years working outside the main campus of UnB, the CDS moved there in mid-2008, although still in temporary facilities. In October 24<sup>th</sup>, 2012, the CDS opened its own building with 1,430 m<sup>2</sup>.

## Academic innovations and challenges

The effort in the search for conceptual soundness on the issues of development and sustainability and of an interdisciplinary practice in the training of its staff and the production of new knowledge has been constant in the 16 years of the CDS`'s existence.

In pursuit of such success, the CDS has made the interdisciplinary treatment of sustainability feasible in the following ways:

- 1) The structure and course curriculum of its postgraduate programme, in different schemes;
- 2) The research lines, projects, and groups;
- 3) The two fundamental requirements in teaching and research of masters' students and doctoral candidates: interdisciplinarity and sustainability;
- 4) The interdisciplinary training and production of the teaching staff and researchers;
- 5) The activities to build and support the undergraduate course in Environmental Sciences, in a multidisciplinary and interdepartmental partnership;
- 6) The arc of cooperation and national and international partnerships; and
- 7) The strategic and participatory management of the Centre.

As already mentioned, the CDS has two programmes, an academic programme, with master's and doctoral degrees, and a professional programme, with a master's degree. Herein we will address what will be accomplished by the postgraduate academic programme following the order of the seven points mentioned above.

### Course curriculum

In terms of structure and course curriculum, the Centre's postgraduate academic programme is structured, as usual, into compulsory and optional disciplines. Compulsory disciplines are divided into two axes: a theoretical one, which addresses the understanding and deepening

of basic development and sustainability concepts from economic, social and natural sciences theories; and a second axis of normative and instrumental nature, concerning the sustainability policy and management and development of the dissertation/theses projects. All students` projects are worked methodologically, in order to meet the conceptual and thematic requirements of interdisciplinarity. With regard to optional disciplines, students a diverse set of disciplines, most with an interdisciplinary nature, around the theme of Sustainable Development, in which they will participate according to the needs of their research project.

Currently, the programme is in its third course curriculum, seeking advances in relation to the two previous ones. This search aims at greater balance in three strategic fronts. The first is the way of contemplating basic concepts, especially those of development and sustainability. Although it is clear in the programme that such concepts are fundamental, the way they are addressed by the curriculum does not make them rigorously effective. Different perspectives on the meaning of development and sustainability, as well as their implications to specific themes, sometimes produce results that tend to an amalgamation or juxtaposition of concepts and knowledge. Despite the importance of the plurality of visions for the support and evolution of such an epistemic basis – a fact that is effectively virtuous in the CDS –, it is necessary that this construction be systematic to become more effective.

The second front concerns the way of emphasizing interdisciplinarity, which has been contemplated differently in several course curricula. In the current course curriculum, interdisciplinarity prevails in the field of social sciences (socio-economic analysis), but there is still a gap to be bridged for greater interdisciplinary interaction between this field with that of natural and exact sciences.

Finally, the third front concerns the need to advance an integrated methodological instrumental core. If, on the one hand, the CDS has deepened the epistemic theme in the field of interdisciplinarity and complexity for many years, on the other hand, it is still necessary to extend it to the instrumental level, with a more structured and integrated



supply of qualitative, quantitative and mixed methodologies. Such methodologies have so far been carried out by individualized and non-systematic initiatives.

An innovative activity, although not related specifically to interdisciplinarity practices, is the recent creation of an optional discipline aiming at the writing of scientific texts. In it, students must have a written text of their own, preferably with their supervisor's co-authorship, which is worked along the discipline. A passing grade in the discipline is connected not only to the development of texts, in individual and collective activities, but also to the submission to qualified scientific journals.

### **Research lines, projects and groups**

The research produced by the Centre is organized into three knowledge fields related to the structuring dimensions of Sustainable Development as an episteme and sphere of action. Ignacy Sachs states that Sustainable Development must be construed from the sustainability development process in five dimensions (SACHS, 1993); later, this number was increased to eight: economic, social, ecological, environmental, cultural, national policy, international policy, and territorial policy (SACHS, 2002). In this sense, the three research lines of the CDS are not disciplinary or sub-disciplinary boxes, but fields of reality in which the knowledge interface occurs in a transversal manner, integrating different areas of knowledge. Thus, from the historically accumulated capacity of the CDS, the following fields have been elected as lines of research:

1. Public policies, culture and sustainability: includes the study of activities related to the formulation, implementation and evaluation of policies, and converges to Sustainable Development. It encompasses the cultural dimension as an inseparable component of sustainability;
2. Technology, consumption and sustainability: aims at the study of relationships between the scientific, technological and innovation dimensions with sustainability, in the development process. It also considers the impact of new productive socio-technical standards on society and nature; and

3. **Territory, environment and society:** discusses how societies shape their territories and the environment, and how activities and life conditions are affected in this process, on different scales and under different regulatory schemes.

Interdisciplinary work takes place mainly in research, stimulated by teaching. Therefore, the research development in interdisciplinary centres is the object of special attention and has to be closely articulated to dissertations and theses, as well as with publications.

At first, the CDS was marked by a great amount of small studies, sometimes not related to each other and to master's and doctoral students' research objects. Successful efforts have been made towards group research and towards establishing projects of greater dimension, as well as towards creating fields of articulation: laboratories and observatories, all with the central concern of sustainability and with clear marks of interdisciplinarity in the composition of the body of researchers and definition of objects of research.

Interdisciplinary research is always a challenge. Gradually we learn that, in order to obtain an innovative interdisciplinary feature, research projects should be articulated in a supportive environment, such as a network, a laboratory, or an observatory. Throughout its history, the CDS has created a set of such spaces to bear its research projects under conditions favourable to interdisciplinarity, together with other units at UnB:

- Laboratory of Energy and Environment (LEA), integrated to the School of Technology;
- Laboratory of Built Environment, Inclusion and Sustainability (LACIS), connected to the School of Architecture and Urbanism;
- Laboratory of the Conservation Unit and of Connected Social Policies (LUC-S), which dialogues with Ibama and the ICMBio;
- Laboratory of Complexity, related to the Advanced and Multidisciplinary Studies Centre (CEAM);
- Laboratory of Studies on Tourism Sustainability (LETS), in a partnership with the Tourism Excellence Centre;
- Laboratory of Social Technology; and
- Climate Network.

However, the participation of master's students and doctoral candidates in these laboratories and observatories is only partial, insofar as the admission to the postgraduate programme is not made by a teacher and/or laboratory. Only a part of these students work in these research groups, which is compensated when the student participates in an ongoing project.

In order to produce greater consolidation of research lines, projects, and groups, the CDS has been making changes in its students' admission process so that the projects of entrant students can be more solidly related to ongoing projects and/or the lines of action of instructors.

### **The two fundamental requirements in teaching and research of masters' students and doctoral candidates: interdisciplinarity and sustainability.**

Experience has shown that the best theses and dissertations are those prepared by students participating in research groups (laboratories or observatories), guided by a defined instructor, and who adopt topics naturally binding to the two axes of the CDS: interdisciplinarity and sustainability.

These axes, in turn, can be boosted by formal and informal educational practices. Good results have been observed in the adoption of disciplines taught by two professors of different disciplinary origin. The same may be noted when that principle is applied to defining instruction and co-instruction. The integration seminar also has this purpose, showing favourable results. Finally, the discipline Methodology and Research Techniques has been designed to join the procedures of social, biological, soil and engineering sciences.

An initiative with good internal repercussions in terms of dialogue and interdisciplinary interactions around the theme Sustainable Development is the *Mesão* ("Big Table"), an internal forum, in the form of seminars, discussion of studies, and publications produced by professors and researchers, aimed at their critical deepening.

## **Interdisciplinary training and production of the teaching staff and researchers**

The CDS has a body of professors and researchers with background in several areas of knowledge, including: agronomy, geology, biology, engineering, geography, sociology, economics, political science, and anthropology, for a total of 51 professionals. These are distributed into: professors with exclusive dedication (11); professors at UnB that participate in the programme and research activities (9); retirees from UnB (3); researchers (10); and visiting professors (2), in addition to professionals in post-doctoral internship (8).

Regarding the background of the teaching staff and researchers of the CDS, its interdisciplinary character has had special care for the expansion of its body of professors and researchers. While senior professors or professors with the oldest training made their transition to multi- or interdisciplinarity in the middle of their careers and by their own initiative, professors more recently incorporated into the PPG-CDS have training in multi- and interdisciplinary courses. Thus, new professors have attended at least two disciplines along their training, holding, for example, a degree in agronomy and a PhD in political science; a degree in agronomy and a PhD in economics; a degree in economics and a PhD in sociology; and so on.

## **The experience of a graduation course in Environmental Sciences in multidisciplinary and interdepartmental partnership**

In 2009 UnB implemented – in the scope of the Support Programme for the Restructuring and Expansion of Federal Universities (Reuni) – the undergraduate programme (Bachelor's degree) in Environmental Sciences, aimed at the formation of environmental scientists with multidisciplinary scientific knowledge of socio-economic and natural systems, to be applied in the context of public or private management and environmental policies.

The interdisciplinary nature of the Environmental Sciences course is reflected in its own multidisciplinary institutional origin. Its creation took place through a partnership between five different academic units required for multidisciplinary composition: the Institute of Biological Sciences (IB), the Institute of Geosciences (IG), the Institute of Chemistry (IQ), the Department of Economics (Eco) and the Centre for Sustainable Development (CSD), in addition to other collaborative units in specific disciplines, such as the Institute of Exact Sciences, the Institute of Physics, and the Institute of Humanities.

The course offers basic conceptual formation in the first four semesters, when students attend introductory disciplines of Mathematics, Physics, Chemistry, Geology, Ecology, Social Sciences, Economics, and Philosophy. From the fifth semester, students choose the disciplines related to one of the four areas of specialization:

- Conservation and the use of biodiversity;
- Management and conservation of water resources and soils;
- Environmental Planning; and
- Sustainability Policies.

Another distinctive feature of the course is that it qualifies students in extension activities, developing mandatory disciplines specific to such a purpose.

As the course is quite new (its first class has not yet graduated), many efforts have been made by the members in the partnership to enhance the contents of the course curriculum, especially regarding its interdisciplinary integration, and to promote innovative spaces for applying such knowledge in research and extension.

### **The arc of national and international cooperation and partnerships.**

International cooperation is another mark of the CDS since its origins, conserved and developed until today. The cooperation began with France, namely with IRD (Institut de Recherche pour le Développement), CIRAD (Centre de Coopération Internationale en Recherche Agronomique

pour le Développement) and IHEAL (Institut d' Etudes sur l' Amerique Latine). Then it was increased to include other countries in South America and Europe. Next, projects with Canada, India and Indonesia were developed. With the Lusophone Network of Cooperation between programmes and study centres of sustainability, cooperation was extended to Portuguese-speaking African countries. Thus, currently the CDS has relations with institutions of more than 30 countries, and masters' students and doctoral candidates always participate in such cooperation activities, some of which having attended their doctorates in co-tutorship.

Consistent with the enhancement of internationalization, called by Santos and Almeida Filho as the fourth dimension of university (2012), the CDS has innovated by adopting an assessment of its activities with a body of researchers and international professors. To compose this assessment, the following professors were invited in 2005: Alfredo Pena Vega, from the École des Hautes Études en Sciences Sociales, in Paris, France; Manfred Nitsch, from the Freie Universität Berlin (Latin American Institute); and Marc Lucotte, from Université de Montréal, in Canada. The activity developed for one week counted on the presence of one representative to Capes, Professor Álvaro Prata, former Dean of UFSC.

The professors invited presented several suggestions, which were all implemented. Among them, some are general, such as strategic planning, internationalization, greater presence in the dialogue with society, and the construction of the new building to provide best workspaces for students. Others are related to the object of this article, such as deepening the closeness with the Department of Ecology, strengthening Natural Sciences, promoting the contact to complex thinking, making deeper reflections on interdisciplinary practices in teaching and research.

The importance of internationalization, in the case of postgraduate programmes such as the ones at CDS, is incremented by its nature and by its central object of study, sustainability. It can only be developed globally.

## The strategic and participative management of the Centre

For almost 10 years, the CDS has adopted the practice of strategic planning. Every three years it holds a workshop, typically offsite, attended by professors, researchers, students and civil servants, during which activities are assessed, its mission is discussed as well as the priority actions on the basis of a future vision and goals, if not by all, at least by a majority of those attending. The first plan encompassed the period 2005-2007; the second, 2008-2010; and the third, 2011-2013. A summary of each plan was prepared, reproduced and distributed to its professors and students. An evaluation meeting was held during the period of validity of each plan. With that, several strategic decisions were taken and implemented, such as moving the CDS to the main campus and constructing a new building; the development of publications, including the participation of the student body; the expansion of the full-time faculty; participation in undergraduate and postdoctoral courses; the expansion of internationalization; the adoption of new teaching practices; and the expansion to the Amazon region.

However, in terms of strategic planning, there remains the challenge of discerning the measures that bring greater robustness to interdisciplinary practices in teaching and research. Everything indicates that, at this point, the Centre has yet to advance, self-assessing its experiences and implementing innovations.

In recent years, the major innovation in the Centre happened apart from the academic programme, with the creation of a professional masters' course programme on the management of indigenous lands – in which half the students were Indians and the other half were non-Indians. Indians also participated in the course as teachers.

Apparently, a new international assessment seems to be a good path. Another front to advance is the deepening of internal forums of debate and evaluation. With regard to the production of the teaching staff and researchers, the *Mesão*, given its good results, must be extended and

intensified. In respect to student production, the CDS's proposal is to implement periodical and regular (biannual) seminars to be presented by students, in which postgraduate students preparing their theses and dissertations present the evolution of their research to the CDS community.

### **Conclusion: the challenges of the new field of sustainability**

People that enter the field of sustainability are those that share some common ideas, among which the idea that there are threats hanging over us. Such threats can be defined in several different ways, from the strangest – our planet is threatened with extinction – through some not very probable – life extinction – to a feasible one – mankind extinction – to the most probable one – threats to the life conditions currently enjoyed by men on Earth (NASCIMENTO, 2012).

In anyway, the threat worries a significant part of society, which moves in search of solutions, and which participates in the debate in a more or less active way. A growing number of social segments have been pressing governments to adopt measures that contribute to sustainability.

Such worries and pressures will probably go on for a rather long time, while the perception that we are under threat remains. The most probable trend is that it will even increase, because by now indications point to this direction: an increase in the greenhouse effect, an increase in thawing and a rise in sea levels, the progressive loss of biodiversity and the fatal effects of the changes in the nitrogen cycle, the expansion of areas with scarce water resources and infected by non-treated waste.

If this assumption is true, the demand for competent professionals to propose sustainability measures and for knowledge to reduce risks without affecting human life will increase. Most of all, the tension between the demand for products and the threat to the environment tends to grow due to approximately 120 million people/year starting to have access to the consumer market, leaving behind the poverty line.



How to feed, shelter, clothe, and give access to health and education to this new population contingent without increasing the use of natural resources, threatening their reproduction?

So demand tends to increase mostly in the fields of practical solutions and monitoring. And these will be the two most pressing aspects in the near future for postgraduate programmes and research institutes. In Brazil's case, with a change that has already been announced in the environmental agenda: urban sustainability tends to weigh more and more, freeing us from the monopoly of the Amazon issue. Accordingly, as temperature rises, the biome of the cerrado and maybe of the caatinga, will start demanding more attention from governments and society.

The best way for Governments to ensure a competent response will be to adjust their policies' focus to boost the most relevant knowledge areas for sustainable development in Brazil. It is a rather hard task, as several programmes and plans developed in the past two decades have not been able to achieve their goal, for being established prisoners of corporate interest<sup>3</sup>. Anything new is always difficult to create because the old already knows the tricks.

The challenge is to strengthen interdisciplinary teaching and research practices, not just by adopting weak interdisciplinarity (in the scope of Human Sciences, for example). After all, problems related to sustainability, especially those related to the threat of a growing of global crisis, demand dialogue efforts from all subject matters.

Therefore, it demands the rupture of both disciplinary and national frontiers. It demands deep reflection that should not be carried out by an isolated centre – which does not even make sense –, but rather in group, preferably by Capes. And in this reflection process, it would be interesting to identify the programmes alumni: where are they and what are they doing? Do their practices reflect interdisciplinarity? After all, words are not important, actions are; not only performances, but results. The evaluation of a postgraduate programme like the CDS (there are others like it in Brazil) cannot be restricted to its scientific

<sup>3</sup> To this effect, please see the dissertation by Lucimar Almeida, 2012.

production; it must also encompass an analysis of its alumni. After all, they are centres and programmes of knowledge production, with a staff of differentiated professionals, whose quality should mainly be reflected in their capacity to analyze and generate scientific and technical solutions for sustainability problems.

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