

INTERDISCIPLINARY AND TRANSDISCIPLINARY APPLICATION IN ADMINISTRATIVE DECISION-MAKING SPACES IN ENVIRONMENTAL MATTERS

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ABSTRACT

Issues involving the environment, whether natural or cultural, are complex. The modern world, in turn, is fragmented. This makes an analysis of environmental issues difficult, since academic training, in general, does not seek a broad view of reality. The object of the article, after contextualizing modernity and knowledge fragmentation, turns to the understanding of an interdisciplinary and transdisciplinary formation as fundamental ways of looking at the environment, suggesting a dialogue between areas and knowledge. Interdisciplinarity and transdisciplinarity will be proposed to Environmental Law, through the analysis of decision-making spaces in environmental Public Administration. In this regard, the current legislation

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and the National Environmental Policy will be resumed, in which the necessary interdisciplinarity and transdisciplinarity will be emphasized, in order to build management and technical positions in environmental bodies. The research will take place through bibliographic analysis, with a theoretical-qualitative method and critical methodology. The conclusion is, therefore, for the necessary adoption of interdisciplinary approaches in the understanding of Environmental Law and its institutes.

Keywords: Environmental Law; environmental public administration; interdisciplinarity; transdisciplinarity.

APLICAÇÃO INTERDISCIPLINAR E TRANSDISCIPLINAR NOS ESPAÇOS ADMINISTRATIVOS DECISÓRIOS EM MATÉRIA AMBIENTAL

RESUMO

As questões envolvendo o ambiente, seja natural ou cultural, são complexas. O mundo moderno, por sua vez, é fragmentado. Isso torna difícil uma análise a respeito das questões ambientais, já que a formação acadêmica, de modo geral, não busca uma visão ampla da realidade. O objeto do artigo, após contextualizar a modernidade e a fragmentação do saber, volta-se ao entendimento de uma formação interdisciplinar e transdisciplinar como formas fundamentais de se debruçar sobre o ambiente, sugerindo o diálogo entre áreas e saberes. A interdisciplinaridade e a transdisciplinaridade serão propostas ao Direito Ambiental, por meio da análise dos espaços decisórios na Administração Pública ambiental. Nesse aspecto, serão retomadas a legislação atual e a Política Nacional do Meio Ambiente, em que se enfatizará a necessária interdisciplinaridade e a transdisciplinaridade, a fim de construir posições de gestão e técnica nos órgãos ambientais. A pesquisa ocorrerá por meio de análise bibliográfica, com método teórico-qualitativo e metodologia crítica. Conclui-se, assim, pela necessária adoção de abordagens interdisciplinares na compreensão do Direito Ambiental e seus institutos.

Palavras-chave: administração pública ambiental; Direito Ambiental; interdisciplinaridade; transdisciplinaridade.

INTRODUCTION

The critical analysis and the discursive plot about the scientific fields and the modalities of dialogue between the different spheres of knowledge are inescapable themes when they are reflected in the applications and theoretical constructions related to the various scientific fields, which take ecosystems and the endless integrated relationships in the biosphere as their object. From the legal point of view, the discourses of environmental assessment are still reductive and puny in their expression of a practical take on assessments and methodological guidelines. This means inherent contradiction of the system. Environmental Law, in its application, still works with perspectives of absolute truth or collection of closed and certain subsidies, granted in a report demanded either in the administrative sphere or in the judicial sphere, without fully internalizing the complexities and nuances of crisis related to the very process of knowledge linked to scientific formulations.

This article proposes to problematize the critical sphere of the interdisciplinary and transdisciplinary approach related to Environmental Law on an applied scale, considering the decision-making spaces in environmental Public Administration. This means situating the fields of interdisciplinary and transdisciplinary confrontation in administrative decisions that deliberate on environmental issues. A still harmful split is sustained between the construction and strengthening of the relevance of mapping scientific divergences in each field of knowledge passed on in theoretical constructions about the way in which administrative spheres relate to the theme of interdisciplinarity and transdisciplinarity.

Under the administrative aspect, the article proposes to develop a specific focus on federal legislation, in particular, as regards Law No. 10,410, of January 11, 2002, and the structural institutionalization of federal environmental entities. This circumscription is justified in terms of the field of activities undertaken by federal environmental agencies in the National Environmental Policy. Along these lines, interdisciplinarity and transdisciplinarity demand analysis of procedural and technical application both in the structuring of environmental agencies and in the development of the administrative decision-making process. The point of confrontation will be aimed at revealing how the formation of environmental administrative constructions can be influenced by the academic training of the public servant or agent, as well as by the decision-making scenario according to the

presence of different actors, a factor that demands the internalization of interdisciplinary and transdisciplinary practices in the very administrative scale, whether normative or inspective, developed by the Government. The development proposal is oriented to clarifying situations of complexity and crisis couplings, little elucidated in the operational dimension of the norms.

Facing the problem demands an initial contextualizing approach, which situates modernity and the fragmentation of knowledge, in order to have theoretical fabric formulations able to make a consistent understanding of social reality. From this contextualization, the article faces the parameters of scientific dialogue, positioning itself for the robustness and advantages of inter and transdisciplinary practices. The governing legislation is analyzed and, based on the National Environmental Policy, the potential for manifestation of the regime of dialogues between scientific frameworks of knowledge is discussed, in the construction of technical and management positions with the federal environmental agencies of execution, Brazilian Institute for the Environment and Renewable Natural Resources (IBAMA) and the Chico Mendes Institute for Biodiversity Conservation (ICMbio).

The article is developed along the critical methodological line, focused on practical judgment in externalization applied according to levels of evolution in the inter and transdisciplinary discussion, in order to have a reflection on the fields of its involvement. Finally, we expect to demonstrate that critical elaboration needs to break with perceptions of split between the theoretical and practical spheres regarding the apprehension of the relevance of inter and transdisciplinary dialogues, providing the legal sphere with flexible and critical nuances, able to overcome the orthodoxy of positioning based on technical reports, without having evaluated its premises of legitimacy and linkage to specific fields of technical and scientific knowledge.

1 MODERNITY AND FRAGMENTATION OF KNOWLEDGE: THE NEED FOR AN INTER/TRANSDISCIPLINARY REFLECTION

Today's world is a fragmented world in many ways. Such a division in the West must be sought at the beginning of modern history. Symbolically, modernity is associated with three great events: (a) the great navigations, which provided the arrival of Europeans to the continent that would come

to be known as America; (b) the Protestant Reformation, which pluralized Christianity; and (c) the scientific revolution, a period known for new scientific theories and methods (ARENDDT, 2007). Hannah Arendt states that the most spectacular event in the eyes of those who lived through the events was the one linked to the great navigations, on the other hand, the most disturbing event was the Protestant Reformation, and the one that had less repercussion in the first moment was the scientific revolution.

Modernity brought with it the reformulation and mutation of knowledge itself, as Giddens points out, insofar as “[...] no knowledge under the conditions of modernity is knowledge in the ‘old’ sense, in which ‘to know’ is to be right. This applies equally to the natural and social sciences” (GIDDENS, 1991, p. 50). The scientific revolution is highlighted here. The third event would enable unimaginable transformations on nature and on the perceptions of interconnection between human beings and the environment that surrounds them.

In this context, reason comes to be understood as “instrumental reason”. For Vaz (2000, p. 194): “Among its fundamental characteristics, there is precisely the displacement of *téchne* from its peripheral place to the central axis traced by the line that unites *theoria* to the *kosmos* through the mediation of scientific discourse (logos) “. The technique is understood as a technique of manipulation of nature. There is certainly a great difficulty for morality and law to keep up with the transformations provided by this instrumental reason:

Therefore, the *logos* of experimental science, in which *praxis* is exercised and which is the place of constitution of the *ethos* transmitted by tradition, which is profoundly remodeled by modern scientific-technical reason. On it is built the new Nature, which occupies the space of the old *physis* (VAZ, 2000, p. 197).

On the other hand, in order to better understand the current fragmentation of knowledge, one must go back to the origins of philosophical reflection in the West with the Greek spirit. Philosophy is born as a rational attempt to explain reality. Its claim was to be universal. This universality will be verified in the attempt of the first philosophers, known as pre-Socratics, to seek the principle (*arché*) of all things. Later, this characteristic will be accentuated with the attempts to systematize all knowledge with the philosophers Plato (428/27 BC.-348/47 BC) and Aristotle (384 BC-322 BC), who will be paradigms for the later thinkers (REALE; ANTISERI, 1990).

Throughout history, a single individual (known as a philosopher) will

have the ambition to create a theoretical framework that allows the explanation of the most diverse knowledge: ethics, metaphysics, physics, logic, aesthetics, rhetoric, politics and others.

In the Middle Ages, the foundation of Universities took place. Some reasons can be listed for this event: (a) the consolidation of cities with their population increase and increase in students; (b) the Crusades and, consequently, the contact with other cultures; (c) the interest of Emperors and Popes in intellectuality; (d) the limit of traditional knowledge represented by *the trivium and the quadrivium*⁴; (e) associations created by professors and students called *universitas*, a name already used by other corporations such as traders; (f) the creation and union of different courses in the same space (even if places with only one course were also called *universitas*); (g) the comings and goings of students and masters from all social classes and European countries to study and teach, for the purpose of spiritual (inner) elevation; (h) the congregation of different individuals (clergy or laity); and (i) the political interests of Popes and rulers for a given region (ULMANN, 2000). Universities emerged in Bologna, Paris, and Oxford, considered by tradition to be the first three in Europe. Such institutions will be consolidated throughout Europe. The *universitas* will initially be understood as:

[...] a corporation or community of people, grouped together under a certain regime, and it equaled, without any difference, to *corpus, consortium, collegium, societas*. Therefore, there was talk of *universitas magistrorum et scholarium*, which did not mean that all subjects were taught as we understand the word university in our times. *Universitas* was also identified, in the Middle Ages, with *studium* or *studium generale*. [...] In summary, *studium generale* had three meanings in close connection: a) influx of students from all geographical areas, b) to an institution of higher education, c) where the title of teaching was conferred (ULMANN, 2000, pp. 114-115).

The embryo of what would become the modern universities was laid. From the point of view of transdisciplinarity, the university was seen from the very beginning as the place for “the union of different courses in the same space”. This characteristic allowed the relationship across the different areas of knowledge.

However, over the centuries, it is also in the Universities themselves that knowledge will be dispersed into increasingly specialized knowledge, which, in many cases, are not related to each other.

⁴ The *trivium* was made up of the following subjects: logic, grammar and rhetoric and the *quadrivium* was made up of arithmetic, music, geometry and astronomy.

Since its creation in the West in the 13th century, the University has been historically marked by a pendulum movement, driven by two different, if not contradictory or opposing, demands. On the one hand, the one that led to organize themselves in areas of knowledge, to distinguish the disciplines and to establish (within the disciplines) the specialties. On the other hand, the one that led to bringing together specialties, disciplines and areas of knowledge in a common institutional space (departments, faculties, institutes, schools, in addition to the Universities themselves), according to their nature and according to their affinities, in an attempt to unify the diverse, the dispersed and the fragmented (DOMINGUES *et al.*, 2004, p. 13).

At first, the university is thought of as the place of the generalist and the specialist. From the 13th century to the present day it is possible to verify a gradual change. If in the early days of the University the generalist was the character in evidence for knowledge, over the centuries he gradually loses this status and the specialist gains greater importance. The generalist will come to be seen as an eccentric being.

Problems that were previously objects of study of the generalist, that is, of the sage, will be analyzed in new fields of knowledge by the “scientist”, a figure accentuated after the scientific revolution. With each new area in which the scientific method is applied, a new area of knowledge will be created. History, Sociology, Psychology, Anthropology, Physics, Biology, Chemistry, for example, are areas created over the last four hundred years. And in each of the reported areas, new specialties will emerge. And, in turn, in a given specialty, specialties will be created within specialties.

Edgard Morin corroborates this view:

It is precisely this renunciation that the university teaches us. The school of investigation is a school of mourning.

Every neophyte who enters the investigation sees that the greatest renunciation of knowledge is imposed on him. They convince him that the age of the Pic de la Mirandole was over three centuries ago, that henceforth it is impossible to form a vision of man and the world.

They show him that the informational growth and the heterogenization of knowledge go beyond any possibility of engraving and treatment by the human brain. They assure him that he should not regret it but congratulate himself on this fact. He should therefore devote his entire intelligence to increasing this knowledge. They integrate him into a specialized team, and in this phrase the strong term is «specialized» and not «team» (MORIN, 1977, p. 16).

With the passage of time, the areas of knowledge and specialties are moving away to the point of no longer dialoguing. The figure of the specialist will be emphasized as never before:

[...] the growing and impactful super-specialization of knowledge, generating an infinity of disciplines and specialties, which at the end of the 20th century reached the limit of the unfathomable (no one knows for sure how many they are today, and the process of division and multiplication is far from being over)" (DOMINGUES, 2004, p. 7).

This process creates curious situations. The archetype of the specialist "sage" still haunts the present day. It is very common, for example, for a Nobel laureate, who is very knowledgeable about a tiny part of knowledge, to comment on items for which he does not have adequate training, reproducing a speech of common sense. Bertrand Russell even said sarcastically: if the generalist knows nothing about everything, the specialist knows everything about nothing.⁵

The fragmentation of knowledge has required new postures from different areas. Knowledge has become so peculiar that the areas find it difficult to relate, as they do not even know where to start. If the division of knowledge seems to have no end, this illustrates the need for new methods. In this sense, inter and transdisciplinarity are indispensable amid the problems of current times.

In the case of Environmental Law, it can be seen how dogmatism is one of the major obstacles for the area. The way in which Environmental Law must presuppose different areas makes the constant dialogue of the legal area with other knowledge indispensable. The continuous, reflective and responsive dialogue of different scientific fields with the Law allows us to capture the so-called greening of the legal system. Law abdicates its contours of austerity and presumption of superiority, which at different times were able to naturalize in legal teaching and practice arguments such as that *res judicata* makes a square out of a circle or a circle out of a square. No judicial decision will effectively determine that vegetation grows faster, that greenhouse gases leave the atmosphere under penalty of a fine, or that the flow of advancing sea waves is interrupted.

As a result, judicial decisions that determine practices of biological, veterinary, engineering, anthropological or ecological assessments as a whole out of time or minimal technical circumstances foreseen in the dimensions of knowledge of other sciences, are not only ineffective, they are retrograde and obsolete, from a time when the Law was imagined as hermetic. Greening is not just about absorbing standards and postulates of environmental protection, greening is a reinterpretation of Law so that it

⁵ The reference to Bertrand Russell was taken from Domingues *et al.* (2004, p. 8).

can be established with dialogue on an equal footing with other scientific fields. Along these lines,

[...] the meaning of the “greening of law” comes from the opening of legal knowledge to dialogue with other sciences and knowledge, namely, with the sciences dedicated to the conservation of nature, and is part of the epistemological-legal movement of construction of a “transdisciplinary discourse” for Environmental Law (ALVARENGA, 2019, p. 45).

One who deals with Environmental Law must necessarily be inter and transdisciplinary. As highlighted by Saulo de Oliveira Pinto Coelho and Rodrigo Antônio Calixto Mello (2011, p. 19), inter/transdisciplinarity is one of the main concerns of contemporary legal science, thus, “[...] it is necessary that the legal system is seen as a complex unit of normative communication instrumentalizing the coherent unit of meaning that is the constitutional project of sustainable development” (COELHO; MELLO, 2011, p. 19). The projection of environmental quality and an ecologically balanced environment, recognized as fundamental rights and human rights, depend on transdisciplinary and interdisciplinary developments that enable the densification of sustainable development in concrete technological and productive practices. In the most diverse economic and social spheres, the internalization of sustainability depends on breaking with the images of fragmentation of knowledge and silencing the reflexes of human activities on the ecological whole.

Even with such findings, the researcher is often inhibited from thinking in a way that takes into account different areas, with the University itself and institutional bodies being obstacles to inter/transdisciplinary thinking and research. Several researchers still think of knowledge as being classically divided into “human”, “exact” and “biological”. These, in turn, are divided into micro-areas. Later we will turn to the reflection on transdisciplinarity in Environmental Law.

For now, it is essential to revisit the history of the term “transdisciplinary” and other correlates for further clarification. According to Domingues:

First, “interdisciplinary”, adjective, whose first appearance in France is recorded by the *Robert* dictionary in 1959, associated with “interdisciplinarity”, noun registered in 1968. Then, “pluridisciplinary”, registered in that country (*Robert*) in 1966, linked to “pluridisciplinarity”, registered in 1969. At the same time, “multidisciplinary” appears, whose dating in France is somewhat imprecise (*Robert* speaks of “half” of the 20th century and gives as an example a phrase from the newspaper *Le Monde*, used in late 1968). Finally, “transdisciplinary” appears as well as “transdisciplinarity”,

not yet included in French dictionaries, but in current use, as jargon by illustrious francophones, like Stengers and Piaget, the latter seeing in the idea of “trans” the ideal of knowledge and in its practice a kind of utopia to be pursued in the future (DOMINGUES, 2004, p. 9).

In his six volumes called “The Method”, Morin criticizes the current paradigm of knowledge mutilation, referring to it as a fragmentation of society itself. The solution to this problem involves the reorganization of knowledge:

I am more and more convinced that the concepts which we use to conceive of our society – all society – are mutilated and lead to actions which are inevitably mutilating.

I am more and more convinced that anthropo-social science needs to articulate itself on the science of nature and that this articulation requires a reorganization of the very structure of knowledge.

But the encyclopedic amplitude and the unfathomable radicality of these problems inhibit and discourage, and thus the very recognition of their importance contributes to divert us from them (MORIN, 1977, p. 13).

Despite the similarities between the terms “disciplinary”, “interdisciplinary” and “transdisciplinary”, some reservations should be made. According to Ivan Domingues (2004), multidisciplinary experiences have the following characteristics:

- a) bringing together different disciplines in order to resolve specific issues;
- b) different methodologies, in which each discipline remains with its own methodology;
- c) the areas remain immune to each other.

As for the interdisciplinary experiences, the following characteristics can be highlighted:

- a) bringing together different disciplines in order to resolve specific issues;
- b) use of the same methodology;
- c) after the relationship between the disciplines, the effect is the creation of new disciplines.

Finally, as for transdisciplinary experiences, Domingues characterizes them as follows:

- a) the coming closer together of different disciplines and areas of knowledge;
- b) use of unified methodologies created from different areas of knowledge;
- c) filling in the undefined areas of knowledge, generating new disciplines or serving as a process between the various disciplines, and here lies the

properly transdisciplinary area.

Interdisciplinarity and transdisciplinarity are fundamental to several contemporary issues, including with regard to Environmental Law. Many areas are related to Environmental Law. Architects and urban planners, landscape designers, engineers of the most diverse specializations, social scientists, sociologists, philosophers, biologists, veterinarians, politicians and economists, for example, are some of the professionals who at some point think about themes inserted in Environmental Law and that can contribute to its reasoning.

In the permanent dialogue between the areas of knowledge, important concepts can be reached. In a dialectical game between the various areas and disciplines, each knowledge can contribute to the other. In addition, there is a continuous dispute over prevalence, characterized by communicative suffocation in attempts to overlap techniques and scientific frameworks specific to each of the agents that are part of the discursive process in the applied manifestation of knowledge. The synthesis will emerge if a fruitful dialogue is achieved, which requires openness, non-dogmatism and a desire to know.

Reflection on the environment requires dialogue between different branches of knowledge, with the actors involved becoming aware of the insufficiency of insular knowledge in their own area of training. The current moment is clear in demonstrating that scientific superspecialization is limited to dealing with this problem. In addition, there is a low interlocation and approach to the subject on the applied judicial scale, including judicial and administrative decision-making incursions without having parameters or metrics of definition suitable for adequate scientific levels of justification.

In addition, Environmental Law itself can be understood as a branch of legal knowledge inserted in other branches of Law. It interacts, influences and is influenced by other disciplines, which is why we talk about Environmental Criminal Law, Environmental Tax Law and Environmental Economic Law, for example.

After noting the importance of inter/transdisciplinarity in the contemporary world, the reflection must proceed to demonstrate that such methods are fundamental as regards environmental issues and Environmental Law.

2 THE FUNDAMENTAL INTER/ TRANSDISCIPLINARY DIALOGUE IN THE REFLECTION ON THE ENVIRONMENT AND IN ENVIRONMENTAL LAW

The environment is complex, as should be the reflection on it. Environment is not only nature, but also that which man gives meaning. In the title that composes the preface to his work *Man and the Earth*, the French geographer Eliséé Reclus (1830-1905) writes that “Humanity is nature becoming self-conscious” (ANDRADE, 1985, p. 39). In this aspect, the man-nature dichotomy makes no sense, because the human being is also nature. Culture is the means which the human being will use to perpetuate the species, being an extension of nature itself. Thus, when talking about environment, it is important to be clear that the term takes into account the natural environment and the environment modified by human beings.

Enrique Leff expresses this complexity as follows:

Environmental complexity emerges from the relationship between the real and the symbolic; it is a process of ontic, ontological and epistemological relationships; of hybridizations of nature, technology and culture; it is, above all, the emergence of a complex thought that apprehends the real and that becomes complex by the intervention of knowledge (LEFF, 2009, p. 22).

The complexity of nature, including culture, makes the combination of different types of knowledge fundamental for a better analysis, even though Edgard Morin draws attention to the difficulty of implementation:

Will we know how to make uncertainty the leaven of complex knowledge? Will we know how to encompass the molar in knowledge and grasp knowledge in its multi-dimensional roots? Will we know how to elaborate the method of complexity? I know: the risks of failure in such an undertaking are highly probable... (MORIN, 1977, p. 91).

Among the different types of knowledge, for example, the biologist deals with biodiversity, the chemist with the elements that compose it, a physicist deals with the laws of nature, a historian deals with the history of a people, an anthropologist studies different cultures, an economist thinks about resources, a jurist about norms for dealing with the environment, a philosopher thinks about values, and an educator can instill ways of behaving. In short, professionals turn to the environment through their training and their specialized “look”.

As worldviews clash, sciences conflict, politics polarize, and institutions entrench, political decisions become dilemmas without obvious solutions. Yet decision must be made: Should we exterminate a species if doing so improves human health? Should we burn trees and bunnies to restore native species and natural fire regimes? Should dams release water for spawning salmon and forgo opportunities to generate clean hydropower and irrigate inexpensive food? Should we subsidize biofuel industries, which produce jobs, enhance national security, and help moderate the climate but convert vast habitats to corn and tree monocultures?

Decision makers facing these wicked choices operate within a segmented and fractured world created by disciplinary, institutional, locale, linguistic, and normative barriers that define communities of practice” (HULL, 2009, p. 384).

As the quote calls attention, in addition to involving scientific issues, environmental problems include political, evaluative, cultural and normative decisions that, when taken into account in practical issues, illustrate, along with the fragmentation of scientific knowledge, the difficulty of dealing with environmental dilemmas.

Returning to the term “complex”, it can be seen that this adjective was used by different thinkers when referring to the environment. François Ost, for example, states:

We can define as “complex” any phenomenon that brings into play a difference of levels and a circularity between these different levels. Taking into account, at the same time, these different levels (for example, between the object, the object’s environment and the observer) and the relations of circularity that are established between them, is characteristic of the epistemology of complexity [...] (OST, 1998, p. 280).

Ost, when agreeing with the notion of the complexity of the environment, also understands the need to reflect it through a new epistemological and, therefore, methodological approach, which, as stated, must be seen as an inter/transdisciplinary reflection. The author emphasizes the fundamental relationship between the social sciences and the natural sciences, which would demand a knowledge of the “environment”. For Ost (1998, p. 297-298),

[...] ecological phenomena broke out in the political field, while man made his appearance in the field of ecology. [...] we can believe that the time has come for an interdisciplinary investigation of a new field of study: that of the interrelationship between human societies and the means they frequent and use.

Perhaps reflection on the environment begins only through a specific discipline, which focuses on a fragment of reality, but it is necessary to go further, emphasizing to the researcher that dialogue with other areas is

essential to avoid remaining in a naive reductionism.

Morin leaves this necessary combination of knowledge implicit when looking at the relationships between the physical sphere, the biological sphere and the anthroposocial sphere. In his view: “We have known for more than half a century that neither micro-physical observation nor cosmo-physical observation can be detached from their observer. The greatest progress in contemporary science has been effected by reintegrating the observer in the observation” (MORIN, 1977, p. 15). The consequence of this notion is that there is an intrinsic relationship between the spheres.

Like Ost, Morin, two decades earlier, also notes the separation between the areas of natural sciences and human sciences, which is a methodological obstacle to carrying out an inter/transdisciplinary reflection, emphasizing the necessary relationship between them:

No science has wanted to know the most objective category of knowledge: that of the knowledge of the subject knowing. No natural science has wanted to know its cultural origin. No physical science has wanted to recognize its human nature. The deep gap between the sciences of nature and the sciences of man hides both the physical reality of the latter and the social reality of the former. [...] *Now, all anthropo-social reality is based somehow (how?) on physical science, but all physical science is based somehow (how?) on anthropo-social reality* (MORIN, 1977, p. 15, italics in the original).

The human being himself is an entity that exemplifies the necessary relationship between the areas of knowledge, for the purpose of a better understanding of oneself and of reality. The human being is the result of a physical/natural/biological, historical and contingent process of millions of years. However, it is this same human being who, through culture, influences the very way in which he is inserted and understood⁶, which is an argument for the realization of the complexity of the environment and the necessary inter/transdisciplinarity in its analysis.

In this process of understanding about the environment there is also Environmental Law, perhaps one of the most fundamental areas of current Law, but which is still under construction. Here, it is not about a construction in the sense of a project to be achieved, but a construction of pursuit to continually adjust to factual demands and interactions, to reveal new problems and new conjunctions of factors and actors involved with the

⁶ As Reis, Naves and Ribeiro (2017, p. 78) state: “Although the biological process was decisive for the existence of a human being, the latter cannot be reduced to the former. The point is that the very statement that the individual is genetically/biologically determined already takes into account a pre-understanding of man’s world”.

problem of scarcity and the search for sustainability in the use of ecological goods. Thus, the construction of Environmental Law will always be constant, always unfinished, always seeking to adjust to the anxieties and uncertainties typical of modernity. Ost states that, at first, the jurist struggles to deal with environmental issues, as he runs the risk of getting lost in technical language that he does not understand:

[...] either environmental law is the work of jurists and cannot usefully understand a decidedly complex and variable datum; or the norm is written by the specialist, and the jurist denies this bastard son, this “engineer’s law”, filled with numbers and uncertain definitions, accompanied by endless and constantly revised lists. It is not enough, says the disillusioned jurist, to flank a purely technical rule with some penal provisions, to really do the work of a legislator (OST, 1998, p. 111).

The reductionism still in force in legal practice is one more argument in favor of inter/transdisciplinarity in environmental issues, so that Law is not isolated. The challenge of the inter/transdisciplinary contextualization of Law in the environmental sphere implies applied judgments of decisions regarding the prevalence or institutional and scientific dialogues. These judgments also go through discussions of methodological definition, when there is judicialization of a topic under administrative discussion, followed by the appointment of an expert who may even be affiliated with a scientific technical basis different from those present in past administrative decisions in environmental agencies.

Paulo Machado defines Environmental Law as “[...] a systematizing Law, which articulates legislation, doctrine and jurisprudence concerning the elements that make up the environment. *It seeks to avoid the isolation of environmental issues and their antagonistic approach*” (MACHADO, 2016, p. 62, emphasis added). Such clarification by the author, which is based and corroborated by different international scholars, understands Environmental Law as being, in theory, inter/transdisciplinary.

The relationship of Environmental Law with other areas begins with its own interaction with other areas of Law. Michel Prieur (2011) states that Environmental Law has a horizontal character, as it relates to the different disciplines of Law, such as Civil Law, Administrative Law, Criminal Law and International Law; in addition to having an interactive character, being present in different regulations. As a result, it is necessary to identify constructive and decision-making processes affected by the theme of inter and transdisciplinarity in the environmental sphere.

3 DISCOVERING INTERDISCIPLINARY AND TRANSDISCIPLINARY ADMINISTRATIVE SPACES

The interactions between public environmental agencies are developed from the National Environment System (SISNAMA), provided for in Law No. 6,938, of August 31, 1981, to regulate the system of the National Environmental Policy (PNMA). Throughout the normative text, the legislation makes direct references to technical and scientific criteria necessary for the delimitation of regimes and legal consequences. Art. 3, III, defines as pollution the degradation of environmental quality that creates adverse conditions to the biota, or that affects it unfavorably, or even that releases materials or energy in disagreement with established environmental standards.

The unveiling of interdisciplinary administrative spaces already begins in the very evaluation of what is degradation or pollution. Environmental quality is defined by technical and management criteria. The identification of what adversely affects the biota also depends on evaluative criteria and conceptual frameworks. Environmental limits and standards explicitly demand thresholds and technical motivations to establish what these limits are and what these standards consist of. In other words, technical criteria and scientific evaluation, combined with evaluative management judgments, will be the defining point between what is and what is not pollution, between what is lawful and what is unlawful.

This means that the adoption of technical criteria is not only a measure of achieving a scientific conclusion after the course of the administrative process in which theses of parameters and evaluation indices are formulated, but also the support of diagnosis of legality and illegality or existence or not of environmental damage for reparability purposes. After all, “[...] in the relationship between administration and citizens, procedural techniques protect competences for the former and rights and freedoms for the latter” (BACELLAR FILHO, 2014, p. 380).

Art. 4 of the PNMA, soon in its item III, determines that it is responsible for establishing criteria and standards of environmental quality and norms related to the use and management of environmental resources. It is within this framework of formulating indexes and parameters that the activities of federal environmental agencies are situated. Art. 6 of Law No. 6,938/81 identifies the functions performed by federal, state and municipal bodies in the National Environment System. The National Council for

the Environment (CONAMA) is assigned the role of advising, studying and proposing guidelines for government policies for the environment and natural resources and deliberating, within the scope of its competence, on norms and standards compatible with the ecologically balanced environment and essential to a healthy quality of life. The quality of executing agencies is attributed to IBAMA and ICMBio. Both have the role of executing and enforcing the governmental policy and guidelines established for the environment, in accordance with their respective competences.

Specifically with respect to IBAMA, Law No. 7,735, of February 22, 1989, in its art. 2, assigns the authority to carry out actions of national environmental policies, referring to federal attributions, related to environmental licensing, environmental quality control, authorization for the use of natural resources and environmental inspection, monitoring and control, observing the guidelines issued by the Ministry of the Environment. On the other hand, ICMBio, according to Law No. 11,516, of August 28, 2007, has as one of its attributions the role of executing actions of the national policy of nature conservation units, referring to federal attributions related to the proposition, implementation, management, protection, inspection and monitoring of conservation of protected areas instituted by the Federal Government.

If the first unraveling involves the critical realization that technical and scientific criteria, as well as management, are pillars to determine levels of quality and environmental compatibility, as well as to define levels of regularity or legality, with accountability if they are violated, the second unraveling works with a simple but profound question. What are the professional compositions that make up the staff of IBAMA and ICMBio in terms of scientific training? Are these compositions approached in interdisciplinary and transdisciplinary terms for the formulation of technical positions related to the PNMA?

In addition, there are themes that intersperse the interactions between the environmental sphere of Public Administration and other branches of knowledge concentrated in other spheres of Administration, such as infrastructure and agriculture. An example of this are the coordinated decisions provided for in the Administrative Procedure Law (Law 9,784, of January 29, 1999), as amended by Law 12,210, of September 30, 2021. Art. 49-A determines that the coordinated decision is obtained through the constitution of an interinstitutional or intersectoral instance that acts in a shared way with the purpose of simplifying the administrative process through the

concomitant participation of all authorities and decision-makers and those responsible for technical and legal instruction, observing the nature of the object and the compatibility of the procedure and its formalization with the relevant legislation.

This means that the decision is obtained by the combination of technical and scientific dialogues allied to management perspectives related to different, and sometimes opposing, areas of knowledge. A coordinated decision related to environmental licensing derives from the argumentative coexistence and even clash between biologists, veterinarians, environmental engineers, civil engineers, economists, jurists, among others. Each one of them dives into the discursive box of confrontations with their lens of debate, with their pre-understandings, with their objective orientations placed in advance of worldviews. Dialogues and confrontations are primarily confluences of underlying discussion of different scientific models and perspectives, that is, they demand dialogue and a model of reciprocal articulation that prevents stagnation.

The articulations and models of interdisciplinary and transdisciplinary interaction are essential for there to be efficiency and real integration of discourses, without mutual exclusion or unilateral silencing of a sense of technical-scientific application. The tension between thoughts, scientific and technical perspectives is an act of choice based on proceduralizations that allow the integration of social and technical vision matrices.

It cannot, therefore, speak of simplisms of choice or standardized solution labels. Social and environmental crises are linked to crises of asphyxiation of discourse, of asphyxiation of the interconnection of transdisciplinary and interdisciplinary debates, founded on *modus operandi* that simply muzzle one bias of scientific knowledge in relation to another. On the other hand, one cannot forget that asphyxiation or silencing can come from the scientific sphere itself linked to preservationist aspirations. Environmental protection discourses can also turn into discourses that are deaf to other scientific or technical perspectives, as well as to social discourses and those related to collective needs. In this situation, the areas of environmental knowledge abdicate coordinated constructions in order to buckle themselves on supports of zero alternative, which on a final scale can lead to the loss of space for the discourse of environmental protection itself, which is previously captured as a discourse of deaf ears.

The environmental crisis can be understood as a crisis caused by speeches and expressions of will that are scientifically enclosed in each

area of knowledge or social or economic action. Along these lines, Melissa Ely Melo situates the environmental crisis as a crisis of knowledge, insofar as “[...] in view of the multidimensional aspect of the elements of knowledge and, furthermore, the complexity of the perceived problems, the challenging dialogue between the subjective reflection and objective knowledge becomes essential” (MELO, 2018, p. 6). Confronting the crisis therefore requires inter and transdisciplinary mechanisms of reflection, here considering the most diverse meanings of the environment.

Be it in relation to the natural environment or in relation to the artificial, cultural, virtual or work environment, inter and transdisciplinarity function as translators and mediators of signs and meanings, bridge the Cartesian fragmentation in its excluding methodological sense, without this determining the loss of specificity or the breaking of the methodological and scientific archetypes characteristic of each dimension of knowledge. Interdisciplinarity acts both in relation to different areas of Environmental Law and in relation to the sciences that are interconnected to each of these areas, capturing levels of complexity, not to ignore them and even less to assume the arrogant role of complete overcoming of theoretical or applied dilemmas. The proposal is, most of all, to what Ângela Issa Haonat and Murilo Braz Vieira see as a coming closer together to the fundamental normative nuclei, to contribute “[...] so that the different disciplines that structure the law maintain reciprocity in the process of development and construction of knowledge sciences” (HAONAT; VIEIRA, 2015, p. 3).

The thematization of inter and transdisciplinary interactions is primarily a presupposition for the practical articulation in the development of the roles and functions of both public bodies and private activities. The technical and scientific suffocation aimed at the prevalence of a modality of knowledge without its confrontation with others, in an institutional environment that legally establishes frameworks for dialogue between forms of knowledge, proves to be incompatible with the democratic paradigm of the scientific approach. It is precisely the institutionalization of interdisciplinary and transdisciplinary matrices that allows reaching the transversality of knowledge, which “[...] can cross, obliquely, the realities of knowledge, promoting the appreciation and interpretation of dynamic realities of systematic thinking” (BÔAS; MOTTA, 2021, p. 800).

The opening to dialogicity and interlocution of different scientific prisms assimilates the complexity and uncertainties inherent to the conjuncture that characterizes the risk society (BECK, 2010). This does not

mean transforming technical criteria into ideological subjection, much less submitting the formation of concepts and definitions to the taste of opinions. The democratic paradigm of the technical and scientific approach means that fields of knowledge need porosity to enter the contemporary discursive agora and understand in motivated dialogue different perspectives from other technical and scientific spheres.

An example of this discussion took place in the administrative process of case No. 02070.001904/2018-91, linked to case No. 00810.001628/2020-40, both from ICMBio. The discussion involved art. 42 of Law No. 9,985, of July 18, 2000, the SNUC (National System of Nature Conservation Units) Law. The article determines that in integral protection conservation units, such as parks, if traditional populations are not allowed to remain, they should be removed from the protected area. In other words, a split between scientific dialogues was established, with hermetic precedence between sociological and anthropological expressions, linked to traditional populations, towards strict biological and ecological perspectives, aimed at separating the human aspect from the faunal and floristic aspects. A non-negotiable incompatibility between the two was assumed.

Among several reasons to overcome this non-negotiable incompatibility, and to allow traditional populations in environmentally protected areas, motivations linked to the constructions of bioculturalism were used, which, in turn, is based on interdisciplinary exchanges for the construction of options based on different aspects of sociological, anthropological, ecological and biological knowledge. The perceptions contained in the SNUC Law need to be reassessed and reinterpreted in the overall context of conservation and environmental preservation, in which, currently, biocultural diversity is spoken of, and not only cultural diversity or biological diversity. This is because traditionality is directly linked to environmental goods placed under protection and recognition.

The split was overcome in favor of judicious and procedural articulation. Thus, it was defined that “[...] ‘biocultural diversity’ is a phrase that means the sum total of the Earth’s biological and cultural diversity in all its expressions” (VERSCHUUREN *et al.*, 2021, p. 9). The interdisciplinary articulation enabled the construction of accommodation paths that overcome previous and hermetic obstacles.

There is an intellectual step of relief here. The broad interconnection of environmental issues progressively becomes involved in amalgamation with other social, economic, cultural and political conflicts. Environmental

problems are implicated in issues of gender, inequality, racial discrimination, poverty, intolerance of the most diverse strains, exclusion in their variable manifestations. Disaster situations, whether anthropogenic or natural, are constantly linked to situations of exclusion, housing and urbanization problems. Health problems in contaminated areas are linked to lower land pricing levels, thus subjecting populations with lower purchasing power. All these themes refer to the idea of environmental justice, which can only be faced by the methodological supports of inter and transdisciplinarity.

The broad interconnection of environmental issues with different scenarios of social crisis and conflicts is emphasized by Bullard (2021), who highlights a new configuration of social protests, understood as intergenerational protests, including those linked to racial issues and exclusion phenomena. Bullard highlights that from 2020 onwards, more and more protests are captured that transcend specific crises, and are affiliated with phenomena of confrontation in which revisitations aimed at claims for justice are demanded. The protests radiate from a circumscribed trigger to expand to a whole range of social relations seen as unfair in their conformations. Thus, related dimensions of justice claims are determined, always subject to different lenses according to the actors involved. The review of protests analyzed by the author reveals that “The protests were about justice: criminal justice, environmental justice, health justice, economic justice, energy justice, food and water justice, transportation justice — all viewed through an overarching racial justice lens” (BULLARD, 2021, p. 248). In other words, environmental justice cannot be abstracted from various claims to correct injustices.

However, if interdisciplinarity and transdisciplinarity present themselves in interlocutions involving different fields and bodies of Public Administration and their interaction with the social and market sphere, it is also necessary to take into account that their presence is also manifested within their own environmental bodies. There is a procedural understanding challenge internal to environmental agencies that also needs to be uncovered. This is about the systematic composition of environmental agencies. The conflicts and aspects of different areas of knowledge that influence the training of professionals, public servants and public agents, members of the Federal Public Administration entities, is not sufficiently problematized in Brazil.

Likewise, technical opinions and reports are no longer captured with expressions related to a technical-scientific aspect of knowledge and come

to be expressed as a single aspect. Thus, it is considered important to resize the atmosphere of argumentative circulation, in order to take into account the underlying composition of scientific and technical pre-understandings that provide the substrate for the matrixes of positional construction in a Public Administration entity, according to the diagnosis of the body of professionals who developed the analyses. This does not mean an indisposition or prior criticism, and even less an unscientific desire to transform constructions based on drafts of opinion, far from it. It does mean to proceed with something such as a tomography of the technical-scientific construction in order to identify the knowledge matrices that underlie its elaborations.

For this problematizing and thematic unveiling, it is relevant to identify the legal formation of the body of servants and managers that enters the federal environmental agencies, advancing here to the administrative legal framework of environmental careers. Law No. 10,410, of January 11, 2002, created and disciplined the career of specialist in the environment, to integrate the positions of manager, environmental analyst and environmental technician, among others. Art. 4 defines as attributions of the occupants of the position of Environmental Analyst the environmental, organizational and strategic planning related to the execution of national environmental policies formulated within the scope of the Federal Government, in particular those related to regulation, control, inspection, licensing and environmental auditing, monitoring, environmental quality management, stimulation and dissemination of technologies, among other activities.

Art. 11 of the Law defines as a requirement for admission to the positions of environmental manager and environmental analyst, a degree in higher education or equivalent legal qualification. The competition for admission to the position of Environmental Analyst may be carried out by area of specialization, and specific training may be required, as established in the public notice. But this training is not necessarily required, being an administrative faculty. This means that in the body of analysts and managers of federal environmental agencies, as well as of state and municipal agencies that follow the same normative vector, there is a diversity of professionals forged under different plans of scientific understanding. Engineers, biologists, veterinarians, agronomists, anthropologists, sociologists, biotechnology professionals with higher education, jurists, can all be part of the public servants who will develop and apply environmental public management in technical and scientific terms.

The question of articulation refers precisely to how the scale of professionals and the dialogue of scientific knowledge develops in the formulation of the position of environmental bodies. An environmental analyst or manager trained under the scientific pillars of agronomy tends to have technical and understanding lenses that are different from those of a biology graduate. An anthropologist who is an environmental analyst will have a different perspective than a biologist when analyzing interactions between traditional peoples and natural resources. The discussion of interlocution involving multidisciplinary, interdisciplinary and transdisciplinary experiences assumes here a character of imminently practical and internal implications for the formation of the administrative will, after all, the systematic of communicative dialogue will determine the scientific or technical bias of manifestation of the Public Power.

IBAMA, through Public Notice No. 1, of November 29, 2021, defined the set of vacancies for the public tender to fill the positions of administrative analyst, environmental analyst and environmental technician. For an environmental analyst, in compliance with Law No. 10,410, the requirement of higher education was established, without restriction of knowledge area. The projection of the question that forms is not in itself of the selection process or the knowledge and capacity of each of the professionals, but from the perspective that, after selection and hiring for the job, there is a plurality of professionals and respective scientific formations that are grouped together under the single name of environmental analyst.

The conjuncture also affects the formation and administrative guidelines of management, hence the need to consider and project technical manifestations and positions for the institutional and discursive confrontation of technical and scientific perspectives. Evidently, this does not mean overcoming or diminishing the relevance of the plural aspects foreseen as in CONAMA Resolution No. 237, of December 19, 1997. It means providing both society and the Administration itself with ways of understanding the interdisciplinary and transdisciplinary character that can be demanded and applied in the course of an administrative process.

In compliance with Decree 8,973, of January 24, 2017, as well as with IBAMA Ordinance No. 2,542, of October 27, 2020, there is a chain of analysis and approval of technical and management manifestations in the Environmental Authority. As provided for in IBAMA's Internal Regulations, the entity is composed of a collegiate body as well as a body of direct and immediate assistance to the President. Based on the actions of these

bodies, regulatory rules are issued, environmental agendas are laid out, and statements on technical, economic and social parameters for defining actions are made, as well as in environmental licensing.

The technical and scientific training of the environmental analyst or manager that integrates the bodies will be decisive for the formation of the propositional guideline that will mean the expression of the will of the Public Administration. To this extent, the structural configuration directly influences regulatory formation, and consequently, regulatory impact assessments. There is no mere coincidence here. As highlighted by Leonardo Pereira Lamego, “the vast majority of environmental bodies and authorities with regular powers do not have a systematic or institutionalized practice to carry out a prior regulatory impact analysis (AIR) for the issue of environmental standards and regulations” (LAMEGO, 2021, p. 420). The lack of interconnection of regulatory impact assessments is linked to the interdisciplinary and transdisciplinary split between legal, economic and social aspects in relation to other scientific spheres. The systemic internalization of critical analyses of complexity and interconnection makes it possible to avoid fragmented solutions.

The issue is not, therefore, an actor’s internal disposition to position himself against or in favor of an environmental thesis, but the training field in which his professional pre-understandings are constituted. It is relevant, in this scenario, that the spaces for issuing Technical Notes, Technical Opinions, Reports and other technical-scientific documents are always considered not only for the identification of their issuer as an environmental analyst or manager, but also taking into account the training inherent to the professional. This unveiling also allows the managers or editors of the norms to demand assessments and different counterpoints, listening to and integrating into the discourse positions related to other fields of knowledge, concretizing in an operational and practical scale the conceptual and teleological matrices that found the interdisciplinarity and transdisciplinarity.

It is essential, therefore, to endow the operational systems of decision-making with a structural awareness that the concrete actors in the normative formulation are not specters of extracorporeal scientific or technical positions. On the contrary, it is relevant, in a historical and contextualized view of science and technique, to understand the formulator of the positioning as a contextualized being and linked to previous training loads.

The fruitful, democratic and effective operability will come precisely from this record, from this confrontation. In no way it weakens a

deliberative process to identify that a certain report or position on the use of genetically modified organisms in an area close to environmental protection was prepared by an analyst or manager with a background in biology and hence also demand a counterpoint position on the part of another analyst whose training is linked to agronomy or a diverse field of science. Instead of weakening, this strengthens the operative and deliberative practice, enabling a true agora of application of interdisciplinarity and transdisciplinarity, which, far from being cloistered in academic ivory towers, become mechanisms of public discussion in Administration and in society. Add to that the continuous possibility of appreciation. The record of different technical and scientific positions in an administrative process does not signal doubt or hesitation, but rather converts the decision-making process into an ability to respond to the dynamics that are always fluid and averse to the absolute that characterize modern society.

FINAL CONSIDERATIONS

The applied construction of scientific and technical understandings in postulates of practical and operational judgment committed to interdisciplinarity and transdisciplinarity is shrouded in challenges when it comes to administrative processes and past decisions in the spaces of environmental Public Administration.

On the one hand, sharp threats to try to convert technical and scientific positions into mere opinionated editions are projected on them, as if they were picked in a garden of colorful flowers, to which everything would depend on the free will of those looking for the rose that suits them. On the other hand, threats of uncertainty and insecurity are projected as well, as if the projection into a discursive agora of positions based on a diverse matrix of knowledge would weaken or remove the social and legal confidence of decisions. In this aspect, the manager would be confronted with the first or second option in the face of technical-scientific problems, as if there were only one correct answer, and then thrown into the well of judicial confrontations or public opinion.

Instead of suffocating or strangling the interdisciplinary and transdisciplinary application in procedural decisions and formulations related to the environmental Public Administration, in order to avoid the potential conflicts that arise, it is considered that only the deepening of the practices of procedural internalization of the diversity of knowledge in communion

of space applied in its production can overcome the pendularities placed in the diverse threats identified, among existing others. Along these lines, the applied clarity of scientific and technical vectors linked to interdisciplinarity and transdisciplinary demands transparency and contextual explanatory procedures.

The operational metrics for the production of decisions or assertions of adequacy or otherwise of procedures or norms face motivating and legitimation challenges that, in order to be overcome, require the explicit taking into account that human beings are contextualized, are historical, are formed in their knowledge by scientific and technical bases that endow them with pre-understandings when analyzing reality. Proceduralizing the debate in an interdisciplinary and transdisciplinary agora, basing technical and scientific positions on aspects of knowledge, without this resulting in conspiratorial accusations or imputations or even crises of confidence, is an unavoidable step towards the practical construction of legitimacy of environmental standards.

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