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Making Sense of Research in a Time of Crisis
Kant's Account of the Regulative Use of Transcendental Ideas as a Way to Interpret Sustainability[1]

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Abstract. *Although ecosystems and society are closely interlinked, a dichotomous conceptualisation of the relationship between them characterizes the Global North and determines the current socio-ecological crisis. Philosophy offers useful tools to face this condition and understand the role of scientific knowledge in finding possible solutions, even if the efforts made do not generate detectable short-term spin-offs. The paper pursues this aim by taking into account the regulative use of transcendental ideas Kant thematizes in the* Critique of Pure Reason *and in particular in the* Appendix to the Transcendental Dialectic*. In this regard, the contribution interprets sustainability as an idea that must be used regulatively. Accordingly, it is conceived not as the concept of an object that is actually given in experience but, on the contrary, as a methodological rule we must presuppose at the beginning of our inquiry and of which we must admit the possibility in order to profitably carry out our empirical research. In other words, our strive to reach a sustainable relationship between society and ecosystems can only make sense if we presuppose that this relationship is possible in the first place, and therefore only if we assume its concept as a heuristic tool aimed at guiding our empirical research, i.e. if we use this idea regulatively in Kant's sense. The analysis adopts an interdisciplinary approach, thereby aiming to provide an example of the possible fruitful collaboration between philosophy and human geography.*

Keywords. Socio-Ecological Relationship, Sustainability, Transformative Knowledge, Appendix to the Transcendental Dialectic, Regulative Use of Ideas.

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1. Introduction

Philosophy and geography have related to each other in multiple ways over time (Tanca 2017), and this linkage has found fertile ground among Italian geographers (Farinelli 2009, 2024; Tanca 2012; Giubilaro 2016; Maggioli 2019).

In order to frame this paper within multiple debates, three key introductory issues need to be highlighted.

First, scholars have developed thoughts that move through two different modes. While some of them emphasize philosophical inquiries starting from the observation of geographical empirical processes (e.g. territorialisation), others start from a conceptual tool and apply it to spatial dynamics. This paper falls within the latter scope.

The second issue concerns the relationship between philosophy and socio-ecological inquiries. The entire modern Western philosophy is sometimes blamed for the development of a dichotomous and hierarchical conceptualisation of environment and society (e.g. Artman 2023).[2] Although for some scholars this position relates particularly to the work of René Descartes (Kureetadam 2017), critical elements have also been identified within Immanuel Kant's thought. In this latter regard, Breitenbach (2022) describes two different positions towards Kant’s views. On the one hand, opponents highlight the conceptualisation of an asymmetrical power relationship between humans and non-human entities, which is described for example in the *Groundwork of the Metaphysics of Morals*; this unbalanced relation is founded especially by the possibility to attribute a market price to non-human entities. On the other hand, those who aim to valorise Kant's philosophy stress his deep understanding of environmental threats and the relevance he attributes to the sense of responsibility towards biodiversity. Although the issue is undoubtedly relevant, this paper does not aim to clarify the overall role of Kant’s influence within the debate on socio-ecological crisis. Rather, it aims to show how conceptual elements of his philosophy that have been neglected so far can be useful tools in addressing current conditions.

Accordingly, this paper examines the role of philosophical knowledge in finding possible solutions to the socio-ecological crisis, even if the efforts made by environmental and social scientists do not generate detectable short-term spin-offs. It pursues this aim by taking into account the regulative use of transcendental ideas Kant thematises in the *Critique of Pure Reason*, and in particular in the *Appendix to the Transcendental Dialectic*. In this regard, the paper interprets sustainability[3] as an idea that must be used regulatively.

A third remark is here necessary. Questioning sustainability is beyond the scope of this work. Thus, the analysis focuses on two out of four pathways to sustainability identified by literature (Martin *et al.* 2024): i) green economy and ii) earth stewardship and biocultural diversity.

The paper is structured into four sections. After this first and introductive one, the second section describes the regulative use of ideas Kant presents in the *Appendix to the Transcendental Dialectic*. The third section applies this regulative use to sustainability. Particularly, it analyses, on the one hand, green economy and, on the other, earth stewardship and biocultural diversity as different pathways to achieve the set goal. Finally, the last section addresses the inquiry of making sense of research in a time of crisis, given the elements previously considered.

[2] The relation between Western philosophy and environment has been analysed, among others, by Varden (2022).

[3] The idea of sustainable property use as defined by the *Doctrine of Right* has been investigated by Lo Re (2022).

2. Kant's Account of the Regulative Use of Ideas

The destructive outcome of the *Transcendental Dialectic* of Kant's *Critique of Pure Reason* was already well-known to his contemporaries.

Moses Mendelssohn, not only one of the most important philosophers of the time but also one of the main representatives of the rationalist metaphysics criticized in the *Dialectic*, called Kant "all-crushing", summarising in this brief qualification an influential account of Kant's critique of (special) metaphysics that has heavily shaped our interpretation of it until today.

Although drastic, Mendelssohn's qualification is not ungrounded. Indeed, Kant's diagnosis of the three traditional disciplines of special metaphysics (i.e. rational psychology, cosmology, and theology) is as short as it is definitive: they are complete failures. Although they deal with ideas that pure reason cannot but think of (the soul, the world, and God),[4] these disciplines fail to provide the slightest hint of cognition of them. Since these ideas have no corresponding objects in experience, our cognitive faculties are unable to establish, for example, whether there is an immortal soul, whether the world has a first beginning in space and time, or whether God exists. Accordingly, if we assume them as concepts referring to actually given objects, these ideas end up being «*conceptus ratiocinantes* (sophistical concepts)», i.e. concepts «obtained by a surreptitious illusion of inference» that, as such, have no «objective validity» (A311 B368).

However, Mendelssohn's qualification is not entirely adequate. While his interpretation of Kant's critique of metaphysics as primarily destructive is grounded on textual evidence, further textual evidence shows that this is not the entire story. More precisely, a closer reading of the *Dialectic* shows that Kant's aim is not merely destructive but, rather, also constructive. This is already suggested by the second possible qualification of the ideas of pure reason Kant provides at the beginning of the First Book of the *Dialectic*, namely not «*conceptus ratiocinantes* (sophistical concepts)» but «*conceptus ratiocinatis* (correctly inferred concepts)» (*ibidem*) that, contrary to the former, have some sort of objective validity. By presenting this dichotomy, Kant is implicitly suggesting that the ideas of pure reason can be both kind of concepts, and that therefore there is a sense or, better, a use of them that makes them not "sophistical" but "correctly inferred" concepts, thereby providing them with an objective validity that in the former case they could not have.

In order to see how ideas of pure reason can have a sort of objective validity, and, therefore, how Kant's account of their nature and function is not only negative but also positive, let us focus on the *Appendix to the Transcendental Dialectic*.

Kant begins the *Appendix* by focusing on two results of the *Dialectic*. On the one hand, its critique of special metaphysics has reaffirmed the main "negative" result of the *Analytic*, namely that our cognition cannot overstep the boundaries of possible experience, and that therefore if we apply our concepts to objects not given in experience, then all the alleged cognitions deriving from this illegitimate application are ungrounded. On the other hand, the *Dialectic* has also shown that ideas are natural to pure reason in the same way as categories are natural to pure understanding, and therefore that the latter are not arbitrary but necessary concepts of reason, just as the former are necessary concepts of the understanding.

However, with regard to this second point Kant makes a remark that casts some doubts on the reading claiming that ideas of reason are necessarily deceptive and, more generally, on the reading of the results of the *Dialectic* as exclusively negative. Indeed, he writes that

[4] On the so-called metaphysical deduction of ideas, see Grier (2000, 130-139) and especially Meer (2018, 69-91; see also 103-111).

«everything grounded in the nature of our powers must be purposive and consistent with their correct use, if only we can guard against a certain misunderstanding and find out their proper direction» (A642-643 B670-671). This claim is sufficient to deny that ideas are intrinsically deceptive: since they are genuine products of our cognitive faculty of pure reason, they cannot be intrinsically illusory, and they must rather play a positive role in our cognitive operations. In this sense, Kant claims that it is not the ideas as such that are deceptive, but rather their use, since not ideas themselves but only their use can be «either *extravagant* (transcendent)» or «*indigenous* (immanent)», according to whether we direct our ideas «straightway to a supposed object corresponding to them» or «only to the use of the understanding in general regarding the objects with which it has to do». Kant takes up and deepens this difference between two possible uses of ideas a few lines later, where he provides his first explicit account of the difference between constitutive and regulative use of ideas:

> I assert: the transcendental ideas are never of constitutive use, so that the concepts of certain objects would thereby be given, and in case one so understands them, they are merely sophistical (dialectical) concepts. On the contrary, however, they have an excellent and indispensably necessary regulative use, namely that of directing the understanding to a certain goal respecting which the lines of direction of all its rules converge at one point, which, although it is only an idea – (*focus imaginarius*) – i.e., a point from which the concepts of the understanding do not really proceed, since it lies entirely outside the bounds of possible experience – nonetheless still serves to obtain for these concepts the greatest unity alongside the greatest extension. (A645 B672).

As the quoted passage makes clear, there are two possible uses of the ideas of reason.

The first is the constitutive (or trascendent) use, which conceives of ideas as concepts of actually given objects. This is the use made by special metaphysics and criticised in the *Dialectic*. According to it, the soul, the world, and God are actually given objects that as such can be theoretically examined in order to establish their features. But, as Kant's critique of rational psychology, cosmology, and theology has shown, this use is illegitimate, and we cannot conceive of these ideas as referring to actually existing objects.

However, while the constitutive use of ideas is illegitimate, there is a second use, which is not only viable but also useful and, as Kant writes, even «indispensably necessary»: the regulative (or immanent) use. According to it, ideas are conceived not as concepts of actually given objects but, rather, as «heuristic principles» that «serve as a rule of possible experience» (A663 B691). Moreover, by means of ideas used regulatively, pure reason prescribes and tries to bring about «the systematic [*das Systematische*] in cognition, i.e., its interconnection based on one principle» (A645 B673), thereby providing the manifold of cognitions of the understanding with a «systematic unity» that is not actually given but only «*projected*» (A648 B676).

But how does this regulative use of ideas exactly work? What does it mean that, when used regulatively, ideas constitute «a rule of possible experience» and provide the manifold of cognitions of the understanding with «systematic unity», which moreover is only «*projected*»?

Curiously, Kant answers these questions by examining the regulative use not of ideas but of other cognitions of pure reason, namely the principles of homogeneity, specification, and continuity. The first principle claims that «all the manifoldness of individual things does not exclude the identity of the species» and that «the several species must be treated only as various determinations of fewer genera, and the latter of still higher families» (A651-652 B679-680); accordingly, it claims that different individuals nevertheless belong to common species and these species in turn to common higher genera, thereby affirming a fundamental homogeneity in nature. On the other hand, the principle of specification maintains the «manifoldness and variety in things despite their agreement under the same genus»;

therefore, by claiming that «every genus requires different species, and these subspecies» and demanding «that no species be regarded as in itself the lowest» (A655 B683), it affirms the heterogeneity of nature. Finally, the principle of continuity derives from the unification of the previous two and states that «all manifolds are akin to one another», since they are «all collectively descended, through every degree of extended determination, from a single highest genus» (A658 B686), thereby affirming a fundamental continuity among natural genera, species, and individuals.

Since Kant provides the same account of the regulative use for both ideas and principles, let us answer the previous questions concerning the regulative use of ideas and the systematic unity they make possible by examining Kant's account of the regulative use of the aforementioned principles.

First of all, what does it mean to use a principle regulatively? Kant claims that, when used regulatively, an idea or, as in this case, a principle does not describe actually given objects but, rather, represents «a rule of possible experience». This means that when we use a principle regulatively we do not assume it as a cognition concerning matters of fact (i.e. as constitutive); rather, we adopt it as a methodological rule that must guide our scientific inquiry.[5] Consider, for example, the principle of homogeneity. As we have seen, it claims that in nature there is a fundamental homogeneity because, despite their differences, individuals nevertheless belong to common species and, in turn, these species belong to higher genera. If we use this principle constitutively, then we are claiming that it is an actual description of nature, which therefore obeys this principle. However, we are not entitled to formulate such a descriptive claim. Indeed, we cannot know neither that all possible individuals in nature belong to more general species nor that all possible species belong to higher genera. Even admitting that we are be able to prove this claim with regard to all individuals, species, and genera given in the present time, we cannot prove that it also applies to all individuals, species, and genera that have ever existed in the past and, especially, that will ever exist in the future. In principle, nothing prevents the existence of an individual that does not belong to a more general species, or of a species that does not belong to a higher genus; therefore, we cannot use the principle of homogeneity constitutively. But this does not prevent us from using it regulatively, i.e. as a rule that must guide our scientific inquiry. In this second sense, we assume the principle of homogeneity not as an actual description of nature but, rather, as a methodological rule. In other words, when we use this principle regulatively we do not assume that there is a fundamental homogeneity in nature but, rather, that we must inquire nature «*as if* [*also ob*]» there were a fundamental homogeneity in nature. Kant provides two examples of the usefulness of the regulative use of this principle. Although chemists have reduced all the possible kinds of salts to two main genera, acidic and alkaline, they regard this distinction «as merely a variety or varied expression of one and the same fundamental material»; analogously, they have reduced all the species of earths (stone, metal, and so on) first to three and then to two, but they «cannot dismiss from their thought the conjecture that behind these varieties there is a single genus» including the different species of earths, and maybe «even […] a common principle for both earths and salts» (A652-653 B680-681). By reasoning in this way, chemists are using the principle of homogeneity not constitutively but regulatively: they are not claiming that there is a higher genus including both acidic and alkaline salts or a fundamental genus including all the species of earths; rather, they are conducting their inquiries *as if* there were a fundamental homogeneity concerning salts, earths, and even both.

[5] The value of the regulative use of principles and ideas for concrete scientific practice has been highlighted, among others, in Wartenberg (1992). Moreover, it has been linked to Kant's philosophy of science not only from a general standpoint (see e.g. Grier 2001, 288-294) but also with regard to specific sciences such as chemistry and astronomy (see Meer 2018, 221-261).

Accordingly, chemists are not conceiving of the principle of homogeneity as a descriptive claim (nor can they do it, since they still do not know whether there actually are fundamental genera including different species of salts and earths). Rather, they are adopting it as a methodological rule prescribing them to investigate different species of salts and earths *as if* these belong to more common genera including salts, earths or even both and, therefore, as a methodological rule prescribing them to look for these genera, thereby enlarging their empirical knowledge. It is in this sense that, as Kant writes, the principle of homogeneity used regulatively is «heuristic» and represents a «rule for possible experience»: it constitutes a rule that, making us assume as a methodological presupposition that all possible empirical objects we can deal with in our scientific practice obey this principle, prescribes us to investigate nature *as if* all empirical objects belong to common species and these to higher common genera, thus encouraging us to find these common species and higher genera and showing that all individuals belong to them; in short, encouraging us to achieve new empirical cognitions. The "heuristic" function of ideas and principles used regulatively consists precisely in this incentive to achieve new empirical cognitions. Following Kant's examples, we look for a more general kind of salt including both acidic and alkaline salts not because we already know that this further and higher kind is actually given (constitutive use) but because, without knowing whether it is actually given or not, we methodologically assume that it is given and try to confirm this methodological assumption by trying to find it, thereby proceeding in our inquiry *as if* a further and higher kind of salt were given (regulative use). Accordingly, the regulative use of ideas and principles of pure reason is aimed at providing us with cognitions concerning not supersensible objects not given in our experience (such as the soul or God) but, on the contrary, empirical objects, be they lifeless materials, plants, animals, and so on.[6] Moreover, this explains in which sense regulatively used principles or ideas provide our cognitions with a «systematic unity» that is only «*projected*». The principle of homogeneity used regulatively provides our cognitions with «systematic unity» because it affirms, although only as a methodological presupposition, that nature is systematic since every individual belongs to common species and these to higher genera, thereby reading nature as an ordinated system of individuals, species, and genera, and therefore as a comprehensive unity where every member is interconnected to others by means of a fundamental homogeneity. However, this systematic unity is only «*projected*» because it is not something actually given but, on the contrary, only something that our reason "projects" onto nature in order to be able to conceive of it as systematic and therefore to explain empirical objects in terms of their relationships to common species and further higher genera.[7]

What we have seen with regard to the principle of homogeneity also applies to the principles of specification and continuity. For the reasons seen above, we cannot claim that all possible genus actually specify themselves in more particular species and all these in more particular subspecies and all subspecies in further subspecies, and so on; analogously, we cannot claim that there is an actual fundamental continuity among all possible genera, species, subspecies, and individuals. Thus, we cannot use these principles constitutively, but we can use them regulatively, as methodological rules projecting onto nature a complete systematic unity that we cannot prove in its universality and necessity but that we presuppose in order to be able, on the one hand, to look for species, subspecies, and individuals for a given genus and, on the other, to try to establish mutual relationships between them.

[6] The transcendental deduction of the ideas, i.e. the proof of their (indeterminate) objective validity, consists precisely in this (indirect) relation to experience; see Marcucci (2005) and especially Meer (2018, 174-212).

[7] On Kant's account of systematic unity, see Horstmann (1998), Grier (2001, 268-288), and Meer (2018, 147-173).

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Moreover, what we have seen with regard to these principles of pure reason also applies to the ideas of the soul, the world, and God. The *Dialectic* has shown that we cannot use these ideas constitutively, as concepts of actually given objects with cognisable features; but we can use them regulatively as methodological rules guiding our scientific practice. Accordingly, we inquire inner experience *as if* we had a soul conceived as a simple substance that persists in its personal identity despite the changes of our body: in this way, we are able to trace back all the different empirical manifestations of our cognitive capacities and acts to a single subject, thereby enlarging our knowledge of the human mind in all its respects. Secondly, we inquire external experience *as if* the world were an infinite series of empirical objects (in the broad sense) interconnected to one another, thereby assuming, for example, every event as the effect of a further cause, which we do not assume as actually given but whose existence we presuppose as a methodological rule prescribing us to explain every given empirical state of affairs without assuming any event as uncaused and therefore not in need of a causal explanation. Finally, we investigate all of experience (both internal and external) *as if* it were originated in a God conceived as the wise and omnipotent author of the world: in this way, we presuppose that all of nature in all of its empirical objects is in accordance with the perfect understanding of its author, therefore being not chaotic and disordered but coherent and systematic (and that this systematicity is structured according to the principles of homogeneity, specification, and continuity); moreover, we presuppose that everything in nature has an end towards which it strives, and that we must therefore discover and make coherent with the other empirical cognitions we already have (see A682-689 B710-717).

The overall picture emerging from Kant's account of the regulative use of principles and ideas of reason is that of cognitions provided by pure reason that cannot be used constitutively as descriptions of actually given objects but only regulatively as methodological rules aimed at guiding our scientific practice and providing our empirical cognitions with a systematic unity they would otherwise lack. Accordingly, they are heuristic principles that do not describe actual matters of fact but guide our empirical research encouraging us to enlarge it in a potentially neverending process. Note that, although it gives a specific direction to our empirical inquiry, the regulative use of ideas and principles does not indicate a single, particular way to conduct them. For example, the regulative use of the principle of homogeneity prescribes us to investigate nature assuming that there is a fundamental homogeneity in all of its empirical objects, but it does not indicate a single and specific way to conduct our inquiries according to this principle. In other words, we can confirm (always progressively and never once for all) the principle of homogeneity in several different ways, according to the specific empirical ways of proceeding that depend from the specific domains of the different sciences and that we choose to adopt. This is coherent with Kant's account of ideas as concepts that have no corresponding objects in experience and that, therefore, cannot indicate a specific empirical way of proceeding when they are used regulatively as methodological presuppositions.

As we have said in the Introduction, our proposal is to conceive of the idea of perfect sustainability in the relationship between ecosystems and society at the global scale as an idea that must be used regulatively. In order to see how this is possible and the usefulness of this approach, let us move on to the next section.

3. Sustainability and the Socio-Ecological Crisis

As is well known, sustainable development has been formally described for the first time by the United Nations World Commission on Environment and Development as a kind of development that allows to satisfy current needs of society without compromising future generations ability to meet their own needs (UN 1987). This statement has profoundly shaped and guided the current scientific and policy debate, and nowadays sustainability constitutes a leading framework at different environmental governance scales. Two different approaches have been consolidated over time since the early 1990s: i) green economy and ii) earth stewardship and biocultural diversity. The former has its roots in relevant scientific publications appeared from the beginning of the 1970s (Holdren & Ehrlich 1974) and it raised from the Ecological Economic movement (Costanza 1990). It relates particularly to Ecosystem Services (ES)[8] analytical framework[9] (Costanza et al. 2017) and to two milestone policy document, namely the report *Ecosystems and Human Well-Being* released by the Millennium Ecosystem Assessment (MEA) in 2005, and the study *The Economics of Ecosystems and Biodiversity* (TEEB) published in 2008 (Ring et al. 2010, Helm & Hepburn 2014). The latter pathway to sustainability appeared later starting from early 2010s, and it mainly relates to Nature's Contribution to People (NCP) analytical framework (Díaz *et al.* 2015, Pascual *et al.* 2017) and to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) environmental governance policies (IPBES 2019, IPBES 2022). Scientific knowledge plays a significant role within both the two pathways to sustainability. However, differences characterise the way wider knowledge on ecosystems and biodiversity is understood within the two approaches. Therefore, although the ultimate goal pursued is the same, i.e. simultaneously safeguarding human well-being and ecosystems and biodiversity health at the global scale, the two pathways to sustainability are characterised by profound differences.

3.1. The Regulative Use of the Idea of Sustainability

The concept of sustainability is a clear example of the regulative use of transcendental ideas. Indeed, sustainability has played a guiding role in defining the objective of both green economy and earth stewardship and biocultural diversity pathways. In the *Preface* of the book he edited in 1991, Robert Costanza claims that it originates from a workshop held in May 1990, whose goal was to define «a working agenda for research, education, and policy for the coming decade to ensure sustainability» (Costanza 1991, xi). The book explicitly mentions and criticises the Bruntdland Report. Gretchen C. Daily *et al.* (1996) also frame the issue. They state that ecosystem's resources need to be managed through a «global scheme designed to keep human impacts at a sustainable level in order to maintain Earth's life-support systems and human well-being» (Daily *et al.* 1996, 19). The same paper attributes a specific role to the academic community, which «has an unprecedented opportunity to lead in the development of fundamental and applied research, of policy instruments, and of regional and global institutions oriented toward sustainable Earth management» (1996, 20). De Groot *et al.* (2002, 398) later stated that «to ensure the continued availability of ecosystem functions, the use of the associated goods and services should be limited to sustainable use levels».

The report released by the MEA (2005) expresses the same intentions. Indeed, its aim was to «assess the consequences of ecosystem change for human well-being and to establish the scientific basis for actions needed to enhance the conservation and sustainable use of ecosystems and their contributions to human well-being» (MEA 2005, vii). Consistently, the same goal was identified by the following scientific publications, which paved the way

[8] ES can be defined as «the benefits people obtain from ecosystems» (MEA 2005, 27).

[9] ES debate can be partially included into earth stewardship and biocultural diversity pathway to sustainability (Kenter 2016). However, the author refers here to that area of the ES debate which focuses on environmental accounting, payments for ecosystem services schemes and carbon credit markets (Gómez-Baggethun 2017), and to the scientific references that laid its foundations.

to a deep change from a mere ecosystems functions and goods assessment to their economical valorisation through market tools. Although some scholars (e.g. Helm&Hepburn 2014, 156-161) highlight different ways to specifically interpretate sustainability, its matter and the guiding role this concept played for scientists and policy bodies did not change: sustainable development constitutes the ultimate purpose for the MEA as well as for the IPBES. Particularly, the intergovernmental body aims to «develop a common ground to understanding how to achieve the various visions of a good quality of life while pursuing the conservation and sustainable use of nature and its benefits to people» (Díaz et al. 2015, 8). This approach lies at the basis of all the reports published by IPBES starting from its foundation in 2012.

In order to understand the regulative use of the idea of sustainability starting from the late 1980s until today, a relevant aspect needs to be highlighted. Both MEA and IPBES aim to simultaneously safeguarding human well-being and ecosystems and biodiversity health at the world scale, but they pursue this goal adopting two opposite approaches. The former placed world-scale surveys and policies as a priority, with regional and local scales playing a secondary role, especially before the early 2010s (Ernstson&Sörlin 2013). The latter attaches higher importance to the regional scale, and it has determined the releasing of four specific regional reports[10] before the global one (IPBES 2019). Therefore, achieving sustainability on a global scale remains the ultimate goal, but this is interpreted as being attainable through a complex sum operation.

The opposition between these two different approaches echoes Kant's distinction between the principle of homogeneity and that of specification. In the first case, we move from a single, universal genus (i.e. ES assessment at the global scale) and try to specify it in all its particular species, subspecies, and individuals (i.e. the application of the ES analytical framework at the regional and local scales). In the second case, we move from the different species, subspecies, and individuals (i.e. benefits assessment at the regional scale) and we try to trace them back to a single, higher genus (i.e global benefits assessment).

3.2. Scientific Knowledge within the two Pathways to Sustainability

Green economy, on the one hand, and earth stewardship and biocultural diversity, on the other, pathways to sustainability share the same purpose, but they differ in the ways through which they intend to achieve it. The former attaches high relevance to hard sciences and quantitative research methods and tools in order to assess ecological functions and biological diversity features (Daily *et al.* 1996; Marino 2024). Economy discipline plays the pivotal role of attributing a value (mainly defined in monetary terms) to positive and negative environmental economic externalities, which otherwise would be ignored by policy-makers (Ring *et al.* 2010; Croci 2022). Nature is here understood as Natural Capital (Costanza 1991), i.e. as a basin of resources that has to be preserved in order to ensure human well-being. States, scientific community, NGOs and private entities are the main actors considered by the MEA (2005) and the TEEB study (Ring *et al.* 2010; Helm&Hepburn 2014). While scientific community ensure science-based policies, private actors have the role of economically supporting them.

Hearth stewardship and biocultural diversity pathway to sustainability emerged from the harsh criticisms towards the first approach in the early 2000s (Martínez-Alier 2002; McCauley 2006). Environmental justice was placed at the core of the scientific and policy debate through the efforts of social and political scientists. Therefore, power relations and values heterogeneity started to be significant elements to be considered in order to assess nature relevance to humans and to reach sustainable development (Díaz *et al.* 2015;

[10] See for example the IPBES Regional report for Europe and Central Asia (IPBES 2018).

Pascual *et al.* 2017). These elements have deeply affected the IPBES reports here considered (IPBES 2019, IPBES 2022). The relationship between humans, ecosystems and biodiversity is not understood here exclusively as the relationship between a services consumer and its provisioners. It is rather observed as a relationship characterised by benefits and co-benefits, i.e. mutual benefits that safeguard both human well-being and ecosystems and biodiversity health. A more equal – yet not already peer-to-peer – balancing can be observed between scientific community and indigenous and local communities in the co-creation of a shared knowledge to face the socio-ecological crisis.

3.3. A Rich Scientific Debate Animated by Fruitless Efforts

Significant steps have been taken in the direction of recognising the scientific community as interlocutors for the implementation of environmentally sustainable and socially equitable policies. At the same time, scientists have become aware of their political role (Wesselinka *et al.*, 2013). However, few space is often dedicated to understand science as a non-monolithic entity, within which scientists may disagree depending, for example, on their disciplinary background or their personal beliefs. These differences emerge, sometimes implicitly and some others explicitly, in the scientific debate on ES, NCP and the best pathway to follow in order to reach sustainable development at the global scale.

The promotion of a transformative change towards sustainability, i.e. a profound and interlinked change of the fabric of legal, political, economic and other social systems (IPBES 2019) and the detection of key points of intervention constitute the responsibilities to which scientists must adhere. Although significant efforts have been made, they result fruitless.[11] Nevertheless, far from being an actual description of a given state of affairs, sustainability still represents a methodological presupposition we assume in our scientific enquiries. Or, in Kant’s terms, an idea we must use not constitutively but regulatively.

4. Making Sense of Research in a Time of Crisis

Geography and philosophy have a long lasting story of profitable interactions. These have sometimes related to environmental issues, leading also to criticalities. However, philosophical conceptual tools can play a relevant role in understanding socio-ecological issues. In particular, the regulative use of ideas, namely that use aiming at guiding the understanding to the systematisation and enlargement of our empirical knowledge, can be a useful conceptual tool to understand sustainability. Indeed, this constitutes a clear example of an heuristic principle that must guide our scientific inquiry and our efforts in the interface with environmental policy. Since sustainability is better understood as a principle rather than as a constitutive description of matters of facts, the goal of actually achieving it cannot be realised.

The pathways to follow in order to meet this principle can deeply differ. Accordingly, the space between our current position and the ideal final destination can be interpretated as an arena in continuous transformation, where different approaches interact, clashing or cooperating. Making sense of research in a time of crisis therefore means understanding this dynamic and keep continuing putting efforts to let the fairest methods prevail.

[11] See for example the analysis made within the fifth report on the condition of the Italian Natural Capital (MATTM 2022).

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