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Paradigm Found? Immanent Critique to Tackle Interdisciplinarity and Normativity in Science for Sustainable Development

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Received: 4 October 2018; Accepted: 18 October 2018; Published: 21 October 2018



Abstract: The ambition of this two-part article is to argue for immanent critique as a research strategy in sustainability studies. We do this by picking up and developing two central, cross-cutting themes in sustainability research, namely interdisciplinarity and normativity. It is widely suggested that the problem-driven and solution-focused orientation in sustainability studies necessitates interdisciplinarity and an engagement with questions of normativity, each creating problems regarding how science is conducted. For interdisciplinarity, questions remain regarding by what scientific procedure rational (i.e., non-arbitrary) interdisciplinarity can be accomplished. For normativity, it is unclear whether normativity can be addressed scientifically, or only politically; in other words, can normativity be objectively incorporated in sustainability research, and if so, how? Ultimately, the paper asks and answers the following questions: when should a researcher move from one discipline to another in sustainability research and, how do we judge the validity of the normative values that are deemed necessary for sustainability? In Part I, we show the silences, gaps, vagueness and inadequacies of how these themes are currently addressed in sustainability science literature, and from this move to propose immanent critique as a potential strategy for dealing with them in a scientific manner. In Part II, we exemplify our strategy by applying it to re-construct the debate over sustainable development, by far the most prominent topical focus in sustainability science research, producing a novel systematized typology of sustainable development approaches in the process. We conclude with reflections on how this paper amounts to an initial contribution to the construction of a Lakatosian research programme in sustainability studies.

Keywords: heuristics; research programme; methodology; sustainability science; typology

PART I—THE PROBLEMATIC NATURE OF INTERDISCIPLINARITY AND NORMATIVITY IN SUSTAINABILITY STUDIES

1. Introduction

All around there are strong indications that the concept of sustainability maintains wide currency with government, private industry, civil society and in particular academia, for example the recent introduction of a sustainability-specific branch in the prestigious scientific journal *Nature* as a platform for sustainability-oriented scholarship [1]. Over the past several decades, sustainability studies, broadly defined, has commanded the attention of a wide variety of traditional disciplines and novel research fields that have made important contributions to the debates over what sustainability means and how it is best achieved. In this two-part paper, we address two prominent cross-cutting problematics within the diversity of contributions to sustainability studies, namely interdisciplinarity and normativity. We address these in two ways: by highlighting the challenges they pose for scientific research and problematizing how they have been handled, and by advancing what we argue is a logical and fruitful

strategy for addressing them scientifically in sustainability research. By doing so, the paper makes an initial contribution to the wider ambition of the authors to put forward a novel, systematic research paradigm within sustainability studies.

More precisely, the ambition of this paper is to construct a method, a heuristic, for addressing these problematics in sustainability research. To do so, we draw primarily on the literature produced under the rubric of Sustainability Science (SS), a burgeoning research field under the umbrella of sustainability studies which developed over the last several decades and achieved relative unification in the early 2000s [2]. We choose SS for two primary reasons: (1) that the issues of normativity and interdisciplinarity have been widely and explicitly discussed within SS and, (2) that the problems arising from the way SS has moved to deal with the two problematics is symptomatic of those tensions found in other disciplines or fields engaged in sustainability scholarship. In Part I, drawing purposively on canonical contributions from some of the field's founding authorities (see [3]), we source examples from the SS literature of the way the issues of interdisciplinarity and normativity have been discussed, and what tensions they bring, before moving to advance an alternative scientific strategy, namely immanent critique, which we argue is capable of overcoming these shortcomings.

In order to demonstrate the approach we advance, in Part II of the paper we reconstruct the history of the sub-discipline of Sustainable Development (SD) as an example. SD is by far the main topical focus within SS research [4] and remains of central relevance to science and politics more broadly, as witnessed by the adoption of the Sustainable Development Goals by the United Nations, which formally came into force in January 2016. However, rather than providing a(nother) chronological review of historical events leading up to the emergence of the SD concept, by employing the method of immanent critique, we offer an analytical history which traces the internal connections between competing approaches to SD. In doing so, we construct a typology of SD approaches, the types which can be shown to be related to one other in a logical and systematic manner. Finally, we conclude with some methodological implications for sustainability practitioners and future research trajectories.

1.1. Whither Sustainability Science?

In the early years of the field's genesis, Clark and Dickson ([5], p. 8060) enthusiastically proclaimed in the pages of the Proceedings of the National Academy of Sciences that "something different is surely 'in the air,' something that is intellectually exciting, practically compelling, and might as well be called 'sustainability science'". In less than two decades since its inception, SS has established itself as a veritable academic field, with a host of teaching and research institutions on different continents, a number of academic journals, and a massive body of literature [4]. As with any emerging academic branch, SS now embraces a healthy pluralism of theoretical perspectives, methodologies, and even epistemologies [6,7]. As a result, the huge body of research in SS is going in different directions, with different orientations (see e.g., [6,8,9]). How can we make sense of the existing accumulated literature? How are we to evaluate these diverse efforts? To be sure, there have been a number of very useful surveys and reviews [2,4,8,10–12]. It seems redundant to attempt to add yet one more to them.

We believe, after nearly two decades of productive scholarship, the time has come to try to identify some potential paradigms within sustainability studies. This seems the natural step to us, since, as Imre Lakatos [13] has elaborated, the precondition for judging the progressive or degenerative direction of scientific research is the concept of paradigm. Lakatos himself uses the term 'Research Programme' instead of the term Paradigm, coined by Koyré, to take distance from Thomas Kuhn's usage of the term and his idea of Paradigm Shift, which Lakatos considered "a mystical conversion which is not and cannot be governed by rules of reason" ([13], p. 9). In view of the currency the term Paradigm enjoys throughout the academy, and the semantic ambivalence the term 'Research Programme' is susceptible to, we follow those who use the term Paradigm in the (non-mystical and rational) sense of Lakatos's Research Programme. It must also be noted that while some sustainability scientists have used the term Paradigm for the whole field of SS (e.g., [14,15]), we use the term quite differently, in the standard way it has been used by historians and philosophers of science.

To this end, our intention in this paper is to trace and map out the contour of a promising Paradigm within the field of sustainability studies. Our attempt is comprised of two basic moves: first, in Part I we take two outstanding problematics of normativity and interdisciplinarity in SS research as our entry point to construct a potential Paradigm; second, in Part II we demonstrate our approach by bringing in the systematic application of the method of immanent critique to a selection of prominent contributions to the debate over SD.

2. Scientificity of Sustainability Science—Interdisciplinarity and Normativity

One decade into the fields development, when reflecting on the question “what kind of a science is sustainability science?”, Kates ([4], p. 19450) summed up the defining characteristics of the burgeoning field this way: “sustainability science is a different kind of science that is primarily use-inspired . . . with significant fundamental and applied knowledge components, and commitment to moving such knowledge into societal action.” Simply put, this description points to the field’s fundamental focus on sustainability *problems*, the conceptualization of which raises questions of interdisciplinarity, as well as to its *solution*-orientation, which raises questions about normativity. As we will see, both interdisciplinarity and normativity pose particular problems for SS as a science.

2.1. Interdisciplinarity and Sustainability Science

Early in the fields development, Clark ([16], p. 1737) noted that “sustainability science is a field defined by the problems it addresses rather than by the disciplines it employs”. In turn, this “problem-driven” ambition is, at least within SS, ubiquitously suggested to require interdisciplinarity [4,8–10]. Within SS, the need for interdisciplinarity is said to pragmatically arise from the nature of the “real-world” problems which are the preoccupation of SS [17]. We are aware of the definitional debates around different forms of cross-disciplinary practice, i.e., multi-, inter-, and trans-disciplinary research (see e.g., [18]). We here proceed under the interdisciplinary rubric, the idea being that definitions of different kinds of cross-boundary activity point to a more generic spectrum of interdisciplinary research practice rather than isolated types ([19], p. 597).

While much attention has been paid to the practical questions of communication and collaborative strategies in interdisciplinary consortiums [20–23], our interest is quite different. We are interested in the procedural logic of interdisciplinary practice; that is, the question of *when* it becomes necessary to bring in a concept from another discipline or to adopt another disciplinary perspective. We are aware of the existing heterogeneity in modes and logics of interdisciplinary practice. For our purposes, in the terminology of Barry et al. [24], our understanding is more-or-less in line with the “integrative-synthesis” mode of interdisciplinary scientific research which aims to “integrate knowledge from two or more disciplines so as to generate an increase in understanding of the causes of a complicated problem which would not be possible were the problem to be addressed from multiple yet disconnected disciplinary perspectives” ([25], p. 3).

To be sure, in addition to the aforementioned work elaborating the practical challenges associated with interdisciplinary consortiums of varying sizes, some work coming from different philosophical traditions has sought to probe foundational questions of what interdisciplinarity means and how it is best theorized (see e.g., [26–28]). However, the practice of interdisciplinary research in SS has proceeded in relative isolation from these contributions, making it difficult to systematically evaluate the logic of interdisciplinarity in SS literature. Much of the literature published on how to perform types of interdisciplinary research in SS is surely practically useful for other researchers who benefit by learning from the experience of their colleagues. This work, however, offers largely experientially-based practical advice and lessons learned, often summarized in some sort of operational framework (see e.g., [29,30]). Such contributions, while useful, lack an explicit general, theoretical justification for the logic and procedure of interdisciplinary work in SS. This is in contrast to, for example, the second central theme we deal with in this article, namely normativity, where the situation is quite different.

Even though we find more than one understanding of normativity in the SS literature, both of the common uses of the term have quite a strong theoretical (and even epistemological) underpinning.

The lack of a foundation for performing interdisciplinarity, for us, suggests the need for epistemologically grounded methodological heuristics to help guide interdisciplinary research in SS. We are aware of the significance of epistemological differences implicit in the above debates, and although the question of epistemology is not central to our current task, it may be useful to clarify that our epistemological view of science relies on Imre Lakatos' perspective, which regards science as both constructed and objective (see [31]), which we also hold to be consistent with the critical realist philosophy of science and the method of immanent critique (see [26]). As we will see, our answer to the question of how to do interdisciplinarity comes in tandem with our strategy for overcoming the problems of normativity in sustainability research. Thus, we will return to the issue of interdisciplinarity towards the end of Part II (Section 5.1). First, we must take up the normative question.

2.2. Normativity and Sustainability Science

A central concern of this paper is the status of normativity in SS as a field in the making. The foundational, normative ambition of bringing scientific knowledge to bear on sustainability problems with the intention of contributing to their resolution (see [32]) has, since the field's genesis, been discussed under a variety of rubrics. Examples include Clark [16] who considers SS to be characterized by the "use-inspired basic research" of "Pasteur's quadrant", where both considerations of use and fundamental understanding are prioritized; Jerneck et al. [9] invoke Robert Cox's distinction between "problem-solving" and "critical" research to differentiate between two kinds of action-oriented SS; and Wiek et al. [30,33] distinguish between an "analytical-descriptive" and a "transformational" mode of SS research. All of these framings of SS are intended in one way or another to emphasize the field's aspirations to, to borrow a popular phrase, "bridge the gap" between science and society [34,35], which some have suggested should likewise be an ambition of the social sciences more generally [36]. Indeed, Kates ([4], p. 19450) goes as far as to suggest that the field's "real test of success will be in implementing its knowledge to meet the great environment and development challenges of this century".

In the almost two decades since the inception of SS, practitioners seem to have come generally to embrace the "inherent" normative component of the new field ([37]; but see also [9,38,39]). The relevance of normative concepts such as justice or equity to sustainability studies is beyond dispute, as several outstanding contributions testify to their usefulness (e.g., [40,41]). The action-oriented ambition ascribed to SS, however, raises important issues for science specifically, which cannot be overlooked. First, it raises questions regarding the ends towards which SS should contribute, and who decides what these goals are. Second, it raises questions of whether or not SS can incorporate normativity into research in an objective, that is, scientific way. The common insistence that normativity is "inherent" to SS only seems to beg the question.

The next two sub-sections are devoted to a close examination of how normativity is brought in to SS, and as will shortly become clear, there are broadly two ways of dealing with normativity to be found in the SS literature. The question we want to answer in either case is admittedly a simple one, but we believe it is a fundamental question: what is the criteria for judging the validity of normative claims thus brought into SS? This leads us to pose the following questions to clarify different aspects of the question of normativity in SS:

- A. How are normative concepts being brought into sustainability studies?
- B. What is the implication of the use of normative concepts for the scientific standing of the field?
- C. How can the tensions the use of normative concepts creates for sustainability studies be resolved?

After reviewing the different understandings of normativity in SS, we will come back to these questions and answer them at the end of Section 2.2.2 below.

2.2.1. Normative.1

Unlike the case of interdisciplinarity that we reviewed in Section 2.1 above, we have already suggested that the handling of normativity in SS has credible theoretical underpinnings. This is why we can start by asking a more general question: what is the place of normative claims in science?

Max Weber's answer to this question has been one of the most enduring, if not the most prevalent, in social science. Weber regards the task of setting the goals of social actions as belonging to the realm of politics, while the purview of science is limited to determining the most efficient ways of getting to such goals. A century ago, Weber gave his best account of such an understanding of the relation between politics and science in two celebrated lectures, *Science as a Vocation* (1917) and *Politics as a Vocation* (1919) ([42], pp. 77–156). The Weberian dichotomy of Science vs. Politics in turn relies on his life work on different types of rationality, and his celebrated differentiation of types of rationality in modern society: setting the aims of actions is a matter of values, a matter belonging to the realm of politics and ethics. The means to those ends, however, have to be chosen according to the criterion of efficiency, which renders them amenable to objective scientific examination. This is the basis of Weberian 'value-free science' that, in the words of Collins and Makowsky ([43], p. 117), "all of social science knows something of the concept". Accordingly, to use terminology that has become quite popular, science deals with *facts* and not *values*. In other words, according to what philosophers call Hume's Law, one cannot infer 'ought to' from 'is' ([44], p. 385). The Weberian opposition between value and fact, together with its corollary dichotomies (normative vs. positive, goals vs. means, politics vs. science, and so on and so forth), rely for their epistemological justification on Immanuel Kant's philosophy and the separation between his first and second critiques of Reason ([45], [46], pp. 11–24).

It is this Weberian understanding of normativity that we see as the point of departure of SS. The first pages of *Our Common Journey* ([47], p. 2), which is generally regarded as among the founding documents of SS, locates normativity squarely outside the jurisdiction of science: "Of course, which goals *should* be pursued is a normative question, not a scientific one" (emphasis in original). Normativity lies in the act of setting the goals, which is the job of politics: The goals chosen, broadly put, are "human well-being and environmental preservation" which have been set by "international political debate and action, and sanctioned at intergovernmental conferences" and "outlined in international conventions" ([47], pp. 2–3, 31).

Regardless of any theoretical reservation one might in general have towards the Weberian/Kantian dichotomy of fact vs. value or science vs. politics, it is obvious that, at least in the case of sustainability studies, leaving the goal-setting to the realm of politics has proven to be quite problematic. The case of Donald Trump's administration in the U.S. would be too easy an example to underscore why setting the aims of ecological sustainability cannot be left to politicians. All governments need not be as dismissive towards environmental science, but there is no guarantee that any government would prioritize the necessary measures for ecological sustainability. As, for instance, the Chinese or Indian governments' stance in international negotiations over climate change makes it abundantly clear (see [48]), politicians may advance rationally plausible arguments for not sympathizing with the goals that are scientifically identified as necessary for coping with climate change or other sustainability challenges.

The Weberian dichotomy of fact vs. value (or science vs. politics) does not solely suffer from incongruity with empirical evidence in the particular case of sustainability. Such dichotomies in Weber's work are also conceptually tension-ridden. The pivotal question here is: how can we judge the validity of the value-judgement involved in goal-setting?

Some Weber scholars maintain that division of labor between politics (setting the normative goals of action) and science (specifying the most efficient means to those goals) is a superficial interpretation by Talcott Parsons and the mainstream American sociologists of the 1950s who appropriated Weber for their functionalism and neo-evolutionism ([49], p. xii; p. xxi, endnote 1). In this interpretation, the neat division of labor between Science and Politics that Talcott Parsons upholds relies on a misinterpretation of Weber which wrongly maintains that increased instrumental rationality will bring about increased substantive rationality; while Weber's idea, as indeed every student of Weber knows today, was exactly

the opposite ([49], p. xii; p. xxi, endnotes 3 and 4). In other words, in the Parsonsian reading of Weber, the validity of the ends (set by politicians) is predicated on the assumption that the increasing instrumental rationality of the means would somehow guarantee that the values involved in setting the goals would become increasingly rational; an assumption which blatantly contradicts the central tenets of Weber's thought.

Weber's dichotomy of science vs. politics is much more problematic than the Parsonsian reading assumes. Indeed, Weber's two celebrated essays on Science and Politics suffer from inconsistency with the body of his thought. Several sympathetic critics of Weber have pointed to Weber's own inconsistencies in constructing the dichotomies of fact vs. value and science vs. politics. For our purpose, two gross inconsistencies are worth mentioning here. The first one, advanced among others by an undisputable authority on Weber's thought, Wolfgang Mommsen, finds Weber's 'value free' science in fact deeply rooted in his personal worldview. Mommsen maintains that while all his life Weber "opposed the idea that science was either entitled or qualified to produce value judgments", his sociological method with its "radical individualistic point of departure . . . in analyzing social reality" can only be understood as rooted in the values of his European liberal worldview. Indeed, Weber's method of 'ideal types', and his central concepts such as 'charisma', 'dominance', and 'professional man', are not "merely the result of empirical analysis of reality, but rooted in the central axioms of his highly personal world view" ([50], pp. 60–61).

The second inconsistency worth recounting here concerns the other side of the science vs. politics dichotomy, namely the non-rational nature of goal-setting by politics. Perry Anderson, while recognizing Weber's two aforementioned essays on Science and Politics as "two of the most influential intellectual statements of [the twentieth] century", upon closer inspection observes that "beneath their surface clarity, each reveals signs of a turbulence that escapes logical control, generating a series of aporia" ([51], p. 182). What is the aporia concerning the goal-setting by politicians? Weber tries to show that the ethics of politicians relate to accepting the responsibility of the end-result of the action. Weber's case for an ethic of responsibility in politics "centres essentially on the claim that in the world of power it is the case that good ends can be achieved by bad means" ([51], p. 190). As Weber himself put it, it is on "this problem of the justification of means by ends that an ethic of convictions inevitably founders" (Weber quoted in [51], p. 190). Anderson, however, notes that for Weber the tragedy of politics is that as a rule, irrespective of the ethics adopted, outcomes never correspond to the intentions, but contradict them. The conclusion is inevitable: "what cause the politician adopts in his drive for power is a matter of faith" (Weber quoted in [51], p. 190). This is the well-known 'decisionism' in Weber, a corollary of his Nietzschean streak (which has been criticized by Habermas ([51], p. 189) among others). One could confidently conclude that, even within Weber's own scheme, the normative goals set in the realm of politics (as, e.g., "sanctioned at intergovernmental conferences") would not be commensurate with any rational criteria of validity.

To sum up: the Weberian dichotomy of science vs. politics, where politics set the normative goals and science determines the means to achieve those goals, not only is not borne out in reality, but is conceptually doubly faulty. First, it is difficult to accept that the science side is free from value judgement; secondly and more importantly, there is no objective criteria for judging the validity of the 'normative values' set in the realm of politics, which are (according to the letter and the spirit of Weber's work) inescapably in the service of different (and diverse) reasons of power.

2.2.2. Normative.2

The crucial question related to normativity in science is how to judge the validity of the normative values, and Weber's work does not address this question. As a close philosophical examination has shown, Weber eschews any criteria for validity of values [46]. Values come first and the criteria for their validity is their cultural context, which is to say values are not amenable to rational examination. Therefore, to judge the validity of such values is a "matter of faith". This does not leave social science, or science as such, unscathed. As G. Rose ([46], p. 18) puts it, "Quite consistently, Weber admitted

that science is a value itself, the value of a particular historical culture, ‘... even the knowledge of the most certain proposition of our theoretical sciences ... is a product of culture’” ([52], p. 55). In effect, Weber acknowledges the charge against him advanced by W. Mommsen that we reviewed in the previous section: Weber’s social science is inescapably imbued with the value judgements of his worldview.

Several decades ago Swedish social scientist and Nobel Laureate Gunnar Myrdal grappled with the problematic dichotomy of science as specifying the means vs. politics setting the ends of social policy. Myrdal’s starting point is what we just saw Weber himself acknowledging, namely the inevitable presence of values in scientific analysis. But what is an inconsistency, indeed a circular argument, in Weber, for Myrdal becomes a re-thinking of the dichotomy of science vs. politics or, put more clearly, the relationship between scientific analysis and social policy.

The author of an influential study on race relations in the U.S. in the 1940s, and later a prominent analyst of problems of economic development in the Third World countries, Myrdal was especially well-placed to judge how social scientists’ analyses of social problems does imply, and should affect, what policies are to be adopted ([53], esp. pp. 48–54 and pp. 206–230; see also the editor, Paul Streeten’s, systematic summary of Myrdal’s argument in the introduction to the volume, esp. pp. xi–xxxvi). For instance, from Myrdal’s perspective, it is easy to see that, (a) the analysis of a social problem by the social scientist has policy implications, and (b) the specific policy implication depends heavily on, e.g., whether the analysis is informed by the ethical value of equality. In other words, there is no rigid dichotomy of means vs. ends. A scientific analysis is not only a matter of determining the means of action, but equally implies some ends too. This is because, consciously or unconsciously, the analysis of a social problem cannot be separated from some value judgements. Therefore the job of the social scientist, Myrdal maintains, is to try to make such value judgements explicit at the beginning of the analysis ([53], p. 54).

While in the orthodox Weberian account normativity lies beyond the realm of science, in Myrdal’s version it is a property of scientific analysis, which has to be made explicit. Let’s call this version Normative.2 (with the orthodox Weberian version being Normative.1).

As we saw above, the founding document of SS adheres to Weber’s orthodox dichotomy of science vs. politics and puts the burden of normativity on politics. But the understanding of Normative.2 is also quite common among practitioners of SS. There are numerous studies which start with explicit acknowledgement of concepts such as justice or equity as ethical values that SS should take as given (e.g., [9,37,38]). An important instance is the sub-discipline of SD in sustainability studies. As a literature survey demonstrates (see [54]), this sense of normative is particularly common in the SD literature, where concepts such as justice or equity are thrown in as components of a “social pillar” without any particular “interconnectedness” to environmental or economic pillars.

How does Normative.2 deal with the problem of validation of normative values? Judging from some of the most oft-cited papers in SS (e.g., [9,33]; also see [54]), normative values in such instances are advanced in an autonomous way, that is to say they are advanced without any justification apart from the moral injunction. This is indeed a very common notion of ethics that traces its best formulation back to Immanuel Kant and his non-consequentialist ethics: moral acts should be undertaken out of a sense of duty with no regard to their consequences ([55], pp. 32–36). John Rawls, arguably the most prominent political and moral philosopher of the twentieth century, starts his great contribution to the theory of justice by stating that values based on ethical considerations “are not subject to political bargaining or the calculus of social interests” ([56], p. 4). Valid as they certainly are from the standpoint of certain philosophical tradition, the crucial question is: what are the implications of bringing in the non-consequentialist ethical values for SS?

In a sense, we are back where we ended up with Normative.1; that is to say, we lack any criteria for judging the validity of these normative values. In Normative.2 too, the normative values are beyond the realm of scientific inspection, but instead of the realm of politics in Normative.1, here they belong to the realm of Kantian ethics; that is, to morality rather than politics. The explicit choice

of some normative values by SS researchers could also be rooted in non-realist, relativist discursive theories of science, such as approaches based on the “co-creation” of “open-knowledge” systems (e.g., [57]). Indeed Myrdal, whose writings pre-date the emergence of post-structuralist discursive theories of science, treats the problem of normative values more consistently. Myrdal’s approach is comprised of two moves. In the first, as we saw, he shows that normative values cannot simply be assigned to the goal-setting and ends, but are present in the scientific analysis which, according to Weber, should specify the means. In our view, Myrdal’s superiority to the existing practices in SS lies in his second move. Here Myrdal insists that, (a) “even if the value premise is now openly assumed to be extra-scientific”, it cannot be arbitrary; (b) “it must be relevant, even significant, and it must be practicable”, in other words, it must be objective, not the whim of subjective preference; and (c) being relevant and practicable means that “it must correspond to the real valuations of existing groups in society, large enough or for other reasons having power enough to make it realistic” ([53], p. 50). According to Myrdal, this is the criteria for judging the objectivity of normative values involved in the scientific analysis of social issues.

We find Myrdal’s account superior to the arbitrary choice of normative values by researchers (now common in social science and SS), not least because he insists on the objectivity of normative values: “To be founded in reality, in the sense of not being arbitrary, the value premises should not be taken out of the air by intelligent guesswork” ([53], p. 51). But Myrdal’s solution does not really deliver what it promises. Myrdal, himself very much a neo-Kantian in his philosophy of science ([53], p. 51), and much sympathetic to Weber’s thought ([53], p. 54; pp. 213–219), had the ambition to correct the problem of a lack of objective criteria for the validity of normative values in Weber. His solution, as we briefly recapped in the previous paragraph, hinges on the correspondence of the normative values chosen by the scientists to “the real valuations of [some effective] *existing* groups in society” (emphasis added). It is exactly this “real valuations of . . . groups”, as Myrdal himself acknowledged, which is problematic. Myrdal mentions two “difficulties”. First, “the valuations should, as far as possible, be ‘rational’, in the sense that they represent the valuations people would have if they had a better knowledge about reality”. And second, “that they must be valuations not only of the elements in the present situation but also of elements in all the possible future developments” ([53], p. 51).

As the reader may appreciate, Myrdal’s line of thought, far from settling the question, points to concepts such as true and false consciousness, ideology and hegemony, discourse and episteme, essentialism and constructivism and the like, which since the 1960s have become the staple of debates in social science, embracing thinkers and schools from Antonio Gramsci’s Marxism to Ernesto Laclau’s post-Marxism or Michel Foucault and Jacques Derrida’s post-structuralism ([58–60], [61], pp. 351–370). As is well known, normative value in much of this literature is regarded as discursively determined and subjective. To sum up, Normative.2, even in its best Myrdalian version, like Normative.1, lacks the criteria of validity of values, and thus fails to account objectively for the norms and values of sustainability.

Now we are in a position to answer the crucial questions for SS practitioners concerning the state of normativity in SS. Regarding question (A) How are normative concepts being brought into sustainability studies?, we have shown it to be in two different ways. The first is straightforward Weberian, where science and normativity are distinct, and normative claims, which are beyond the purview of science, are left to politics. The second is semi-Myrdalian, where normative values are seen as an inescapable property of scientific analysis and, as such, are to be made explicit by the scientist at the beginning of the research endeavor. Regarding question (B) What is the implication of the use of normative concepts for the scientific standing of the field?, we have shown that, first, in Normative.1, there is no guarantee that politicians will set the goals according to the objectivity of ecological problems while, in Normative.2, these normative goals are subjective, even taken as ‘self-evident’, and basically amount to the values of the individual researcher (or the dominant ethics in a particular community). Regarding question (C) How can the tensions the use of normative concepts creates for sustainability studies be resolved?, this will be dealt with most directly in Part

II. Provisionally, we can say that immanent critique is our strategy for handling both the problem of interdisciplinarity and normativity in a consistent, objective manner. Before offering an exposition of our method in Part II, we conclude Part I with a short introduction to immanent critique as a method.

2.3. Interdisciplinarity, Normativity and a Different School of Ethics

As we pointed out at the outset, it has been suggested that SS as a problem-driven academic field is by nature interdisciplinary. Equally, as an action-oriented field, it has to be normative. Indeed, without the objective normativity of actions to curb ecological destruction, there would be no need for a science of sustainability. SS needs a method that provides a procedure for bringing in concepts from different disciplines when necessary, and equally guides research to normative values that are objective.

Regarding interdisciplinarity, we have argued above (see Section 2.1) that the lack of epistemologically grounded procedural guidelines in SS points to the need for a methodological compass that can tell researchers when bringing in a new concept and the move to a new discipline is objectively called for. Regarding normativity, *pace* Weber, there are several philosophical traditions that not only uphold the objectivity of scientific knowledge, but also defend the objectivity of values. As we elaborate shortly, we adhere to the method of immanent critique that goes back to Hegel. But among contemporary trends in philosophy, Critical Realism has also explicitly addressed this point and argued against Hume's Law of the impossibility of inferring 'ought to' from 'is' ([62], pp. 59–71, [44], pp. 409–432, [63,64], pp. 219–243). Thus, far from the simplistic dichotomies of fact vs. value or science vs. politics, we need a conceptualization of the inter-relation between these poles in which "[s]cience informs values and actions which in turn motivate science, so one is in effect dealing with fact-value and theory-practice helices here" ([65], p. 116).

Below, we put forward the method of immanent critique as a research strategy in sustainability studies that can handle both interdisciplinarity and normativity in SS. The method of immanent critique has its roots of course in Hegel, and specifically in his critique of Kant's philosophy. The Hegelian approach to normativity may best be explained by its contrast to Kantian ethics. For Kant, ethical principles need no grounding other than the "good will"; that is, to comply with moral principles is our duty, and we need no other motive than to do our duty for the sake of doing our duty ([66], pp. 185–191). For Hegel, on the contrary, recourse to any normative principle must be able to demonstrate the *necessity* of adhering to that principle ([67], p. 8, [68], pp. 211–231). Hegel's method for demonstrating such 'necessity' is the method of immanent critique, that is, "taking a system of thought on its own terms, [and] showing how it involves various internal contradictions and aporia" ([69], p. 21). In addition to providing objective grounds for normative claims, we hope to show that the exposure of inadequacies through immanent critique can likewise demonstrate the necessity of bringing in concepts or perspectives from other disciplines in the process of scientific investigation.

We believe that Part II, by applying this method to the concrete case of different theories of SD, conveys better our claim that the strategy of immanent critique can serve as a heuristics that tells us (a) when it becomes necessary to bring in other disciplinary concepts and perspectives, and (b) what normative values are objectively necessary for SD. After demonstrating its application in Part II, we will have more to say about immanent critique at the end of the paper (Section 4). Here we give only a minimal introduction to immanent critique in general.

2.3.1. The Method of Immanent Critique

Starting with the rubric, originating in German classical philosophy, immanent simply means internal (as opposed to transcendental, i.e., external), and critique of a system of thought signifies specifying the *limits* of such a system, as exemplified in Kant's celebrated three Critiques. Immanent critique thus simply implies showing the limitation of a system of thought based on its own internal assumptions. In one of young Hegel's earliest formulations of his method, he characterizes immanent critique as spotting the contradictions of a conceptual framework which attempts to represent the whole, but is valid only for part of the whole ([70], pp. 89–90).

Procedurally, in immanent critique one begins by accepting the premises of a system of thought, then spotting the gaps, silences and contradictions in it, and finally showing the necessity of introducing new concepts in order to resolve such tensions ([66], pp. 192–203). As Isaksen ([71], p. 97) notes, the contradictions noted by immanent critique can take different forms, for example “theory–theory, theory–practice, and/or theory–data inconsistencies.” Once tensions or gaps in a particular way of thinking or acting are uncovered, more adequate ways of thinking and acting become necessary to overcome these inadequacies. This provides the objective justification for specific, concrete theoretical and practical improvements, a point that obviously touches on both the interdisciplinary and normative preoccupations of SS.

PART II—A CASE FOR THE HEURISTIC POWER OF IMMANENT CRITIQUE FOR SUSTAINABILITY STUDIES

3. Constructing a Typology of Sustainable Development

The purpose of Part II of this two-part article is to demonstrate that, by applying the method of immanent critique to the sub-discipline of SD, not only could one make sense of the evolution and progression of the sub-discipline, but by exposing the internal logic of such progression, one could foresee the need to bring in new concepts or disciplinary perspectives at different stages. That is to say, the necessity of moving to new disciplines (and borrowing useful concepts from them), and equally for the changing normative values that emerge in this process. In short, such an exercise demonstrates how immanent critique can serve as heuristics for sustainability studies practitioners.

We now move to examine the formation and subsequent evolution of the field of SD [72]. In doing so, we try to do three things: (a) to construct a typology of different approaches in SD and, in doing so, to demonstrate how the debate has been compelled to broaden the spectrum of disciplinary consideration and to incorporate explicit normative values; (b) to establish that the types in question can be shown to follow each other in an orderly and systematic fashion, through applying an immanent critique to the previous type; and (c) to argue that the method of immanent critique, when applied consistently, can act as a positive heuristic which points towards other relevant areas of research and practice.

As we will see, the application of immanent critique to differing perspectives of SD allows us to trace out the internal, necessary connections between ecology, economy and society; that is, we do not simply insist that these considerations should be included *prima facie*, but show concretely *when* and *why* they need to be brought in. Our typology, furthermore, demonstrates that there is an objective progression as we move from one type to another, with each subsequent type representing an improvement on the previous type in terms of its adequacy and comprehensiveness in conceptualizing the widening challenge of SD. Indeed, no single type should be considered “Sustainable Development”, not even what we identify as the current pinnacle of the debate (as represented by Sen, see Section 3.5). Instead, SD as such is best viewed as the *process* of passing through each of the types to the next. The process itself is essential, as it is what allows the researcher to demonstrate the necessary relationships between otherwise incommensurable and competing perspectives: “Impatience demands the impossible, to wit, the attainment of the end without the means. But the *length* of this path has to be endured, because, for one thing, each moment is necessary; and further, each moment has to be *lingered* over, because each is itself a complete individual shape, and one is only viewed in absolute perspective when its determinateness is regarded as a concrete whole, or the whole is regarded as uniquely qualified by that determination” ([73], ¶29, emphasis in original).

To be very clear, in producing the typology we focus on the pivotal transformations between SD types and how they are internally related. In doing so, we aspire to produce more than a simple categorization. Different approaches in SD can obviously be divided into a number of ‘classes’ according to some criteria (see e.g., [74]). A typology is different from such common classifications in that it is not merely descriptive, but claims that the organizing principle of the types has an explanatory power; that is to say, it can explain different features of each type in a consistent manner.

A typology of SD should provide some criteria for judging the consistency between aims – declared or tacit—of SD, relevant concepts and tools within each type. The novelty of our typology is not in its content *per se* (though the systematic incorporation of Sen’s work is, to our knowledge, a genuinely unique contribution), but in the organization of these well-known approaches into an internally related, systematic and coherent progression of types. The point is not a comprehensive survey of all contributions to SD (sufficiently comprehensive, quantitative surveys already exist [75]), but to show *why* the transformation from one type into another occurs and how the resulting new type supersedes the accomplishments of the previous types.

3.1. From Environmentalism to Sustainable Development

The now famous Brundtland Report, published in 1987, had as its point of departure an argument that was very much in line with the emerging mainstream environmentalism of the mid-twentieth century, namely that, while economic growth may have led to improved living standards for many, unintended environmentally harmful impacts also resulted from this growth due to ignorance, ineffective regulation and inefficient technology. These unforeseen environmental harms were, furthermore, being inadequately accounted for ([76], p. 28). The solutions, then, to these unforeseen but serious problems were improved regulations and policies, and improved efficiency through technological innovation and knowledge programs.

What made the Brundtland Report so groundbreaking, however, was not the recognition that economic growth through industrialization could lead to environmental degradation, but because it seemed to succeed in combining the post-WWII developmentalist project and the emerging environmentalist project in a way that justified both. While acknowledging the environmental impacts of industrial development in the Global North, the Brundtland Report recognized that the argument for regulating economic production in the name of environment could not simply be transferred to the Global South. This is because the environmental degradation occurring in the Global South was not a factor of too much development, but of too little, as those living in abject poverty were forced to engage in environmentally destructive practices, such as deforestation or over-grazing, simply to eke out a living. The Brundtland Report forcefully argued that “poverty itself pollutes the environment” and that the environmental impacts of poverty were “so far-reaching as to make poverty itself a major global scourge” ([76], p. 28). From this realization, a true SD which meets the needs of present and future generations seemed to hinge on a particular kind of win-win scenario where development and environmentalism were complementary rather than antagonistic. The developmentalist community had every reason to welcome the currency that SD quickly came to enjoy. Economic development had found a new, environmentalist, justification; provided that it targeted the poor who were damaging the environment. This perhaps helps clarify why the Brundtland Commission speaks in terms of sustainable *development* rather than sustainable *growth*.

It is worth remembering that by the 1980s the original development project was on retreat. The global economic recession of the early 1970s had resulted by the early 1980s in the ascendancy of Reaganism and Thatcherism. Anglo-Saxon neoliberal policies were in full swing while Keynesian policies were on the defensive everywhere, not least in the international bodies sponsoring development, such as the World Bank and IMF [77]. The developmentalist Paradigm, which rested more or less on the same Keynesian foundation, was under attack from within and without. From within the discipline, the leftist critique had for some time pointed to the meager record of some thirty years of development experience in improving the lot of the poor in developing countries. They had advanced theories of Dependency and World System to explain why the attempt at capitalistic economic development was doomed from the start. From without, the neoclassical economists, who were from the start skeptical about the soundness of the special branch of Development Economics [78], could now point to the success of the first generation of East Asian economies [79,80]. The East Asian countries, disregarding the developmentalists’ prescriptions, had managed to transform their economies by, allegedly, putting their faith in the world market and opening up their economies

to foreign trade and investment. Consequently, in the realm of academy the sub-discipline of Development Economics came under fierce attack as bad science justifying worse policies [77,81].

The normative identification of SD with poverty alleviation, formed the crux of the Brundtland Report's contribution. By pointing out the limitations of education, technological innovation and regulatory policy implemented to address environmental problems in the developed Global North, the Brundtland Report effectively transformed the way the environmental problem was conceptualized from one focused on regulating undesirable behavior to one of socio-economic structure and constraint. The world's poor must be *enabled* to act in environmentally sustainable ways. This shift in the conceptualization of the problem is captured by the Brundtland Report's ultimate solution, namely the need for improved flows of capital from North to South to incentivize development and curb the environmental degradation associated with poverty.

3.2. From Brundtland to "Weak" Sustainability

In the wake of the Brundtland Report, empirical evidence was mounting that, even though higher levels of development could work to curb poverty-based environmental degradation, and technological and regulatory improvements could curb many forms of pollution and resource waste, countries which had reached the highest and most technologically advanced levels of economic development were experiencing, despite their economic advancements, declines in numerous environmental quality indicators even as income levels grew. This problem was noted, for example, in the World Bank's World Development Report: Development and the Environment ([82], see especially p. 11, Figure 4), published in 1992. More recent work regarding what some have called the "great acceleration" (see [83]), a concept capturing the post-1950 rapid decline in many environmental quality indicators and correlated growth in many socio-economic indicators, furnishes further evidence regarding this persistent tension between economic growth and environmental degradation. These residual, unresolved tensions begged the question of how an approach to SD could be generalized to both the Global North and South; that is, a concept of SD which could be used to make a decision when faced with any trade-off between environment and economic development, which would ensure that the ability to meet intra- and inter-generational needs (*a lá* Brundtland) was being sustained. As we will see, the types of SD which were developed after Brundtland provide differing answers to a common question which arises from this environment-economy tension, and which acts as an organizing principle of the types, namely the question "what is to be sustained?" ([72], p. 7).

A pathway towards over-coming the Brundtland Report's residual tensions came from within the discipline of economics. After some lively debate over how to handle the question of sustainability in the late 1980s and early 90s, economists had begun to form a consensus around what came to be known as the "Capital Theory Approach" to sustainability (see [84]). Nobel laureate Robert Solow, among the most prominent economists to pick up the sustainability question, succinctly captured the crux of this emerging economic approach to the SD question: "If sustainability means anything more than a vague emotional commitment, it must require that something be conserved for the very long run. It is very important to understand what that something is: I think it has to be a generalized capacity to produce economic well-being" ([85], pp. 167–168). For Solow, by applying the theoretical tools of neo-classical economics, the idea of meeting the needs of present and future generations is fundamentally a factor of the productive capacity of the economy, which in turn relies on the total stock of capital available for production. From this perspective, a *sustainable* development would be development which at least maintains, if not grows, a country's total capital stock in the very long-term. And with this definition come some very important normative implications regarding how to decide on environment-development tradeoffs.

Because the primary concern is the *total* stock of capital, the specific combination of natural and manufactured capital that makes up this total stock is considered to not be particularly important. This has major normative repercussions. In particular, it suggests that, counter to what many environmentalists would argue, SD does not necessarily require conservation of *specific* environmental

resources. Solow ([86], p. 181) put the point straightforwardly: “There is no specific object that the goal of sustainability, the obligation of sustainability, requires us to leave untouched . . . what we are obligated to leave behind is a generalized capacity to create well-being, not any particular thing or any particular natural resource.” It is perhaps not difficult to see why Solow’s approach has been labelled “weak” sustainability. The directing of attention to the abstract total capital stock, and the resulting irrelevance of the composition of this total stock in terms of natural and manufactured capital, is theoretically justified by the principle of capital substitutability; that is, the idea that “[r]esources are, to use a favorite word of economists, fungible in a certain sense. They can take the place of each other” (ibid). If natural capital stocks are used up in the process of development, this is not necessarily a problem as long as they are adequately compensated for by other forms of capital, whether natural or manufactured: to borrow a line of hyperbole from Solow ([87], p. 11), “The world can, in effect, get along without natural resources, so exhaustion is just an event, not a catastrophe”.

Once we accept the “weak” sustainability injunction to focus on total capital stock, the logic of the economic theory of capital already provides us with (1) a consistent approach to decision making; (2) tools for the strategy’s operationalization; and (3) an appropriate indicator for monitoring and evaluation. The approach to decision making which is consistent with “weak” sustainability is what we term *economic choice*, meaning SD decisions should be made based on whether or not they are economically justified in terms of the benefit to cost ratio, i.e., Cost-benefit analysis (CBA). By ensuring that monetary benefits outweigh costs, the idea is that the total exchange value of a country’s capital stock can be sustained even across a wide variety of concrete decision making scenarios. At the nationally aggregate level, the total stock of capital can be monitored via an adjusted Net National Product (NNP) indicator which would record whether substitutions between natural and manufactured capital stocks were being conducted in a sustainable way. This NNP indicator, furthermore, can be expressed in terms of income per capita, the idea being that income is an indication of the individual economic well-being to be derived from the economy’s current productive capacity. Mainstream economists generally regard monetary income per capita as the measure of people’s welfare or well-being, which constitutes the rationale for economic growth as a means to ensure social well-being. It must be stressed that although this view of human well-being might seem simplistic, it has a respectable pedigree that goes back to Scottish enlightenment philosophers and Adam Smith. Smith regarded the Market as *the* social institution for realizing the aim of the enlightenment, i.e., human autonomy and freedom. As opposed to Rousseau, whose political institution of Republic demanded that the individual put the general interest above his or her individual interest, Smith saw the beauty of the Market in that, while each individual would selfishly pursue his or her basest instinct, i.e., their own private interest, the Market, as if guided by an invisible hand, would bring out the best for society as a whole by creating more material wealth, material wealth being the indispensable condition for attaining individual autonomy or freedom (see [88], Ch. 1). Solow’s argument is likewise in no way empty of lofty ideals.

Because the “weak” sustainability approach is operationalized through CBA, and measured in monetary units, it requires that all relevant concerns (i.e., relevant natural and manufactured capital) in a given decision making scenario be quantified and monetized. As many environmental resources are non-market goods and services, they have been historically neglected by economists [89]; however, to remedy this problem, a wide variety of valuation techniques have been developed within environmental branches of economics as a means to capture the price of natural capital and more adequately incorporate it into SD decisions. These techniques would include, for example, contingent valuation and the use of shadow markets. The wide-spread uptake of this “weak” sustainability logic is witnessed by, for example, the vast literature focused on quantification and monetization of ecosystem services (see e.g., [90–92]). A recent and ambitious example of “weak” sustainability in practice, applied at the international level, is the joint UNEP and UNU-IHDP Inclusive Wealth Project [93].

3.3. From “Weak” to “Strong” Sustainability

The “fungibility” of capital assumed by the principle of substitutability is essential to the “weak” sustainability approach, and it in turn relies on the conceptualizing of capital in its most abstract articulation, i.e., as pure exchange-value, as measured in Net National Product, per capita income, etc. Indeed, Solow ([85], p. 169) insists that it is “absolutely vital” that the concept of capital be understood in its most general sense to include “everything, tangible and intangible, in which the economy can invest or disinvest, including knowledge”. This flexibility is what allows for CBA to be applied as a tool for SD in any context, and is ultimately what makes “weak” sustainability universally applicable and practically operational, and, in this way, is in many ways the theory’s strongest and most critical point. However, at the strongest point of a given theory is also the possibility of what Roy Bhaskar ([69], p. 21) calls an “Achilles’ heel critique”, that is, “a critique of a system of thought on the very point where it is believed to be, and believes itself to be, strongest”.

Early and forceful criticism of “weak” sustainability came most notably from the field of ecological economics, with Nobel Prize nominee Herman Daly being among its most accomplished proponents. As a point of departure, Daly agrees with Solow’s basic interpretation of SD as implying the normative goal to maintain the productive capacity of the economy over-time; however, Daly advances a seemingly small and technical reservation which comes with immense repercussions.

While “weak” sustainability assumes near perfect substitutability between capitals, Daly and his colleagues point out that manufactured and natural capital tend to be complements rather than substitutes. What came to be known as the “strong” sustainability argument can be advanced along two main fronts. The first is logical. While the logic of “weak” sustainability suggests that manufactured capital is a near perfect substitute for natural capital, Daly points out that, if this is indeed true, it should work *both ways*, meaning natural capital should also be a near perfect substitute for manufactured capital. This would then make the historical fact of accumulated manufactured capital redundant, since humanity was already endowed with a world of near-perfect natural capital substitutes. The fact that we have accumulated manufactured capital, Daly argues, is “precisely because it is complementary to natural capital” ([94], p. 51).

The second argument is at a more concrete, material level. The assumption of perfect substitutability, which requires that capital be conceptualized purely in the abstract, in terms of exchange value, implicitly assumes equivalence between monetary wealth and the satisfaction of material (e.g. physiological) needs. However, while perhaps logically sound, a recognition of the limits of this assumption is nothing new. For example, Aristotle invokes the fable of King Midas as a way to question the tendency to conflate monetary wealth with the satisfaction of material needs: “how can that be wealth of which a man may have a great abundance and yet perish with hunger, like Midas in the fable, whose insatiable prayer turned everything that was set before him into gold?” ([95], Book I, Part IX). In other words, guaranteeing the production of monetary wealth is not the same as satisfying material needs, thus the sole focus on aggregate monetary indicators is problematic in terms of guaranteeing the fulfillment of the original normative goal of SD, namely meeting current and future human needs.

Accepting Daly’s arguments, the first major normative implication that follows is that, if manufactured and natural capitals are complements, not substitutes, then the limiting factor in production should be conserved if economic productivity is to be maintained. And Daly [96] emphasizes that, while it may not have always been the case, we currently live in a world where natural capital is clearly the limiting factor in production. This realization necessitates a significant shifting of normative position from that staked out within “weak” sustainability. That is, *pace* Solow, who insists that we owe nothing *in particular* to future generations, “strong” sustainability means that *very definite* resources should be sustained for future generations if we are to ensure the capacity to produce economic well-being: “The complementary nature of natural and human-made capital is made obvious by asking: what good is a sawmill without a forest? A refinery without petroleum deposits? A fishing boat without populations of fish?” ([97], pp. 94–95). The need to preserve complementary natural

capital, furthermore, has clear implications for interdisciplinarity, as it obviously requires moving beyond economics to incorporate concepts and tools from the discipline of ecology, as exemplified by the widely adopted concept of “ecosystem services” [98–101] and the utilization of related metrics (e.g., habitat units).

The second major implication of moving from “weak” to “strong” sustainability is in many ways an extension of the first; that is, when taken to its logical conclusion, “strong” sustainability necessitates the acceptance of absolute limits to growth [102]. In other words, “strong” sustainability requires a shift in normative position from one predicated on pursuing growth to one predicated on curtailing it; or, as Daly has put it, from focusing on *quantitative* growth to focusing on *qualitative* development [103]. The implication is that, due to the limited availability of essential natural capital stocks, society must prioritize environmental conservation over economic growth and begin to transition, as quickly as possible, to what Daly calls a steady-state economy (see [104,105]). Given that the prevailing growth-based market system would never provide the justification or mechanisms for realizing steady-state, this transition would instead need to rely, in Daly’s view, on effective political pressure and the support of enlightened voting citizens. As a result, the strategy for operationalizing steady-state, which fundamentally relies on the mechanism of political pressure to mandate the prioritization of environment over economy in terms of trade-offs, is what we label *political choice*.

The concept of political choice does not only imply voting (though in actuality voting is often what it boils down to), but in essence it means the exercise of political power from outside the economic realm to which “weak” sustainability was confined. In realizing “strong” sustainability, the force of political choice must come in to regulate the workings of the economy, in particular the economic use of natural resources (i.e., natural capital). If the political will to preserve natural capital and pursue steady-state is not there, of course social movements or other civil society groups could play a role in forcing those in political power to do so. However, once “strong” sustainability is on the agenda of the state or local governments, the most common way of exercising political power in democratic societies is through an all-inclusive referendum or voting process. These “strong” sustainability arguments, both the rejection of growth as a desirable goal and the insistence on political choice, are what underpin those still marginal but growing anti-growth movements operating under rubrics such as de-growth [106] and post-growth [107].

3.4. “Critical Capital” Sustainability as Synthesis

Drawing out “strong” sustainability to its logical conclusion points to the necessity of transitioning to a steady-state economy and, even if this might pose a major political challenge, Daly insists that, given the biophysical impossibility of never-ending growth, it is none-the-less necessary [96]. However, even if the political challenges can be overcome, there are still major problems with the practical feasibility of the normative no-growth position of “strong” sustainability.

The possibility of natural limits to economic growth has been discussed by economists since the time of Malthus and Ricardo, but John Stewart Mill was the first to welcome such a prospect [108]. Accepting the desirability of steady-state, as Mill did, or indeed its necessity, as Daly does, the question is how are we going to get there? One problem in answering this question is that steady-state cannot really be aimed at locally, or even nationally. As Mill knew only too well, “(f)or the safety of national independence it is essential that a country should not fall much behind its neighbours in these things [economic growth]” (Mill quoted in [108]). And, in the absence of a universal transition to steady-state, Mill himself believed that until “the better minds succeed in educating the others into better things” the energies of mankind are better spent in the struggle for riches (Mill quoted in [108]). From this, “strong” sustainability seems to require commitment to the political enforcement of a no-growth economic strategy which would be unfeasible at less-than-planetary (or at least regional) scales.

If both “weak” and “strong” sustainability have valid points, but also suffer from serious theoretical and practical deficiencies, where can one go from here? At this point, we can recall two main arguments that have been put forward in moving from “weak” to “strong” sustainability,

which still require resolution. First, “weak” sustainability, by bringing in concepts from the discipline of economics, put forward the normative claim that *SD a lá Brundtland* should be thought of as maintaining productive capacity into the future. Second, “strong” sustainability demonstrated that maintaining this productive capacity comes with the normative implication that the limiting factor of production, i.e., non-substitutable natural capital, needs to be preserved, forcing the further incorporation of concepts from the discipline of ecology. While these polarized positions are incompatible, there have been attempts to account for the valid points of each while avoiding their pitfalls. What we call “critical capital” sustainability concedes that different forms of natural capital are not merely an economic input, but often a general pre-requisite of human life and economic activity [109]. At the same time, this approach qualifies the general statement of non-substitutability of “strong” sustainability. The crucial issue for “critical capital” sustainability advocates is to identify those ecological processes (instances of natural capital) that are in fact critical for human life and economic production, and, from this, establish some boundaries or “safe minimum standards”, for admissible economic evaluation and trade-offs. The normative implication is that, within these critical boundaries, i.e., as long as the minimum standards are not violated, “critical capital” sustainability follows the same route as “weak” sustainability, that is to say it allows the substitution of (non-critical) natural capital, “as long as it is compensated by a corresponding increase in other forms of capital” ([109], p. 5).

Formally speaking, the “critical capital” sustainability approach is in effect a stronger variant of “weak” sustainability; as acknowledged by the proponents of this type (e.g., [109,110]). As such, it relies on an adoption and operationalization of concepts and tools from both the disciplines of economics and ecology. Once the point raised by “strong” sustainability about non-substitutability of natural capital by manufactured capital is qualified by the concept of “critical natural capital”, it seems unproblematic to follow the strategy of economic choice of “weak” sustainability, i.e., to let the Market mechanism take its course with the adjusted prices of critical natural capital. As for the tools, similarly it seems that the basic tools of “weak” sustainability, i.e., CBA and economic modelling, can be used here with some minor corrections; that is, “critical capital” sustainability practitioners can use ecological modelling to identify critical natural capital, and then apply CBA to decide on how to make tradeoffs on non-critical capitals. The Oxfam concept of living within the “Doughnut”, which seeks to promote socio-economic development within planetary boundaries (see [111]), provides a useful example of this “critical capital” sustainability logic in practice [112].

At first, “critical capital” sustainability seems an obvious resolution to the polarized “weak” and “strong” varieties. Problems arise and the strategy diverges, however, once we give due thought to the question of identifying the instances of critical natural capital. The question at first glance seems simply a technical one, best to be answered by experts at the local level, and then generalized. Thus, following Ostrom’s [113] lead on generalizing local practices in the management of commons, an early advocate of “critical capital” sustainability saw the solution in relying on the local ecological and biological knowledge of experts for “identifying the specifics” to construct a large “matrix of concerns” at a general level [114]. In the meantime, more sophisticated attempts have been made by ecologists to specify what constitutes critical natural capital more accurately [115]. Yet the problem is not simple, nor is it a purely ecological one. To begin with, given our imperfect knowledge of (not to speak of the inherent uncertainty in) ecological processes, how can we be sure of having identified the right critical natural capital? Recommending the pre-cautionary principle, it has been argued, is not a satisfactory reaction to this problem since “(i)n a situation of fundamental uncertainty, inactivity cannot claim any particular dignity compared with specific activities” ([109], p. 18).

Furthermore, identifying some critical natural capital, if followed consistently, will end up accepting the undesirability of economic development, at least in some cases (as we saw in more extreme terms with the logical conclusion of no-growth in the case of “strong” sustainability above). Once a particular critical natural capital is identified, sustainability is no longer in line with economic development, and the latter must give way to Economic Sufficiency, or some similar concepts. And because instances of critical natural capital occur at specific geographic locations and are by

nature local, a host of questions about distributive justice and ethics in general are raised [109,110]. Once again, as with “strong” sustainability, what started as a modest correction to “weak” sustainability ends up far removed from the realm of economics, and has to grapple with the question of values and ethics for its vision of SD. Similarly, “critical capital” sustainability drifts away from adopting the tools of “weak” sustainability, CBA and economic modelling, and has to recourse not only to the techniques of ecological modelling, but to try to operationalize some ethical principles.

3.5. From Capitals to Capabilities in Sustainable Development

The necessary resort to ethics arising from the requirements of “critical capital” sustainability poses a major challenge to its operationalization and thus to the realization of SD. The question of ethics, however, cannot be settled by some technical adjustment or pre-made formula, and instead must be addressed directly. This is the position of the Nobel laureate economist Amartya Sen, whose Human Development approach, rather than viewing the ethical question as an obstacle, takes it as the point of departure. Indeed, as we will see, the operationalization of Sen’s approach to SD ultimately rests on bringing in the discipline of moral philosophy and appealing to a universal ethic to guide SD decision making.

Sen elaborated his ideas in the context of development and only later extended them to the SD debate, so it is necessary to start from his view on development. Sen, going back to Adam Smith, points out that the ultimate rationale for economic development has been the enlightenment belief that material wealth is a condition of human freedom. To be sure, Sen does not question the link between material wealth and human freedom, but he questions the common practice of economists (and developmentalists) to take monetary income as an indicator of well-being. His reasoning is straightforward: if income (material wealth) is merely a means to the end of human freedom, why shouldn’t we use directly freedom as the indicator of development? Hence Development as Freedom [116]. This necessitates an important normative shift in the pursuit of SD from prioritizing the total stock of capital, or preservation of (critical) natural capital, to prioritizing the expansion of human freedom. Sen operationalizes progress in human freedom as the expansion of human capabilities (e.g., a longer life, a healthier life, more education, participation in community life, more disposable income, etc.). His case for measuring development in terms of an increase in human freedom (expansion of capacities) seems more plausible when one reflects on his evidence of how, at comparatively lower levels of income per capita, better results in terms of education, health, gender equality, and so on, have been achieved in some communities and societies [116]. This is the core of a development Paradigm that has come to be called Human Development. UNDP Human Development Index [117] is inspired by and based on Sen’s ideas.

Yet there is more to human development than simply specifying the desirable ends of the development process (i.e., the expansion of human freedom). When the aims are known, the crucial question for any development strategy is how to realize those aims. Here Sen claims that freedom is not only the end of the development process, but it is also the means. Aiming at improving human capabilities, apart from its intrinsic value, is good investment in “human capital” (e.g., increases in labor productivity), and, as acknowledged by modern economics and borne out by the experience of many developing economies, “human capital” is a crucial factor in economic development. Sen’s Human Development approach does not neglect the role of markets in economic development, but argues that people should have the relevant capabilities (among them, e.g., the entitlement to productive assets and/or education) to take part in and benefit from the market. That is, that the fruits of economic development must be shared equitably; and that the expansion of the capabilities of the poor and the deprived must be prioritized. Sen defends these qualifications on two grounds, both for ethical reasons (the intrinsic value of human freedom, the ethical obligation of equity) and for instrumental reasons (successful outcome of the market economy is dependent on capable participants, equitable initial conditions, etc.). The question arises, however, of how the arrangements that Sen advocates can be imposed on the Market? Who is to decide what capabilities of what group of population is

to be expanded, or what level of equity should prevail? Mainstream economists believe that such arrangements cannot be based on any objective criteria (known as Arrow's Impossibility Theorem, i.e., the impossibility of inter-personal utility comparison, see [118,119]).

Bringing in concepts from welfare economics and moral philosophy, Sen maintains that what is involved here is not the comparison of individual subjective utilities, but prioritizing *objective capabilities*. Once we accept that the outcome of economic development should be measured not simply in terms of a rise in income per capita, but in terms of expansion of human capabilities (constituents of freedom), there are universal ethical grounds for ranking the claims of participants. Here we come to the concept of *social choice* (distinct from economic choice of the invisible hand of the market and political choice of majority rule in a democracy) as a choice procedure the outcomes of which "take the form of ranking different states of affairs from a 'social point of view', in the light of the assessments of the people involved" ([120], p. 95). In a social choice exercise, the alleviation of poverty, gender equality, command over primary goods, etc., can be taken as universally accepted values, as social imperatives. A free society must make sure its members enjoy such capabilities (freedoms) [116,121]. Decisions on SD trade-offs can be made with these social imperatives as choice criteria.

Necessarily, social choice entails participation, and the Human Development approach is often enough associated with participatory development. However, it is worth noting that social choice does not imply that the priorities of society in the realm of development or sustainability should be the accidental outcome of social interaction or dialogue of the members (as in the fashionable prescription of Stakeholder Dialogue). Rather, it means that, once we accept the normative goal of development as freedom expansion, we are obliged to prioritize a series of targets as choices that are socially justified. This implies the removal of capability deprivation (which in Sen's conceptualization is the mechanism of poverty creation), such as securing basic needs to all members of society, gender equality, universal health and education, entitlement to some productive asset, etc. Bringing in the perspective of SD adds to this list intergenerational equality; not only leaving adequate social institutions and productive assets to future generations, but taking responsibility for nature and environment in such a way that future generations have the same freedom regarding the environment as we have (see [122,123]). To operationalize the strategy of social choice for SD one needs to draw policy conclusions for this strategy. Sen's vision of development as the expansion of capabilities (with priority given to the most deprived section of the population), lends itself easily to policy formulation, but to be meaningful the policies must be informed by a variety of statistical and other forms of information for relevant issues.

Sen's vision of SD, as far as the economy is concerned, is mostly in agreement with Solow's postulate on intergenerational equity and maintaining the level of total stock of capital; although Sen naturally stresses the stock of "human capital" (e.g., level of education, health, etc.) [124]. For environmental sustainability, Sen is definitely an advocate of "strong" sustainability, but more on ethical grounds. The conflict between sustaining environment and sustaining economy, however, is less pronounced from Sen's perspective, since he does not aim for high rates of growth *per se*, and he would be more prepared to forego higher rates of growth as, in his understanding, any gain for environmental conservation is directly an increase in the freedom of future generations. The problem of comparing different types of freedom (or what are the same, different types of capabilities) has of course to be handled. The problem of trade-offs between different types of capability (e.g., should we expand education, environmental quality or health services?) will surely arise. But the logic of social choice might help us avoid the inadequacies associated with informationally limited approaches to SD like economic and political choice. As Sen has put it, social choice exercises "can be extremely messy, and many technocrats are sufficiently disgusted by its messiness to pine for some wonderful formula that would simply give us ready-made weights that are 'just right.' However, no such magic formula does, of course, exist, since the issue of weighting is one of valuation and judgment, and not one of some impersonal technology" ([116], p. 79).

3.6. Typology Summarized and Implications for Practitioners

As stressed from the outset, our concern in this paper is not philosophical or even theoretical, but *methodological* in the mundane sense of how to do sustainability studies in practice. To underscore the methodological aspect, in this section we would like to demonstrate briefly that the typology, far from a mere theoretical exercise in interpreting the development of the sub-discipline of SD, is quite relevant in choosing decision making strategies and tools for sustainability practitioners. Throughout Section 3, while working out the typology of SD approaches, we have also included the corresponding strategy, relevant indicators, and appropriate tools for the types' operationalization (see Table 1 for a summary).

Table 1. Typology of Sustainable Development.

Type	Decision Making Strategy	What Is to Be Sustained?	Ex. Operational Tools
Weak Sustainability	Economic Choice	Total stock of capital Ex. Indicator: GDP	Cost-benefit analysis
Strong Sustainability	Political Choice	Total stock of <i>natural</i> capital Ex. Indicator: strategic habitat units Critical natural capital <i>and</i> total non-critical capital stock Ex.	Ecological modeling
Critical Capital Sustainability	Constrained Economic Choice	Indicator: strategic habitat units and GDP	Ecological modeling and cost-benefit analysis
Human Development	Social Choice	Human freedom Ex. Indicator: functionings and capabilities	Universal ethics

For practitioners, the typology's significance lays in the idea that a certain perspective of SD, whether explicit or not, is already reflected in weighing different impacts of a decision, or weighing different features of competing projects. A choice of tools (e.g., ecological modelling vs. CBA) is at the same time the choice of a particular conception of sustainability. One could speculate that the fact that many NGOs concerned with sustainability often oppose the most carefully researched decisions of governments or business projects has less to do with blind opposition than different visions of sustainability. The best practitioners can do, it seems, is to make explicit at the outset their underlying assumption of what constitutes SD, and justify their choice of tools and techniques with reference to this particular vision of SD. A typology of different approaches to SD is useful for this purpose, provided that it offers more than a classification of different conceptions of SD, and tells us what tools are consistent with each conception; that is to say, what methods can capture the particular conception of SD, and what indicators can be used to measure SD in each type.

4. Immanent Critique: Clarification and Elaboration

4.1. Objectivity and Necessity

A short clarification of two related pivotal concepts in Hegel are useful here. The first concerns the concept of objectivity. Hegel insists that values (i.e., 'norms' in our terminology) are objective. But for Hegel this does not entail that everybody can see this and agree with the objectivity of normative values. It takes people's acceptance and action for these objective values to be realized. (This is indeed not different from, for instance, the claims of many contemporary economists that some structural reforms are objectively needed, while obviously their realization depends upon active policy implementation.) In modern sociological parlance, one could more-or-less say that objectivity for Hegel refers to the level of *structure*, but it takes action on the part of the *agent* to realize the structural objectivity. (Hegel himself follows the Aristotelian distinction between 'order of explanation' and 'order of existence'; see [70], pp. 56–57).

The second clarification, closely related to the first, concerns the concept of necessity. As we saw in the application of immanent critique to the sub-discipline of SD in Section 3, one central feature

of the method of immanent critique is that, through examining conceptual tensions, it points to the necessary concepts which can resolve such tensions. However, no determinism is implied here:

[C]onceptual necessity should not be understood as an endorsement of the view that the dialectical movement of our concepts . . . is set in advance . . . We look back over the development from where we are. When we do so, we discover certain patterns (and so, a certain logic of necessity) . . . Looking back, we can make rationally intelligible the progressions among the various stages [of theoretical development]. In this sense we can tell a story about the necessity of that development . . . Hegel's commitment to conceptual necessity [can be explained] along the same lines. ([67], pp. 12–13, footnote 16).

Likewise, our typology is not meant to imply that there was a neat, hidden 'logic of necessity' in SD and different thinkers each uncovered part of it. Rather, looking back at the evolution of SD, our typology is a construct judging some particular perspective in SD in relation to its success in overcoming the tensions in another perspective. The historical production of one or more competing perspectives is an important pre-condition for the strategy we promote because, as Isaksen ([71], p. 98) has put it, immanent critique works by taking "premises and conclusions that are *presently available*" (emphasis in original).

The non-deterministic nature of the immanent critique has an important implication for research: one constructs the typology by looking *back* at the evolution of the field. However, from the vantage point of the latest type, one could also look *forward* and, by using the very same immanent critique, try to work out the shape of the next type to come. Below, in Section 4.3, we give an example of how our constructed typology could help in orienting us in further research by the immanent critique of Amartya Sen's perspective on SD.

4.2. Other Forms of Critique, Other Forms of Research

There are certainly more tensions in each of the perspectives we have examined for constructing our SD typology. One could focus on any of the different tensions and, applying the method of immanent critique, take the research in a different direction and end up with other types and a novel typology. (This is another way of saying that the necessary progression to higher types is not deterministic.) For instance, one could take the question of distribution in the first type we started with (Section 3.2 above), namely the "weak" approach to SD. Solow never poses the question whether the distribution of wealth (including productive assets) has consequences for sustainability. This is quite in line with Solow's conception of SD, which is sustaining human welfare (as measured in terms of income per capita), and his commitment to mainstream neoclassical economics. For neoclassical economics, the most desirable distribution is the one that maximizes welfare (i.e., maximizes economic growth), and this is achieved through the impersonal operation of the free market, where every economic actor receives back the market-price of their contribution to the creation of wealth.

Interestingly enough, Political Ecology started exactly by questioning the market-distribution of assets. As Guha and Martinez-Alier put it in 1997 ([125], p. 31), "[i]f political economy studies economic distributional conflicts, political ecology would study 'ecological distribution' conflicts". In this early work, the authors explicitly situate themselves in the tradition of ecological economics, and their rationale for investigating the question of distribution is the economic incommensurability of environmental assets with conventional economic assets ([125], p. 22–30). This critique is quite consistent with immanent critique (as is the critique of ecological economics examined in Section 3.3 above). However, in its subsequent development, Political Ecology abandoned this line of internal (immanent) critique.

In a later work, Martinez-Alier, one of the leading theorists of Political Ecology, identified it more emphatically with Environmental Justice Movements and stressed its moniker of "Environmentalism of the Poor" [126]. More importantly for our discussion, here there was no need for the careful examination of some conceptual tension in the rival perspectives. Rather, after a (short) characterization

of the competing perspectives, the principles of Political Ecology were now counter-posed to those of the two other varieties of environmentalism, namely “The Cult of Wilderness” and “The Gospel of Eco-Efficiency” ([126], pp. 1–15). This is obviously not following the method of immanent critique, yet it is a completely a valid method, namely external critique; or, maybe more precisely, what in the philosophical tradition of Critical Realism is called “quasi-transcendental critique”, “which departs from significant or relevant, but non-immanent, premises” ([127], p.83).

The fact that Political Ecology, at least in this line of its development, adheres to a non-immanent critique was further brought out in 2014 in a paper by Martinez-Alier together with a large number of researchers in this field [128]. In this paper, the authors make clear how a number of key concepts used by adherents of Political Ecology in the academy are issued from their practical usage by “Environmental Justice Organizations”, and not from the internal critique of the concepts and categories in the rival perspectives; howsoever one chooses to label them.

We hope that the short account above on Political Ecology and its non-immanent method of critique will suffice to show why, despite the significance and relevance of its agenda, we did not include it in our typology. The same is true of some other strands of literature in sustainability studies that we had to exclude since we could not relate their ideas in an immanently critical manner to other perspectives in sustainability studies. Maybe a good example of such literature would be Andrew Dobson’s work on Ecological Citizenship [41] which, as the author gracefully acknowledges, despite dealing with the significant subject of agency, remains speculative and disconnected to the important literature on structural obstacles to sustainability ([41], p. 208 and p. 211).

It is worth repeating that the choice of non-immanent forms of critique is a valid methodological choice, and indeed more common with researchers. If one does not adhere to some extreme forms of methodological fundamentalism, as we certainly do not, this point is self-evident. No piece of research is to be judged by its choice of methodology, but by the fruitfulness of the research itself; i.e., the useful insights that it produces, the new questions that it generates, the avenues that it opens up for further research, and so forth, or what in Lakatosian terminology would be called *progressive* (rather than *degenerative*) research ([13], pp. 86–90).

By the same token, our advocacy of the method of immanent critique finds its strongest justification only if it facilitates fruitful research. We trust it is not difficult to appreciate that revealing the critical connections between different perspectives, as for instance we tried to demonstrate in constructing our SD typology, by bringing more sense to the existing literature on the subject is of some help for researchers and practitioners. Then again, as we pointed out above (Section 4.1), one does not only look back, but, from the standpoint of the best available perspective, and relying on the method of immanent critique, one could equally look *forward* and choose new paths of research. We believe that this method (immanent critique) opens up a host of avenues for pushing the frontier of research in different directions. But to remain within our case, i.e., SD, we want to briefly signal how the typology developed above can be pushed further, namely by applying immanent critique to Sen’s idea of SD, the most advanced type in our typology.

4.3. Moving beyond Sen in Sustainable Development

In surveys of the standard literature on SD, Sen has not occupied a prominent place (see e.g., [75]). However, by following the logic of immanent critique, we have attempted to show why and how Sen’s contribution is relevant, even necessary, and indeed an improvement upon the types previously considered and which have taken a far more central place in the debate over SD. In staying true to our method by provisionally applying an immanent critique to Sen’s approach, we want to point towards two major tensions in Sen which could demarcate the next stage of research aimed at furthering the development of SD. In other words, we want to demonstrate how immanent critique acts as a positive heuristic for our emerging research Paradigm, and by doing so can identify further research pathways that direct the focus of our attention beyond those captured by the concept of SD thus far. (What follows is only a brief example for purposes of demonstration. As such, it draws on a forthcoming

manuscript by Faran, T., O'Byrne, D., and Boda, C. titled *Sustainability and Sen's Capabilities Approach: An Appreciation and Appropriation*, where the arguments presented are elaborated in full).

In applying immanent critique to Sen's perspective on SD, we begin by posing the following question: what guarantees (makes possible) that the participants in social choice will make decisions using the essential criteria of "the expansion of the capabilities of the most deprived" when it comes to their competing claims? As we have seen, for Sen the answer lies in an appeal to universal ethics. However, while we find Sen's social choice extremely useful for addressing the problem of public decision-making in the theory and practice of SD, and indeed an objective improvement on previously considered approaches, the conceptual tensions in Sen's own approach, in particular his problematic resort to *universal* ethics, leads us to suggest the need for an appropriation of Sen's ideas for a new paradigmatic perspective more fitting to social reality. We in particular look to the concept of hegemony, most famously developed by the Italian Marxist Antonio Gramsci, as a way of conceptualizing the formation of social values that does not rely on the assumption of universal values that forms the crux of Sen's social choice. With this shift in paradigmatic position, the role of social movements in struggling for and imposing hegemonic social values in society comes into focus, an issue and potential research frontier which the foundational assumptions of Sen's own position makes impossible to foresee.

The second major tension we have identified in Sen's work on social choice, closely connected to the one above, relates to the lack of a theory for its practical implementation and institutionalization. Sen himself has promoted the adoption of more social-choice oriented decision making processes, policies and indicators by utilizing his professional prestige to gain the attention of those in power. This is an obviously limited strategy, and indeed the practical uptake of social choice and a focus on capabilities has been minimal. Our developing solution to this practical problem of implementation intersects with the solution to the first major tension in Sen's approach discussed above, namely turning to the role of civil society initiatives, in particular social movements, as a promising mechanism for pushing the needed adjustments in institutions and social norms from outside the traditional economic and political avenues.

5. Conclusions

5.1. Interdisciplinarity, Normativity, and Necessity

In the process of working our way through the typology of SD, we have already pointed to how moving to a new discipline becomes necessary. As interdisciplinary sustainability researchers we should understand the necessary conceptual connections relating economic, ecological and social dimensions of a problem to each other, and immanent critique provides a method for doing just that. As alluded to at the start (Section 2), we want to suggest that, in the final analysis, the incorporation of various insights from a variety of disciplines into sustainability research is itself a normative question—i.e., which discipline (and even which particular Paradigm within a discipline) *ought* we to seek out and incorporate? What disciplinary concepts are *necessary* for resolving exposed tensions and gaps in a given theory and practice? For instance, we saw how "strong" sustainability *required* the incorporation of insights from the discipline of ecology, in terms of maintaining natural capital stocks, in order to overcome the problems with "weak" sustainability's economistic emphasis on near perfect substitutability. The specific kinds of tensions and contradictions uncovered through an immanent critique will of course be a concrete question and context specific, requiring context-sensitive analysis; the point we want to emphasize is the methodological procedure itself.

A second point to be emphasized involves normativity. At this point, it can be more clearly stated that following the immanent connections between disciplines, and more importantly between Paradigms within disciplines, is also an objective source of changing normative concerns in sustainability research. For example, as we have seen, Brundtland's integration of environmentalism and developmentalism posited that SD means we ought to provide for human needs now and in the

future, from which “weak” sustainability posited the neoclassical economic argument that doing so means we ought to preserve productive capacity and thus total stock of capital. From this, “strong” sustainability accepted the injunction to preserve productive capacity, but pointed out that, to do so, we have to draw on ecological knowledge and preserve non-substitutable natural capital, and so on. In other words, the *interdisciplinary* movement from the neoclassical economics of “weak” sustainability to the ecological economics of “strong sustainability” came with major *normative* implications. Our argument is that, when applying immanent critique, interdisciplinary and normativity are intertwined, as the theoretical underpinnings of varying SD perspectives already assume a normative position to which they are logically linked.

5.2. Paradigm Found? Pathways Forward for Sustainability Studies

The still developing field of sustainability studies, and SS in particular, at its foundation is an interdisciplinary and normative endeavor. In this two-part article, we have sought to, first, problematize how interdisciplinarity and normativity were being handled by SS practitioners, and from our critique, advance what we see as a promising emerging Paradigm which can handle both of these questions more adequately than current practice. The method and logic of immanent critique in particular was put forward as a rational scientific procedure which provides the grounds for making objective, epistemologically grounded normative claims while also providing a heuristic for guiding researchers in their movement between different disciplines and fields of scientific inquiry, and among different competing Paradigms within these particular disciplines or fields. In the interest of demonstrating the fruitfulness of our strategy, we, in Part II, applied immanent critique to some of the most prominent and influential contributions to the debate over SD, developing a typology of SD strategies in the process. While we have here applied immanent critique to our conceptual tools and theories, the same method and heuristic can handle the particularities of context specific sustainability challenges. For example, Boda [129] applied the method of immanent critique to the concrete challenge of sustainable coastal development, and by doing so was able to demonstrate the theoretical and practical limitations of, and thus the necessity of moving beyond, mainstream governance and economic-oriented approaches to SD currently practiced in the management of Florida’s coastal zone.

Does this mean that we are claiming that a new Paradigm for SS is found? Not quite. Looking forward towards future research and practice, the purpose of this paper is to show that immanent critique has, at very least, the potential to be fruitful. In developing our emerging Paradigm, further concrete research will show how credible and fruitful the Paradigm can be, and to these ends we strongly encourage other interested researchers to join us in applying and interrogating the emerging Paradigm and its constitutive features, such as immanent critique. In Lakatosian terminology ([13], p. 88), continuously extending the reach and enriching the content of an emerging Paradigm (research programme), and comparing its progression or degeneration to other competing Paradigms, is indispensable for the maturation of sustainability studies as a science. If we take a more evolutionary approach to the field, that is, if we accept that sustainability studies is a field in the making, we are not yet dealing with a fully-fledged Paradigm, let alone a clear set of competing Paradigms. Hopefully these will emerge, but this can only happen as a result of resolving the problem of when and how to move from discipline to discipline, and how to justify the norms that are deemed necessary in the process; that is, with a clear heuristic. In time the Paradigm we are promoting will accumulate a real ‘hard core’, which will be comprised of theoretical and epistemological assumptions and methodological heuristics like immanent critique.

One final point on the comparison of immanent critique with other methods. As we have made it clear, we do not believe in any form of methodological fundamentalism, and regard other non-immanent methodologies equally valid. However, we would like to draw attention to one obvious advantage of our method. With Hegel, its first exponent, immanent critique is a form of rationalism that, unlike the abstract rationalism of the early enlightenment philosophers, is historical

and contextual. One important upshot of this type of rationalism is that it regards the production of novel ideas not as a property of inspirational thinking, but the outcome of systematic re-thinking of historically accumulated knowledge. Likewise, while some lucky researchers may come up with novel insights by flashes of creativity, lesser mortals had better do by systematic, immanent, investigation of the existing knowledge in their field.

Author Contributions: The authors claim equal contribution.

Funding: C.S. Boda received funding from the Swedish research council FORMAS [grant number: 259-2008-1718].

Acknowledgments: We would like to thank David O’Byrne, Ellinor Isgren and Robert Isaksen for helpful comments on earlier versions of this paper. We would also like to thank Robin Gullstrand, Britta Smångs and Lars-Johan Lyttkens Lindeén at the Lund University Geo-Library for their professional support and personal good cheer. Finally, we appreciate the efforts of two anonymous reviewers.

Conflicts of Interest: The authors declare no conflict of interest.

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