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## Intellectual treatment of the normative notion 'sustainability'

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**Abstract:** While the prevailing conceptualisations on sustainability exhibit fragmentary, selective nature of the concepts, an appropriate intellectual treatment of sustainability would instead require an integrated, non-reductionist nature of enquiry that can produce understandings on the entirety of reality as the problems of sustainability exist only on the totality of reality. Despite the selective nature of the reductionist, fragmented nature of enquiries appears to be unproblematic for addressing particular fragments of reality, this approach becomes inadequate and normative – regardless of how analytical or operative it could be – when there is a need to study the entirety of reality. Drawing on the difference between a normative essence and a fundamental intellectual perspective on sustainability, this research establishes the necessity of discovering the knowledge avenue of the scholarship of sustainability instead of imaginatively describing a normative-speculation-based treatment of it. It, thus, creates the intellectual basis for the discovery of the scholarship of sustainability.

**Keywords:** sustainability; intellectual treatment of sustainability; the scholarship of sustainability; epistemology of sustainability; sustainable development; fundamental research.

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**Biographical notes:** A.M.M. Maruf Hossain, PhD, specialises on the intellectual treatment of sustainability. His Doctoral work at RMIT University, Australia had discovered a fundamental intellectual process for the study of pluralistic knowledge and research structures with regard to sustainability. This led to the necessity of "integrated knowledge" invention instead of mere "reductionist knowledge integration" for an effective intellectual treatment of sustainability. In realising this need he established *Center for Integrated Knowledge Invention* (<https://integratedknowledgeinvention.com>), which is devoted in building the knowledge avenue of the scholarship of sustainability as well as its applications in reality including in business and organisational sustainability innovations, advanced multidisciplinary and trans-disciplinary research activities, and sustainable development initiatives, while also developing effective sustainability curricula for primary school through to postgraduate research degrees. His other areas of expertise include environmental sciences and atmospheric aerosol science.

## 1 Introduction

“Because traditional science focuses on the accrual of knowledge in specific disciplines, it is ill-equipped to deal with the inconsistencies and incoherence on a larger scale that result from this narrow vision. This has led to the present crisis of seemingly uncontrollable global system degradation that only now is beginning to be recognized and questioned.” (Yoshikawa, 2011, p.263)

The fundamental cause of the emergence of the crisis of sustainability is ascribed on the rise of industrialisation and the accompanying rapid economic growth (Komiya and Takeuchi, 2011). It implies that the notion of sustainability arose as a response to the afflictions or negative by-products that are resulted from scientific and technological advances brought by industrialisation. In a literal sense, the term ‘sustainability’ implies that we do not want afflictions as they produce uncertainty about the costs and benefits of progress. As such, sustainability means that seeking progress from development would require a consideration of the long-term prospects – or ‘sustainability’ – of such development. This pursuit has been considered as a key issue for human and planetary well-being in the 21st century (Komiya and Takeuchi, 2011).

Discussions on the issue of sustainability could be traced to different origins. One strand arose in Malthus’s work *An Essay on the Principle of Population*, which dealt with the potential tensions between a geometric increase in population and an arithmetic increase in food production (Malthus, 1798). A similar concern was echoed in the works of Mill (1909), revealing the impossibility of world’s population and wealth to continue to increase indefinitely. In this respect Hardin (1968) pointed out to the absence of technological solutions on the issue of population, which led Odum (1971) to coin ‘environmental capacity’ to explain the dilemma. In *The Limits to Growth*, Meadows et al. (1972) foretold an impending crisis of sustainability if humanity was to continue on its course of natural resource depletion and environmental degradation. The term ‘sustainable’ had, accordingly, been used within the contexts of ecology, forestry and fisheries (Onuki and Mino, 2011).

Another strand of discussions on sustainability arose in terms of the sustainability of humanity and society, hence, the book *The Sustainable Society* had contained Daly’s essay (Daly, 1977) on steady-state economy in attempting to respond to the predictions of the sustainability crisis. The World Commission on Environment and Development (WCED) report *Our Common Future* (WCED, 1987) had related sustainability to development processes, which – through the coining of the notion *Sustainable Development* – had attempted to integrate these two strands, i.e.,

- the sustainability of the ecosystem functions, which provide
- the natural resources upon which all human, social and economic developments depend (Kajikawa, 2011).

This view speaks of the nature and causes of the problems such as global warming, environmental degradation, the appearance of new diseases, burgeoning world population coupled with growing inequalities between rich and poor, the North-South divide, regional conflict, insecurity, urban isolation, racial tensions, cyber-crime, and many others (Takemura, 2011; Yoshikawa, 2011).

The WCED report (WCED, 1987) gave the sustainability agenda rapid global recognition (Onuki and Mino, 2011). Its definition of *Sustainable Development* had

attracted global support due to being founded on the idea that development processes must ensure the coexistence of economy, society and environment (Komiyama and Takeuchi, 2011). This report, together with the publication of *The Future We Want* (UNCSD, 2012), the sequence of the three United Nations conferences on sustainability – taking place at Rio de Janeiro, Johannesburg, and Rio de Janeiro (again) in 1992, 2002 and 2012, respectively – as well as the recognition of the MDGs and the SDGs (millennium development goals, and sustainable development goals) have together established a wide agreement on the roots of the sustainability crises to have been located in both the unsustainable levels of production and consumption in the Global North and the (often related) enormous poverty in the Global South.

A key development in our sustainability journey since the 1992 United Nations conference on sustainability (also known as the 1992 Earth Summit) has, therefore, been in the recognition that Sustainable Development is multidimensional (i.e., social, environmental, economic, political, cultural, etc.) and underpinned by a set of core or common values. As noted of the seven Millennium Goals, which were later changed to eight goals:

“The goals for international development address that most compelling of human desires – a world free of poverty and free of the misery that poverty breeds ... Each of the seven goals addresses an aspect of poverty. They should be viewed together because they are mutually reinforcing ... Many poor people earn their living from the environment. So progress is needed on each of the seven goals.” (United Nations et al., 2000)

This recognition of the moral or normative base of Sustainable Development was a key factor for the popularity of the notion *sustainability* throughout the globe. Indeed, Kajikawa (2011) and Marsden (2011), among numerous others, have argued that sustainability is a normative goal of society.

## 2 The chaos of sustainability

Although the notion of sustainability is proclaimed by many to be a normative concept, the notion is viewed through a plethora of meanings, conceptualisations and approaches. These diverse meanings are grouped between distinct classes in different classification schemes. One of these schemes contrasts between universalist, thick and procedural sustainability (Miller, 2013) with respect to the discourse of sustainability science (Kates et al., 2001). The ‘universalist sustainability’ in this classification scheme defines sustainability as a universal constant that aims at improving the quality of human life while maintaining the planet’s life-support systems for the present as well as the future generations. While this way of conceptualising sustainability resembles a utopian view of reality without providing much guidance on the measures for advancing towards such a state, the thick and procedural sustainability attempt to advance such operational aspects. ‘Thick sustainability’, as per Miller, means the practice of making concrete and explicit choices over – which aspects of welfare to be advanced, what environmental elements and states need to be considered as necessary for promoting such welfare, and at what time scales these are to be achieved. The ‘procedural sustainability’, on the other hand, defines sustainability as a process of defining, learning and adapting to changes in conditions as well as in embracing uncertainties.

Another classification scheme views the concept of sustainability either through a set of social-ecological criteria, or a vision of humankind, or an object/thing/phenomenon, or an approach of study (Salas-Zapata and Ortiz-Muñoz, 2019). Through proposing this classification scheme the authors deny the existence of ambiguity and lack of clarity within the concept of sustainability by claiming that the diverse meanings and usage associated with the concept could broadly be grouped within these four classes. In this scheme the authors differentiate between the view of sustainability as a vision of humankind and the rest of the three views by identifying the earlier as a teleological/normative view and the latter as operative views.

The universalist concept of sustainability in Miller's classification corresponds to the concept of sustainability as a vision of humankind in Salas-Zapata and Ortiz-Muñoz's classification as both of these are teleological concepts. In that sense the concepts of thick sustainability and procedural sustainability in Miller's classification could be regarded as operative/analytical concepts similar to the three other views on sustainability in Salas-Zapata and Ortiz-Muñoz's classification scheme. However, such categorisation would contradict the fundamental nature of the intellectual necessities of sustainability, as the operative/analytical concepts of sustainability in both of these classification schemes are epistemologically and methodologically rooted in fragmentary modes of studies that either apply or emulate the reductionist nature of enquiry. As the problem of sustainability exists only on the entirety of a given reality, the intellectual treatment of sustainability, therefore, needs to study the realities/things in their entireties. However, such studies would characteristically differ from the fragmentary modes of studies due to the selective nature of the fragmentary modes as opposed to the entireties of the given realities.

This selective nature of the fragmentary modes of studies, relating to the operative/analytical concepts of sustainability, is evident from the data that were analysed by Salas-Zapata and Ortiz-Muñoz in producing their classification scheme. For example, the concept of sustainability as a set of social-ecological criteria is deduced in their classification scheme from statements (that appeared in research literatures) such as "reduce or eliminate the use of dangerous substances – CO<sub>2</sub> emission" (under the reference system "designing chemical products and processes"), or "employing renewable sources that do not release greenhouse gas emissions" (under the reference system 'production of energy'), or "makes optimal use of natural resources, respects cultural authenticity and ensures economic viability" (under the reference system 'tourism'), etc. All these statements are selective in their incorporation of criteria, where the selected criteria do not represent all elements that together constitute the integrity of the realities represented by these reference systems as we acknowledge them.

Similarly, the concept of sustainability as an object/thing/phenomenon in Salas-Zapata and Ortiz-Muñoz's classification scheme is deduced from statements such as "maintenance of a harmonic relationship between stakeholders" (under the reference system 'mining industry'), or "availability of fish in spite of el Niño and la Niña phenomena (under the reference system 'fishing'), or "maintenance of marine resources in spite of fishing activity originated in tourism" (under the reference system 'fishing tourism'), etc. In terms of the concept of sustainability as an approach of study, the authors demonstrate statements such as "this study used a framework which analysed agro-ecological conditions (land, water, climate), socio-economic conditions, and markets" (under the reference system "the community on Mount Merapi"), or "to present an approach to make social and cultural values concrete in a planning context" (under the

reference system 'natural resource systems'), etc. Similar to the authors' construction of the concept of sustainability as a set of social-ecological criteria, these objects/things/phenomena or the approaches of studies also reveal selective nature of elements that do not treat the entireties of the realities represented by their reference systems.

This lack of presence of any mechanism for treating the entireties of the realities associated with the given reference systems renders these operative/analytical concepts of sustainability also to be regarded as normative concepts due to their selective and reductionist nature of construction, in contrast to the necessity of studying the integrity of these realities for an effective intellectual treatment of sustainability. Treating the entireties of realities for the intellectual treatment of sustainability would instead require a fundamental, non-reductionist/integrated nature of enquiry that can produce understandings on the entireties of these realities.

In the reductionist mode of studying the reality, the fragmented nature of studies does not appear problematic as it is understood that a given study attempts to understand only a particular fragment of reality. However, this approach becomes inadequate as well as normative – regardless of how analytical or operative it could be – when there is a need to study the entirety of a given reality, such as, for the intellectual treatment of sustainability. This effectively renders the notion of sustainability, as approached in our present intellectual discourse, to be acknowledged as a normative concept, regardless of its present teleological or operative/analytical views. These diverse normative representations of the notion of sustainability, hence, reveals an intellectual chaos, existing within the discourse of sustainability, which is defined here as *the chaos of sustainability*.

### **3 Problem definition and research design**

As sustainability is not a firm, intellectual concept; the normative nature of its notion requires rigorous intellectual test. This test needs to ask two fundamental questions:

- 1 How intellectual is the notion of sustainability?
- 2 What would constitute an intellectual perspective on it?

The research answers these questions through analysing relevant published literature – as secondary data – within the frame of fundamental research. Hence, two research methods are employed in this work: literature analysis, and fundamental research. In examining how intellectual the notion of sustainability is, the research analyses the fundamental nature of the discourse of sustainability science that has emerged as an overt attempt, aiming to champion pluralistic and integrated forms of knowledge and research in addressing the problem of sustainability. The other question is addressed irrespective of any particular reference system.

### **4 Examining the intellectual standing of sustainability science**

#### *4.1 The problem of the perspective of sustainability science*

The term *Sustainability Science* was first coined in 1999 by National Research Council, United States (NRC, 1999). Beginning from the publication of *Our Common Journey*

(NRC, 1999), scientific deliberations had continued through a number of others in shaping the practice of sustainability science. Kates et al. (2001) describes:

“A new field of sustainability science is emerging that seeks to understand the fundamental character of interactions between nature and society. ... Sustainability science needs to move forward along three pathways. First, there should be wide discussion within the scientific community – North and South – regarding key questions, appropriate methodologies, and institutional needs. Second, science must be connected to the political agenda for sustainable development ... Third (and most important), research itself must be focused on the character of nature-society interactions, on our ability to guide those interactions along sustainable trajectories, and on ways of promoting the social learning that will be necessary to navigate the transition to sustainability.” (pp.641–642).

This sets out the perspective behind the emergence of sustainability science, which articulates a presumptuous approach in terms of seeking to understand the fundamental character of nature-society interactions. Besides, the following assumptions are also adopted for the practice in terms of:

- trying to discover the key research questions and appropriate methodologies through discussions
- the necessity for science to be connected with the political agenda on sustainable development
- adopting a methodological approach that aims to understand and guide the character of nature-society interactions along sustainable trajectories.

These assumptions portray a speculative character of sustainability science, which was not produced from a fundamental intellectual inquiry in terms of the appropriate intellectual necessities of sustainability. It, thus, reflects a normative base of sustainability science, while the remainder of Section 4 analyses the consequences of such normative essence.

#### *4.2 The problem of nature*

The IR3S (Integrated Research Systems for Sustainability Science, inaugurated in Japan) describes the concept of sustainability science as “a discipline that points the way towards a sustainable society” (Komiyama and Takeuchi, 2011). Sustainability science has also been claimed to be a discipline by others. De Vries writes, “Sustainability science has emerged recently as a new academic discipline and is a growing area of both research and teaching” (de Vries, 2013, p.1). However, the justification of such proclamation could be brought to question, as the proclamations asserting sustainability science to be a new academic discipline contain ambiguity:

“As an integrated academic discipline, sustainability science is able to propose the correct direction and path for existing academic disciplines to solve complex problems and eventually lead society to a state of peace and prosperity. All academic fields may have the same ultimate goal as sustainability science, and that is why sustainability science, with its intrinsic nature as a discipline, requires collaboration among many academic fields.” (Fukushi and Takeuchi, 2011b, p.116)

This statement could possibly be viewed in two notions. According to the first notion, sustainability science would appear as an overly simplistic practice, having the proclaimed intrinsic capacity of proposing the correct direction and path for the existing academic disciplines, provided that it requires these disciplines to collaborate among one another in order for its discourse to be advanced. In this sense, sustainability science does not become an independent discourse given it requiring collaboration among the existing disciplines (through accepting the direction and path proposed by it). Therefore, this notion represents a dependent form of practice, whereas the intrinsic nature of an academic discipline must refer to an independent form.

The other possible notion could be in terms of considering sustainability science as an independent discipline, which would present self-contradictory assertions. As per such a notion, if the existing disciplines do not and/or cannot collaborate, then sustainability science cannot independently advance its discourse in order to solve the complex sustainability problems, hence, the proclaimed intrinsic nature of it being a discipline would come to question. If the discourse of sustainability science is to be regarded with the two qualities of “independent rather than dependent practice”, and “in-depth rather than overly simplistic discourse” (overly simplistic in terms of merely proposing the correct direction and path for the existing academic disciplines), then sustainability science lacks the merit of an academic discipline as yet.

#### 4.3 *Definitional and foundational problems*

The problem in defining sustainability science is even more profound. It has been defined at the launch of the journal *Sustainability Science* as “an academic field that points the way to understanding the diverse issues associated with sustainability in a holistic manner and to offering visions of the development of a sustainable society and methods for achieving it” (Onuki and Mino, 2011). Such frame of definition communicates an eclectic identity of its normative essence instead of emanating from firm intellectual foundation. Another attempt to define sustainability science follows as: “Sustainability science is an academic field that aims to secure the sustainability of natural, social and personal systems and the peace and prosperity that human beings tend to seek” (Fukushi and Takeuchi, 2011b, p.116). The existence of such multitude of optimistic, normative and eclectic definitions of sustainability science may rather serve to impart obscurity and uncertainty into its essence.

Sustainability science has speculatively been described as having the basic character of an interrelationship-based transformative science:

“One of the key characteristics of sustainability science is that it does not end with the unilateral process of dispensing research results to the general public. Rather, it depends on a bilateral process through which changes in social values and sustainability-oriented actions taken by the public in turn transform the character of sustainability science. In other words, sustainability science itself is an interrelationship-based discipline ...” (Takeuchi, 2011, p.89)

Such speculation-based projection of a proclaimed basic character of sustainability science communicates a desire for overcoming the limitation of its reductionist way of inquiry – that is fundamentally inconsistent with the intellectual necessities of sustainability (see Section 2) – through altering the traditional unilateral process of the reductionist disciplines into a bilateral one, which does neither address these intellectual necessities of sustainability. Besides, as per such speculation, “changes in social values

and sustainability-oriented actions taken by the public” in turn transforming the character of sustainability science leaves the notion to be populated with disparate considerations from diverse, potentially inconsistent traditions. Moreover, such speculative character may also create contradictions in terms of the social/non-academic aims within the notion of a discipline as well as on their interrelationships.

In the concluding chapter on the discussions of the concepts of sustainability and sustainability science, IR3S communication states:

“By integrating the knowledge produced by existing academic disciplines, sustainability science can develop innovative solutions and propose pathways to them ... however, existing academic disciplines are not well prepared to link with each other, and researchers who do interdisciplinary work of this sort often suffer from a lack of recognition ... Sustainability science proposes that conventional disciplines open channels to link with each other. Such linkages are the only way to reach solutions to complex problems. The specific methods of linkage and integration have to be developed for individual cases, and professionals capable of doing such work need to be educated.” (Fukushi and Takeuchi, 2011a, p.117)

As per this speculative statement, unless the existing academic disciplines become linked to one another – which is a task that goes in contrary to their nature, expertise and practice – the matter of knowledge integration through the exercise of sustainability science remains imaginary.

#### 4.4 *Summary*

As discussed insofar, problems are manifest in the intellectual standing of sustainability science. The presumptuous approach and speculative nature and characters of this discourse reveal its lack of a credible intellectual foundation. While it is characterised by a normative essence instead of being based on a fundamental intellectual process, the problems with its nature and characters could be identified as being the natural consequences of its normative essence:

“The science is in its infancy. Criteria, approaches, and even definitions of the science vary. Although there is general agreement on three key concepts that underscore sustainability science (transdisciplinarity, integrative analysis, and the creation of knowledge for action), there is no established methodology, and the means employed to measure outcomes are inconsistent.” (Yoshikawa, 2011, p.257)

### **5 Sustainability: to be perceived from an intellectual perspective or through a normative essence?**

The notion of sustainability has been characterised by the moral consciousness that surface it, instead of arising from a fundamental intellectual perspective (see Section 1). This, in turn, populates the notion with disparate considerations that effectively yield an intellectual chaos (see Section 2). As such, it becomes imperative to distinguish between the *intellectual perspective of* and the *intellectual discourse on* the notion of sustainability. Although the global recognition of the notion had occurred owing to its normative essence, the notion does not cease from being intellectually treated due to the paramount importance implicated with its issues that cross-cut a wide of range of human

activities and scholarships. Therefore, attempting to *intellectually* treat the *normative essence* of the notion represents a troubled area, as has been exemplified through analysing the discourse of sustainability science in Section 4. This could be ameliorated through *intellectually* treating a notion based on a *fundamental intellectual perspective*.

A normative approach is not necessarily a fundamental or disciplined approach, nor is free from the scope of intellectual contamination, although such an approach could become the most contributing factor for a notion's rise in popularity. On the contrary, a fundamental intellectual perspective can provide a definitive and disciplined approach, while carefully avoiding yielding intellectual chaos. For an appropriate intellectual treatment of sustainability, it is, therefore, imperative to recognise the gap between the *normative essence of sustainability* and a *fundamental intellectual perspective on sustainability* to be reflected in their subsequent intellectual discourses. Given the problems with respect to the normative base of the discourse of sustainability science (as exemplified in Section 4), it becomes necessary to surpass this essence of normative impulse and form an intellectually justified fundamental approach on the notion of sustainability. Emphatically, there is a necessity of discovering the scholarship of sustainability instead of imaginatively describing the normative-speculation-based treatment of it.

## 6 Questioning the intellectual standing of sustainability

The contemporary notion of sustainability – as a multi-faceted area of public awareness and academic deliberations as well as having a global recognition as a conscious way of living – has come to host an unforeseen wave of social interest. However, its values-driven, normative nature yields an intellectual chaos that can obfuscate many sustainability issues, resulting in a potential deepening of social confusion and political inaction. Hence, developing an intellectual perspective of sustainability, based upon which, a scholarship of sustainability could be constructed, becomes imperative for an effective intellectual treatment of sustainability. However, the construction of the scholarship of sustainability would become a fundamentally difficult task due to the unprecedented necessity for a pluralistic orientation of knowledge that would be capable of studying the integrity of reality for producing understandings on its entirety (see Section 2). As the prevailing notion of sustainability is underpinned by normative assumptions, the following questions could be asked on its fundamental intellectual standing.

- In contrary to researching sustainability based on its normative essence and diverse applications of the reductionist methodology (that have been taken for granted), to what extent can sustainability be understood and researched through the development of a fundamental intellectual process that can study the integrity of a given reality for producing understandings on its entirety?
- To what extent can we conceive of, and indeed, engage in creating the scholarship of sustainability through the exercise of such fundamental intellectual process?
- How can this intellectual process foster the development of integrated knowledge acquisition processes that would be required for producing the knowledge avenue of the scholarship of sustainability?

## **7 Forming the intellectual perspective of sustainability**

### *7.1 The paradox of studying sustainability*

The study of sustainability potentially sits on a paradoxical tension between the breadth and depth of comprehending a given reality. As the reductionist mode of enquiry produces narrow, fragmented and vertical advancement of knowledge; its linear, disciplinary approach does not suffice for meeting the intellectual necessities of sustainability while at one hand the sustainability problems are characterised with a proliferation of afflictions with entangled nature in feedback loops (Ayres, 2000) and on the other hand this vertical advancement of knowledge produces disintegrated comprehension of reality, along with a resultant pool of fragmented, inconsistent or even contradictory artefacts (Yoshikawa, 2011).

While the intellectual treatment of sustainability through the exercise of reductionist, disciplinary methodology forms one part of the problem in terms of producing disintegrated, vertical comprehension of reality, the other part of the problem lies at the other end of the spectrum, i.e., into the breadth of comprehending the reality. The expanse and complexity of the problems of sustainability could potentially be as vast as incorporating anything and everything in reality, which, in human intellectual terms, could effectively lead to reducing the issue of sustainability into an empty/meaningless notion. The following two statements, taken together, illustrate this tension that the study of sustainability is characterised with: “The time has come ... to liberate the study of real-world processes from the confines of artificial, 19<sup>th</sup> century boundaries between the scientific disciplines” (de Vries, 2013, p.5) and “For some, the term ‘sustainability’ is now so broad as to be meaningless. Essentially, anything, anywhere or anyone can be taken as the focus for a sustainability research project” (Franklin and Blyton, 2011, p.5).

Amid this risk of getting lost either into too much breadth or into too much depth, the potential scholarship of sustainability ideally needs to operate between these two extremes, while sufficiently incorporating both of these elements, i.e., the breadth and depth of comprehending the reality for producing understandings on its entirety. The breadth, here, refers to the horizontal comprehension of the integrity of reality, whereas the depth represents the vertical comprehension of the specificity of the integrated reality. This unique intellectual orientation of the potential scholarship of sustainability brings on the necessity of epistemologically assessing the position of the reductionist scientific methodology in the light of the sustainability crisis.

### *7.2 Epistemological necessity of a new mode of enquiry*

The emergence of the notion of sustainability in human intellectual discourse unfolds an unprecedented problematic dimension of the reductionist scientific methodology. From a sustainability point of view, the structure of the reductionist scientific disciplines could be described in terms of containing 19<sup>th</sup> century artificial boundaries between the disciplines (de Vries, 2013, p.5), which enable them to function in their reductionist way. In human intellectual discourse, the dominance of such boundaries – that have been driving an enormous production of reductionist knowledge – has been so great that others have described the same to be the “traditionalist view of sanctity, and indeed, hegemony of single disciplinary approaches” (Marsden, 2011, p.297). Shaping an effective intellectual response to the problem of sustainability, hence, necessitates the liberation of

the human intellectual discourse from the dominance of these artificial 19th century boundaries through countering such sanctity and hegemony of reductionist, disciplinary approaches.

### *7.2.1 Limitations of the reductionist scientific method*

Hossain (2018) analysed the epistemological and methodological problems of the reductionist nature of enquiries in the light of the problem of sustainability. As evident in his analysis, the traditional scientific method and its characteristic reductionist practice exhibits the limitations of:

- inability to address the entirety of reality
- a restricted capacity in terms of observing and explaining its matters of enquiry, which takes place merely in an objective manner that excludes the subjective as well as the holistic aspects of reality
- its incapacity of yielding artefacts but within highly restrictive scopes and manners.

While the reductionist methodology remains characterised by these limitations, many reductionist disciplines tend to address the problem of sustainability from their own, singularistic perspectives (Takeuchi, 2011), which may exacerbate the chaos of sustainability (see Section 2).

The exercise of the reductionist scientific practice – although meant to improve the quality of life – has, ironically, facilitated the creation of the sustainability crisis through producing fragmented scientific and technological advances that yielded inconsistent/contradictory artefacts, leading to excessive, localised and uncoordinated human actions (Yoshikawa, 2011). These limitations of the reductionist methodology, together with the separation of the reductionist disciplines by their artificial borders, have acted to prevent modern science from seeing this effect at a scale beyond its compartmentalised narrow domains. While the specialised disciplinary progress in the reductionist mode had taken place without the reality-match of simultaneously advancing our understanding on the entirety of reality, the dominance of the reductionist mode of enquiry on human intellectual discourse has also been so great that the resultant reality had offered little encouragement for the development of alternative intellectual perspectives that could potentially provide an effective intellectual treatment of sustainability.

In the light of the intellectual necessities of sustainability, Hossain (2018, p.419) asked, “how could the traditional scientific method not prevent the emergence of these complex problems, and indeed, through the yield of inconsistent and contradictory artefacts that result in excessive, localised and uncoordinated human actions it actually has created our contemporary problems that it is inherently unable to solve?” This query could be taken to question the true level of accomplishment from the exercise of the reductionist scientific practice in human intellectual discourse while at one hand there is an explosion of reductionist results and artefacts, inconsistent to the integrity of reality, and on the other hand there is a dire poverty of effective knowledge of the system and its sustainability. In the search of an effective intellectual treatment of sustainability, it, thus, becomes necessary to reorient our perception on the traditional scientific method to be recognised as a part of sustainability-problem-making instead of assuming it to be an effective tool to solve it.

### 7.2.2 *A new mode of enquiry for the scholarship of sustainability*

In a situation where the inherent limitations of the reductionist scientific method had prevented its practice from recognising its deleterious effects in terms of facilitating the emergence of the sustainability crisis while epistemologically and methodologically the method being incapable of solving the problem of sustainability, the formation of an alternative perspective, i.e., a new mode of enquiry in human intellectual discourse has become imperative. As Hossain (2018) articulated with reference to Ziman's (2001) words, the fundamental intellectual orientation of such a mode of enquiry needs to be characterised by the capacity of producing bricks of knowledge while looking at the whole building, in contrast to producing specialised bricks of knowledge at the expense of not seeing the whole building (which is characteristic of the reductionist mode of enquiry). This new mode of enquiry calls for the development of a fundamental intellectual process that could enable such capacity – i.e., production of bricks of knowledge while looking at the whole building – while also overcoming the limitations of the reductionist mode of enquiry in addressing the problem of sustainability.

As identified in Section 7.1, this new mode of enquiry needs to simultaneously progress a horizontal comprehension of the integrity of reality (i.e., the breadth of comprehending the reality) as well as a vertical comprehension of the specificity of the integrated reality (i.e., the depth of comprehending the integrated reality). The importance of the simultaneous production of horizontal and vertical understandings within what could be identified as “*integrated knowledge*” production lies in the nature of the produced knowledge that should reveal understandings on the integrated reality in both of its characteristic dimensions, instead of either a strictly disintegrated vertical comprehension of it, or a superficial, shallow horizontal comprehension, not telling much on the specificity of the reality. It is, indeed, between these standalone horizontal and vertical extremes that the new mode of enquiry, and the potential scholarship of sustainability, should operate. This new mode of enquiry would also necessitate a new epistemological interpretation of knowledge – in terms of ‘integrated knowledge’ production – in order to characterise its unique intellectual orientation.

While Plato had defined knowledge as *justified true belief* (Dretske, 1981; Kakabadse et al., 2003), and in that sense, most of our knowledge are not justified *per se* (Kajikawa, 2011), there is a controversy as to the nature of knowledge among the disciplines. Each discipline tries to define knowledge in the way such becomes relevant to the discipline's intellectual necessities rather than flowing from a common/shared epistemological interpretation of it. This lack of uniform epistemological interpretation as to the nature of knowledge within the disciplines has, thus, resulted in a number of schools of thought within the discourse of philosophy of science, with little agreement among the different schools (Riggs, 1992). Due to a multitude of disciplines operating with multitude of epistemological perspectives, the unique intellectual orientation of the new mode of enquiry needs to arbitrate within this complex philosophical reality of knowledge in order to define the epistemological interpretation necessary for ‘integrated knowledge’ production for the potential scholarship of sustainability.

## 8 Conclusion

The WCED Report *Our Common Future* (WCED, 1987) and other contemporary milestones together invoked a historic wake-up call for humanity, the necessity of a scholarship of sustainability, in which light, is unquestionable. The growth of consciousness since 1990s has nourished a great deal of energy for addressing numerous, diversified issues associated with the crisis of sustainability. However, epistemological and methodological limitations and incoherencies have limited progress. As the knowledge acquisition processes in their most effective forms operate in singular, reductionist perspectives, inventing “integrated knowledge” acquisition processes to meet the intellectual necessities of sustainability requires the formation of an unforeseen intellectual project in human intellectual history. This requires treating the notion of sustainability from a fundamental intellectual perspective in contrary to pre-emptively perceiving it through a normative essence. Besides meaningfully resolving the chaos of sustainability (see Section 2), a fundamental intellectual perspective can also reinvigorate the moral basis that acted to popularise the notion of sustainability. This leads to the necessity of the formation of a new mode of enquiry in contrast to the reductionist mode, and requires the development of a fundamental intellectual process that could enable ‘integrated knowledge’ production for the creation of the scholarship of sustainability.

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