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Sustainable Development, Architecture and Modernism: Aspects of an Ongoing Controversy

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Abstract: In some discourses on sustainability, modernism in architecture is blamed for its technocratic beliefs that supposedly generated a lot of the social and environmental problems the world is facing today. At the same time, many architectural critics seem to be convinced that the present call for sustainability with its “green buildings”, is but another screen behind which well-known old power structures hide. In this paper, we react to these viewpoints in different ways. First we clarify the issues that are haunting current architectural discourses by unraveling the logics behind the viewpoints of the critics of the “environmental doctrine” on the one hand and the technical environmentalists on the other hand. We will offer, secondly, a new framing to these debates by relying upon the modal sphere theory of the Dutch philosopher Herman Dooyeweerd. This new framing will allow us to reconnect, thirdly, with the discourse of modernism, which, we will argue, is all too often conflated with a technocratic paradigm—a partial, incomplete and even misleading representation. In conclusion, we present a different framing of modernism, which allows understanding of it as a multilayered and multifaceted response to the challenges of modernity, a response that formulated a series of ideals that are not so far removed from the ideals formulated today by many advocates of sustainability. We are, thus, suggesting that the sustainability discourse should be conceived as a more mature and revised version of the paradigm of modernism, rather than its absolute counterpoint.

Keywords: modernism; modernity; sustainability; Dooyeweerd

1. Introduction

In several schools of thought, modernism has acquired a bad reputation. Political scientist James C. Scott, for example, blames what he calls “high-modernist ideology” for a series of man-made tragedies, such as The Great Leap Forwards in China, collectivization in Russia, and compulsory villagization in Tanzania, Mozambique and Ethiopia [1]. For Scott, high modernism relies upon a strong belief in science and technology as carriers of economic expansion, growing satisfaction of human needs and a rational design of the social order. When combined with a strong administration, an authoritarian state and a weak civil society, this high modernism gives rise to disastrous projects of social engineering that produce in the end much more human suffering than beneficial outcomes.

In a similar vein, but this time focusing on its technological border conditions, Peter Droege has linked the emergence of modernism to the availability of fossil fuel powered engines. He coins the latter phenomenon as *fossilism* and explains it as the “*unique and brief development period in society, economic systems, cultural meaning, urban form and architectural expression expected to last no longer than roughly three centuries (1750–2050), as a brief era driven and marked by an all-encompassing, global dependence on fossil fuels*” [2] (pp. 10–11). Fossilism should, in his view, be seen as the key historical technology driver for modernism [3] (p. 35). The modernist avant-garde in architecture was indeed particularly well embedded in the machine ethics that accompany fossilism. The appreciation of the possibilities offered by new technologies formed an integral part of the mind-set of the modern building pioneers. Besides exploiting the obvious material advantages of industrialization and mechanization, the uptake of technology also led to a symbolic attitude which we know as *Machine Age aesthetics* [4].

In this paper, we nevertheless want to question these viewpoints. If we see modernism as the body of intellectual and artistic movements that responded positively to the experience of modernity [5,6], is it correct to blame these movements for derailed ideological projects or for the ruthless exploitation of natural resources? Should we not be more careful in understanding modernism’s complex relationship to the social and economic processes of modernization, rather than assume that modernism caused modernization or that it was responsible for modernization’s worst effects? Might it not be possible to rather take up the legacy of modernism, in order to deal with the inevitable tensions and contradictions that face us when we set out to embrace an ethos of sustainability? We will argue that the latter attitude is more promising, because it is based, on the one hand, on a more adequate understanding and reception of modernism, whereas it also allows, on the other hand, to make sense of some of the most astute challenges proponents of a sustainability discourse and practice are facing.

The paper consists of four parts. We start from a discussion on the meaning of “sustainable development”, mapping the controversy between environmentalists who call for immediate action and postmodernist critics who question the legitimacy of these calls because they see them as a new meta-narrative that is in the interest of ruling powers rather than subaltern people. In a second part we propose a possible way out of this controversy by building upon the theory of modal spheres of

Herman Dooyeweerd. In a third part, we reconnect this discussion with the conceptualisation and historicization of modernism, which we will highlight as a project of emancipation and justice. In the concluding fourth part we will consider how the legacy of modernism can be inspirational for our response to the sustainability challenge.

2. Sustainable Development: The Controversy

By 2014, the call for sustainability has become common sense and is in many regions and countries part of official policy. The field of architecture and urbanism emerges in this context as a major area for intervention. Worldwide, cities develop climate mitigation and adaptation action plans, Green Building Councils arise, new indexes are developed to monitor the sustainability of buildings and neighborhoods, and new buildings will soon—at least in Europe—have to obey very strict criteria with respect to energy efficiency and the share of renewable energy sources used [7]. In a comparable way, building material impacts make their entry into the regulatory framework (life cycle assessment, environmental product declarations). In the field of spatial and infrastructural planning, environmental impact assessments make up an official part of European planning regulations for a long time already and public and political attention for this aspect has steadily increased. In the developing world, sustainable building techniques based on locally available resources and well-thought renewable energy production schemes are championed as an interesting alternative to the costly, disruptive and high-impact solutions that come with Western style “instant modernization”. Obviously the field of sustainable building and planning starts to become a real concern in many parts of the world, with the scope of interventions ranging from the simple building component to entire regions, and covering the strictly ecological dimension as well as the complementary socio-economic dimensions.

Suspicion towards the ecological imperative nevertheless has been a constant factor in the debate on sustainable architecture. Although hardly any scholar would risk now to challenge the base line of the environmental problem—in particular after the Intergovernmental Panel on Climate Change concluded that climate change is anthropogenic [8] (p. 30, 37), [9] (p. 15)—the way this problem is being dealt with still provokes much controversy. Neo-capitalist recuperation of the sustainability effort is a major source of concern, but at a deeper level, the way the natural world is perceived within this context enters into the debate as well. As such, questions emerge on “who constructs what kind of reality for which type of goal?”. A brief selection of writings is reviewed to illustrate this line of thought.

Already, in 1999, Mark Jarzombek stated that “*as Sustainability becomes ever more involved in the politics-of-change, it becomes saturated with the problem of hypocrisy*” [10] (p. 33). Sustainability risks to become “*the rhetoric of some grand compromise*”. The comparison with a discredited modernism is also made: “*Sustainability thus implies a grand narrative, the likes of which have not been seen since the days of the International Style*” [10] (p. 34). Thus, Jarzombek warns against the infection of architectural education with the politically correct sustainability discourse. Since 1999, the scientific claims about climate change have been further corroborated, but at the same time the discomfort with climate issues remains present in many minds. Jarzombek expresses the fear of such interference well when he suspects that “*The new ‘interdisciplinarity’ of architecture-with-science will create, for example, an anti-interdisciplinary polarization of architectural discourse along the antinomic lines of artistic freedom vs. technological complicity*” [10] (p. 38). In other words, the constraints of ecological design

pose a threat to architectural freedom and expression—even if Mark Jarzombek does not allow himself to put it so sharply. Later on, Jarzombek even deepens his suspicion, claiming that “*scientocracy, technocracy, and biocracy*” are imminent dangers when eco-determinist protagonists “*fail to take into account the relativism and complexity of culture, life, and technology*” [11] (pp. 55–56).

A similar argument is formulated by Richard Ingersoll when he criticizes, without strictly denying the environmental problem, the fuss about a “*green apocalypse*” and the “*nagging obsession*” with climate change. Likewise in his eyes are the “*Eco-guerillas*” that perpetrate some “*unwitting sort of elitism*” in claiming nature’s right over that of humans [12] (pp. 580–589).

Panayiota Pyla [13] embarks on concurring pathways when she denounces simplistic interpretations of sustainability, based on “*ecological doomsday scenarios*”, where one is not “*mindful of the immense complexities of sociocultural politics*”. Moreover, nostalgically proclaiming the wisdom of nature as did Rachel Carson in her famous book “*Silent Spring*” [14] might well have a “*subtextual emphasis on quasi-mystical conceptions of an age-old balance that needed to be preserved*”—a kind of naïve return to romantic simplicity, with an equally naïve view on harmonious biophysical system functions. Regarding the dangers of meta-narratives, she equally refers to the precedent of modernism: “*However noble, heroic models have pitfalls.*” As a matter of fact “*sustainability is constantly running the danger of turning into a totalizing doctrine that subsumes critical thinking*” [13].

It is interesting to note that Panayiota Pyla arrives at an aspectual reading of the sustainability problem, but she does so while isolating the sustainability premise, rather than integrating it: “*Adopting this warning to the terms of the architectural debate could mean that sustainability should not become a totalizing concept that subsumes crucial design questions about the social, the cultural, the political, the aesthetic and the physical, which, incidentally, are not unambiguous categories. Maybe it is good that sustainability does not have a fixed or coherent definition.*” For such type of definition “*will threaten to reduce design to a series of small decisions (on materials, energy or feasibility) that will ultimately have less to do with design and more with management or with political correctness*” [13].

Whereas Pyla, thus, conflates ecological awareness in architecture with a technocratic refusal to recognize the complexity and richness of design, Susannah Hagan is more optimistic. She also acknowledges that there is at present a wide gap between the environmentally inclined architects and builders on the one hand and the digital design avant-garde on the other. Whereas the first group is primarily motivated by the “*desire to replicate in the built world, the waste-not-want-not efficiencies of natural ecosystems*”, the second group is rather searching for novel forms, innovative structures and breath-taking aesthetics [15] (p. 3). It is however clear to her that architectural culture will have no choice, in the long run, but to mediate between both imperatives: respecting nature and seeking for the new. She advocates a rapprochement between environmental practice and digital architecture, suggesting that there is no reason why digital architecture should not confront the messiness and constraints of natural “thingness” that is implied in ecosystems [15] (p. 128).

Jiat-Hwee Chang [16] highlights some of the contradictions the discourse of sustainability runs into, by looking at its “*tropical variants*”. His discussion, based upon an analysis of the Aga Khan Award for Architecture, points towards different tendencies that alternate among the winning projects: on the one hand a combination of green developmentalism with ecological modernization (large scale, technology driven projects that are very similar to “green” architecture in the West) and on the other hand projects that build upon either the sophisticated use of traditional local skills or on the creativity that is

embedded in grass-root initiatives such as squatter settlements. The first, technology-driven projects can be questioned from a social-political point of view, because they frame “*the question of sustainability strictly in terms of neo-classical economics and technical change, while largely ignoring the underlying questions of distributional justice and socio-economic relations*” [16] (p. 606). The projects that deploy traditional skills may also become problematic, because they are so labor-intensive that they can only be afforded by the wealthy, and hence give rise to an elitist architecture. Only the projects that were based upon self-help and grassroots initiatives seem to really comply with the triple orientation (“people, planet, profit”) of a broadly conceived sustainability.

For all of these authors, technocratic intervention is detected as a creeping danger. The perception is echoed by Simon Guy and Graham Farmer in a 2001 article on the place of technology in sustainable architecture. After inventorying some six different trends in the response to the ecology equation, they conclude that “*our analysis raises significant questions about the positivistic scientific assumption underpinning the search for a consensual definition of sustainable architectural practice*” [17] (p. 146). Hereby, the authors argue that competing environmental debates are not the result of uncertainty, but the outcome of conflicting visions on the environment, and how to solve the problems related to it. Pushing this interpretation to the limit, they conclude that “*Environmental concerns are both time and space specific and are governed by a specific modeling of nature*” [17] (p. 146). Simon Guy reiterates this view in a 2012 contribution, asserting that “*the multiple ways environmental problems are identified, defined, translated, valued and then embodied in built forms*” prove the untenability of a single “*universal environmental sublime*” [18] (p. 558). Guy, thus, takes a constructivist position, quoting Latour in order to argue that this might be “our only defense against fundamentalism” [19] (p. 28).

We wonder, nevertheless, if these are the two only alternatives. Is it either constructivism or fundamentalism? And if constructivism seems to be the philosophically most convincing position, does this really mean that all sustainability concerns should be minimalized, because they are the result of competing claims over the significance of “nature”? All too often, it seems, a constructivist position turns into overt relativism or complete skepticism with respect to the urgency of problems related to climate change or other issues of sustainability. How to find an alternative? How can we philosophically pertain to a position that refutes any fundamentalism, but that nevertheless acknowledges that sustainability is a “matter of concern”? If we do not want to adopt the fundamentalist position of “eco-determinism”—the conviction that the logic of sustainability, understood in a narrow, technical sense, is so all-encompassing that it should overrule all other (social, cultural, political, aesthetic, ...) considerations in setting the pace for national and regional policies, how then should we frame the current challenges for architecture and urbanism?

3. The Modal-Sphere Theory of Herman Dooyeweerd

The Dutch philosopher Herman Dooyeweerd’s epistemological work offers an interesting tool to discuss the perceived dangers of eco-determinism. Herman Dooyeweerd (1894–1977) was a Dutch philosopher who began his professional career as a jurist. In 1922, he became the director of a new political research institute in The Netherlands, the Dr. Kuyper Stichting, founded by the then Dutch Anti-Revolutionary Party (ARP). The ARP was the first national political party of the Netherlands and was ideologically linked to the protestant New Reformed Church. The party would later, in 1980, be

absorbed in the Christian-democrat CDA. As a condition for his appointment, Dooyeweerd required that he would be able to study the application of Neo-Calvinism in law, economy and politics. In this function, he started to develop the philosophical ideas that would make up his “Wijsbegeerte der Wetsidee” or “Philosophy of the Law-idea”. Although he maintained a Calvinist outlook, he stressed the philosophical character of his work. From 1926, he became a professor at the Law Faculty of the Free University of Amsterdam where he taught, among others, philosophy of law.

Building further on his philosophical premises we could define sustainable development in terms of its knowledgeable aspects or *modal spheres*. The modal sphere theory was initially developed by Dooyeweerd starting from the 1930s, and subsequently applied in, among others, systems theory and sustainable urban development studies [20–24]. Dooyeweerd identifies, in a non-exclusive manner, 15 modal spheres that logically succeed each other as follows: the numerical, the spatial, the kinetic, the physical, the biological, the sensitive-psychical, the analytical-logical, the historical-cultural, the linguistic-communicative, the social, the economic, the aesthetic, the jural, the ethical, and the credal law-sphere. It would lead us too far to discuss the arguments Dooyeweerd brings in for building his epistemological framework in this way, but its power lies essentially in the relations he discerns between these modal spheres. All spheres meaningfully and functionally link to each other in modal “chain reactions”, but have at the same time an irreducible autonomy. An important characteristic of the spheres is that their functions evolve from being ruled by strictly determinative laws (e.g., the laws of physics, which are evidently not open to negotiation) towards regimes of human normative character (e.g., the laws of a given juridical system which are the result of human convention, and therefore open to negotiation). Their natural order implies specific functional consequences; as such there is no biological life possible without the basis of physical matter, or there can be no economy without social relations. A lower order sphere is, thus, always conditional for the existence of higher order spheres. Moreover, spheres can metaphorically describe other spheres: for example statistics (belonging to the numerical sphere) can help to clarify social phenomena (in the social sphere). However, due to sphere autonomy, these metaphors are only partially valid; they fall short of explaining the other sphere completely (for example, statistics can never say all about social life). This has important consequences for the explanatory power of scientific idioms [24].

Considering the sustainability question from this framework, it can be argued that sustainable development involves modal aspects starting from the functioning of the biophysical world as a material basis, and from there on reaching far into all strata of human society with its social conventions, economical activities and juridical and political institutions. Resultantly, questions of sustainable development stretch over many, if not all of the modal spheres from the very determinative to the ultimately human normative. As an example, the commonly referred to Brundtland definition (“*Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*” [25] (Chapter 2, Article 1)) is expressed as a high-order ethic engagement, and, thus, situates itself at the upper normative end of this aspectual range. By contrast, CO₂-emissions are subject to the natural laws of physics and chemistry, but they equally make up a substantial part of the sustainability equation. For a coherent analysis of sustainable functioning, the challenge, therefore, resides in meaningfully relating all the concerned modal aspects to each other. In other words, an assessment of integrated sustainability requires us to inquire what an

engagement like the Brundtland statement implies for issues as diverse as CO₂-emissions, resource depletion, urban development, social provisions or the preservation of natural and cultural heritage.

Furthermore, it is important to acknowledge that these aspects or spheres do not operate in isolation. From a philosophical point of view, this has been expressed as the fact that aspects anticipate and, reversely, *retrocipate* other aspects. Retrocipation is, in Dooyeweerd's theory, the opposite of anticipation: if sphere A anticipates (makes up the lower order foundation for) sphere B in the modal sequence, then sphere B retrocipates (or falls back on) sphere A. As argued above, it is not possible to have an economic system without social relations: the economy is, thus, a social construct. Expressed in Dooyeweerd's terms social relations anticipate economic behavior and economic behavior necessarily retrocipates into its foundations of social interaction. In a similar way, we can conclude that human societies with their social and economic functions cannot operate without the ecosystem services provided in the physical and biological spheres, because a society necessarily retrocipates into these material spheres. In addition, Dooyeweerd fully acknowledges the deterministic character of this material life basis.

At the same time, each modal sphere has an inherent autonomy, which implies that it cannot be further decomposed into a combination of other modal functions. A relevant example is the role of ethics in sustainable development. When assessing the sustainability of a project, for example an urban redevelopment scheme, its ethics should be discussed as an explicit matter of concern, and therefore not only in terms of social or economic equity which are anticipations of the ethical principle *in se*.

Building upon Dooyeweerd, one could further claim that sustainable architecture should reflect sustainability into all of its singular but interconnected aspects through modal coherence. There is no integrated sustainability without simultaneous environmental, social, economic and ethical sustainability. It is to be noted that aesthetics is another modal aspect within Dooyeweerd's framework, and hence the autonomy of, e.g., architectural or landscape quality in these terms is equally being recognized. Merely focusing on environmental, social or economic issues never reflects the entire spectrum of sustainability, nor is it possible for a purely formal or aesthetic approach to deliver buildings that are sustainable from an environmental, social or ethical point of view. Changing social parameters of sustainable functioning will have implications on the environmental and economic parameters, and *vice versa*. This is equally true for the architectural avant-garde: in order to be sustainable, its designs must remain functionally embedded in a complex logic of expectations from different modal spheres on foundational levels (use of resources, climate, habitat and shelter, communication, heritage, *etc.*) while at the same time meaningfully anticipating its superstrata (in particular aesthetics, ethics or integrity).

The theory of modal spheres thus provides a powerful key for analyzing sustainability problems, and subsequently identifying critical constituents of integrated sustainable performance. It also however points to a difference in the determining capacity of the different spheres. It can indeed hardly be ignored that the biophysical world is ruled by deterministic laws. Burning one liter of gasoline produces 2.3 kilograms of CO₂, whether this is happening in Tokyo, Berlin, or Las Vegas [26]. On this level, eco-determinism is a fact—a fact that inevitably conditions us. On a physical level, we need food, water and shelter, we need certain atmospheric conditions to stay healthy, we know that certain toxic substances will increase the incidence of certain diseases, *etc.* Inevitably, ecosystems have an impact on human well-being. We cannot change the composition of the atmosphere without bearing the consequences thereof.

By contrast, the human normative end of the modal chain can swing between fundamentally different extremes [24]. Differing human norms are hereby the motor behind the “*choices about how to represent a state of affairs*”, as Simon Guy cites Markus and Cameron [18] (p. 558). In terms of sustainability, we can interpret the possible asymptotes of human normative positions to range from ethically integral sustainable development towards its antipode, famously described by Garrett Hardin as the *Tragedy of the commons* [27]. The biophysical outcome (or modal retrocipation) of these two extreme human normative positions is correspondingly different, while strictly obeying to the same laws of nature. In the case of integral sustainable development the aims are at guaranteeing relatively stable natural cycles (preferably as they existed before the industrial revolution), and, therefore, related strategies involve social and institutional structures (modal anticipation) based on appropriate guiding principles to realize the commonly defined interest [24,28]. By contrast the world ruled by Hardin’s individualist herdsman leads to disruptive ecosystem functioning with, in nowadays’ context, rising temperatures and sea levels, collapsing biodiversity and, for human society, probably a few surviving fittest or richest. For nature, both scenarios are perfectly “sustainable” because ecosystems will continue to exist in one way or another—eventually as deserts. In this view, eco-determinism corresponds to the fact that we have a limited range of choices to act along one of the possible modal lines situated between both mentioned extremes, taking into account the systematic nature of biophysical outcomes. Thereby, the perceived *unsustainability* of the second scenario is clearly defined by our normative position towards what happens at the level of nature.

Eco-determinism, thus, exists on the level of the bio-physical, and it simply refers to the laws of nature—or expressed in terms of the current debate, Johan Rockström’s meanwhile famous *planetary boundaries* [29]. Contesting this condition is, as Hardin has pertinently expressed, a sign of *psychological denial* [27] (p. 1244). If the ecological meta-narrative refers to the laws of nature, than it should be simply admitted that such laws are not under negotiation. However, one often sees a conflation between such a meta-narrative referring to nature and specific normative positions of certain groups. The latter, according to modal sphere theory, should nevertheless remain open for negotiation, but only in so far as they correctly retrocipate into the laws of nature. It would be a methodological flaw indeed to suggest that the intrinsic behavior of the biophysical world can be influenced by the normative perceptions of particular groups: this would be a denial of the deterministic foundations of human society and the related functional retrocipations throughout the modal chain. It implies that normative positions are only logically defensible if they respect this modal coherence—a famous example of not doing so in the business world is known as *greenwash*.

In that sense, Dooyeweerd’s epistemology might offer a nuanced version of constructivism, which acknowledges that there is a problem of sustainability, without denying the complexity of precisely understanding the nature of that problem. When we suggest to adopt a viewpoint taking clues from his ideas, this might not be that far apart from the one taken by Simon Guy, who ascertains that “*the challenge of architectural sustainability involves confronting a range of theoretical questions about how we conceive of ‘nature’, what forms of knowledge we reify, how we prioritize competing ecological issues, how we relate to particular contexts. That is, how we might juggle complex balance of resource efficiencies, aesthetics, health, community involvement, equity and so on.*” [18] (p. 571) He cites Bruno Latour for concluding that this implies “*acknowledging ‘matters of concern’*” and recalls Steve Hinchcliffe’s suggestion for the type of solution building that is needed: “*any attempt to assemble a*

garden, landscape, city, policy, or other grouping will require more than one mode of ordering” [18] (p. 571).

4. Reconceptualising the Legacy of Modernism

Modernism, as stated above, has acquired a very bad reputation as the paradigm that fed human hubris because of its absolute belief in science and technology. For the modernist architects of the Modern Movement the new possibilities opened up by technology were indeed a major source of inspiration [4,30]. The Modern Movement was fascinated by the machine, as is evidenced, e.g., by Le Corbusier’s concept of the *machine à habiter* or in his urban projects for Algiers and Rio de Janeiro, where high-rise buildings serve to carry highways. The latter are the ultimate expression of progress, literally and figuratively. Additionally, as Le Corbusier verbally states, nature is there to applaud the scene: “*au large de Rio, j’ai repris mon carnet de dessin: j’ai dessiné les monts et, entre les monts, l’autostrade future et la grande ceinture architecturale qui la porte: et les pics étaient exaltés par cette impeccable horizontale.*” [31] (p. 177) Le Corbusier was not alone with his expressions. Earlier, Frank Lloyd Wright had already formulated a technological manifesto, *The Art and Craft of the Machine* (1901), and later on he would conceive of a utopian future under the form of *Broadacre City*, an endless suburban landscape, which was only imaginable as car-based [32].

Many more references to the ethos of technology are found among the creators of the Modern Movement. In Hannes Meyer and Hans Wittwer’s Bernau trade union school, for example, the main entry is marked by the three chimneys of the heating installation, a loading platform and a series of garage doors—a very symbolic position of technology indeed. In Mies’s IIT campus in Chicago, the building containing the heating installation is as prominent within the urban design as the one containing the chapel [33] (pp. 16–17).

In its experimental enthusiasm, the Modern Movement was rather blind for the emerging energy and resource failures—as was most of its history writing afterwards. Shortly after the Bauhaus teachers went to live in their new master’s houses designed by Walter Gropius, Paul Klee started to complain about the astronomic heating bill. He and Wassily Kandinsky finally went to ask the town of Dessau for a rent subsidy in order to afford for the energy bills [34] (p. 126). While this fact has become an anecdote in the history books of Modernism, in retrospect it seems very significant as an indication of the unlimited belief in nature’s bounty and in the capacity of technology to overcome all effects of scarcity. Even though at that point in time there was not yet a massive awareness of problems with the availability of resources, there were nevertheless already people warning against unexpected effects of the liberal use of organic materials for energy production. The Swedish scientist Svante Arrhenius, e.g., started to calculate and publish the effects of CO₂-releases on the atmospheric temperature levels as early as of 1896, pointing at “the enormous importance” of greenhouse effects in the atmosphere [35] (p. 237), [36]. If modernist architects were maybe not to blame for their ignorance in these matters, one cannot avoid the observation that their enthusiast embrace of oil-based technologies contributed to the environmental problems that we are now confronted with.

There is, nevertheless, also much in modernism that is worth redeeming. Focusing on modernism’s belief in science and technology leaves aside other aspects of its legacy, aspects that might be much more inspirational for the discussion of sustainability. For the Modern Movement in architecture certainly was

not only about machines and technology. It was most of all about building a “rational” society—meaning a just and emancipatory society, with opportunities for all. In that sense, the Modern Movement was indeed part of what Jürgen Habermas later called the “project of modernity”, which, formulated in the 18th century by Enlightenment philosophers, “*consisted in their efforts to develop objective science, universal morality and law, and autonomous art according to their inner logic. At the same time, this project intended to release the objective potentials of each of these domains from their esoteric forms. The Enlightenment philosophers wanted to utilize this accumulation of specialized culture for the enrichment of everyday life - that is to say, for the rational organization of everyday social life.*” [37] (p. 9) Interpreted in our frame of reference, Jürgen Habermas functionally connects a range of higher order modalities (science, morality, law and art, all having their “inner logic” or sphere autonomy) to everyday life, thus, implying that the harmonious functioning of the entire modal chain is a basic principle of the Enlightenment. Hereby “*releasing the objective potentials*” and “*the enrichment of everyday life*” correspond to Dooyeweerd’s retrocitations. Considered this way, both modernism and sustainability strive for sphere coherence over the entire modal spectrum.

It is worth investigating what these principles mean on the very working grounds of early modernism. Instructive in this respect is, for example, modernism’s preoccupation with social housing. This is especially visible in the experience in the interwar period in the Netherlands and in Germany. In the Netherlands, J.J.P. Oud and others built multiple housing estates, which went a long way in mitigating the housing shortage caused by the First World War [38,39]. In Germany Bruno Taut was responsible for a massive investment in social housing in Berlin [40], while Ernst May provided the city of Frankfurt with 15,000 new housing units between 1925 and 1930. It is worth looking somewhat closer into the experience of this *Neue Frankfurt*. Rationality and functionality were the qualities that were given first priority in this endeavor. “Rationality” for May and his associates referred to the idea of a future, rationally organized and conflict-free society of people with equal rights and common interests [41]. In order to promote that distant ideal, they gave priority to the industrialization of the construction process and the principles of Taylorism in the use of space, because they were convinced that rational technologies would prefigure a rational society. The purpose of the Frankfurt experiment fitted perfectly in the scheme of the project of modernity, which took the view that “progress” was the result of an increasing rationality on all levels of life and of society. In this scheme of things the social aspect occupied a prominent place: it was the deliberate aim of May and his team to ensure that the housing need of the poor and the underprivileged was alleviated, as one aspect of the increasing emancipation of all individuals.

Characteristically, experiments such as that in Frankfurt were confronted with questions about the reciprocal relationship between resource availability, technology, rationality, good design and social ideals. Whereas it was the aim of May and his associates to provide the mass of people on the housing lists with decent accommodation that would free them from intolerable living conditions, they had to face some dilemmas in this respect. Even with rationalization of the construction process, it was still not possible to meet all the needs within the available budget. Tough choices, thus, had to be made, e.g., about the standards of housing. May acknowledged, therefore, that it might be preferable to house many in homes that were smaller than was objectively desirable, rather than provide fewer homes up to standard and let the majority of needy people go without new accommodation [6] (p. 50). This might be seen as one instance of the retrocitation between Dooyeweerd’s different modal spheres: whereas

technology and material resources are generating possibilities for addressing housing needs, it is in the social and political realm that normative decisions need to be taken about just distributions and priorities, while design is one of the factors that helps to make the most of all these conditions.

Such social and emancipatory ambitions were not at all exceptional within the interwar Modern Movement [42–45]. The historiography of modernism in architecture, however, has sometimes been too eager to overlook this aspect [46,47]. From an American point of view, modernism has been too easily equated with the International Style [48], which made it then particularly suitable for corporate architecture [49]. Too many histories of modern architecture have been written that barely acknowledge modernism's rootedness in socio-political programs of justice and emancipation for all. One should however not forget that modernism was one of the driving forces shaping the Welfare State, especially in Europe [50]. When after the Second World War the social contract was renegotiated in Western European countries, this gave rise to a solidification of the social security system, which was underpinned not only by arrangements focusing on pension, child support and unemployment benefits, but also by an effort to provide enough social housing to ban homelessness, ghetto's and slums as everyday occurrences. This effort has overall been hugely successful, even if its success has been overshadowed, in media representations, by stories about the problematic character of many housing estates [51]. A similar argument applies to (post)colonial modernism: even when one might admit that in many cases, colonial modern architecture was used to appease local populations and to reinforce the power base of colonial empires, it nevertheless also provided the housing and social infrastructures that in many of the former colonies are still in use as very basic necessities [52,53]. Modernist architects—especially those of the Team X generation—were motivated by the drive to take into account regional conditions, local habits and cultural differences, while still aiming for an architecture that would emancipate and uplift its users and inhabitants [54].

Miles Glendinning makes a distinction between, on the one hand, the original Modern Movement, which was genuinely driven by the desire to provide a progressive order that would benefit all strata of society and the current “global modernism”, which has transformed and debased its social ideals [55]. According to his analysis, an originally coherent and well-meaning set of architectural ideas has been tragically fragmented by the ambition to produce iconic buildings (at the detriment of contextual harmony) and by architecture's gradual integration into the consumerist logic of capitalism. We could add that, in this process, modern architecture's problematic reliance upon oil-based materials and resources has not been problematized enough. Hence, global modernism is seen by many as part of the problem rather than as part of the solution. We pose, however, that these critics take a wrong turn, because in applying the term “modernism” in such a way, they dissociate modernism from what we see as its most compelling and most promising characteristics.

Rather than seeing modernism as purely technocratic, and, hence, as the culprit responsible for the depletion of natural resources, we claim that the social and emancipatory aspects of the original modernism of the Modern Movement should be taken as the starting point to reframe, renegotiate and reinvent the “project of modernity” advocated by Jürgen Habermas. Modernism, we claim, was indeed about negotiating the constraints of nature, about using science and technology to arrive at a more just society. Translated into the terminology of sustainability, we could state that it was about “people” taking into account “planet” and accepting “profit” as a driving force. Hence, rather than discrediting modernism, we should build upon its legacy of negotiating natural, technological, social, political

and cultural conditions in order to further the emancipation of individuals and collectivities. Since sustainability has now become a main concern, this could then be interpreted as a shift of urgencies from providing a basic and equitable standard of living for everyone, to saving the biophysical resources for being able to provide that standard. This shift is urged by contextual differences, and in particular because the environmental drawbacks of industrialization and modernization have started to become fully clear from the last quarter of the 20th century onwards.

5. Reconsidering Sustainability

Peter Droege has provocatively blamed modernism and modern urban development for their fundamental blindness with respect to their dependency on fossil resources: *“The vast majority of current urban development discussions are not only largely disconnected from the true price paid in environmental and ecological damage, but both deaf and mute on the manner in which cities are powered—root cause of the massive urban challenge humankind is facing”* [56] (p. 142). Fossilism, according to Droege, is the *dirty secret* behind all of this: the driver that, although essential, most actors prefer to forget. For Droege even reputed scholars suffer from this blindness. He mentions a number of studies on urbanization, prosperity and innovation and notes that *“Among the best researched and most thoughtful of these texts is Saskia Sassen’s Cities in a World Economy (Sassen 1994/2000) which attempts to describe the global economic system without reference to its underlying fossil energy economy: it ignores the very engine that propels the much-admired global financial industry. Examined critically, the financial sector is but the froth on the churning, petroleum-rich global resource consumption and value-adding streams”* [3] (p. 14).

In terms of our analytical framework, Peter Droege reproaches Saskia Sassen for not considering the entire modal chain of retrocipations, far into the material basis of our complex societies. Loosing oneself in the complexity of the “froth” is no excuse to forget about the “churning”: it might indeed prove to be a fatal mistake. For without churning, no froth. When Panayiota Pyla warns against not being *“mindful of the immense complexities of sociocultural politics”*, we should remember that under these complexities lay other modal functions that afford such complexities to exist altogether. Systematically ignoring these conditions might now have reached the point of provoking system failures.

It is only by fully recognizing the real dimensions of our dependency on fossil resources, and more generally on ecosystem services, that we may start to distinguish both the core problems and the possible solutions for overcoming them. Such a breakthrough is now commonly referred to as a *system transition* [57], and many experts coincide on the belief that such whole system transformation is utmost urgent. Seen from the modal analysis point of view, this requires the entire modal chain to be reconsidered.

This conclusion can be straightforwardly transposed to the problem of sustainable architecture. Sustainable architecture has everything to do with overcoming fossilism or ecosystems destruction because it is modally coherent with such requirement. Additionally, as this problem has strong ecological and technological dimensions, its solutions will do so as well. It means that science and technology—like in the modernism of the Modern Movement—can contribute to better strategies for coping with these problems, with that difference that we now, more than during the last century, realize that natural and ecological constraints are much more severe than we imagined. Otherwise, the

battle for sustainable architecture is very similar to that for modern architecture: how to conceive of architectural projects that contribute to the construction of a more just society, within, conditions of altogether, limited material resources.

6. Conclusions: Towards Sustainable Modernisms

This paper has been elaborating a double argument. On the one hand we have argued that modernism, rather than being framed as the main culprit for the environmental problems of today, should be reconsidered as a source of inspiration, because of its valuable legacy of social and emancipatory ambitions. We have, on the other hand, also tried to defuse the sharp polarity between those who claim that sustainability concerns should prevail over all others and those who fear that such a tendency would lead to technocratic approaches that would leave aside all other concerns of architecture. We, thus, are now able to advocate a rapprochement between the discourses of modernism and sustainability, arguing that “sustainable modernism” can provide a good paradigm to foster architectural education and architectural culture.

This paradigm could build upon Guy and Farmer’s suggestion that a “*more heterogeneous coalition of practices*” in sustainable design and policy is preferable over the dogmatic “*searching for a singular optimal technological pathway*” [17] (p. 146). If truly sustainable architecture, however, is different from one place to another or from one climate to another, we should accept that this is the result of different contextual parameters of both the receiving ecosystem and the human culture grafted onto it. This is, in our opinion, how sustainable architecture can emerge by displaying modal coherence, and hence, integrated sustainability. This condition can moreover become a reason for celebrating architectural diversity, and for delivering alternatives to the globalized architectural monoculture that many fear is arriving. For doing this successfully, it is essential to embrace the ecological condition rather than to suspect it. Ecological constraints should be taken up as opportunities for creative interventions rather than be seen as disturbing impositions.

We, thus, advocate that technology should be considered in an embedded view, and not as a factor of potential dominance. Embedding technology means accepting its constraints and smartly using its potentials, without, however, succumbing to its dominance. In this way, techno-optimism and techno-pessimism have both a role to play in the architectural debate. Polarizing the sustainability question into a relativist vs. technocratic position, is counterproductive and reductive because it fails to take into account the interconnectedness of the modal spheres as posed by Dooyeweerd. One, nevertheless, rather easily, falls into this trap, because of the tendency in our society to foster expertise and specialization, to the detriment of people’s capacity to see the whole picture. Insisting on the intermodal retrocipations and anticipations, as Dooyeweerd’s theory allows us to do, offers a vocabulary and a tool to frame interdisciplinary and transdisciplinary discussions in such a way that mutual understanding is not precluded from the beginning.

This also means that formalism and aesthetics, far from being irrelevant, become crucial points of discussion. Aesthetics do matter (Dooyeweerd considered the aesthetic as an independent sphere), even if they function only in modal resonance. Wittgenstein stated that “*ethics and aesthetics are one*” [58] (p. 88), pointing out what in Dooyeweerd’s terms are anticipations and retrocipations between aesthetics and ethics. The embedding in modal linkages is what makes aesthetics not only tangible and defensible,

but even necessary. While the relative autonomy of architecture as a particular *art* is, thus, congruent with its *sphere autonomy* in Dooyeweerd's terms, its foundations and underlying constraints should never fall out of the sight. Applied reversely, this also implies that "eco-architecture" should meaningfully contribute to the aesthetic realm (as to the social, the economic or the ethic). Both green consumerist technology and imitation vernacular will probably not live up to this expectation.

Concluding for the present contribution, we did not pretend to contribute to an ultimate definition of sustainable development or of sustainable architecture, nor did we offer an exhaustive science-philosophical analysis of current debates. We most of all aimed at highlighting how, in architectural education and culture, the paradigm of sustainability can be enriched by linking it with the legacy of modernism, and by highlighting how its different knowledgeable aspects relate to each other. Modernism and sustainability do have much more common grounds than current debates seem to suggest. By adopting the legacy of modernism and accepting that there is continuity between the desire to be modern and the imperative to be sustainable, we hope to promote a more encompassing perspective that accommodates many defensible claims and many genuine concerns, generating momentum, we hope, towards informed action.

Author Contributions

Both authors have contributed equally to this manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

References

1. Scott, J.C. *Seeing Like a State. How Certain Schemes to Improve the Human Condition Have Failed*; Yale University Press: New Haven, CT, USA; London, UK, 1998.
2. Pitts, A. *Planning and Design Strategies for Sustainability and Profit*; Architectural Press: Burlington, MA, USA; Oxford, UK, 2004.
3. Droege, P. *The Renewable City: A Comprehensive Guide to an Urban Revolution*; Wiley: Chichester, UK, 2006.
4. Banham, R. *Theory and Design in the First Machine Age*; Praeger: Westport, CT, USA, 1960.
5. Berman, M. *All That Is Solid Melts into Air. The Experience of Modernity*; Verso: London, UK; New York, NY, USA, 1985.
6. Heynen, H. *Architecture and Modernity. A Critique*; MIT Press: Cambridge, MA, USA, 1999.
7. European Union. Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (recast). *Off. J. Eur. Union* **2010**, L 153, 13–35. Available online: <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32010L0031> (accessed on 23 September 2014).
8. IPCC. *Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*; IPCC: Geneva, Switzerland, 2007.

9. IPCC. Summary for Policymakers. In *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*; Stocker, T.F., Qin, D., Plattner, G.K., Tignor, M., Allen, S.K., Boschung, J., Nauels, A., Xia, Y., Bex, V., Midgley, P.M., Eds.; Cambridge University Press: New York, NY, USA, 2013.
10. Jarzombek, M. Molecules, Money and Design: The Question of Sustainability's Role in Architectural Academe. *Thresholds* **1999**, *18*, 32–38.
11. Jarzombek, M. Sustainability, Architecture and “Nature”. Between Fuzzy Systems and Wicked Problems. *Thresholds* **2003**, *26*, 54–56.
12. Ingersoll, R. The Ecology Question and Architecture. In *The Sage Handbook of Architectural Theory*; Crysler, C., Cairns, S., Heynen, H., Eds.; Sage: London, UK, 2012; pp. 573–589.
13. Pyla, P. Counter-Histories of Sustainability. *Volume* **2008**, *18*, 14–17.
14. Carson, R. *Silent Spring*; Houghton Mifflin: Boston, MA, USA, 1962.
15. Hagan, S. *Digitalia. Architecture and the Digital, the Environmental and the Avant-Garde*; Routledge: London, UK; New York, NY, USA, 2008.
16. Chang, J.H. Tropical Variants of Sustainable Architecture. In *The Sage Handbook of Architectural Theory*; Crysler, C., Cairns, S., Heynen, H., Eds.; Sage: London, UK, 2012; pp. 602–617.
17. Guy, S.; Farmer, G. Reinterpreting Sustainable Architecture: The Place of Technology. *J. Archit. Educ.* **2001**, *54*, 140–148.
18. Guy, S. Whither “Earthly” Architectures: Searching for Sustainability. In *The Sage Handbook of Architectural Theory*; Crysler, C., Cairns, S., Heynen, H., Eds.; Sage: London, UK, 2012; pp. 555–572.
19. Latour, B. The Promises of Constructivism. In *Chasing Technoscience: Matrix for Materiality*; Ihde, D., Sellinger, E., Eds.; Indiana University Press: Bloomington, IN, USA, 2003; pp. 27–46.
20. Dooyeweerd, H. *A New Critique of Theoretical Thought*; Volume 2: The General Theory of the Modal Spheres; The Presbyterian and Reformed Publisher Company: Phillipsburg, NJ, USA, 1955.
21. De Raadt, J.D.R. Multi-modal systems design: A concern for the issues that matter. *Syst. Res.* **1989**, *6*, 17–25.
22. Basden, A. The critical theory of Herman Dooyeweerd? *J. Inf. Technol.* **2002**, *17*, 257–269.
23. Lombardi, P.; Brandon, P. The Multimodal System Approach to Sustainability Planning Evaluation. In *Sustainable Urban Development Volume 2: The Environmental Assessment Methods*; Deakin, M., Mitchell, G., Nijkamp, P., Vreeker, R., Eds.; Routledge: London, UK, 2007.
24. Vandevyvere, H. How to cut across the catch-all? A philosophical-cultural framework for assessing sustainability. *Int. J. Innov. Sustain. Dev.* **2011**, *5*, 403–424.
25. WCED. Our Common Future (Brundtland Report); United Nations—World Commission on Environment and Development: Geneva, Switzerland, 1987.
26. United Kingdom Department for Environment, Food & Rural Affairs. 2012 greenhouse gas conversion factors for company reporting. Available online: <https://www.gov.uk/government/publications/2012-greenhouse-gas-conversion-factors-for-company-reporting> (accessed on 15 September 2014).
27. Hardin, G. The Tragedy of the Commons. *Science* **1968**, *162*, 1243–1248.
28. Thompson, M.; Ellis, R.; Wildavsky, A. *Cultural Theory*; Westview Print: Boulder, CO, USA, 1990.

29. Rockström, J.; Steffen, W.; Noone, K.; Persson, A.; Chapin, F.S.; Lambin, E.F.; Lenton, T.M.; Scheffer, M.; Folke, C.; Schellnhuber, H.J.; *et al.* A Safe Operating Space for Humanity. *Nature* **2009**, *461*, 472–475.
30. Cohen, J.L. *Scenes of the World to Come. European Architecture and the American Challenge 1893–1960*; Flammarion: Paris, France, 1995.
31. Besset, M. *Le Corbusier*; Skira-Flammarion: Genève, Suisse, 1987.
32. Dehaene, M. Broadacre City: The City in the Eye of the Beholder. *J. Architect. Plan. Res.* **2002**, *19*, 91–109.
33. Jencks, C. *The Language of Post-Modern Architecture*; Academy Editions: London, UK, 1978.
34. Droste, M. *Bauhaus 1919–1930*; Taschen-Librero: Köln, Deutschland, 1990.
35. Arrhenius, S. On the Influence of Carbonic Acid in the Air upon the Temperature of the Ground. *Philos. Mag. J. Sci.* **1896**, *41*, 237–276.
36. Arrhenius, S. *Worlds in the Making: The Evolution of the Universe*; Harper & Row: New York, NY, USA; London, UK, 1908.
37. Habermas, J. Modernity—An Incomplete Project. In *The Anti-Aesthetic. Essays on Postmodern Culture*; Foster, E., Ed.; Bay Press: Port Townsend, Washington, DC, USA, 1991; pp. 3–15.
38. Rebel, B. *Het Nieuwe Bouwen: Het functionalisme in Nederland 1918–1945*; Van Gorcum: Assen, The Netherlands, 1983.
39. Taverne, E., Wagenaar, C., de Vletter, M., Eds. *J.J.P. Oud. Poëtisch Functionalist 1890–1963*; Nai Uitgevers: Rotterdam, The Netherlands, 2001.
40. Whyte, I.B. *Bruno Taut and the Architecture of Activism*; Cambridge University Press: New York, NY, USA, 2010.
41. Mohr, C.; Müller, M. *Funktionalität und Moderne. Das neue Frankfurt und seine Bauten 1925–1933*; Fricke im Rudolf Müller Verlag: Köln, Deutschland, 1984.
42. Frampton, K. *A Critical History of Modern Architecture*; Thames and Hudson: London, UK, 1980.
43. Ciucci, G. The invention of the Modern Movement. *Oppositions* **1981**, *24*, 68–91.
44. Docomomo *Conference Proceedings. Vision and Reality. Social Aspects of Architecture and Urban Planning in the Modern Movement*; Docomomo_International: Lisboa, Portugal, 1998.
45. Colquhoun, A. *Modern Architecture*; Oxford University Press: Oxford, UK, 2002.
46. Trachtenberg, M.; Hyman, I. *Architecture: From Pre-History to Postmodernity*; Prentice Hall: Upper Saddle River, NJ, USA, 2002.
47. Watkin, D. *A History of Western Architecture*; Laurence King: London, UK, 2011.
48. Hitchcock, H.R.; Johnson, P. *The International Style*; MOMA: New York, NY, USA, 1934.
49. Martin, R. *The Organizational Complex. Architecture, Media and Corporate Space*; MIT Press: Cambridge, MA, USA, 2003.
50. Swenarton, M., Vandenheuvel, D., Avermaete, T., (Eds.) *Architecture and the Welfare State*; Routledge: London, UK, 2014.
51. Urban, F. *Tower and Slab. Histories of Global Mass Housing*; Routledge: London, UK, 2012.
52. Avermaete, T., Karakayali, S., von Osten, M., (Eds.) *Colonial Modern. Aesthetics of the Past, Rebellions for the Future*; Black Dog: London, UK, 2010.

53. Wright, G. The Ambiguous Modernisms of African Cities. In *The Short Century: Independence and Liberation Movements in Africa 1945–1994*; Enwezor, O., Ed.; Prestel: München, Deutschland, 2001; pp. 225–233.
54. Risselada, M.; van den Heuvel, D. *Team X. In search of a Utopia of the Present*; Nai Publishers: Rotterdam, The Netherlands, 2005.
55. Glendinning, M. *Architecture's Evil Empire? The Triumph and Tragedy of Global Modernism*; Reaktion Books: London, UK, 2010.
56. Droege, P. The renewable city: Dawn of an urban revolution. *Bull. Sci. Technol. Soc.* **2006**, *26*, 141–150.
57. Grin, J.; Rotmans, J.; Schot, J. *Transitions to Sustainable Development: New Directions in the Study of Long Term Transformative Change*; Routledge: London, UK, 2010.
58. Wittgenstein, L. *Tractatus Logico-Philosophicus*; Kegan Paul, Trench, Trubner & Co. Ltd.: London, UK; Harcourt, Brace & Company, Inc.: New York, NY, USA, 1922.

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