

REVIEWING “REGENERATIVE BUILDING” CONTRIBUTIONS TO LEARN FROM THE PAST AND SET DIRECTIONS FOR THE FUTURE

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Abstract

A contemporary definition of regenerative building is “a built environment that strives to create positive environmental impacts that match or surpass those provided by ecosystems and native habitats”. By 2025 this means using an understanding of the planetary boundaries of resource limits, when designing and constructing new buildings. And it means departing from a reduction approach to emissions. “Regenerative building” is entering European legislation and building sectors. So on this background this contribution asks: “What are the main characteristics of regenerative building (RB) and what will be the future direction of RB?” The paper uses Watson & Webster’s thematic reviewing, to review the extant literature on RB emerging since the 1990s. This is well suited for the RB literature and designed to construct foresight. The review distinguishes between an early and a contemporary version. The early had its source in architectural design of landscape and buildings. A qualitative discourse outlining overall goals for regeneration, practicing it mainly through single projects, claiming to realize RB. The contemporary version can be understood as a consequence of the Stockholm Resilience Center’s introduction of planetary boundaries for human activity. This adds a quantitative metric to the qualitative goal of regeneration, which extends beyond the early RB approach. Looking into the future, two contributions with concrete proposals are reviewed. They both carry out a quantitative allocation of planetary boundaries into single projects. The review showed that “RB” is diverse – but that is a possible source of constructive development. There is a challenge of combining qualitative and quantitative elements. The allocation method is a latent political conflict. The need for national decision making involves creating a balance between sociopolitical and scientific methods. Another worry would be the connection of the ambitions of RB and the needed acceleration towards EU 2030 and 2050 goals.

Keywords: climate crisis, literature review, regeneration, buildings, neighborhoods, landscapes.

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1. Introduction

Many European Countries have introduced CO₂ emission legislation in an attempt to provide climate change mitigation. However, this attempt to merely reduce CO₂ emission is increasingly becoming insufficient and the development of a deeper insight into what the planet can cope with, i.e. the planetary boundaries [1,2], further corroborates that CO₂ reduction is not sufficient to meet the Paris agreement [3]. As the building sector is one of five main issues in the climate change, new measures have to be taken and this is in short why “Regenerative building” is entering European development programs, legislation and building sectors [4, 5, 6].

A contemporary definition of regenerative building can be “a built environment that strives to create positive environmental impacts that match or surpass those provided by ecosystems and native habitats” (own elaboration). But while the proliferated role in EU regulation is new, the concepts have for long been present in building sector research and development. It is therefore timely to ask:

What are the main characteristics of regenerative building (RB) and what will be the future direction of RB?

The answer to this aim is to carry out a [7] inspired thematic reviewing, which is a qualitative approach well suited for the regenerative building literature and designed to construct prevision for the future. The

literature review aims at briefly reviewing the most important and relevant literature on the topic of regenerative building. The review is striving to be critical but only include a limited number of references due to the short form of this contribution.

The paper is structured in the following way. The following section presents briefly the method. Then follows the review, a discussion and a conclusion.

2. Method

The aim of this contribution is to provide a insight into the regenerative building scholarships. The method adopted is Watson & Webster-s thematic reviewing [7], which is a qualitative approach well suited for the regenerative building literature and designed to construct prevision.

The sample of literature on regenerative building, totalled 27 pieces. The literature was selected to represent regenerative building, including “regenerative design”, “regenerative development” and “absolute sustainability” [8, 9]. The Focus on built environment contributions, however with a view to more general concepts of regeneration [10], climate and sustainability research such as the Doughnut economy [11], Planetary Boundaries [1, 2] and no growth.

The themes organizing the review was “definition of regeneration”, “scope” (city, building, landscape), “paradigmatic foundation” (systems theory and other), “metrics” and building on or overlapping with other concepts (Donut, Nature Based Solution, Circularity). Finally practical reference projects were sought.

The review identifies two main strands or regenerative building concepts: An “early” [12, 13] and a “contemporary” contribution [14] and Beyond Reduction Roadmap [15]. The two paradigmatically different approaches do exist in parallel in contemporary sustainable building research and can also be characterized as qualitative (early) versus quantitative (contemporary). Moreover, they also overlap to some extent.

To identify a future path for development the two contributions of [14] and [15] with concrete proposals are reviewed to illustrate possible future paths.

The chosen review approach hopefully produces valuable insights in the regeneration concept(s). The approach used here focus on building but the regeneration concept has also been used in other sector such as ecological agriculture. It is thus a limitation that the focus is narrow and the number of reviewed papers limited.

3. Review

3.1. The qualitative old school

Lyle (1994) understood regeneration as “based on the value of living within the limits of available renewable resources without environmental degradation” ([13]. Lyles profession was “Landscape Architect”, but his research and development of regenerative design was an architectural approach that encompassed single buildings, places, urban areas and landscape. The approach was mostly basis for architects students and researchers work at California State Polytechnic University, Pomona. [12] approach to regeneration was qualitative, without explicit measures of climate impact (CO₂e). It also involved systems thinking and concepts of material balances. A few more characteristics of the approach is the directing of criticism towards linear flows, which is claimed to be degenerative. The ideat that nature should be explicitly included in design, that waste is a Resource and a distinct technology optimism. Lyle established a center and a staff around working with regenerative design.

Bill Reed, also an architect, founded together with among other Pamela Mang Regenesi Group, a private architectural company dedicated to regenerative design in 1995 in Santa Fe, US. Thus, more or less in parallel to Lyle. The group has published numerous contributions; books and articles.

In [13], the basis critical systems thinking, “living systems thinking” is described as well (close to Lyles concepts)

[12] represents an architectural perspective (landscape, place) but with a broader view including more parts of the building process. It involves a critique directed towards Issue-based approaches (fragmented as currently practised). It attempts to limit the damage high-performance design might do. And create design that realizes high efficiency and reduced impact in the building structure, operations, and site activities.

[12], and [16] describes a whole system approach to achieve real sustainability beyond the so called “green design” as a need to shift our mental model to the whole system thinking and in this they emphasises the importance of having a proper bottom-up approach to understand the place. This approach has according to [13] been referred to as regenerative design because it seeks to restore the physical, social and environmental systems to “good health”.

[18] and [19] takes stock of regenerative design at the time and point to critical issues of first using different scale, in space, time and the system level; Second a rejection of list- or element-based approaches (ie. quantitative concepts) grounded in and critique of reductionism (phrased by [18] as “holism versus reductionism” [18]); and third the lack of choosing and specifying methods of monitoring, evaluation and intervention. Tainter here characterises [13] as advocating shifting from a mechanistic to an ecological world view.

3.2. The quantitative new regeneration position

Hill-Hansen and Guldager Jensen (2023) posit that “regeneration strives to create positive environmental impacts that can match or surpass those provided by ecosystem services from native habitats” (Hill-Hansen and Guldager Jensen 2023 p 137). In line with Reed (2007) they emphasise the shift from mitigation (“how to do less bad”) to regeneration (“how to do more good”) (Hill-Hansen and Guldager Jensen 2023, p137). Another similar trait is the emphasis on the involvement of future users.

In their development of a concept for regeneration aimed at urban, neighborhoods and single buildings they collaborate with Kate Raworth (the donut economy) and the Stockholm center for Resilience [2]. It becomes central to methodologically couple the planetary boundaries with frames and demands for each built entity. This exercise is called “allocation” [14 p88] which is a down-scaling and translating the planetary boundaries from global level to urban development scale using allocation principles and Life Cycle Assessment [14] p88. They mention three allocation principles: equal per capita, capacity, and historical responsibility and propose a stepwise method for the allocation. It is important for the authors to posit the political character of allocation, a position different from some other planetary boundary scholars, who strive for a scientifically based allocation.

The concept has been used in a real estate company and developer Home.Earth. One of the practically realized buildings is described in [14]

3.3. Beyond the Roadmap

Beyond the Roadmap [15] is a second step conceptual development departing in 2024 from a previous carbon reduction approach done by a group of building professionals in Danish building firms. The first generation gained quite a lot of traction in the Danish Building sector and community. However already one year later the group was ready to move on to a regeneration building concept.

In the concept “regeneration” is placed as a long term goal, moving from a net zero goal through planetary boundaries arriving at safe and just earth-system boundaries. This journey would go on another 50 years according to Beyond Reduction Roadmap 2024. Conceptually the proposal builds directly on [1] proposal of a roadmap from reduction to regeneration, as well as [14] concept dealing with the planetary boundaries, yet less with the social aspect of regeneration.

3.4. Summarizing

The approach of regenerative design-processes has been around for some time [12,13]

but have for long mostly focused on architecture and the context of the building and not the lifecycle, for example long-term operation [20]. The newer more recent contributions link regeneration to planetary boundaries and also introduce far more detailed metrics [8, 9, 14, 15]. Regeneration surpasses traditional sustainability by not only minimizing harm but actively restoring and enhancing the surrounding ecosystems [20]. To support regeneration, built entities and environments must be designed for evolution rather than a limited lifetime and demolition. Engaging actors in regenerative practices and collaboration can facilitate long-term transformation, ensuring positive impacts are sustained over time [22]. A more systemic approach to the lifecycle and the planetary impact viewing buildings as part of an evolutionary ecosystem has been developed far more explicitly by the second generation. Expanding the scope of the research area to encompass long-term aspects and the scope of the globe can contribute to a better understanding of how building information is utilized over time, and how knowledge-sharing can be implemented to support further regenerative development [13].

4. Discussion

The contributions reviewed differ in more aspects than this small page limited review can do justice. Just one further example is the role of digitalization that can support the extensive need for data the quantitative approach demands.

The main difference between the two strands are the embracing versus dismissal of quantitative metrics to support the realization. By 2025 “sustainable building” has for long been flooded with quantitative metrics of sustainability, also directly supported by law and regulation and importantly by the interests of the corporation that purchase building as real estate and view them as an investment object. The quantification can therefore be viewed as a necessary compromise with driving forces and dynamics of the building market. But this very feature is probably contributing to a continued exhaustion of the resources of the globe. And while the new regenerative building approach has been enabled by the (quantitatively based) Planetary Boundary research [2], the link to “no growth” or degrowth research [17] is still to be established.

The tension within the regenerative scholarship are probably going to be exacerbated by the urgency and need for acceleration that is related to obtaining a globe in balance, at some state beyond 1,5-degree increase of temperature, that a present appears to be a unreachable goal.

Measuring solve some conflicts and create new ones. Having a measure for the degree of regeneration enables it to be a feature of a commodity that can be traded and valued. Measuring also enables a tackling of the societal and global aspect. The flipside however is that measuring risk opening up for new types of conflicts among building sector professionals and other societal actors and a trigger a need for new mediating and other legal procedures to handle “regeneration conflicts”.

It should also be noted that climate mitigation and sustainable concepts do have fashion aspects, that make them come and go. This is mainly due to the consultancy business related to sustainability. Selling knowledge about sustainability leads to a constant for competitive advantage on consultancy markets and one strategy is to introduce ever new concept. This dynamic might prevent “regeneration” to become bigger to the benefit or another very similar concept (such as for example “absolute sustainability”, [8, 9]).

5. Conclusion

This contribution sets out to review the concepts of regenerative building, given that the approach appears to be able to deliver some of the strengthened mitigation that the present dominant reduction approach can deliver. The contribution aims at answering what are the main characteristics of regenerative building and what will be the future direction of regenerative building

Webster and Watson's thematic reviewing, was adopted as method as it is a qualitative literature review approach well suited for the regenerative building literature and designed to construct prevision.

The review came to identify two main strands of regenerative building concepts: An "early" [12,13] and a "contemporary" contribution [14,15]. The two paradigmatically different approaches do exist in parallel in contemporary sustainable building research and can also be characterized as qualitative (early) versus quantitative (contemporary). Moreover, they also overlap to some extent. The newer more recent contributions link regeneration to planetary boundaries and also introduce far more detailed metrics. "Regeneration" surpasses traditional sustainability by not only minimizing harm but actively restoring and enhancing the surrounding ecosystem. To support regeneration, built entities and environments must be designed for evolution rather than a limited lifetime and demolition. Engaging actors in regenerative practices and collaboration can facilitate long-term transformation, ensuring positive impacts are sustained over time. A more systemic approach to the lifecycle and the planetary impact viewing buildings as part of an evolutionary ecosystem has been developed far more explicitly by the second generation. Expanding the scope of the research area to encompass long-term aspects and the scope of the globe can contribute to a better understanding of how building information is utilized over time, and how knowledge-sharing can be implemented to support further regenerative development.

The prediction for the future development of regenerative building is that its quantitative strand will be strengthened by the other tendencies of quantification of sustainability such as EU legislation of sustainable investment and CO2 quotas. The downsides of such a development will hopefully be outweighed by the upsides strengthening climate mitigation.

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