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PREPARING A NEW CONCEPTUALIZATION OF BUILDING PROCESSES

– INTEGRATING SUSTAINABILITY AND A RESOURCE-ECONOMIC VALUE PRODUCTION

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KORTRAPPORT OM FORSKNING | 2024: #3

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INTRODUCTION

The impact of the construction industry's mainstream practices on ecosystems, resources, and human living conditions is substantial. For example, it is responsible for 10% of the global and 21% of the Swedish CO2 emissions, as well as generating 37.5% of the total waste in the EU. A critical part of this harmful impact is created during the on-site building processes.

To amend this impact, environmental management, until recently an afterthought compared to the iron triangle of construction management (i.e., time, cost, and quality), has been valorized. This is underlined by demands related to emission-free building sites, re- and up-cycling, climate declarations, lifecycle analysis, circularity, and the EU's taxonomy of sustainable investment, as well as Energy Performance of Buildings and Energy Efficiency directives. However, the current work performed during building processes, while legitimizing some sustainable and circular initiatives up to an extent, mostly fails to change norms in practice. It has even been evinced that just testing new technologies geared towards more sustainable building processes will not have a lasting impact beyond the test context. What is rather needed is that sustainability demands in building processes are integrated with operating a building project's economy within the ecological constraints of the Earth's natural resources – what we call a resource-economic value production.

Seen from a building site practitioners' point of view, this implies an unparalleled demand of capturing data (about, e.g., water and energy consumption), as well as rethinking the progression of task versus elapsed time, costs compared to budgets, health and safety, and quality. However, changing into a resource economy of building projects brings more at stake than just demands of documentation. In a resource-economic building market, clients are, for example, demanding budgets combining classic cost and CO2e impact/costs. This change can pose both threats and opportunities for construction management.

The responses to such a development vary. Some claim that sustainability is but an extra cost, others that it consists of soft values that cannot be easily integrated with a money exchange-focused economy. Many of such responses are developing contemporarily from practitioners, consultants, suppliers of digitalized solutions, trade associations, knowledge institutions, and academia. It is difficult to maintain an overview of this development, including its competence demands when facing the associated risks.

Therefore, we hereby initialized the research on this ongoing change of building processes in the context of changing the building projects' economy into a resource-economic value production. Through this project, financed by CMB, we found concepts and empirical experiences about threats and opportunities emanating from such an ongoing change – which we will show below. We therefore support the addressing of central considerations related to sustainability, circular economy, and regeneration in construction, as a focal point in climate policies in Sweden and the EU.

METHOD

This study documented and scanned the state-of-art of the potential shift towards a resource economy of building projects and processes in 2022–2024, by exploring the newly surfaced literature, as well as the new relevant industry documentation and practices.

The mapping of the literature and industry documents yielded limited results. This was expected – such a literature is scarce due to the contemporaneity of the phenomenon. Following this, a qualitative study was carried out, aiming at scanning the experts', practitioners', and researchers' practices and responses to the transition towards an integrated resource-economic construction management and value production.

Initially, a sample of 252 practitioners was addressed in a snowballing fashion – including, but not being limited to, observers of sustainable construction developments, sustainability and production managers in leading contractors (found predominantly within SCB's sector groups 41, 42, and 43), sustainability opinion makers and researchers, architects, consultants, and others who may have been pointed by previously identified expert practitioners. Moreover, we searched for interviewees representing organizations, initiatives, and firms (both within and outside Sweden) found in the nexus of resource economics, the concepts of planetary boundaries and regeneration, and sustainable and circular development in construction. In Sweden, they indicatively include the Stockholm Resilience Center, LFM30, Centrum för Circulärt Byggande, IVL Svenska Miljöinstitutet, Nätvärket för hållbart byggande och förvaltande, local initiatives (e.g., Hållbart Byggande i Värmland, Klimatarena Stockholm, Uppsala klimatprotokoll), Circular Sweden, Sweden Green Building Council (responsible for the Miljöbyggande and BREEAM certifications), architects (e.g., FOJAB, White), contractors (e.g., Skanska, NCC Sverige), consultants (e.g., Sweco), and universities (e.g., Chalmers). Outside Sweden, they indicatively include BLOXHUB (Denmark), architects and other practitioners (e.g., EFFEKT), and other initiatives (e.g., Earth4All, Home.Earth).

This initial sample was then slimmed down based on the following criteria, ending up in the selection of 11 interviewees (nine from Sweden and two from abroad):

1. Being enablers in areas that represent a cross-section of resource economics, planetary boundaries, regeneration, and sustainable and circular development in construction.
2. Connecting, as much as possible, the macro perspective (planetary boundaries) with the micro perspective (the level of the single building).
3. Not relying too much on practitioners just following a "boxy" logic of standard practices, even if those are enforced by a regulatory framework promoting sustainability and/or circularity; but rather, prefer experts that push the boundaries of our understanding of regeneration and a resource-economic value production.
4. Being, as much as possible, members of multiple relevant organizations and initiatives – e.g., consultants working with projects while also being active in climate initiatives.

At the time of this report's publication, not all of the planned interviews had been yet conducted, but the ones that did showed a convergence of the interviewees in many critical parts of our discussions.

RESULTS

Our research allowed us to explore how we can conceive a new value production in building processes in the nexus of resource economics, the concepts of planetary boundaries and regeneration, and sustainable and circular development in construction. We summarily show our most important findings in the form of specific questions and answers.

WHAT ARE THE MAJOR TRENDS MOVING FORWARD IN THE TOPIC OF SUSTAINABILITY AND CIRCULARITY IN BUILDING PRODUCTION?

Moving forward, we should design man-made ecosystems (incl. buildings) that can eliminate waste – such as with dividing material flows into technical and biological nutrients, designing for disassembly, not just recycling but rather upcycling, and focusing more on material passports. This way, we could also define sustainability in a more precise manner, by scaling it back to the capacity of the planetary boundaries.

Having a simultaneous focus on social aspects and the planetary boundaries is key – as a "business as usual logic", even with the spin of a claimed "green transition", is not enough. There is a need to not only set clear targets for firms in terms of sustainability and social impact, but also be aware of the existing business structures around companies and decisions – and how those can be transformed in a ripple effect touching upon more organizations. In essence, the trending question is: "How can a business be outright designed so that the end purposes of sustainability, circularity and regeneration can be achieved"? In that sense, more care should be given to the "economy" aspect of circular economy (which can then be enhanced further to address regeneration). "Economy", here, largely reflects a new way to organize resources in order to be shared more effectively over a long time.

In this forward movement, it is important that clients empower innovation, knowledge creation and sharing, and be the "first movers" in taking actions towards sustainability, circularity and regeneration. Moreover, it should be understood everywhere that things are constantly evolving in terms of conceptualization and planetary boundary demands.

HOW STRONG CAN WE CONSIDER THE SHIFT FROM DAMAGE REDUCTION (CLASSIC SUSTAINABILITY DISCOURSE) TO "DOING MORE GOOD" (REGENERATION DISCOURSE)?

This kind of shift is not yet strong and is going rather slowly. An interviewee actually called this field of research and practice "blurred". Nonetheless, it is important to strive for such a shift on the basis of a common practice, i.e., not just in the cases of extremely ambitious and expensive flagship projects that only few potential homeowners can afford. Moreover, bringing theory (i.e., knowledge gained through academic research), and practice together is important in enhancing circularity into regeneration.

It has been claimed that while conceptual toolboxes have been developed, the built environment has difficulty adopting them. At the same time, different levels of knowledge application exist within practice itself. Eventually, strengthening this shift would require both a wider practical application of relevant concepts, and an increased sharpness in

innovation – where flagship projects should still be made in order to showcase the state-of-art.

A trend that needs to continue and even increase in support of this shift would be that both leading and emerging companies should have, and even increase, some kind of permanent foundation where a percentage of the firm's revenue is continuously invested in activities geared towards circular and regenerative development.

A way to facilitate this shift would also be to look at the longer perspective and create a form of shared economy among a building project's stakeholders, as a way of "de-risking" the investment. In this shared economy example, a dividend could be paid back to the tenants – thus creating a greater sense of ownership and caretaking duty for the users living in the building, as well as allowing for an easier acceptance of the potentially more expensive "green" materials and building solutions. Moreover, building users need to experience some form of biodiversity and nature even if their dwellings are within a dense urban setting, so that a form of regeneration becomes a lived-in experience and gathers further support.

Interestingly, it has been claimed that things are not going nearly fast enough in the shift towards regeneration – and there might be a need for social action and a generational revolution. Otherwise, many climate initiatives may remain corporate "greenwashing". Interestingly, it has been highlighted that the fast and global mobilization of scientists during the COVID-19 crisis to effectively combat the disease shows that when needed, humanity can indeed concentrate its efforts towards a global goal. This could and should happen with regard to climate crisis, including the efforts of construction industry professionals.

WHAT ARE THE "VERTICAL" INTERLINKAGES BETWEEN THE MACRO LEVEL (NATIONAL AND INTERNATIONAL) AND THE LEVEL OF THE SINGLE BUILDING PROJECT? CONVERSELY, WHAT ARE THE INTERLINKAGES BETWEEN THE "HORIZONTAL" PROCESSES – MATERIAL SUPPLY, BUYERS, CUSTOMERS – ON THE LEVEL OF THE SINGLE BUILDING PROJECT?

A consideration of a building's impact must go far beyond than one can see hands-on on-site and the immediate surrounding area, with wider local, national, international and global links of impact and consequences. An example of such a linkage, at least on the local and national levels, are municipalities having a CO2 "budget" when it comes to their urban development.

Those interlinkages can be reflected in the impact that buildings have both on-site and off-site in terms of climate change and biodiversity – namely the two core planetary boundaries. Considering the planetary boundaries perspective, the building's impact can be understood to go through the value chain for procurement and extracted resources (incl. shared platforms for reusing materials), as well as the social aspect of the dwellers and tenants. In practice, workshops and exercises involving main stakeholders (e.g., the clients, architects, and contractors) during procurement, could qualitatively elucidate a construction project's impact from the micro to the macro level.

This calls back to the three dimensions of sustainability (environmental, social, and economic) and the way that common discourse tends to separate those and create silos. This compartmentalization cannot work in a circular context. Particularly, in circular economy, there are more dimensions than just the linear value chains understood by most companies in the building sector. In such an extended and circular dimensional context, contractors, subcontractors and suppliers should strive to align their value chains. Moreover, that context requires us to incorporate human resources to a higher extent. In that sense, even human well-being can be considered a currency or form of value, one which, however, can come at odds with a capitalist market geared almost exclusively towards growth – even if we label the latter as "green growth".

These interlinkages should also consider different kinds of values that are hard to quantify, such as cultural heritage and embedded work practices in specific regions.

TO WHAT DEGREE AND WITH WHAT KIND OF SHAPING SHOULD THE POLICY AND REGULATION ASPECT BE PRESENT? CAN THERE BE A SYMMETRY BETWEEN EU AND STATE REGULATION AND THE MARKET?

The new EU taxonomy, the Paris agreement and national frameworks in Sweden and elsewhere currently shape the outline of climate policies for building production. Such policies drive the way climate actions are taken on a national level – in the case of Sweden, this would refer to things like climate declarations and building energy certificates. This can also refer to new criteria needed to be accounted for getting a higher level of climate certification for a new building, as well as developing better linguistic terms with which new needs and sustainable concepts can be described. Moreover, the new EU regulations, and especially the new EU taxonomy and energy performance directive, can create synergies and compatibilities between different national certification systems. However, it must be acknowledged that national and EU guidelines regulating how much each building is "allowed" to impact the environment, are way too limited with regard to the planetary boundaries' argument.

Considering the market, it has been proposed that it should dive deeper into considering carbon emissions and even human well-being as the new "currencies" – with which a supposedly more transparent documentation of a business' practices and social investments towards climate change mitigation can be facilitated. Nonetheless, it was claimed that, from a construction companies' perspective, it is hard to consider and quantify new kinds of values or "currencies" until some kind of authority says so.

An important point was also made regarding policies on research funding for projects related to sustainable building development. There needs to be a matrix where related projects' impact can be better situated on the international, national, regional, and local levels.

However, it has been claimed that things might need to get worse until they get better and there is a functional symmetry between regulations and the market that can actively support regeneration and climate change mitigation when it comes to building processes. At present there is asymmetry – as the market will largely only do the bare minimum that is required to meet the policy standards, while the latter may continuously fall behind emerging needs for climate actions regarding building processes. We should move away from a common building practice relying on doing "just enough" to meet the policy thresholds, but rather towards one where value flows are understood in the context of people's well-being and the planetary boundaries. This would in turn mean that a new understanding of a building's development's economy should be established.

WHAT ROLE CAN WE ASSIGN TO TECHNOLOGY AND DIGITALIZATION FOR THE FURTHER DEVELOPMENT OF SUSTAINABILITY, CIRCULARITY AND REGENERATION?

Artificial Intelligence (AI) and other digital tools can be really helpful in tackling metrics and quantitative methods of carbon management, climate performance measurement in buildings (e.g., LCA), and data management related to climate-related KPIs. Conducting more precise studies on carbon assessment can help in decision-making regarding renovating, rebuilding, or even demolishing an existing building. Furthermore, such tools can help in navigating different building scenarios resulting in different levels of carbon emissions and/or waste – like different material choices, structural systems, typologies, and even considerations for the adaptive re-use of existing structures. In that vein, there is a trend in which more professionals in the construction sector (e.g., architects, managers) are becoming more competent in using digital and AI tools.

DEVELOPMENT OF NEW CONCEPTS FOR VALUE INTEGRATION IN BUILDING PROCESSES: WHAT HAVE WE LEARNED?

Sustainability and circularity as core concepts appear to be losing legitimacy when considering the context of building processes. This loss is maybe not so apparent in the official discourse, but despite years of well-meaning efforts and initiatives, those concepts appear to have become but small correctives to the continued rule of market economy – which, at large, keeps one asking for growth (even if it labeled as "green growth") that is generally inconsiderate towards resource, biosphere, and planetary boundaries.

Moreover, the classic definitions of those concepts are becoming gradually obsolete with their intrinsically modern industrial placing of nature as secondary to human society. Sustainable transition approaches have thus called for a conceptual renewal, based on specific points for how such a transition can come about: Multi-dimensionality (like in circularity), multi-actor processes, coexistence of stability and change, appreciation of long-term processes, open-endedness and uncertainty, rethinking of values, embracing of contestation and disagreement, and normative directionality (i.e., that some directions might be better and more plausible compared to others, depending on the socioeconomic and historical context).

These points show that reconceptualizing values in building processes towards climate change mitigation and the healing of the natural environment should go beyond just the acceleration and implementation of existing measures. Fig. 1 illustrates this reconceptualization within the regenerative paradigm.

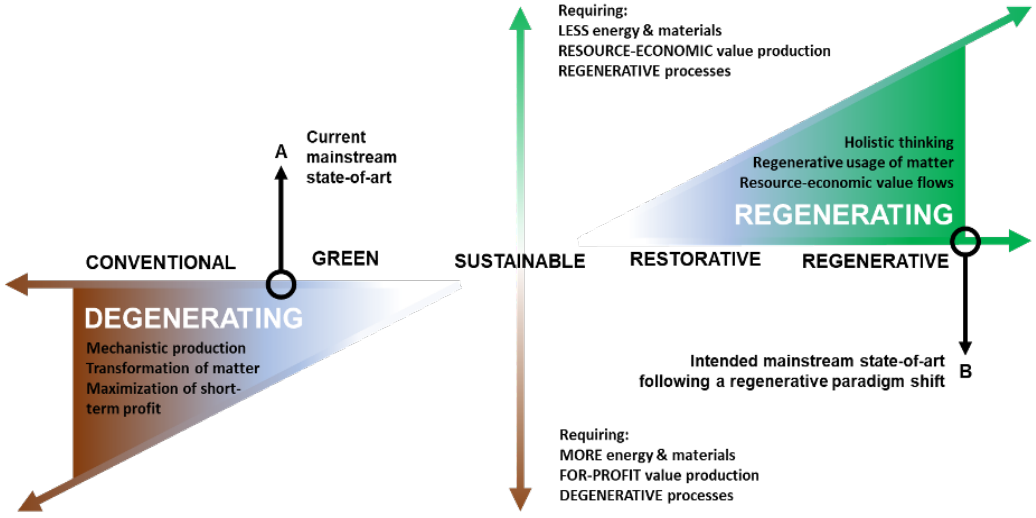

Fig. 1 Reconceptualizing value production in building processes within the regenerative paradigm (image made by Kifokeris (2024) while adapted from and originally inspired by Hawken (2021)).

For this reconceptualization, we must understand how sustainable transition, planetary boundaries, regeneration, and circular development in construction, are intertwined with the evolution of the business and economic aspects of the context within which building processes take place. While in this project we initially called this evolving business and economic aspects as "resource economics", through our research we have expanded this perception into including several lenses, such as ecological economics, doughnut economics, and regenerative economics. We label the nexus of those concepts and lenses as "heterodox economics" and view them as alternative approaches to post-neoclassical, or "orthodox" economics rooted in neoliberal capitalism that is focused on growth – even if labeled as "green growth". We consider that the "orthodox" economy is no longer able to fully understand emerging markets and new rules of demand, supply, and value production in building processes and beyond. Rather, the "heterodox" economic approaches are the ones that are more saliently characterized by the sustainable transition points mentioned earlier.

Following this line of thought, we develop the following concepts:

- → Paradigms: Interpretive, natural science-oriented, quantitative, and qualitative. Such paradigms can show that "numbers" are not automatically chained to orthodox economy. On the contrary, quantitative methods (incl. LCA of buildings) are sometimes used to legitimize and underpin a heterodox approach.
- → Scope: Micro-, meso-, and macro-levels. The doughnut economy and planetary boundaries respectively advocate "allocation" and "carrying capacity" as spanning from very general global concepts (macro) to single entities such as products (micro). This "cutting across" all levels should be underpinned when considering building processes.
- → Market perception: Markets are in some paradigms understood as underlying structures, while in others, as something continuously and socially reshaped. For a new value production focused on regeneration, a heterodox approach would be to focus on continuous and social reshaping, as stagnant underlying structures would be falling short in understanding new rules of demand, supply, and value production.
- → Conceptual overlap and conflicts: Some concepts address the conflictual coexistence of traditional markets with new relational networks producing alternative values.
- → Transition concepts: There is a somewhat surprising dominance of reform-oriented change proposals, while only a few of them demand revolutionary, disruptive action.

To illustrate how these concepts can be translated from macro-oriented theories into micro-phenomena – and consider how heterodox economics may be implemented – we can think of an example connected to another research project we have recently completed.

This illustrative example concerns the transition from using diesel construction vehicles to electrical ones at building sites. From a micro-perspective, the substitution of diesel with electrical machines appears to be rather simple – as the electrical machines are currently designed as marginal variants of existing diesel ones. However, the main barrier of a large-scale transition lies with the machine manufacturers that continue producing diesel engines to a dominating degree. The transition to a new economy requires a change in the business model for large corporations like Caterpillar, Liebherr, Volvo, etc. This can hardly be carried out exclusively bottom-up through the introduction of new agreements in purchasing and contracting; overall, public governance and legislative action must also be taken simultaneously.

CONCLUSIONS AND RECOMMENDATIONS

The mainstream practices and understanding of value in construction significantly affect ecosystems, resources, and human living conditions. A major portion of this detrimental impact arises during the actual on-site building processes. To address these issues, environmental management has recently gained importance along the traditional construction management goals of "time-cost-quality".

This shift is reflected in the growing emphasis on emission-free construction sites, recycling and upcycling, climate declarations, LCA, circularity, the EU's sustainable investment taxonomy, and directives on the energy performance and efficiency of buildings. However, current building practices, while supporting some sustainable and circular initiatives, largely fail to fundamentally alter industry norms. What is required is a new approach to understanding building processes, integrating sustainability demands with the economic management of building projects while considering the ecological limits of Earth's natural resources – i.e., resource economy.

From the perspective of practitioners on building sites, this new approach entails an unprecedented need for data collection, a rethinking of task progression, elapsed time, costs versus budgets, health and safety, and quality, and clients demanding cost budgets that combine traditional costs with CO2e impacts/costs. Nonetheless, some claim that sustainability is but an extra cost, others that it consists of soft values that cannot be easily integrated with a money exchange-focused economy. As a side effect of this, the core concepts of sustainability and circularity seem to be losing their legitimacy in the context of building processes. Although this decline may not be outright obvious in the official discourse, it can be observed that these concepts have been reduced to minor adjustments within the dominant market economy – which largely continues to demand growth with little regard for resources, the biosphere, and planetary limits. The traditional definitions of sustainability and circularity are becoming outdated, as they inherently position nature as secondary to human society within a modern industrial framework.

To address this, sustainable transition approaches have called for a conceptual renewal, highlighting specific points on how such a transition can be achieved: multi-dimensionality, multi-actor processes, the coexistence of stability and change, appreciation of long-term processes, open-endedness and uncertainty, rethinking of values, contestation and disagreement, and normative directionality. For building processes, to reconceptualize climate change mitigation and restore the natural environment towards a balanced planet, would mean going beyond merely accelerating and implementing existing measures.

To achieve this reconceptualization, we propose that the concepts of sustainable transition, planetary boundaries, regeneration, and sustainable and circular development in construction are further intertwined with the evolving business and economic context of

building processes. Initially referred to as ”resource economics” in our project, our research has expanded this notion to encompass various perspectives, such as ecological economics, doughnut economics, and regenerative economics. We term the integration of these concepts and economic perspectives as “heterodox economics”, viewing them as alternative approaches to post-neoclassical or “orthodox” economics rooted in neoliberal capitalism focused on unfettered growth – even if the latter is labelled as “green growth”.

We believe that the “orthodox” economy is increasingly inadequate for fully understanding the emerging markets and new rules of demand, supply, and value production in building processes and beyond. In contrast, we propose the embracing of “heterodox” economic approaches, as they are integrally characterized by the sustainable transition points mentioned earlier, and offer a more relevant framework for these evolving contexts.

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