Learning from living systems – regenerative principles in practice

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SYNOPSIS
In this article, Oliver Broadbent and James Norman explore the concept of regenerative design and its goal of ensuring that humans and living systems can survive, thrive and co-evolve. The authors explain how structural engineers can learn from the living world to inform the mindsets that should guide their designs. The article considers three characteristics of thriving living systems, and uses these to propose five ways in which structural engineers can start to change the way they design to shift the built environment system towards this new regenerative goal.

The concept of regenerative design started to gain popularity with built environment professionals around the time of the publication of the 2019 Intergovernmental Panel on Climate Change (IPCC) report. At that time, more and more structural engineers and other designers began realising that aiming to be sustainable – to meet the needs of today without compromising the needs of tomorrow – is not enough to tackle the climate and biodiversity emergency.

The goal of regenerative design goes further than simply meeting our needs. The goal of regenerative design is for humans and living systems to survive, thrive and co-evolve. In other words, that every time we design a building, the living world – which includes us – becomes healthier. In short, that our work leads to greater thriving, not less.

At the time of writing, 450 firms worldwide have signed up to the Structural Engineers Declare statement (www.structuralengineersdeclare.com), which contains two commitments to regenerative design. But while regenerative principles have been applied in other disciplines, such as agriculture and medicine, for some time, their application in the design of the built environment is relatively new.

It is important to recognise that while the goal of regenerative design may sound good in theory, some readers may feel it has little to do with their day jobs. Others may support the goal of regenerative design but not feel they have the agency to make change in their projects.

In either case, while it may not be immediately obvious, regenerative design is likely to impact all our work in future. For example, once clients start to get concerned about biodiversity net-gain as well as zero-carbon targets, it is likely they will demand more regenerative approaches in their design briefs. And if you work for a company that has signed the Structural Engineers Declare statement, then your organisation has

FIGURE 1: Process of continuous, place-based design
already made a board-level commitment to adopting regenerative principles.

So, how do we turn the idea of regenerative design into reality? The best guide we can find to being regenerative is to look at how living systems behave. Structural engineers learning from the living world is nothing new. Just as through biomimicry we seek to learn from the incredible structures that living systems build, in regenerative design we can learn from how living systems operate, creating the conditions for thriving within the limits of what the ecosystem can sustain.

Using this living system template, we can start to think about what buildings and communities might look like in a world in which humans and the living world are surviving, thriving and co-evolving, and how we might go about designing them. And from there, how might the industry that we operate in – from design codes to supply chains – need to be organised to design in this way? And above all, what should be the mindsets guiding our design work to meet this goal?

In this article, we consider three characteristics of thriving living systems, and use these to propose five ways in which we can start to change the way we design to shift our built environment system towards this new regenerative goal.

**Learning from living systems**

Living systems share in common three characteristics that we can learn from.

**High degrees of connectivity**

Living systems are highly interconnected, enabling feedback from one part of the system to easily be communicated to another. These feedback loops, backed up by multiple levels of redundancy, enable living systems to operate within material and energy limits and to respond when a part of the system becomes damaged and needs repair.

**Use of renewable energy and materials**

Living systems use renewable sources of energy and materials, with the waste becoming the input for other processes. This process is generative, creating richer and richer environments over time, all within ecosystem limits.

**The capacity to self-organise and adapt**

Living systems self-organise and adapt, using simple rules and patterns to respond to environmental changes. Coupled with their high degree of interconnection, this capacity to adapt enables living systems to become highly adapted to the specific environmental niche that they inhabit.

**Changing the way we design**

To create a thriving world for ourselves and all living things, we argue that we need to use these characteristics to guide how we design. So, here are five things we can do to apply these ideas in practice.

**Practise continuous, place-based design**

The living systems we work in are inherently complex. As such, it is impossible to fully predict how they will respond to the changes we make when we design something. Recognising this complexity is key to understanding how we need to intervene if we want to design in a way that truly enhances the living world. Rather than treating Aiming to be sustainable is not enough to tackle the climate and biodiversity emergency
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design as a process with fixed start and end points that we do in lots of different places, we should see it as an ongoing relationship with a specific place. We call this continuous, place-based design (Figure 1).

To a certain extent, an engineer on a framework with a large institution or local government is already engaged in continuous, place-based design. What is necessary for regenerative design is that the design needs to evolve with the needs of the place, in response to the feedback that all the elements of that place are providing.

A continuous, place-based design relationship enables the designer to embrace the complexity and interconnectedness of the living systems we work in and see design as an ongoing, iterative process in that place.

See the wider interconnection

By tracing the origin of all the materials we use, we can gain a deeper understanding of the far-reaching impact of our designs. It’s not enough to create systems that thrive in one place while depleting resources from another. For instance, adding a green roof to a building to support insect habitats is meaningless if the project’s supply chain has destroyed more insect habitats somewhere else in the process. It’s crucial to acknowledge the interconnectedness of our actions.

Expedition Engineering’s work, supported by an Institution of Civil Engineers R&D grant, to develop a measure of embodied biodiversity exemplifies this holistic approach. This initiative expands our perspective beyond the living world we can see, to encompass the places we cannot.

Build material abundance

The construction industry’s supply chain relies heavily on extracted materials. But what if our industry shifted from a model of depletion to one of abundance? With the right approach, humans can work with living systems to create a thriving environment that provides renewable resources in abundance. This approach is known as symbiosis.

To create abundance, we must draw upon a range of strategies. Some of these lie in the past, such as rediscovering traditional techniques for using local materials. Others are emerging technologies, such as bio-based technologies or the reuse of the abundant materials that already exist in the build environment.

A great example of abundance in action is Yes Make (www.yesmake.co.uk), a London-based organisation that specialises in repurposing felled street trees for construction (Figure 2). Instead of seeing the trees as a waste stream, it saw an opportunity to create abundance. Yes Make works with local communities to process the timber, building material literacy in the process. It is now using 3D-scanning technology to create a digital model of tree crowns, which it can use as connections in more complex structures. By combining cutting-edge technology with a waste stream, Yes Make is creating an abundant resource.

Aim to intervene higher in the system

If we think of sustainability as being largely focused on projects, regenerative design focuses on the sum total of our actions across the wider built environment. From rules and regulations that guide how we design, to the commercial agreements we enter; from planning guidance to how we educate engineers, these higher-level factors all govern the design decisions we make on an individual project.

To truly transform the built environment industry, we need to intervene at this higher level, seeking to change the way the industry operates. Structural engineers at all levels are already taking active steps to create guidance, educational resources and regulations around decarbonisation, and we can do the same to work towards our regenerative goal.

But we can also make a difference at the individual project level by identifying and chipping away at the barriers that prevent projects from achieving regenerative potential and translating approaches from one project to the next. By asking critical questions, we can help shift the industry toward a more regenerative approach to design.

Be guided by a regenerative mindset

The climate crisis is a crisis of the imagination. We see three mindsets that we can adopt to help unlock us from our current ways of thinking and help us imagine a regenerative future.

> Interdependence – recognising and valuing the deep interconnection between us and the living world that supports us and that can help us thrive.

> Abundance – seeing the potential for renewable sources of energy, materials, collaboration, trust and care.

> Emergence – understanding that to co-evolve with the living world, we must work with it rather than control it.

When we start to see the world through these lenses, we begin to recognise that regenerative design is not just something in the future, but something that is already happening when you know how to spot it. As the author William Gibson said, “the future is already here. It’s just not evenly distributed”.

Conclusion

To conclude, we see the job of the regenerative structural engineer as holding a vision for what it would mean to build in a way that left the human and living world healthier. And then collaborating with others to create the transition to a regenerative way of working: by changing how we design; by reconfiguring how we organise ourselves in industry; and by shifting our mindsets so that we can be guided by the better world we want to build.

REFERENCES


