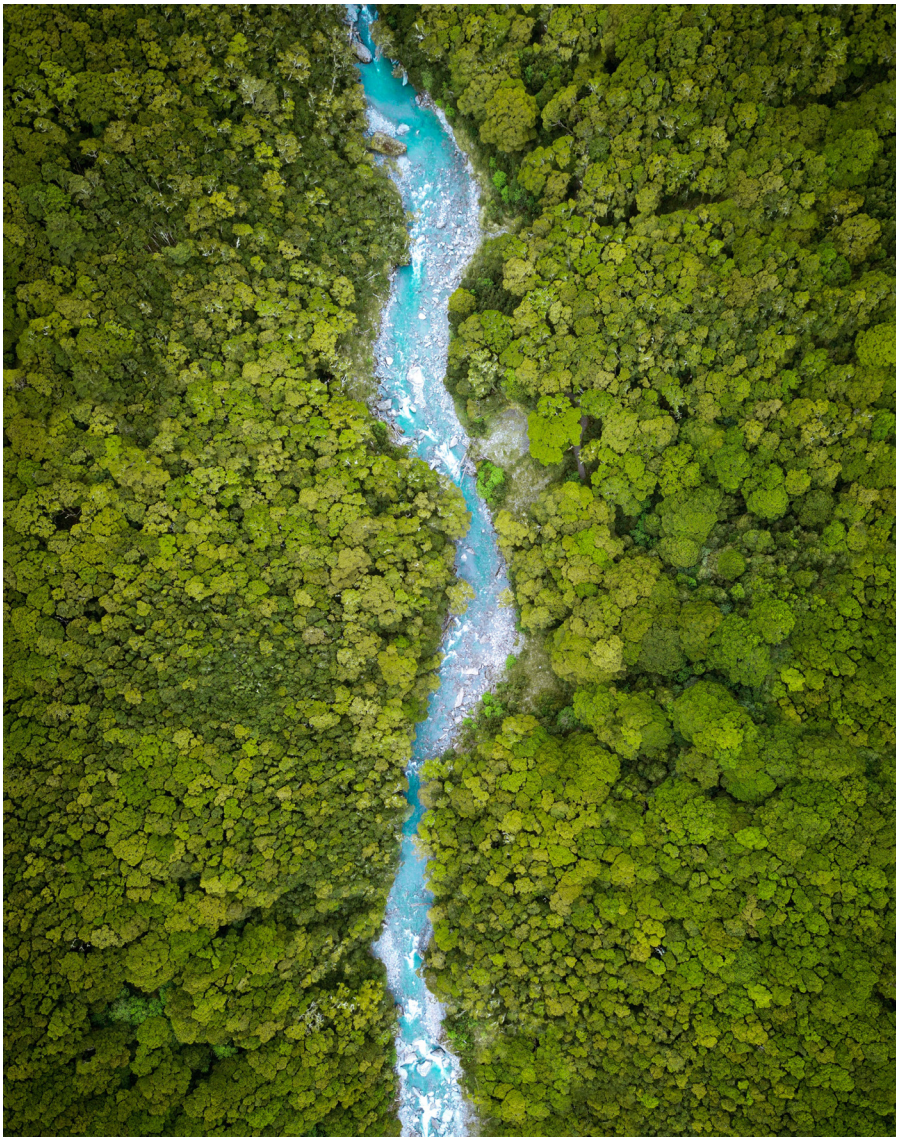
REPORT

Arup Explores Regenerative design



Berlin, Germany
6 February 2020

ARUP

ABOUT

Arup Foresight

Arup Foresight helps organisations understand trends, explore new ideas, and radically rethink the future of their businesses. We examine the many forces shaping the future of the built environment. We developed the concept of 'foresight by design', which uses innovative design tools and techniques in order to bring new ideas to life, and to engage all stakeholders in meaningful conversations about change.

For more information, please email:
foresight@arup.com

Please consider the planet when printing this document.

ARUP

13 Fitzroy Street
London
W1T 4BQ
www.arup.com
foresight.arup.com

Front cover image: Will Turner on Unsplash

ARUP EXPLORES

Contents

FOREWORD

ABOUT
Arup Explores
Regenerative design

RESEARCH
Rethinking the status quo
Redefining regenerative design
Reconnecting with nature
Redesigning for the future

FUTURIUM

PERSPECTIVES
Sustainable transformation within planetary boundaries - Dr. Holger Hoff
Designing regenerative cities - Demetrio Scopelliti
DGNB certification for sustainable buildings - Dr. Christine Lemaitre and Thomas Kraubitz
BIOFab, fabulous bio-made building materials - Dr.-Ing.Jan Wurm
Ecosystemical constructions - Oliver Storz
Regenerative modelling - Dr. Emanuele Naboni
Animalesque - Florentin Steininger

FUTURE
Paths forward
Conclusion

CITATIONS

CONTACTS

Foreword

DR. GEREON UERZ

Associate Director | Foresight Leader Europe

Living in a world characterised by increasing climate volatility, uncertainty, complexity and ambiguity makes it impossible to predict the future. At the same time our global future is being compromised by climate change, biodiversity loss and resource scarcity that requires urgent action and new forms of global collaboration over the coming decades.

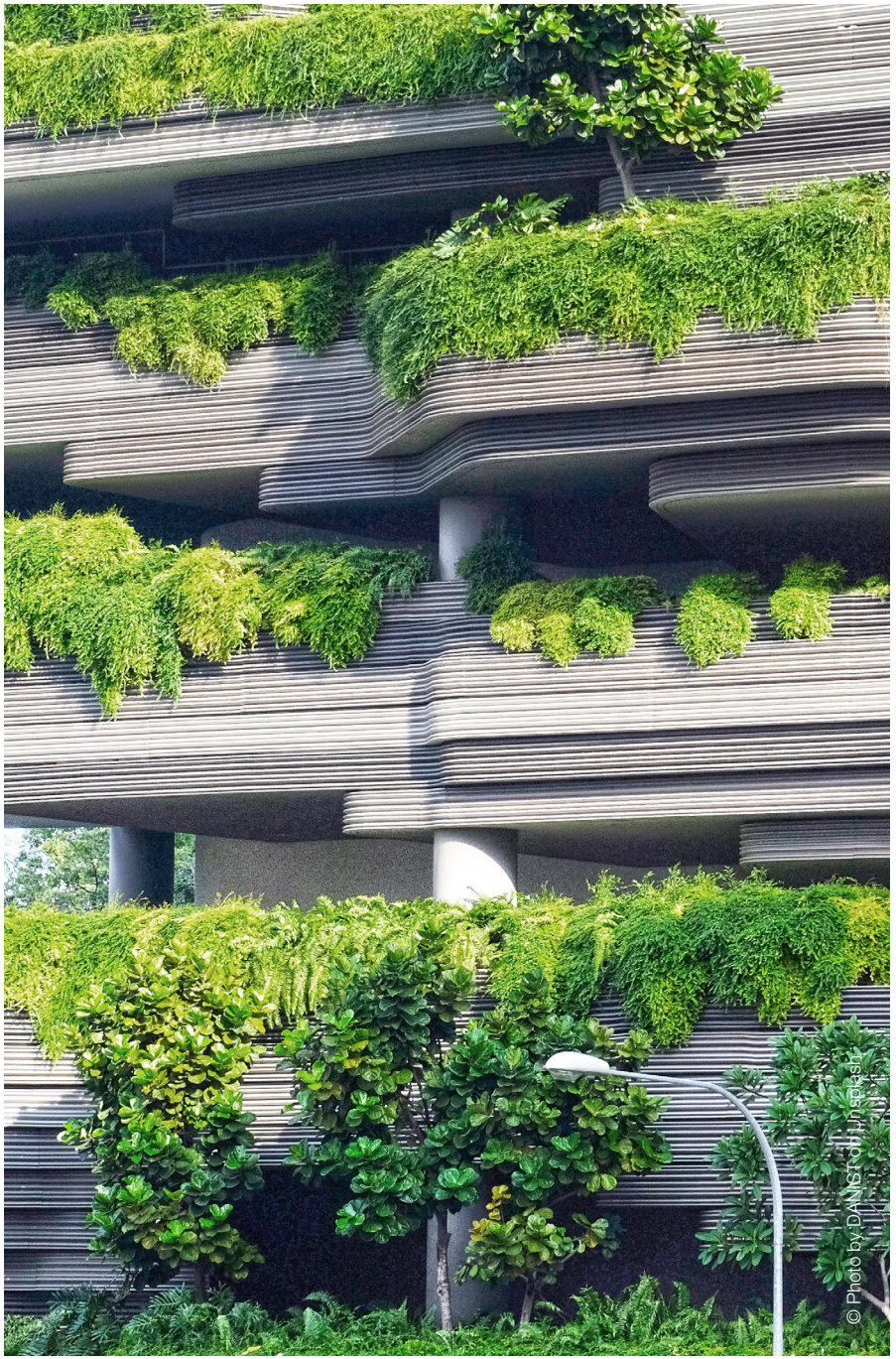
The relevance of the 'built environment' for our global future can hardly be overstressed. Given the growth of the global population, urbanisation and the need for infrastructure the architecture, engineering and construction industry (AEC) will need to aim for a step change in the way it is thought about, planned, constructed and how it operates. Not only will we have to re-think the built environment, but we will have to re-design it. The paradigm shift needed must acknowledge the fact that 'being less harmful' will not suffice in dealing with the challenges ahead.

Arup have committed to doing their part in achieving the UN Sustainable Development Goals (UNSDGs). As a firm we also believe that challenging the status-quo and outlining a bold vision for our common future will help us to arrive at better solutions. The potential of this 'better future' and the way to get there should be explored jointly across professions, disciplines, industries and backgrounds.

Arup Explores Regenerative design aimed to share the evidence, emerging material and technical components as well as the emerging tools and processes needed to enable 'regenerative' design. The event demonstrated that a shift in mindset is what is needed to move beyond sustainable and towards regenerative design. This should be at the forefront of our minds and designs.

The lines that divide the built and natural environments, as well as those between humans and animals need to be re-considered and overcome. For years now, people have been creating 'human habitats' – a second and artificial nature – that we call the 'built environment.' To progress towards regenerative design and systems for our planet, we will need to figure out how to design for all species; respecting planetary boundaries and utilising science-based targets as the common ground to help mother nature not only survive but thrive.

© Jan Jonkman on Unsplash



About

Arup Explores

Arup Explores is a series of global events, engagements and learning journeys focusing on disruptive themes and their implications for the built environment and society at large.

Arup Explores events aim to form an early understanding of the factors driving change in our sector, and what this change means for Arup and our clients. Past events have investigated themes such as digital fabrication, biomimicry, machine learning and prototyping. By bringing together Arup professionals and industry experts from a wide range of disciplines, these events have sparked new partnerships and client engagements, supported our culture of innovation, and provided early insights regarding our priorities for research, strategic investments and capability development.

This year's programme includes four global events spread across four different regions, examining four different themes:

- Geoengineering
- Urban Agriculture
- Regenerative Design

Regenerative design

Ongoing ecosystem degradation, growing resource shortages, and a looming climate crisis will necessitate a change in the way we design human settlements. The current focus on minimising negative impacts will no longer suffice, and instead we need to respect planetary boundaries and define, develop and embrace new paradigms that enable a rapid shift toward zero-impact, and an eventual transition to net-positive and ecological gain. We need solutions and approaches that deliver 'regenerative design;' where our choices and systems are guided by circular principles and ecological renewal.

This event aimed to explore different approaches and innovations for regenerative design. The three thematic focus area were: rationale for regenerative design; policy, governance and instruments; and technologies for new materials and green infrastructure. Topics and ideas included: materials that capture more carbon than they consume, designs that actively enhance biodiversity, components with full circularity, buildings that clean water and utilise waste, and approaches toward implementing policies and strategies.

The regenerative vision is relatively clear, yet, the practical applications and actions for the built – and natural – environments are not. This document aims to help us better grasp the topic and to consider what regenerative design means – and could mean – for the industry, different projects, the wider built environment, and the transition ahead.

Research

© Emma Hoette

BUNDJALUNG NATIONAL PARK

NSW

These cabbage leaf palms in the Bundjalung National park, NSW, Australia are examplar of nature's power and capability to regenerate. These images were taken only three weeks after the bush fires.

Research

Rethinking the status quo

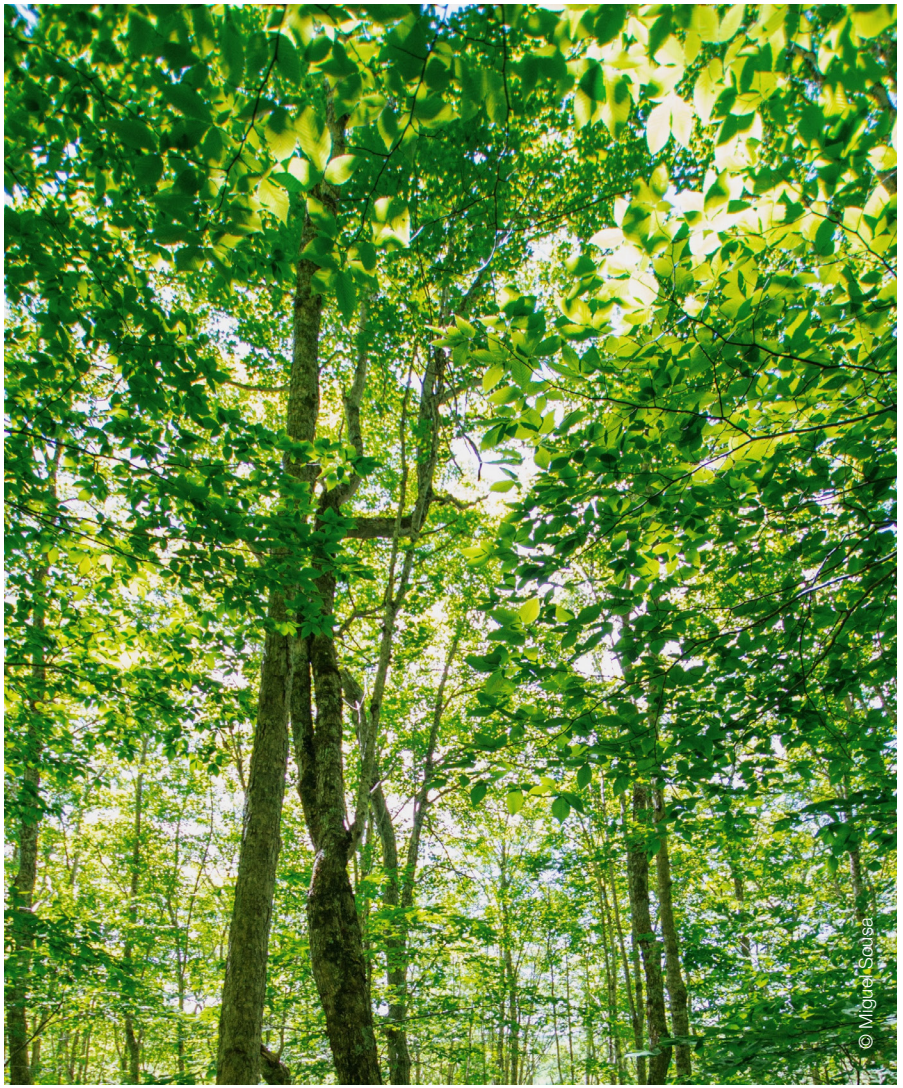
Cities today house over half of the global population; as well they do not provide biological value (diversity), yet consume many natural resources.[1] The development of urban areas has advanced societal wellbeing; but this has been at the cost of our natural resources and biodiversity. Increasing consumption rates, population growth, urbanization, pollution, and the climate crisis are just some of the cascading effects of human-driven urban developments, and these effects need to be considered urgently if we want to ensure a sustainable future and achieve the targets set by the Paris Agreement and the United Nations SDGs.

Biodiversity and the balance of natural resources are essential to the future livelihood of people on our planet. Their equilibrium secures our wellbeing by helping to stabilize food production, which in turn impacts economic and societal development. Today, more than a third of the world's land surface and approximately 75% of our freshwater resources are reserved for livestock and crop production.[2] Biodiversity loss indicators state that the Earth has lost 50% of its plant species[3]; and global land surface net productivity has diminished by 23%.[4] The building and construction sectors account for approximately 39% of global energy-related CO2 emissions.[5] With all of this in mind, we now must seize the opportunity to change our consumption patterns and to rethink the way we design our built environment in ways that counteract the negative effects of anthropological activity.

Redefining regenerative design

Applying regenerative methods to design is one response to today's challenges. Architectural theorists Krasny and Fitz state that to provide 'critical care' for a broken plant requires systemic change. "Restoring the future to good condition does not mean more of the same, largely developer-driven and capital-centric architecture and urbanism, but rather a long-term commitment to planetary care based on human and non-human liability."[6] For the environment, a systemic approach that actively improves the health of ecosystems by reversing anthropological degradation and allowing for active natural recovery is advised. Regenerative design holds the promise of active ecological gain through endured responsibility and stewardship over resources, also providing benefits for social and natural capital.[7]

Regenerative design is about not only creating zero-emission or circular cities, but also advancing further and creating a real positive impact on the environment by actively improving the health of ecosystems, For example, by enabling a higher degree of biodiversity and creating a symbiotic relationship between natural and human-built systems. Regenerative design this way instigates a shift of the rationale from a human-centered approach to a more systemic one.One that includes a holistic view that reconnects humans to the natural environment and that considers the positive impacts a design can also bring to non-human species. The relationship rationale between humans and nature would benefit from being framed less like a managerial one and more as a partnership.[8]



© Miguel Sousa

60%

decline of all vertebrate species populations since 1970.[9]

20%

decline of native species land-based habitats since 1900.[10]

TOWARDS ECOLOGICAL GAIN

Timeline

Transition from conventional to regenerative design. Current practice is between green and sustainable, the aim is to reach living system design. [14]

ARUP EXPLORES

Research

Reconnecting with nature

Human reconnection with nature requires a reframing of the relationship between built and natural ecosystems. The relationship should not center on altering surroundings in a predatory manner but learning to respect and appreciate the diversity and pace of nature and its species so we might better co-habit with the natural world. Our ability to survive and thrive as a species relies on this. From this renewed respect come approaches such as: the improvement of the overall ecological structure, systems and composition of construction sites, the strengthening of ecological networks by creating new habitats and buffer areas, and the improvement of services provided by ecosystems by bolstering biodiversity – both by tending to natural environments and by designing buildings that support plant and animal habitats.[11] Reintegrating people with the natural environment and motivating them to care for it also has a positive impact on wellbeing, improving both physical and mental health.[12]

Redesigning for the future

Apart from shifting the paradigm from human-centered towards nature-centered design and the creation of real positive ecological gains, regenerative design also changes our perspective of time as designers. Studies that advocate for the benefits of regenerative design acknowledge that the benefits produced by regenerative design and its development practice cannot be fully grasped within the timeline completion of a project and that projects which aim to be regenerative spawn results that usually require an inherently longer timeline than usual.[13] This challenges our current thinking on design responsibility, and how we measure performance.

Regenerative design thus gives us the opportunity to go beyond reducing harm to the planet, and use our skills to replenish resources, boost natural diversity and drive meaningful change for lifetimes beyond our own, all through changing the way we design.

ARUP EXPLORES

Futurium

The event was held at Futurium in Berlin, a space that showcases possible scenarios on the changing shape of life. Emphasis is placed on the impact of research and innovation.

The current exhibition ‘Human beings, nature and technology’ looked at human drivers for degradation, ways to rethink nature and design, and considered how humanity can work towards new technology horizons. This exhibition questions what is the most possible, probable and preferred futures, and poses thought-provoking questions: how will we work and live in the future? How will we use technologies to construct a better tomorrow? How do we continue serving our needs as humans without harming nature? Where will our food come from in ten years? A focus to consider the relationship between nature, people and technology, reiterating humanity’s role in moulding our surroundings and lifestyle with technology and environmental factors.

The Futurium was a powerful parallel for this event. Both the Arup Explores programme and the Futurium cultural centre lent themselves well to exploring what is new within the field, unafraid to trigger bolder questions and dares to imagine what the future ahead might look like.

FUTURIUM VENUE

Berlin

The modular facade system is composed of off-site prefabricated cassettes, each 700x700mm. Developed by Arup and architect Richter Musikowski.

CC BY-NC-ND 2.0 JoithB

ARUP EXPLORES

Perspectives

Selected experts each delivered a presentation and engaged in a panel discussion followed by a question and answer session with the audience.

Sustainable transformation within planetary boundaries

DR. HOLGER HOFF

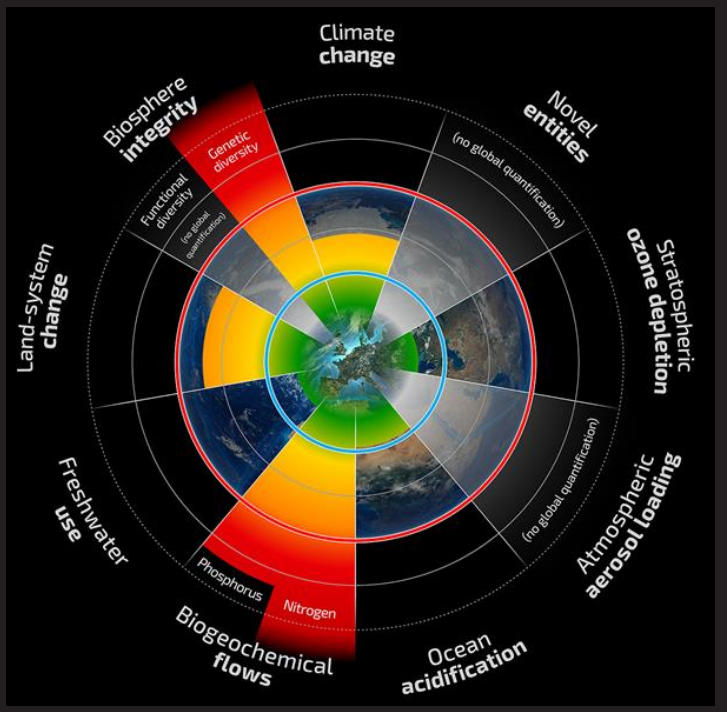
PIK, Potsdam & SEI, Stockholm

‘Anthropocene’ means, we’re leaving the geological epoch called Holocene, which provided the benign conditions for civilisations to develop. The Anthropocene or “great acceleration” defines our current era – a time when human activity modifies our climate and environment globally. Cities play a major role, currently accounting for 75% of all greenhouse gas emissions, and urbanisation continues to drive land and water use, causing unprecedented pressures on our ecosystems and irreversible loss of biodiversity. We urbanise at a rate that commandeers land the size of one city of London every seven weeks, meanwhile biomasses of the world vegetation have halved, and we have lost 85% of our wetlands. Still, we are ever more reliant on the biosphere and natural resources, so changing the way we operate our planet has become vital for humanity.

We must now downsize consumption, reconnect with our biosphere and increase our social-ecological resilience. The planetary boundaries have set out quantitative global targets for the Earth system to further support human wellbeing, To put this framework into action we must get from incremental to transformative change, reduce negative impacts to zero and protect and eventually regenerate vital ecosystems.. Scientists and practitioners together must regionalise and contextualize planetary boundaries so that they translate to relevant industries and accommodate for their different local needs. Increasing resilience entails climate protection, managing and promoting biodiversity, moving towards a circular economy and practicing sustainable sourcing.

Where possible we must align local action with global sustainable criteria such as the planetary boundaries, co-developing systemic solutions such as green infrastructure – a nature-based approach that is both sustainable and widely applicable.. It is essential for diverse sectors ranging from scientific research to city planning and hands-on construction to cross-pollinate and devise systemic solutions that work and produce notable change across all sectors, scales and regions.

> “We need to explore synergies and co-benefits across sectors and scales. For this, we must regionalise the planetary boundaries to bring us closer to decision making. Only then can we co-develop and achieve systemic solutions.”



© Photo by Stockholm Resilience Institute

PLANETARY BOUNDARIES

Safe Operating Space

The nine Planetary Boundaries of the Earth system, e.g. climate, biodiversity, land, freshwater, biogeochemical cycles, as identified by the scientific community are the Safe Operating Space that supports human wellbeing on Earth.

Designing regenerative cities

DEMETRIO SCOPELLITI

Advisor to Deputy Mayor of Urban Planning, Green and Agriculture City of Milan

Younger generations are demanding a new vision – one that regenerates our cities for people. New paradigms are emerging for successful design and there is a clear drive to change the standards of building, forsaking surface-level 'greenwashing' efforts for designs that facilitate sustainability and social integration, changing the cityscape holistically through the lenses of infrastructure, mobility and accessibility.

Could we envision a city of neighbourhoods instead of a city of cities? Chrono-urbanism is a vision put forward by the Mayor of Paris, imagining a built environment where all an inhabitant's needs can be met within a 15-minute radius of their dwelling. By treating the city as a smaller kit of parts, our efforts for change could be made more localised and achievable.

Could we envision regenerative infrastructure? Prioritising retrofitting over fresh construction can reduce waste, cost and carbon footprint. In Milan, for example, seven derelict railway yards are being regenerated to create a green network across the city – a climate-based master plan. The New York High Line also demonstrates the wider social benefits of repurposed infrastructure, regenerating not only the surrounding environment and ecology, but also the locals, driving engagement with the development and highlighting regeneration as vital for reconceiving our cities and how we inhabit them.

Could we envision an accelerated shift towards collective transport? Electric and autonomous cars may reduce carbon emissions, but they will continue to occupy space that might otherwise be repurposed for a greener, more walkable, bike-friendly and lively public realm. Piazza Aperte project in Milan aims to activate piazzas with painted surfaces that shifted traffic flow and were overtaken by children playing in the streets. To truly modify our mobility behaviours, there may need to be a change in the mainstream mode of transport, which will then be followed by new street models.

> "We have to rethink what we already have in our cities in order to start considering a new approach to building. Could we repurpose and put people at the core of our new concepts?"

PIAZZA APERTE PROGRAMME

Milan

Piazze Aperte ("Open Plazas") is an urban regeneration project based on the principles of "Tactical Urbanism". The goal of Piazze Aperte is to introduce new public space to residential districts that lack it.

DGNB certification for sustainable buildings

CHRISTINE LEMAITRE
CEO | DGNB German Sustainable Building Council

THOMAS KRAUBITZ
Associate Director | Buro Happold

With buildings accounting for more than 30% of global CO2 emissions and contributing to 30% of global resource use, an industry-wide shift is needed to work towards keeping global warming below a harmful increase of 2 degrees Celsius. To achieve this, we need better buildings that are resilient and environmentally responsible. We will reach this stage by sensitising the general public, translating sustainability into practice and sharing knowledge. Sustainability will be used to gauge the quality of buildings, coupled with their viability in future contexts, and certifications such as WELL, LEED, DGNB and BREEAM are a useful way of driving the industry to be more sustainable and even regenerative. Aiming to promote a sensible understanding of quality and a foundation of responsible and sustainable action in construction, the DGNB has put forward a certification – the DGNB System. What sets this certification apart from others are its three fundamental factors: life cycle assessment, applying a holistic approach and putting emphasis on performance. It can be adopted for various building types, indoor environments and districts, as well as for new and existing buildings. The key topics that sit under the DGNB System are people, circular principles, design quality, SDGs, EU conformity and innovation, and the framework is also underpinned and linked to the United Nations Sustainable Development Goals to provide a 2030 benchmark for today's building practitioners.

The DGNB certificate also sets itself apart with a criterion for sustainable deconstruction, which aims to alter the material flows of current practice and increase the value of building fabric. Sustainable deconstruction encourages the adoption of circular economy principles such as uptaking reuse and recovery from the onset of a project, and responsible disposal where upcycling is not possible. Such a certification will also catalyse new, innovative sustainability processes that could eventually feed into possible regulatory development at EU level.

> The DGNB system is one of the first certifications for buildings and districts that considers circular economy principles and offers a certificate for sustainalbe deconstruction methods and planning.

CERTIFICATE FOR DECONSTRUCTION
DGNB

The DGNB certificate for deconstruction serves as an instrument to support the deconstruction processes in such a way that material flows are kept in circulation, economic advantages are generated and negative ecological effects are minimised.

BIOFab, fabulous bio-made building materials

DR.ING.JAN WURM

Director | Leader Research & Innovation Europe

As we witness a paradigm shift towards a circular economy and circular design principles for the built environment, new materials are emerging to help us reach zero-waste goals. The three key material families of the biological cycle are timber, plant-based materials and bio-fabricated materials. Timber is widely established as a low-carbon alternative to industrial materials such as concrete or steel, but trees take decades or even centuries to grow, and a hectare of forest takes around 50 years to absorb 20 tonnes of CO2. Plants and bushes on the other hand can be grown rapidly on roofs or terraces, and can absorb 22 tonnes of CO2 per annual cycle, whilst micro-algae cultivated in bio-reactors could absorb 100 times more CO2. Using plant-based and bio-fabricated materials for construction will also help regenerate the ecosystems and will help safeguard our planet's biodiversity.

Hemp grows at the rapid rate of 4 metres per year and its fibres offer flexible, varied use. Practice Architecture's 'Flat House' in Cambridgeshire demonstrates thorough use of hemp as a plant-based material in a construction project. Prefabricated timber-framed cassettes were filled with 'hempcrete' and assembled as walls once dry. These were then coated externally with corrugated panels made of hemp stalk fibres combined with resin taken from agricultural waste.

From its technical performance and affordability bio-composites could become more mainstream in the construction industry, given also that a growing community of designers are exploring their aesthetics and morphing properties. In the future I believe our built and grown environment will merge and our buildings become hybrids, where structures and surfaces are substrates for rapidly renewable, fabulous biomaterials. We as architects face a new world of fabulous possibilities and opportunities to combine living and inert materials, solid and soft materials, creating new local eco-systems, where we co-design and construct our buildings with the biological cycle.

> "We tend to jump to timber as a renewable material– which is a proven solution, but there is more out there. Plant-based materials and bio-fabricated materials are a real possibility and offer a growing opportunity for the future of our built environment."

BIO-ENERGY FACADE MOCK UP

Hamburg, Germany

The glass elements of the bioenergy façade are part of a solar thermal system with which additional microalgae are cultivated to build up biomass and absorb C02.

Ecosystemical constructions

OLIVER STORZ
Bureau Baubotanik

Three useful facts about building with living plants that have wood as a structural tissue: firstly, woody plants can intergrow with each other. Secondly, woody plants can incorporate technical components, and thirdly, younger, weaker plants need supportive temporary auxiliary structures. Arthur Wiechula was a German landscape engineer who envisioned growing trees into buildings, and whose prototypes consisted of the guided grafting together of living branches. His studies have inspired Bureau Baubotanik to conduct further research into building architecture with living plants. Their work highlights the beneficial properties of trees as dwelling providers: how they provide shade, cool and filter the air, regulate the natural water cycle, produce oxygen and absorb CO_2.

To understand the viability of building with living plants, it is important to process the ways in which various types of trees and plants grow, what their needs are (light, preferred weather conditions), their properties (how fast they grow, their ultimate size, and the possible geometries they can produce), and the existing context and ecosystem of the intended build. This information facilitates the moulding of living plants into structurally sound dwellings or infrastructure, such as footbridges, viewpoints or parts of façades. Often, this requires the incorporation of steel parts for those parts of the construction, which can not be out of a living material like walkways, stairs or handrails. A temporary auxiliary structure is often necessary, to guide young plants into a desired shape and to stabilise young plants until they are capable to bear the required loads.

Ultimately, using living trees in construction takes time and patience. It is a process-based thinking approach to design that positions the wild, organic features of woody plants as an aesthetic, and their strength and regenerative features as rich opportunities. As we become ever more reliant on our planet's resources, we urgently need buildings that embrace nature and include vegetation as an integral part of their design. This requires us to study natural growth in a way that equips us to work with it rather than against it and create everchanging buildings that eventually become ecosystems in themselves.

> Oliver, and Bureau Baubotanik use trees to grow buildings and structures. Starting with saplings they shape and guide the growth of plants into built structures. It is a process that takes time and patience.

HANDRAIL
Olfen, North Rhine Westphalia, Germany 2017

This architectural structure offers its visitors an ingrown staircase with a platform to observe the nearby stork nest or simply the Steveraue itself with its semi-wild herds of rear cattle and Konik horses.

Regenerative modelling: coupling architectural and non-architectural domains

DR. EMANUELE NABONI

KADK | The Royal Danish Academy of Fine Arts

A concept used to assess building performance, regenerative sustainability[15] argues for design approaches that go beyond mitigating environmental impacts and instead positively impact people and nature. While this is a promising direction for sustainable design, new tools and workflows need to be developed to put these ideas into practice.

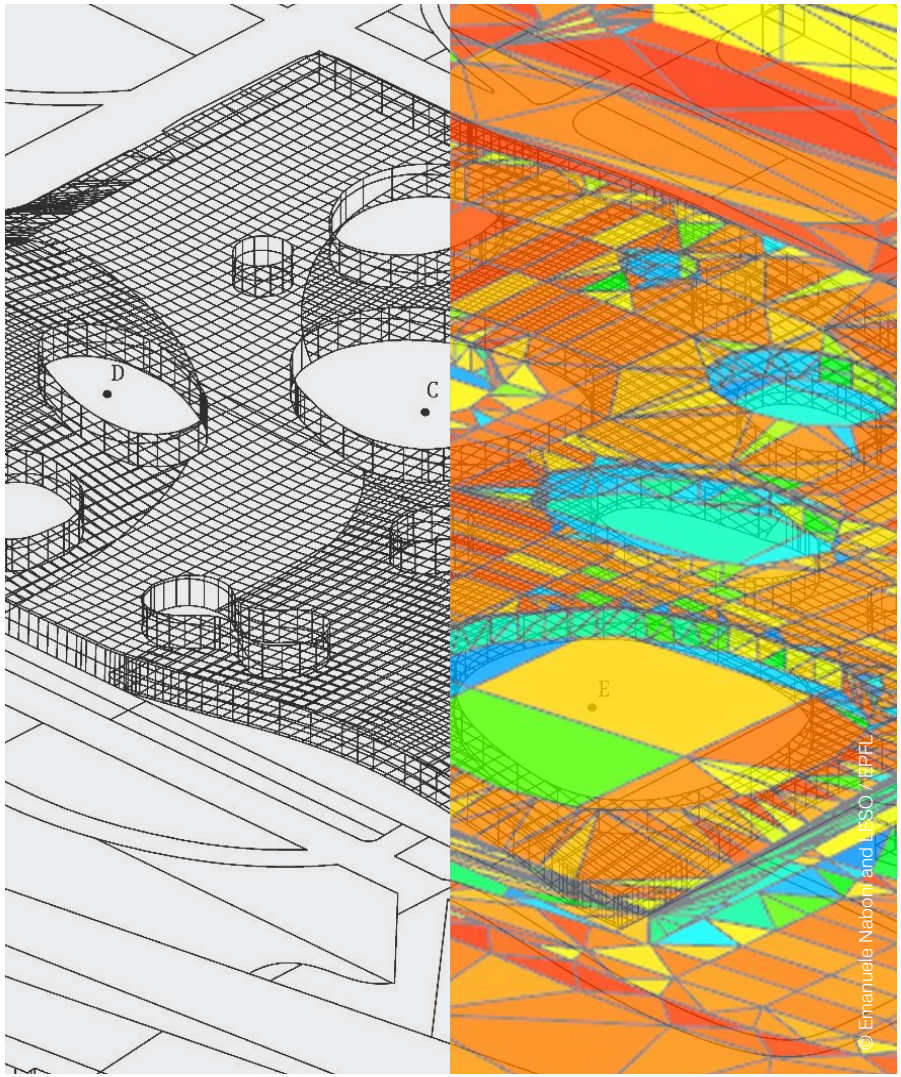
Regenerative design calls for simulation tools that are open to user customisation, enabling responses to performance targets such as those linked to the local ecosystem and to human health. It is no longer conceivable to simply model the impact of design on the ecosystem, or the impact of design on health. Regenerative design necessitates coupling models of one or more ecosystem variables (e.g. local climate, local water cycles, the behaviour of other species, natural patterns of vegetation growth) and variables relating to people (e.g. behaviours, physiology).

These crucial steps in integrating and customising models are made possible by parametric simulations. Based on algorithmic thinking, parametric design enables the expression of parameters and rules that, together, define, encode and clarify the relationships between design intent and design response.

One prominent tool in the field of parametric simulation is the visual programming tool Grasshopper. Grasshopper and its environmental plugin Ladybug allow the geometrical co-modelling of urban, natural environments and buildings coupled with equations relating to ecosystems, climatology, material sciences, synthetic biology, biology, botany, human comfort and physiology. Using Grasshopper, architects can model a diversity of design options by overlaying problems and performances from various disciplinary domains, enabling them to plan and prepare for complex environmental issues.

As regenerative design continually evolves, the computational process is showing itself to be increasingly holistic, but also convoluted. Interdisciplinary education and collaboration are therefore crucial for designers and software users, and will enable the creation of architecture that transcends disciplinary boundaries.

> Emanuele's work focuses on regenerative principles and their translation into design via computational processes that model the interaction of cities and buildings with ecosystems, climate, materials flow and people health.



SURFACE TEMPERATURE MODELLING

Rolex building

The hyperspecific climatic information is used to foster strategies to reverse climate change dynamics and grant students and faculties wellbeing within the campus.

Animalesque

FLORENTIN STEININGER

Founding partner at S.T.I.F.F. | Animalesque

The built environment has predominantly focused on providing habitable space for humans, adhering to our preferred functions and aesthetics. With an increasing decline of flora, fauna and insects in rural areas, cities are becoming attractive territories and habitats for animals, yielding the opportunity to explore human and animal co-inhabitation in urban environments. This would first and foremost require us to shift our human-centred focus to an more ecocentric vision, placing intrinsic value on all living organisms and their natural environments, as well as the symbiotic relationships and benefits that could stem from human-animal urban cohabitation.

Exchange across varying disciplines - such as between designers, beekeepers, scientists, ecologists and musicians – will be valuable here for the thorough researching and understanding of how this vision could work. Multisensory experiences during research and prototype stages could help equip us with a better understanding of the needs of animals adapting to urban life, and other prototypes could focus on material testing paired with monitoring processes to study how aspects of nature occupy space and grow, or on augmenting natural processes to help us rethink our way of designing.

Animalesque's The Nest was a prototype for co-habitation that explored the collective creation of a place for animal-, vegetal-, or algae life to nest in, based in the Tempelhof airport water basin. The Nest was built from primitive materials including branches, soil, rope and bags, and is an experiment in construction based on engagement with and understanding of a specific environment and its on-site components. Constructing the prototype encouraged consideration of prospective animal use and inhabitation, as well as how a structure suitable for animals can co-exist in a human-oriented space.

> Animalesque looks at how humans and animals can co-habitat in more resilient urban environments. This requires us to shift our focus from a human-centred lens to valuing all living organisms and their natural environments.

THE NEST - A PROTOTYPE OF CO-INHABITIATION

The Floating University in Berlin, 2019

The structure was built in 10 days using natural materials. The project was about the collective process of creating a place for animals-, vegetals- or algae life to inhabit. The experience of building it aimed to connect humans with the surrounding enviornment and ecology.

ARUP EXPLORES

Future

As built environment practitioners we design and build the future. As we begin to look at what it could, should and might be we should reflect on what it is today, what it was yesterday, and use that knowledge to shape where we are going. As we consider the planet and natural environments it is important to reflect on what we have collectively learned, question why it matters, ask provocations that examine what we as practitioners should be doing about it, and develop visions that consider what the world of 2030, 2050, and/or 2100 could look like if regenerative method are applied to today's environments.

© Brian Sumner on Unsplash

Paths forward

Now what?

Thinking about regenerative design principles and the role that built environment practitioners play in today's world, questions around what action can and should be taken to move humanity forward and how practitioners will change our approaches to work considering our offices, teams, jobs, and roles, were considered.

The main directives that emerged were:

A need for more cross disciplinary actions, projects and discussions

Leadership that challenges and considers different perspectives

A desire for more actionable and progressive change

More frequent sharing of what we do with clients and colleagues

A drive for purely proactive work, as opposed to reactive

To ask more questions

Questions we think Arup should consider are:

How can we incentivise behaviour change in the built environment?

Should we be nature and ecosystem service leaders?

What is Arup's nature-based vision?

How can we more swiftly test our (imperfect) prototypes?

Can we scale actions and solutions?

What type of meaningful offsets can we be doing, and promoting?

Should we recruit more ecologists?

Vision for 2050

Imagining the future, a word that does not yet exist, can be challenging; yet aspirational thinking can help us envision it. Considering the world we would like to live in someday, factoring in existing efforts to improve physical surroundings, and noticing small acts and features of current life that bring us happiness are all ways to help us start creating this vision.

Many opportunities exist for regenerative design to occur in the built environment, and in any industry, but it is something we now know we must collectively consider if we desire to have a planet Earth for future generations to inhabit. Considering a collective vision for the future world some themes resonated, including: the value of human diversity, plants and animals, sensory environments incorporating sound, touch and sight, balanced ecological and built systems, seamless connectivity of systems, and remembering that sometimes less is more.

IDEAS ACROSS STEE(P)

Vison for 2050

Key findings from discussions about the groups vision for 2050, broken down into STEEp (P here stands for physical environment) categories.

Conclusion

The United Nations has labelled 2020 as a critical year for biodiversity, the climate emergency and nature-based solutions. Calling it a 'super year' for the environment, setting the tone for the decade to come. We are the first generation to have enough data to understand our impact on the planet; giving us a unique opportunity to act.

Our collective experiences with degraded ecosystems, resource shortages, polluted waterways and poor air quality, allow the opportunity to consider how to create net-positive solutions that offer ecological gains. This brings to the forefront important questions: can the built environment really be regenerative, or this a process achieved only within nature? Can humans create regenerative systems, or is it our position at the 'top of the food chain' that allows us to believe this is possible? As practitioners, we must strive to create human-made environments that operate as seamlessly as natural environment. For this, we must start by better understanding our planet as it is; how it functions and operates, its interconnected systems, networks and dependencies across and within different systems – flora, fauna, and people. We must gain better insights and consider how to work in harmony with Earth, and not against it.

This event gave insights into how various practitioners, organizations and industries are exploring the potential of regenerative design to address the global challenges we all face: inequity, finite resources, climate change. Ideas were explored through diverse approaches and speculations. By considering what was possible a collective desire to think more broadly, to question who and how work is performed, to find creative solutions to solve today's problems and to proactively engage with different actors will result in new ways of working, delivering projects, and considering new business models for future services. As an industry there is an opportunity for us to be brave in finding and trying new approaches and to remember that technology is a tool to help us and not an answer to our problems. It's our responsibility to keep the desires and needs of children and future generations in mind when making decisions and thinking about the collective future we will build.

What is needed now is to work collaboratively across disciplines considering scalability, feasibility and how to design, build and construct in ways that promote positive planetary impacts. These considerations should be embedded in processes of research, knowledge sharing, prototyping solutions, and policy to move beyond theoretical responses and activate our journey towards a more regenerative future.

It is crucial that we improve the state of our planet. Before us lies the opportunity to rewire our approaches and trigger change, and as built environment professionals it is our collective mission to design and build for societal resilience, planetary health and the regeneration of our ecological systems. We must embed sustainability and positive change into the way we design and shape the world around us.

Citations

1. UN DESA Department of Economic and Social Affairs. (2018) 68% Of the World Population Projected to Live in Urban Areas by 2050, Says UN [online] Available at: www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html

2. United Nations (2019) Report: Nature's Dangerous Decline 'Unprecedented'; Species Extinction Rates 'Accelerating' [online] Available at: www.un.org/sustainabledevelopment/blog/2019/05/nature-decline-unprecedented-report/

3. PNAS, National Academy of Sciences (2018) The Biomass Distribution on Earth, [online] Available at: https://www.pnas.org/content/115/25/6506

4. EurekAlert (2019) IPBES: Nature's Dangerous Decline 'Unprecedented,' Species Extinction Rates 'Accelerating', [online] Available at: https://www.eurekalert.org/pub_releases/2019-05/tca-ind050519.php

5. Global Alliance for Buildings and Construction (2018) Towards a zero-emission, efficient and resilient buildings and construction sector, [online] Available at: https://wedocs.unep.org/bitstream/handle/20.500.11822/27140/Global_Status_2018.pdf?sequence=1&isAllowed=y)

6. Merriam Webster (2020) Definition: Regenrated, [online] Available at: https://www.merriam-webster.com/dictionary/regenerated

7. Raymond J. Cole (2012) Regenerative design and development: current theory and practice, Building Research & Information, [online] Available at: https://www.tandfonline.com/doi/pdf/10.1080/09613218.2012.617516?needAccess=true

8. Raymond J. Cole (2012) Transitioning from green to regenerative design, Building Research & Information, [online] Available at: https://www.tandfonline.com/doi/full/10.1080/09613218.2011.610608

9. Grooten, M. and Almond, R.E.A.(Eds). WWF (2018) Living Planet Report – 2018: Aiming Higher, [online] Available at: https://s3.amazonaws.com/wwfassets/downloads/lpr2018_summary_report_spreads.pdf

10. United Nations (2020) Land and Biodiversity, [online] Available at: https://www.unccd.int/issues/land-and-biodiversity

11. Asha Rajvanshi , Susie Brownlie , Roel Slootweg PhD & Roshni Arora (2011) Maximizing benefits for biodiversity: the potential of enhancement strategies in impact assessment, Impact Assessment and Project Appraisal, [online] Available at: https://www.tandfonline.com/doi/pdf/10.3152/146155111X12959673796245

12. Mang, N. (2009) Toward a Regenerative Psychology of Urban Planning Saybrook Graduate School and Research Center, San Francisco, CA [online] Available at: https://www.tandfonline.com/doi/pdf/10.1080/09613218.2012.617516?needAccess=true

13. Raymond J. Cole (2012) Regenerative design and development: current theory and practice, Building Research & Information, Available at: https://www.tandfonline.com/doi/full/10.1080/09613218.2012.61751

14. Data for diagram taken from: Re-defining cutting edge sustainable design: from eco-efficiency to regenerative development by Zari and Jenkin

15. E & Havinga, L. C. (2019) Regenerative Design in Digital Practice: A Handbook for the Built Environment. Bolzano, IT. Eurac

Contacts

Event team

Iris Gramegna
Lucy Henriques
Marija Kesic
Barbara Seifert
Gereon Uerz
Jonelle Simunich

Contacts

Dr. Gereon Uerz
Associate Director, Foresight Leader Europe
Gereon.Uerz@arup.com

Jo da Silva
Global Sustainable Development Leader
Jo.da.Silva@arup.com

Josef Hargrave
Associate Director, Global Foresight Manager
Josef.Hargrave@arup.com

Jonelle Simunich
Senior Foresight Strategist, Arup Explores Programme Manager
Jonelle.Simunich@arup.com

We shape a
better world

www.arup.com
foresight.arup.com