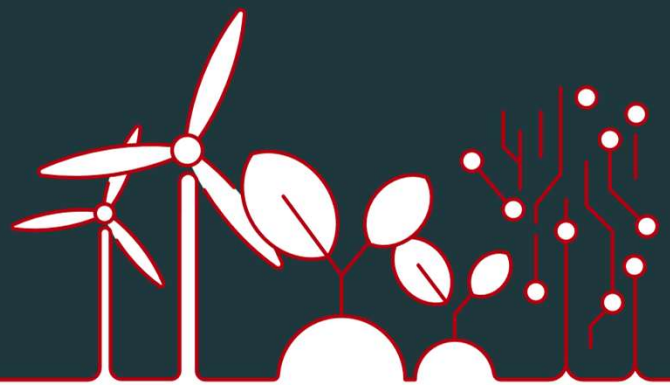
GUIDE 5

Mission Lab: Realising

Regenerative building



ATV

Colophon

To develop this guide, ATV has received input and valuable contributions from a core group consisting of:
Mikkel K. Kragh, Associate Director, Arup; Flemming Wisler, CEO and founder of NXT and Dome of Visions; Peter Vangsbo, Associate Director of Climate and Sustainability Services, Arup; Signe Kongebro, Global Director of Future Resilient Design, Ramboll.

Editorial team, project group & ATV Secretariat:
Mette Stasiak Hagelquist, Aarhus University; Siv Werner and Vera Mosbæk, NXT; Karen Grønneberg, BLOXHUB; Anna Høybye, Mette Tolling, Jon Terkildsen, William Lyngbæk and Lise Thurmann, ATV.
Photos: Stine S. Olesen, NXT

Special thanks for valuable input to:
Annabeth Aagaard, Aarhus University; Gertrud Marie Grabbert, Hanne Tine Ring Hansen, Søren Jensen and Jacob Rask, BLOXHUB; Kristoffer Tejlgaard, Atelier Kristoffer Tejlgaard; Lotte Bjerregaard Jensen, Aarhus School of Architecture; Louise Heebøll, Vigør; Mette Glavind, Danish Technological Institute; Mia Kruse Rasmussen, Alexandra Institute; Steffen Petersen, Aarhus University; Stig Hessellund, Realdania.

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Foreword

How can we transform the building sector to ensure it respects the planetary boundaries while promoting human well-being in harmony with the Earth's ecosystems?

The building sector is one of the sectors with the highest resource consumption, land use pressure, climate impact and claim on nature. At the same time, the building sector is a vital economic component for both private and national economies. Denmark holds the EU record for housing square metres per person, and our business models and incentive structures currently favour building of new buildings over conservation and transformation.

This guide is based on the recognition that a paradigm shift is needed. A building sector that contributes to a society operating within the planetary boundaries, requires more than efficiency improvements and incremental changes. It requires a fundamental shift in purpose, understanding of value and practice.

The transition is necessary and possible
Regenerative processes represent and encapsulate this paradigm shift. It requires building in ways that give back positively and rooted in healthy, surrounding ecosystems. This goal, which is far more ambitious than simply reducing the sector's harmful impacts, requires a systemic focus that takes into account the climate, the environment, nature, the economy, human well-being and communities.

This guide is the result of a Mission Lab that focused precisely on this.

The Mission Lab has brought together stakeholders across the entire building value chain, from research and advisory services to public authorities, developers and practitioners, to identify barriers, dilemmas and concrete courses of action. The work has been based on a mission-oriented approach: we have placed ourselves in the future – in the year 2075 – and asked what it will require for the building sector to remain within the planetary boundaries.

The transition is necessary. It is also possible. But it requires a systemic approach, where we coordinate and collaborate across sectors and disciplines. It calls for thinking and acting in multiple dimensions, not just focusing on the carbon footprint, but also engaging with place-specific conditions, biodiversity, resource use, land use, social values, economic structures and the interplay between them. We must dare to imagine a different aesthetic. Different materials. Different priorities. We must recognise quality in what is transformed, in using less space, and in biogenic solutions. It calls for a new normal, where longevity, reuse and positive interaction with our surroundings and nature are fundamental conditions. We hope this guide will serve as a shared point of reference and an invitation to action.

Mikkel K. Kragh, Associate Director, Arup
Flemming Wisler, Director and Founder of NXT and Dome of Visions
Peter Vangsbo, Associate Director of Climate and Sustainability Service, Arup
Signe Kongebro, Global Director of Future Resilient Design, Rambøll
Claus Crone Fuglsang, CSO & Executive Vice President, Novonesis, Chair of ATV's Guide Committee
Lia Leffland, Director, ATV

Summary

The building sector is one of the major contributors to climate change, accounting for a huge proportion of Denmark's CO_2 emissions, material footprint and land use. At the same time, it is also where people spend their time, live and form communities.

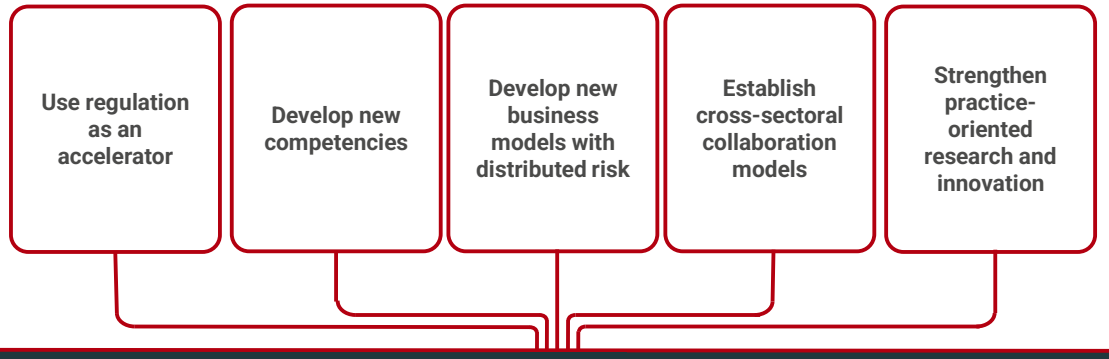
The vision is that by 2075, the sector's overall impact will remain within planetary boundaries, whilst the built environment actively contributes to restoring and strengthening the planet's ecosystems and human well-being. This requires a transition across the entire value chain, where technological solutions, innovation and new forms of collaboration go hand in hand with economic incentives, regulation and changes in practice and behaviour.

This guide shows how we can realise this vision. Together with more than 50 participants from the building sector, research, local authorities, foundations and civil society, we identify seven pathways with concrete proposals for what is needed to support the transformation.

7 pathways towards regenerative building

Five recommendations for ecosystems

Legislators and authorities, knowledge communities, consultants, investors, building and property stakeholders, as well as civil society and citizens, are all part of the complex system that needs to be transformed. Everyone has a role to play in ensuring that the pathways are implemented. Across the guide's seven action pathways, we outline five recommendations targeted more specific actors within the ecosystem:



Regenerative building

Regenerative building is an approach in which buildings and places are planned and managed as part of living ecosystems and within planetary boundaries, so that they restore and strengthen the ability of the planet, nature and people to thrive and develop over time.

Regenerative building is an emerging practice, and precise definitions, methods and metrics are still being shaped and discussed.

The starting point for regenerative building is the ecosystems we build withinin and with. Rather than merely reducing harm or minimising negative impact, a regenerative practice is about contributing to restoring and strengthening the ecological systems that the built environment is part of.

This implies a shift in our view of nature: ecosystems are not separate from humans. We are part of the systems we affect, and therefore it is not sufficient merely to simply reduce our impact or ‘leave nature alone’.

Planetary boundaries
An important framework for this approach is planetary boundaries. These describe the Earth’s capacity to absorb impacts and continue to support life – what is often referred to as a safe operating space for human activity.

In practice, this means that building must be adapted to the planetary boundaries. Nature and food production set the overarching conditions, and construction of new buildings is therefore not the first choice, but a last resort after conservation, transformation and better utilisation of the existing building stock.

At the same time, the built environment should support health, well-being and social cohesion by strengthening local rootedness, access to nature and fostering resilient communities.

In this Mission Lab, we have placed particular emphasis on the two planetary boundaries related to CO_2 and biodiversity. These are closely linked to the significant impacts of the building sector, such as land use, material consumption, and energy use. At the same time, trade-offs may arise between them, and it is important to avoid problem shifting.

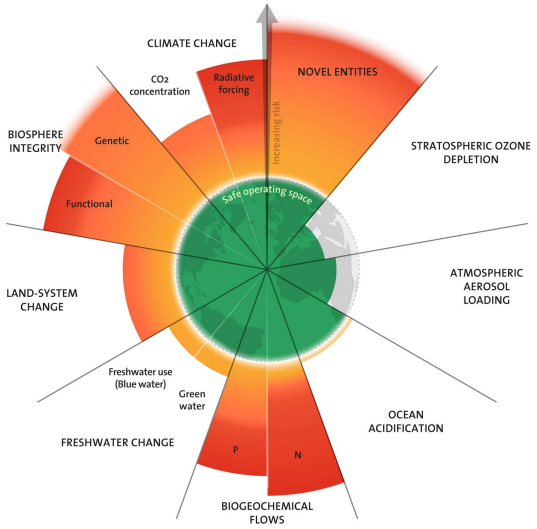
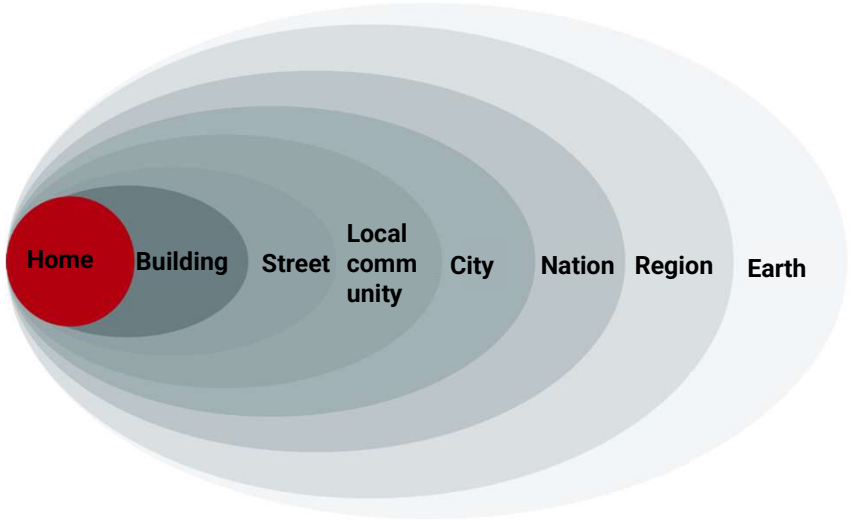


Illustration: Azote for the Stockholm Resilience Centre

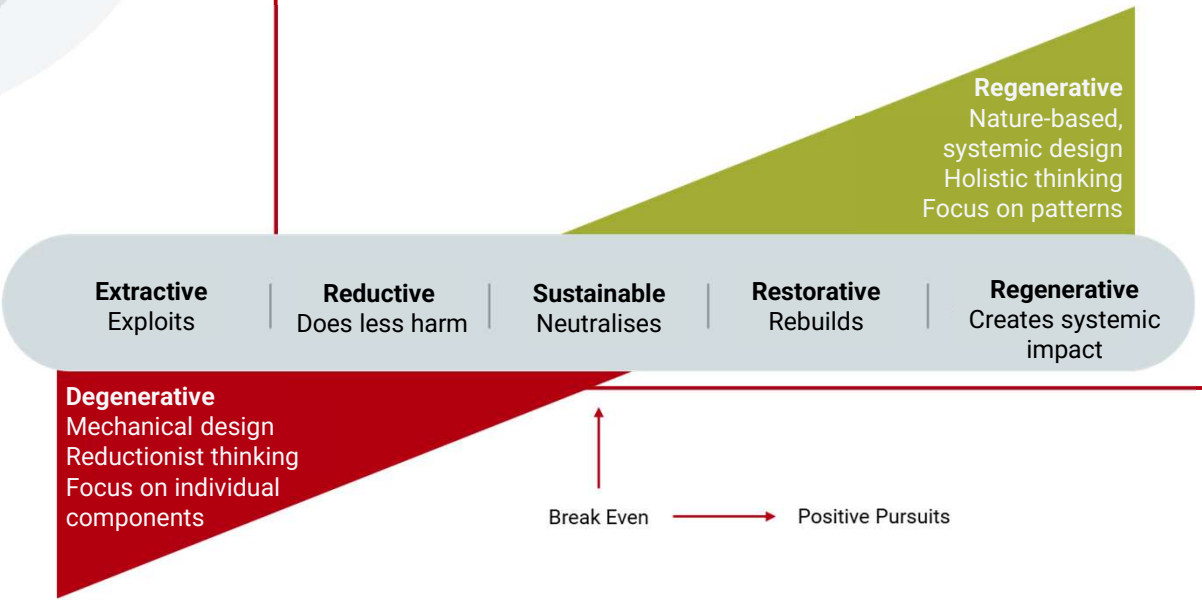


This model illustrates how the home is embedded in larger systems – from building and city to planet. Regenerative building addresses impacts and opportunities across these scales.
Model by Jacob Rask, BLOXHUB.

Measurable improvements

Regenerative building works in harmony with ecosystems rather than viewing them as an external framework or resource. This involves identifying the 'acupuncture points' within a system where targeted interventions create positive, self-reinforcing effects, and building capacity over time.

Regenerative building is an emerging practice. Concepts, methods and metrics are still evolving, but the direction is clear: the building sector must operate within planetary boundaries and contribute to restoring the ecological and social systems of which it is a part.



Model showing the shift from degenerative to regenerative approaches in construction. After 'break-even', the focus shifts from minimising impact to actively creating positive effects.

Based on a model by the Aarhus Centre for Regenerative Building

Seven pathways – towards regenerative building

The seven pathways set out the specific steps required to realise regenerative building in the built environment. They have been developed based on work carried out in the Mission Lab, as well as ongoing dialogue with participants and stakeholders in the building ecosystem.

The pathways are not independent areas of focus. On the contrary, there are close connections and interdependencies between initiatives and goals across the tracks. For instance, the required level of ambition regarding material consumption, bio-based materials, and circularity depends directly on how much we build and how many square metres we use per person.

Stop – Start – Transform
The pathways provide concrete proposal for three key questions:

- What should we stop doing today?
- What actions and initiatives should we start now?
- Which key initiatives and focus areas are needed to support a more systemic long-term transformation?

The specific targets and percentages in the action tracks (e.g. 60%, 80% or 90%) have been formulated to make the ambitions more tangible and open to discussion. They should not be regarded as definitive, scientifically established thresholds, but as benchmarks illustrating both the direction and the necessary scale of the transformation facing the building sector.

The seven pathways →

Seven pathways towards regenerative building

- Ecosystems as the starting point
- Innovate building materials
- Transform and activate existing buildings
- Scale circular material flows
- Share more – build and live smaller
- Optimise energy, water and environmental footprints throughout the entire life cycle
- Climate resilience as a foundation

Ecosystems as the starting point

The built environment must be shaped with living ecosystems as its foundation. Ecosystems are place-based systems of life, where organisms (plants, animals, microorganisms) interact with one another and with their physical surroundings (soil, water, air).

Soil conditions, water cycles, biodiversity and the functions of the landscape must guide where and how we build. This means planning and designing in ways that actively support and work with natural processes, cycles, and habitats.

The aim is a built environment that strengthens the resilience, connectivity and regenerative capacity of ecosystems. It is about creating living connections between people, other species and the surrounding system, and integrating solutions that enhance ecological function and biodiversity.

Targets for 2075:

- All building projects (including transformations) deliver net-positive impacts on biodiversity and ecological connectivity, both on-site and off-site.
- All buildings and built environments integrate physical habitats for plants, animals and microorganisms, supporting local ecological functions.
- No one has more than 100 metres to living nature from their home.
- Homes – including outdoor spaces – contribute to the experience of the seasons and ecosystems.

Innovate building materials

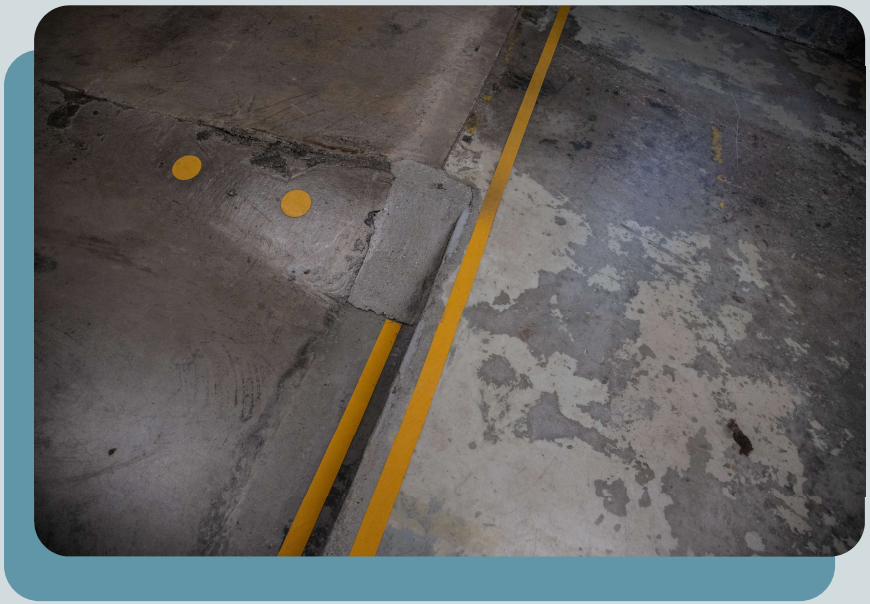
Materials used in buildings and the built environment play a decisive role in the sector's overall climate, resource and ecological footprint. Advancing regenerative building therefore requires innovation in the materials we build with.

This involves both developing new material types and improving existing ones to significantly reduce resource use, enhance carbon storage, and better align materials with natural cycles. At the same time, material innovation can unlock new regional value chains and architectural expressions, where buildings better reflects local resources, ecosystems and craft traditions. In this way, materials become an active driver of the transition.

Targets for 2075:

- 100% phase-out of fossil-based building materials, unless they are part of closed and circular loops.
- Biobased materials used in building deliver net-positive contribution to biodiversity and the functioning of terrestrial and marine ecosystems.
- At least 60% of biobased materials are sourced from waste and side streams.
- New materials and material technologies with significantly lower climate and resource footprints are widely adopted; materials based on secondary raw materials or production processes with substantially reduced emissions.

Transform and activate existing buildings



The existing building stock must form the foundation of future regenerative built environment. Instead of constructing new buildings, the focus must shift to transforming, reusing and activating existing buildings and spaces that have already required significant resources to create.

By preserving, transforming and reactivating existing buildings, the need for new materials, raw materials and energy is reduced. At the same time, the values embedded in the buildings – expressed through materials, cultural heritage, craftsmanship and local identity – are maintained and further developed.

This also involves adapting buildings to evolving needs over time. Through retrofitting, renovation and changes in use, existing buildings can continue to support new forms of living and activity, while gradually improving their performance in terms of climate, ressource efficiency and environmental impact.

Targets for 2075:

- At least 70% of existing materials are retained during renovation and adaptation.
- At least 80% of building space needs are met through transformation, conversion or change of use rather than new construction.
- Buildings are designed for a minimum lifespan of 100 years.
- The reuse of buildings and materials takes place as close to the site as possible.
- Local communities are always involved in transformation and refurbishment.

Scaling up circular material flows

A large share of the building sector's impact stems from the linear approach to material use: raw materials are extracted, used once, and end up as waste. To move towards a regenerative approach, materials must be kept in circulation and retain their value over time. Today, only around 0.17% of building materials are directly reused.

While innovation in building materials often focuses on developing and using better materials, this action pathway is about ensuring that materials are used again and again in closed, value-preserving loops.

This will reduce resource use, waste and emissions, ease pressure on nature and raw materials, and help build a more robust building sector that is less dependent on global supply chains and less vulnerable to geopolitical risks and price volatility.

Targets for 2075:

- The use virgin building materials is reduced by 80–90% per capita compared to 2020 levels.
- At least 50% of building materials are directly reused, primarily sourced from local or regional material flows, while maintaining their function and quality.
- All building materials are traceable, documented and designed for reuse through material passports, material banks and established circular markets.

Share more – build and live smaller

How much we build and how much space we use per person significantly impact the climate, resource and environmental footprint of the building sector. To stay within planetary boundaries, we need to reduce the demand for new floor space and make better use of what we have already build. By increasing space efficiency, sharing more functions and designing multifunctional buildings, we can reduce the need for private space without compromising quality of life. At the same time, shared facilities and outdoor spaces can strengthen communities, improve health and deepen the connection to nature.

Targets for 2075:

- Average living space is reduced to 30–35 m² per person (down from around 54 m² in 2025).
- At least 30–40% of functions such as work, guest accommodation, mobility and storage are shared.
- Shared functions are the default in new buildings and renovations, not optional add-ons.

Optimise energy, water and environmental footprints throughout the life cycle

Buildings and the built environment impact climate, resources and the environment throughout their entire lifecycle. To operate within planetary boundaries, energy use, water resources and environmental impact must be optimised across the entire lifecycle.

This action pathway focuses on developing buildings and urban environments that go beyond reducing their footprint to actively contributing to the systems they are part of. Buildings and neighbourhoods can generate, store and share renewable energy, manage water as a valuable resource and, through intelligent design and operational solutions, minimise their overall environmental impact.

Targets for 2075:

- Buildings make a net-positive contribution to energy and water cycles over their lifetime.
- Buildings and urban areas achieve local water balance: 100% of rainwater is managed, treated and reused locally.
- Buildings are considered part of the carbon capture infrastructure through the use of biobased materials – for example, by storing biogenic carbon in materials rather than burning it.

Climate resilience as a foundation

Climate change reshapes the conditions of the built environment. Climate resilience must therefore be incorporated as a fundamental design parameter. A resilient built environment works with, rather than against, nature's dynamics.

This action pathway focuses on planning and building based on the systems of the landscape and the natural environment. Through risk assessments, and integrated blue-green solutions, we can develop buildings and built environments that not only withstand climate change, but strengthen the overall resilience of the landscape and society.

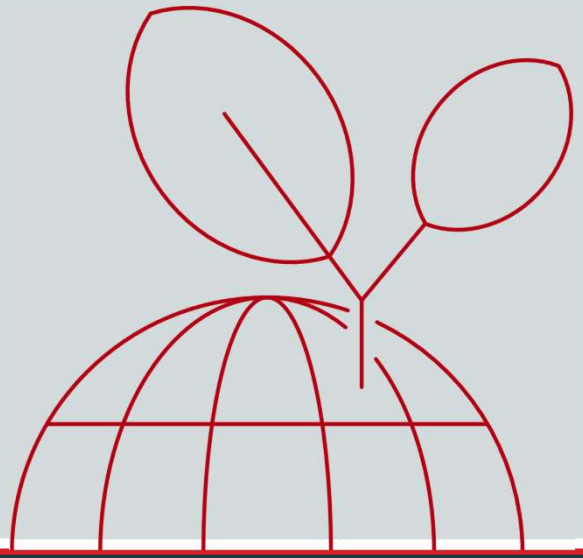
Targets for 2075:

- Design for flood risk is standard practise.
- Rainwater is managed locally through blue-green systems rather than hard drainage.
- Planning is based on the landscape's ecosystems, such as catchment areas, and transcends administrative boundaries.
- The design of buildings and sites is consistently informed by ecosystemic knowledge of the landscape, the water cycle and the impact of other larger systems.

Five recommendations for the ecosystem

A paradigm shift in building requires a new approach to how we plan, build and use our buildings and the built environment. Many stakeholders, including legislators and authorities, researchers and educational institutions, developers, consultants and architects, investors, the building industry, materials manufacturers, as well as civil society and residents, play a role in this transformation.

Across the guide's seven pathways, we therefore highlight five recommendations designed to ensure that efforts are aligned and collectively support the development of a built environment that contributes positively to both nature and human well-being within planetary boundaries.



- **Use regulation as a catalyst**
- **Develop new competencies**
- **Develop new business models with distributed risk**
- **Establish cross-sectoral collaboration models**
- **Strengthen practice-oriented research and innovation**

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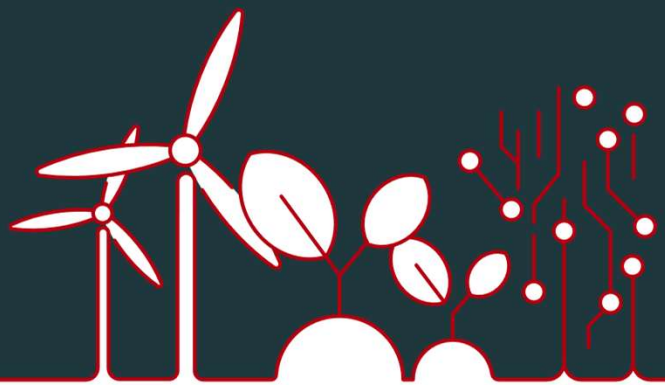

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