A New Economy for Europe's Built Environment White paper

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Dark Matter Labs

This White paper has been developed by Dark Matter Labs↗ as part of the New European Bauhaus lighthouse project, Desire, an Irresistible Circular Society ↗. Published in March 2024 for the New European Bauhaus Festival.

desire an irresistible circular society

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About this paper

This Working White Paper has been developed by Dark Matter Labs↗ as part of the New European Bauhaus lighthouse project, Desire, an Irresistible Circular Society ↗.

Published in March 2024, for the New European Bauhaus Festival in Brussels, this paper updates and adds to the contents of our Invitation Paper ↗, published in July 2023.

The textual and graphic content of it has been developed by Ivana Stancic and Indy Johar with valuable inputs from the interdisciplinary team across Dark Matter Labs: Oliver Burges, Alexandra Hansten, Leon Seefeld, Meggan Collins, Eunji Kang, Olaf Lewitz, Alicia Carvajal Rowan and editor Richard Martin.

This iteration draws on our interdisciplinary team's work and numerous dialogues with relevant European actors.

The Invitation Paper set the context and identified the problem space, hinting at potential solutions based on our research findings. Its launch at the UIA World Congress of Architects in July 2023 was followed by a Panel discussion. The updated paper builds on that discussion and numerous other conversations with relevant actors, exploring pathways that will move us closer to tangible action. The launch of the Paper is in April 2024 at the New European Bauhaus Festival in Brussels.

Our objective is to establish shared understanding among leading European actors responsible for driving the systemic transition of Europe's built environment. Together, we have sought to map out the landscape of constraint, abundance, opportunity and risk that will shape the new economy of our built environment.

We have explored how collective action can drive the transition at the necessary scale and speed, while examining how we can collectively rethink, redesign and drive new systems.

Our focus has been on identifying and outlining the capacity needed for innovation across sectors. This encompasses legislation, finance, civic structures, engagement, education, innovation, energy and resource governance, as well as our relation to nature, land and biodiversity.

This paper reflects the current status of our work in progress and ongoing dialogues. It will be maningful only if we evolve it through dialogues with partners willing to pioneer new ways together.

We are aware that many of the solutions and directions covered in the paper already exist on the ground across Europe and we explore initiatives and organisations implementing them.

Building on the findings in this paper, we are developing an Alliance Building Paper, developing pathways, defining clearer action plans and building Alliances in various geographies across Europe. Alliance Building paper will be published at the end of 2024.

We are committed to a collective effort and look forward to join forces with actors on the same mission, so please get in touch:

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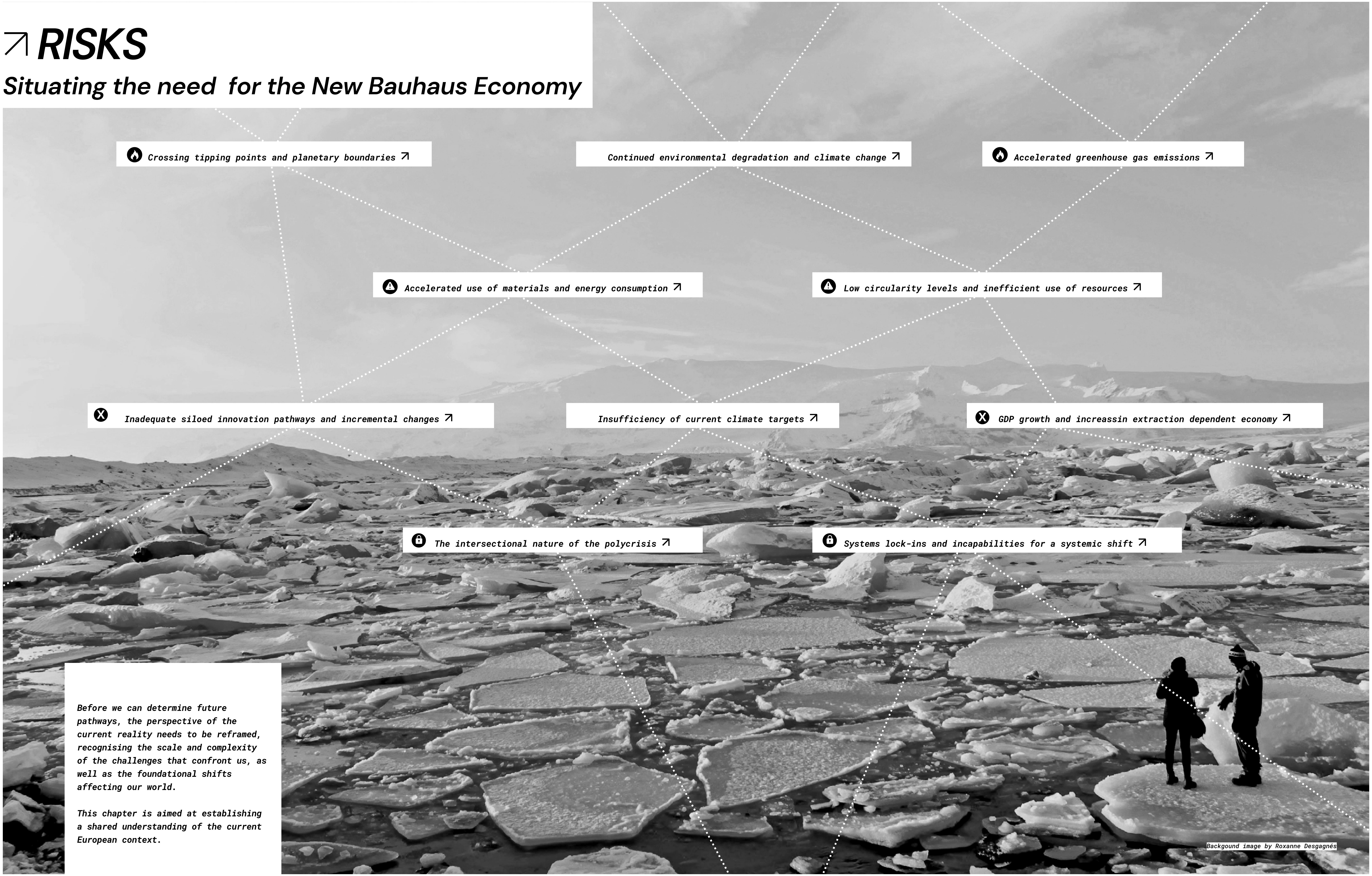
↗ RISKS

Situating the need for the New Bauhaus Economy



Crossing tipping points and planetary boundaries ↗

Continued environmental degradation and climate change ↗

Accelerated greenhouse gas emissions ↗

Accelerated use of materials and energy consumption ↗

Low circularity levels and inefficient use of resources ↗

Inadequate siloed innovation pathways and incremental changes ↗

Insufficiency of current climate targets ↗

GDP growth and increassin extraction dependent economy ↗

The intersectional nature of the polycrisis ↗

Systems lock-ins and incapabilities for a systemic shift ↗

Before we can determine future pathways, the perspective of the current reality needs to be reframed, recognising the scale and complexity of the challenges that confront us, as well as the foundational shifts affecting our world.

This chapter is aimed at establishing a shared understanding of the current European context.

Backgound image by Roxanne Desgagnés

↗ Even our most ambitious pledges[1] lead to climate disaster[2]

We are in the midst of a triple planetary crisis: the crisis of climate change[3], the crisis of nature and biodiversity loss[4] and the crisis of pollution and waste[5].

Most commitments for climate action are based on incremental change and siloed innovation, or centred on invalidated claims and greenwashing, hindering collective action.

↗ We have crossed Tipping points[6] and Planetary boundaries[7] facing threats of unprecedented magnitude

Five major natural systems are already at risk of crossing tipping points: the Greenland and West Antarctic ice sheets, warm-water coral reefs, North Atlantic Subpolar Gyre circulation and permafrost regions.

These tipping points pose threats on a magnitude never before faced by humanity[8].

In 2023, we had already crossed six out of the nine Planetary boundaries[9] with an increased likelihood of crossing them all.

This reality forces us to recognise the intersectional nature of the crises we are facing.

This polycrisis has to be addressed by reimagining our material and ecological world, economic growth and innovation models.

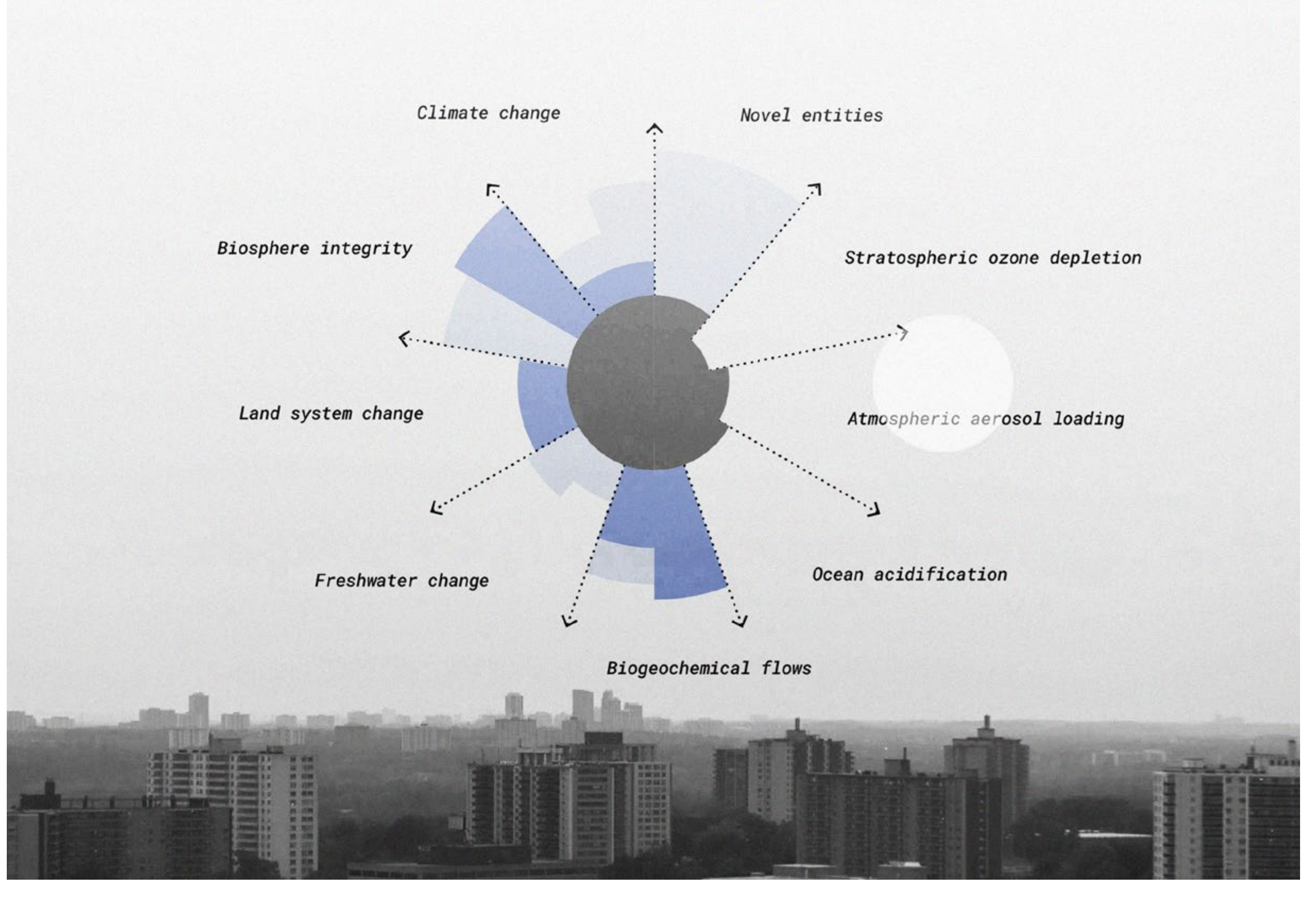


ILLUSTRATION:

Changes in relation to planetary boundaries, with measurements from 2009 overlaid with measurements from the 2023 and safe operating zones.

Visualisation by Dark Matter Labs based on sources:

↗ Stockholm resilience centre and J. Lokrantz/ Azote based on Steffen et al. Planetary Boundaries (2023)

Background image source:
↗ Designecologist

↗ 1 IPCC; AR6 Synthesis Report, Climate Change (2023)

↗ 2 PNAS, Climate Endgame: Exploring catastrophic climate change scenarios (2022)

↗ 3 UNEP, Climate action (2024)

↗ 4 UNEP, Nature action (2024)

↗ 5 UNEP, Chemicals and pollution action (2024)

↗ 6 Hans Joachim Schellnhuber, Tipping elements in the Earth System (2009)

↗ 7 Rockström et al, A safe operating space for humanity (2009)

↗ 8 Natural Resources Defence Council, Climate Tipping Points Are Closer Than Once Thought (2022)

↗ 9 Yale Climate Science, Breaking 6 of 9 planetary boundaries of safety (2023)

↗ 10 Climate Action Tracker, 2100 Warming Projections (2022)

↗ 11 Lawrence et al: Global polycrisis: The causal mechanisms of crisis entanglement (2023)

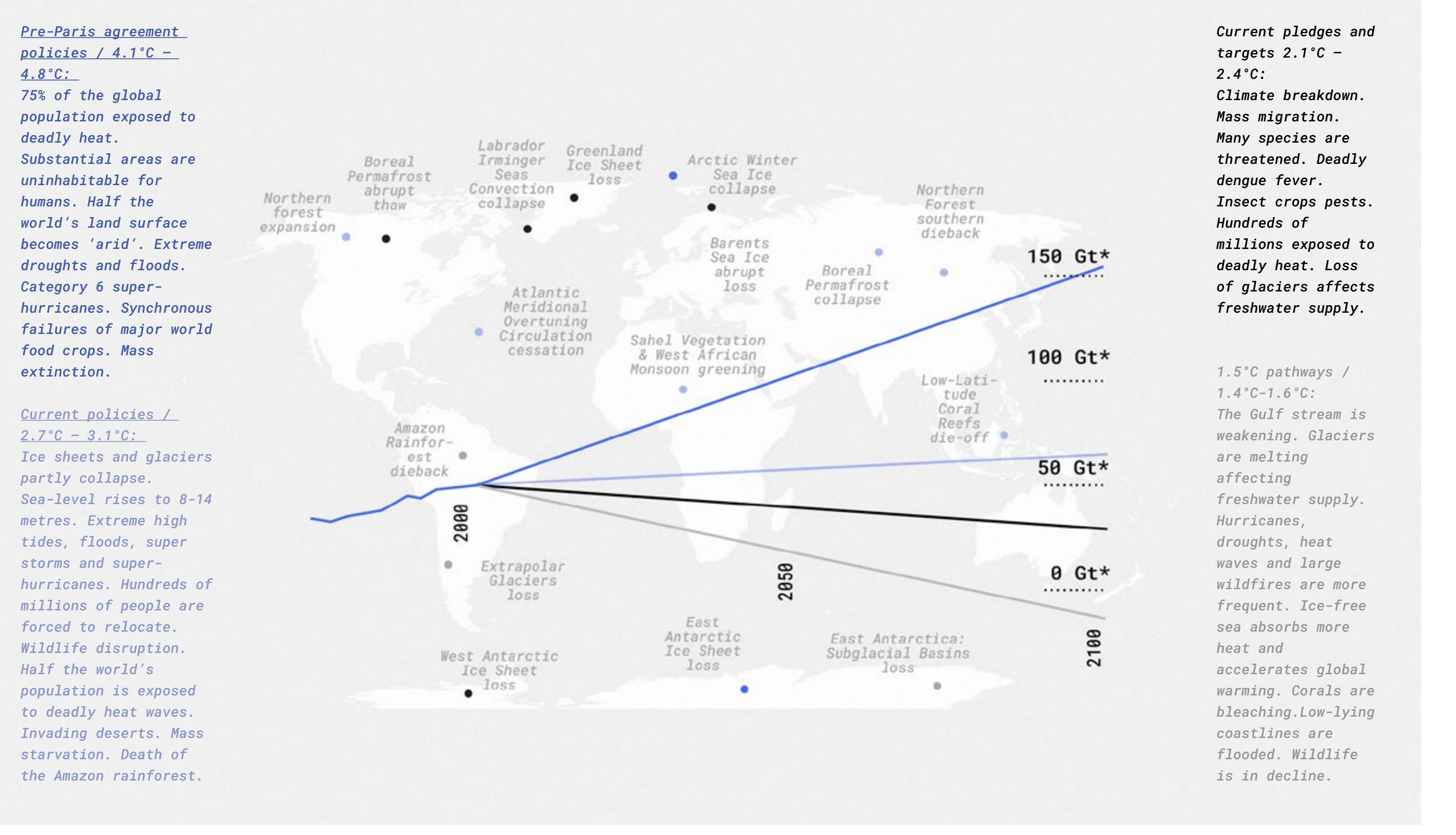


ILLUSTRATION:

Global policies and pledges effects on greenhouse gas emissions and warming scenarios, overlaid with data on the tipping points and effects and outcomes of those warming scenarios, highlighting the inadequacy of both current policies and ambitious pathways. Visualisation by Dark matter labs based on sources:

↗ Climate action data tracker, Policies and pledges, (2022)

↗ Massachusetts Institute of Technology, Climate Endgame: Exploring climate change scenarios (2022)

↗ Mark Lynas, Six Degrees of Climate Emergency (2020)

↗ Armstrong McKay et al. Exceeding 1.5°C global warming could trigger multiple climate tipping points (2022)

↗ Current pledges are fully inadequate

The current policies in place globally are projected to result in 2.7°C warming. When net-zero targets are included, warming is still expected to reach 2.1°C[10] by the end of the century.

This will have severe consequences: heat waves, food and water scarcity and coastal flooding, posing a threat to all forms of life.

This reality requires us to increase the ambition of policies and targets. We must recognise and adapt to the constraints necessary to achieve these targets, while developing agile forms of response and our innovation capacity in the face of unpredictable changes.

We need to increase the ambition of policies and targets, while developing agile innovation capacities

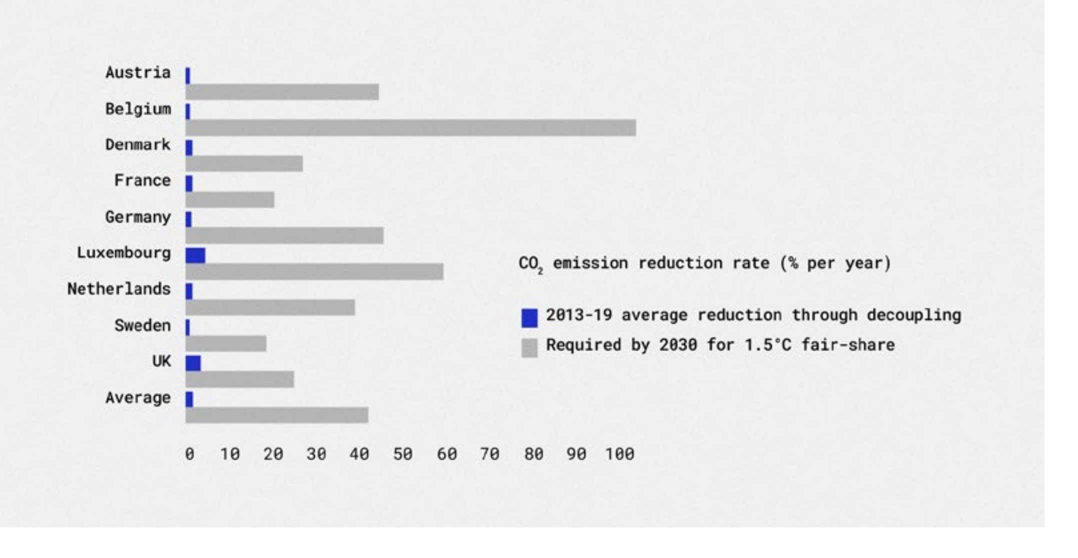


ILLUSTRATION:

The achieved emission reduction rates and nowhere close to the required emission reduction rates, for high-income countries to respect their 1.5°C fair-shares. Visualisation by Dark matter labs based on sources:

↗ Vogel, Hickel, An empirical analysis of achieved versus Paris-compliant CO2-GDP decoupling, Lancet Planet Health (2023)

↗ The need for fundamental transformation at speed and scale

The extent and severity of the polycrisis[11] is forcing us to systematically re-evaluate the speed and scale of the transition facing our built environment.

The original Bauhaus movement drove the industrial transformation of design and manufacturing in the twentieth century.

New Bauhaus movement must drive a redesign of our systems, fundamentally transforming our relationships with the planet.

The transition required is structural and systemic. It is likely to change how and what we account for, how we interact with and use spaces, how we live and work, and how we design our built environment.

Beyond design and creativity, however, this will necessitate new ethics, governance, institutions, accounting regimes, regenerative investments, smart services and more. This is nothing less than a holistic reinvention of our systems, ushering in the New Economy of European built environment.

↗ Our economic models are the main cause of environmental damage

Our current development models result in dangerously accelerated use of materials, increasing energy consumption and greenhouse gas emissions.[12]

Historically, there is a minority of the world's nations that not only have overshot their own carbon budgets[13]*, but have consumed the rest of the world's as well.*[14]

↗ 12 UNEP, Global Resources Outlook press (2024)

↗ 13 Evans, Which countries are historically responsible for climate change? (2021)

↗ 14 Thompson et al., Wealthy Countries Have Blown Through Their Carbon Budgets (2023)

↗ 15 Ritchie et al., CO_2 and Greenhouse Gas Emissions, Our World in Data (2023)

↗ 16 Kuperus Heun et al., Meeting 2030 primary energy and economic growth goals (2019)

↗ 17 European Environment Agency, The Jevons paradox for energy consumption (2021)

↗ 18 Berners-Lee M, There is No Planet B (2021)

↗ 19 Richties, Many countries have decoupled economic growth from CO2 emissions (2021)

↗ 20 Ellen MacArthur Foundation, How the Circular Economy Tackles Climate Change (2019)

↗ 21 Our World in Data, Cumulative CO_2 emissions by world region (2023)

↗ 22 Richtie, Who has contributed most to global CO2 emissions? (2021)

↗ Current green growth isn't viable

The global GDP is linked to 99% of energy and material consumption and pollution[15], while current economic forecasts predict an average of 2–3% GDP growth per year. This means we will double our energy and material use every twenty-five years.

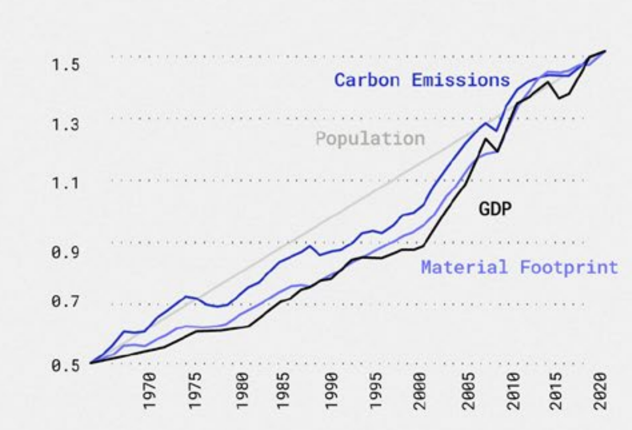
Decarbonisation is not possible without decoupling economic growth and wellbeing from resource use and environmental impact.

Despite impressive technological and efficiency gains, absolute decoupling of GDP from energy on a global scale has not been achieved to date.[16] This is because of a rebound effect – known as the Jevons paradox [17]– where improvements in technological efficiency prompt increased demand and greater resource consumption.[18]

We can see some minor tendencies to decouple economic growth from carbon emissions[19] but that is nowhere near effective enough. Such decoupling happens in wealthier countries that already have significantly overshot the planetary boundaries.

These relationships are complex, but they highlight that our current notion of green growth isn't viable.

Overshooting our planetary boundaries won't decrease without fundamental changes in our economy.[20]



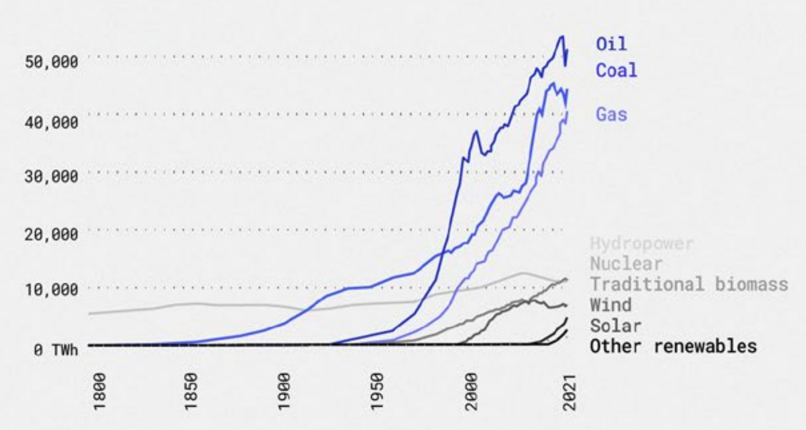


ILLUSTRATION:

Carbon emissions are directly correlated to material consumption and GDP

↗ Wiedmann et al., Scientists' warning on affluence (2020)

Fossil fuels remain our primary energy sources

↗ Our World in Data, Energy consumption by source (2017)

↗ The inequality of carbon, energy and material footprints

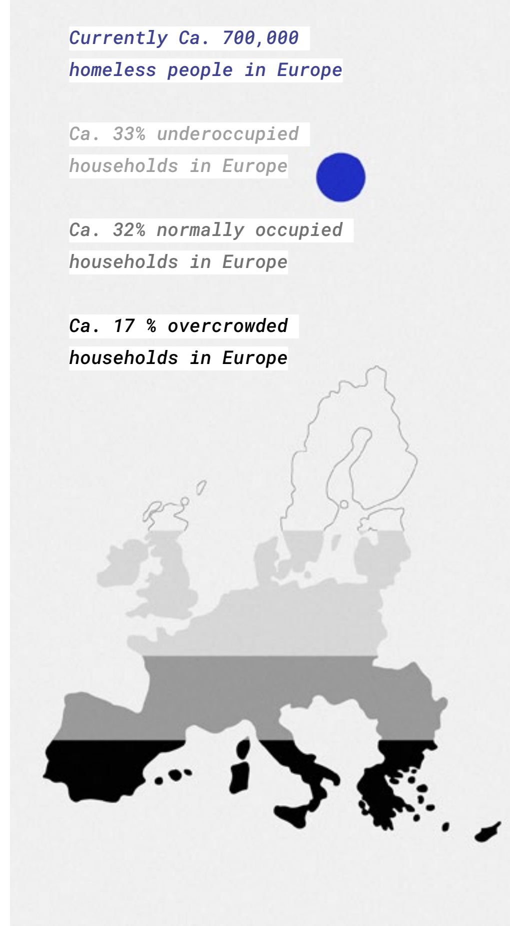
Of the 1.5 trillion tonnes of greenhouse gases[21] emitted throughout history, the United States has contributed more than any other country, 400 billion tonnes or 25%. The European Union and the UK are responsible for 22%, while China has emitted 12.7% of the historical total.

Countries like India and Brazil have recently started to largely emit, did not do so in the past. Africa has always contributed a small percentage of emissions per capita.[22]

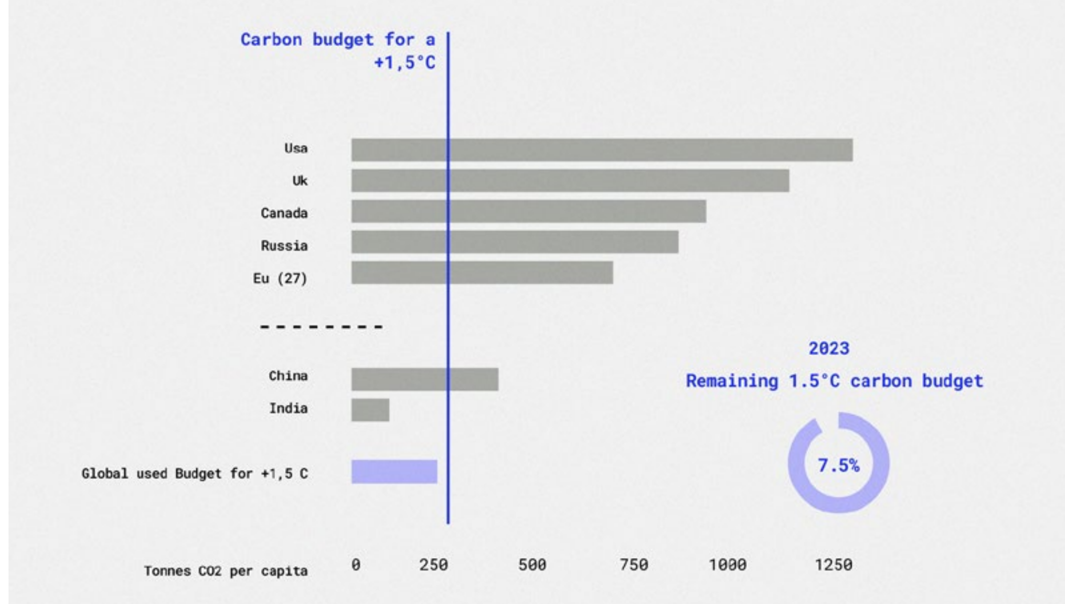
There are vast differences in energy consumption across the world. Europe's energy consumption (38.3 kWh), for example, is ten times higher than Africa's (3.9 kWh). Within Europe, Norway's energy use (96.9 kWh) per capita is five times higher than Latvia's (21.4 kWh).[23]

While the global average material footprint is approximately 12.4 tonnes per capita, Europe's average material footprint is 15 tonnes per capita, with Finland topping the list at 46 tonnes per capita. Malta, by contrast, is found at the bottom of the list with a footprint of 7 tonnes per capita.[24]

Finland generates the most waste per person in the EU (20.9 kg), twenty-four times more than Croatia which generates the least (1.5 kg).[25] The average EU citizen's waste footprint in 2020 was 4.8 kg, seven times higher than the world average of 0.7 kg per capita. [26]



Overall, high-income countries are responsible for six times more material use and ten times more climate impacts per capita compared to low-income countries.[27]



↗ European comfort standards and systemic inefficiencies play a significant role in climate degradation

As comfort standards, energy-intensive lifestyles and resource-heavy infrastructures rise, demand for energy and increased resource extraction follows. Combined with continued reliance on fossil fuels, this drastically increases carbon emissions, exacerbating the climate crisis.[28]

Currently, approximately 18% of European housing units remain vacant.[29] Public buildings such as schools, municipal offices and churches are only occupied about 20% of the time, while, on average, office space is used 35% of the time.[30] Infrastructure associated with road vehicles takes up 80% of public space.

Products, mostly privately owned, are heavily under utilised. On average, cars are parked 95% of the time.[31] 92% of households own a washing machine, but only use it 5% of the time.[32] Private ownership, under utilisation and the linear 'take-make-waste' mindset significantly increase resource demand.

We underutilise our housing (18% vacant, 33% underutilised) public buildings (20% used) and offices (35% used), as well as products like cars (5%) and household appliances (5%)

Yet we continue to build new, causing further environmental damage.

ILLUSTRATION:

Data on Household occupancy

↗ European Commission, Vacant real estate (2018)

↗ Eurostat: Is your home too crowded (2020)

↗ 23 Richtie, How much energy do people consume? (2021)

↗ 24 Eurostat, Material footprint (2024)

↗ 25 Eurostat, Waste generation per capita (2024)

↗ 26 The world bank, A Global Snapshot of Waste Management (2018)

↗ 27 UNEP, Global Resources Outlook 2024: (2024)

↗ 28 Eurostat, Energy statistics (2024)

↗ 29 Foundation Abbé Pierre, Vacant real estate (2016)

↗ 30 Forbes, Office Buildings Are Still Less Than 50% Occupied (2023)

↗ 31 Barter, Reinventing Parking (2013)

↗ 32 EEA, Europe's consumption in a circular economy (2023)

ILLUSTRATION:

Historical cumulative per-capita carbon emissions, distributed equally to all currently living people

↗ Hickel, Quantifying national responsibility for climate breakdown

↗ Carbon brief, How colonial rule radically shifts historical responsibility for climate change

↗ Delusions of the green transition

↗ Risks of invalidated environmental definitions

Originally, terms such as circularity, carbon-neutrality and regenerative design are well-defined, describing methods that sucesfully address challenges caused by the climate crisis.

Misinformation and greenwashing distorted original meanings of concepts for transition, undermining their utility and hindering collective action.

Greenwashing, either through naïvety or fraudulence, has become commonplace,[41] distracting from genuine attempts to take climate action and raise awareness. It arises in part from the need for compliance with environmental regulations (such as those in force in the EU),[42] but highlights the shortfall between organisational claims and meaningful action.

↗ Circularity is not happening despite its potential and popularity

It is possible to decouple economic growth from resource use and the environmental impacts they cause. This can be achieved by replacing prevailing linear growth models with regenerative and circular models.[33] Moving towards a shared circular economy is vital for meeting climate targets. It could cut greenhouse gas emissions up to 44% by 2050.[34]

In practice, there is not much evidence of circularity happening. The global economy is now only 7.2% circular and declining (9.1% in 2018, 8.6% 2020, 7.2% in 2023) because of rising material extraction.[35] Material recovery rates across the EU are still far from acceptable[36] while material extraction continues to increase.

Rising levels of extraction means that more than 92.8% of materials are either wasted, lost or remain unavailable for reuse as they are locked into buildings and machinery.

↗ Biomaterials could be as harmful as traditional practices if biodiversity and regenerative land use are not deeply embedded in their production

The increased use of timber and other biomaterials has the potential to dramatically reduce the embodied carbon[37] emissions of buildings, providing pathways for long-term carbon storage and supporting more regenerative forestry practices.

However, there are also significant risks associated with an unregulated increase in demand for timber. These include deforestation, reduced biodiversity and loss of habitats.[38]

A timber building harvested from old growth forests generates similar, if not higher, carbon emissions than a typical concrete structure.[39]

The current production of hemp, straw, timber and other biomaterials often relies on monoculture growth and unsustainable processing, which is harmful to the land and to biodiversity.[40]

To succeed in the transition toward biomaterials, we will need to develop regenerative land use methods, involving sustainable biomaterials growth and harvesting practices, in terms of biodiversity and land restoration and social justice.

↗ 33 UNEP, Global Resources Outlook press (2024)

↗ 34 Ellen MacArthur Foundation, How the Circular Economy Tackles Climate Change (2019)

↗ 35 Circle Economy Foundation, The Circularity Gap Report 2023 (2023)

↗ 36 Interreg Europe, Collection and recycling of construction waste: (2022)

↗ 37 UCL Engineering, Embodied Carbon: Factsheet (2023)

↗ 38 Forest Research, Forest carbon stock (2018)

↗ 39 IISD, Emission Omissions: Carbon accounting gaps in the built environment (2019)

↗ 40 UNEP, Building materials and the climate: constructing a new future (2023)

↗ 41 Belitardo, Greenwashing in Architecture: Identifying False Sustainable Strategies (2023)

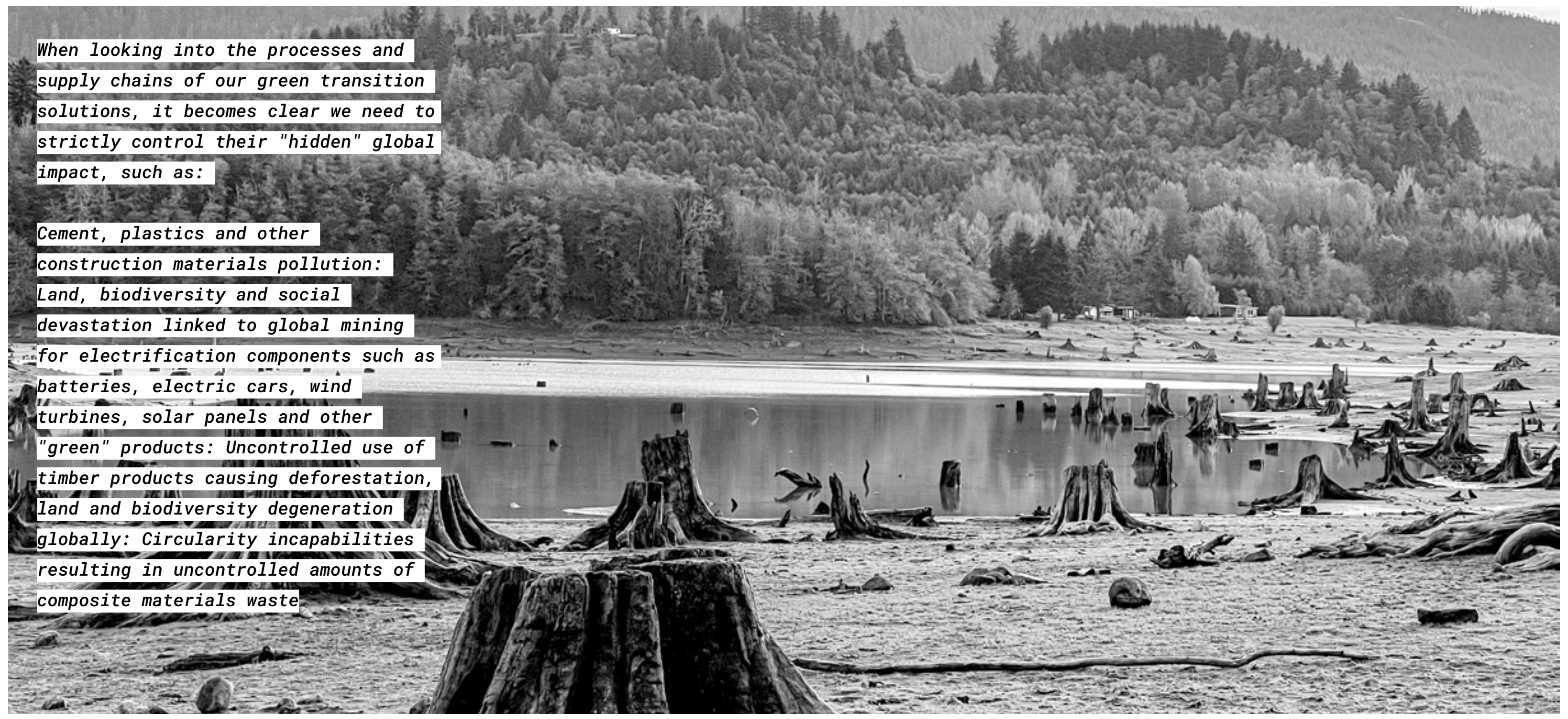


IMAGE:

Global impacts of the green transition concepts

Background image source:
↗ Aishwarya Gunde

↗ Tensions and risks of energy transition

1/Material intensity and embodied carbon: Clean energy technologies reduce the operational carbon, but require more resources and energy to produce, which generates considerable embodied carbon emissions[43] seriously impacting the planned green transition.

2/Supply risks: It is estimated that three billion tonnes of mined metals and minerals will be needed to power the energy transition.[44] This requires a rapid increase in supply of critical minerals such as lithium, nickel, cobalt, manganese and graphite for batteries, rare earth elements for permanent magnets in wind turbines and electric motors, copper and aluminium for electricity networks.

The mining and processing landscape of critical materials is geographically concentrated, with a select group of countries playing a dominant role, and China dominating the processing stage.

3/Environmental impact: Green energy transition will catapult the mining industry to the most polluting industry[45] as it depends on rare minerals which causes heavy metal discharges, acid rain and contaminated water sources. The location of these critical materials is often in the vicinity of carbon sinks already in need of restoration.[46]

4/Geopolitical and social tensions: The combination of resource concentration and material scarcity will drive geopolitical risks, tensions, migrations and violence.[47] Mining and the processing of materials at the necessary scale will intensify already widespread exploitative labour practices and human rights abuses.[48]

The installation of renewable energy systems is lower than the growth of overall energy consumption. We are not seeing energy transition but energy addition. [49]

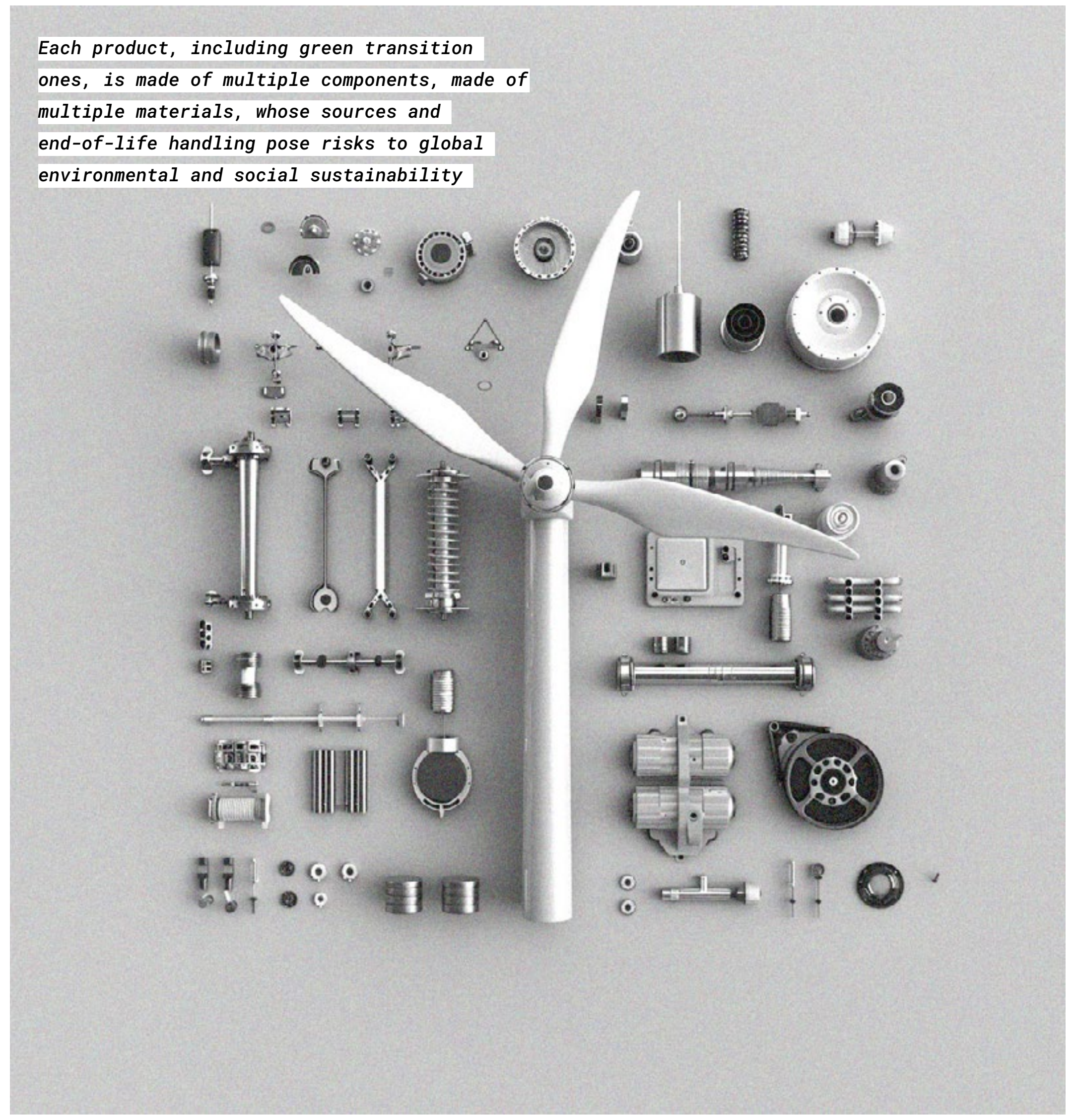


IMAGE:

Sourcing and end of life of green energy components have a significant global impact

Visualisation by Dark Matter Labs based on:

↗ Visualizing All the Metals for Renewable Tech (2021)

Rebound effect happens when optimising a single-objective exacerbates others [51] *while reductionist approaches, such as carbon-tunnel, fail to consider impacts on the entire system.*

↗ Risks of single-objective optimisation and their impacts on the system

There's a significant risk associated with adopting single-objective optimisation when considering net-zero targets and policies. This has been well illustrated by carbon-only approaches, known as 'carbon tunnel vision'.[50] Reductionist approaches fail to consider interdependent challenges associated with the polycrisis.

The same risks face all green transition pathways, where carbon reduction by consumption of a certain product: timber construction components, heat pumps, wind turbines, solar panels, doesn't account for the entire global systemic impact. Mass uncontrolled use of timber, for example, can cause deforestation and biodiversity loss, while mass use of batteries can cause land degradation and increased embodied carbon.

That's why a multi-objective systemic approach is key, taking into account greenhouse gas emissions, material extraction, biodiversity, water cycles, land use, inequality, health and wellbeing, and other factors when optimising, making sure to avoid hidden negative effects.

↗ 42 European Parliament, Substantiation and communication of explicit environmental claims (2023)

↗ 43 IISD, Green Conflict Minerals (2018)

↗ 44 Mining Watch, The terrible paradox of the green energy transition (2021)

↗ 45 Green Cross Switzerland, Pure Earth, 2016 World's Worst Pollution Problems (2016)

↗ 46 Strassburg et al. Global priority areas for ecosystem restoration. Nature (2020)

↗ 47 Lèbre et al. The social and environmental complexities of extracting energy transition metals (2020)

↗ 48 IEA, The Role of Critical Minerals in Clean Energy Transitions (2021)

↗ 49 The Energy Institute, Statistical Review of World Energy (2024)

↗ 50 Cognizant, Moving beyond carbon tunnel vision with a sustainability data strategy (2022)

↗ 51 Guzzo et al., DTU, Rebound effects in sustainability transitions (2023)

↗ Material crisis

↗ Resource use is the main driver of the triple crisis of climate, biodiversity and pollution

Our economies have for too long been built on relentless and senseless extraction, involving the use and disposal of natural resources. Materials extraction is responsible for 60% of global heating impacts, 40% of air pollution and more than 90% of land-related biodiversity loss and water stress.[53]

The green transition, which has been aligned with meeting the goals of the Paris Agreement and net-zero targets, is estimated to require a 600% increase in mineral demand by 2040.[54] In total, between now and 2050, the energy transition could require up to 6.5 billion tonnes of materials, of which 95% will be accounted for by steel, copper and aluminium.

Some other materials, even though small in terms of tonnage, are critical for their role in industry. There has been a surge in the demand for cobalt, lithium, and rare earth minerals, given their crucial role in the manufacturing of wind turbines, electric vehicles and energy storage batteries. The demand for pure lithium will be fifteen times current levels by 2030.[55]

There are multiple challenges our material economy will face in the future. Just to give a few examples: Electric vehicles use almost ten times more critical raw materials[56] than conventional cars. Solar and wind facilities require up to fifteen times more concrete, ninety times more aluminium, and fifty times more iron, copper and glass than fossil fuel or nuclear energy counterparts.[57]

As global circularity levels are low, we keep on exploiting virgin materials and producing massive amounts of waste. For example, the process of mining rare earths generates about 2,000 tons of toxic waste for every ton of rare earth extracted.[58]

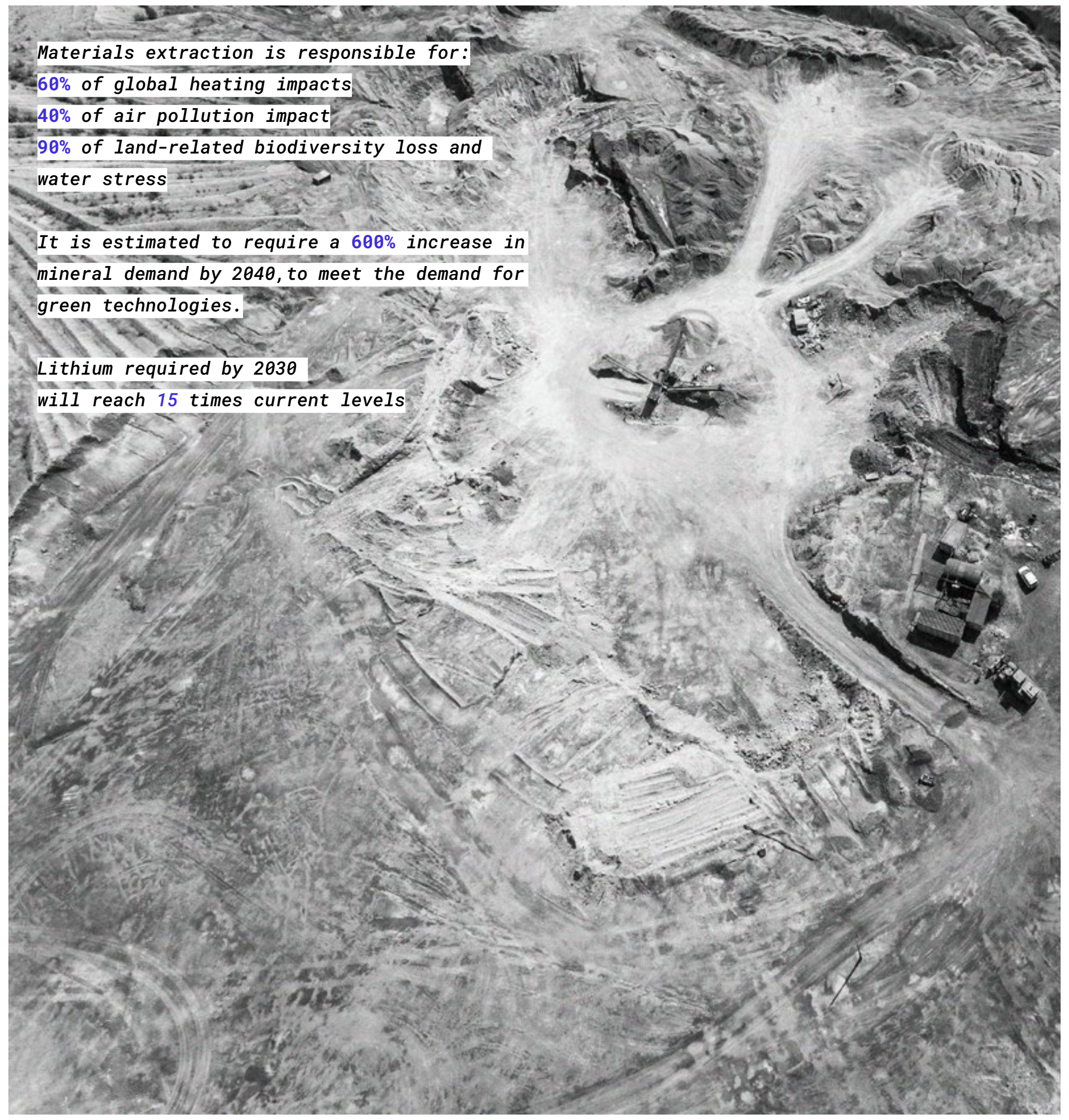


IMAGE:

Material extraction historical and predicted growth, Based on source:

↗ UNEP, Global Resources Outlook press (2024)

Photography source:
↗ Curioso Photography

The global material footprint has risen 300% over the last fifty years and its annual levels will go up another 200% by 2050[52] if the current trajectory continues.

The construction sector is responsible for over 50% of EU's extracted material,[59] 40% of energy use (80% fossil fuels), 40% of waste[60] and 37% greenhouse gas emissions.[61]

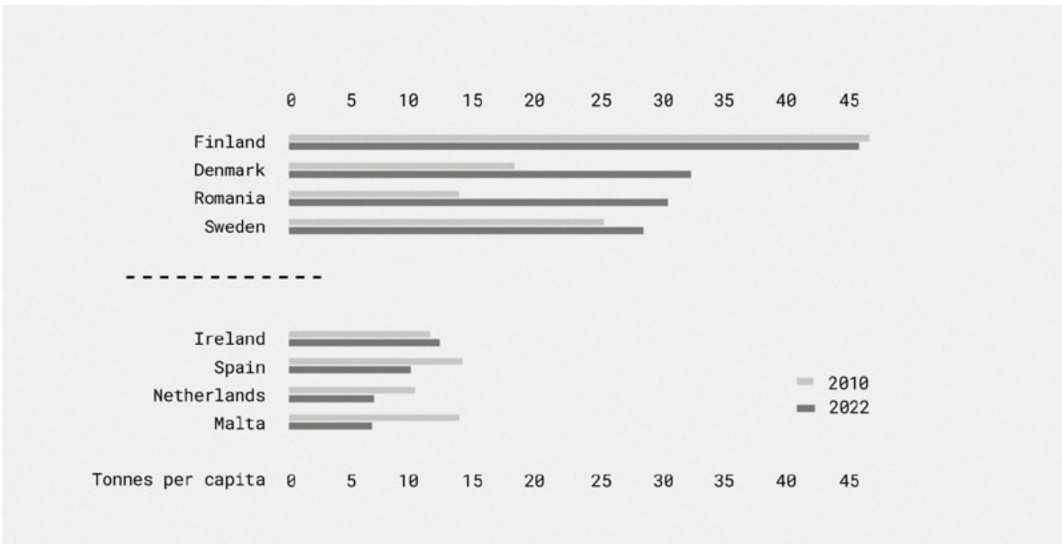


ILLUSTRATION:

Material footprint among EU member states. Visualisation by Dark Matter Labs based on:

↗ European Environment Agency , EU Member States' material footprints (2023)

↗ 52 OECD, Global Material Resources Outlook to 2060 (2018)

↗ 53 UNEP, Global Resources Outlook press (2024)

↗ 54 IEA, World Energy Outlook 2023 (2023)

↗ 55 Energy Transitions Commission, Material and Resource Requirements for the Energy Transition (2023)

↗ 56 European Commission, Critical raw materials (2022)

↗ 57 International Energy Agency, World Energy Outlook Special Report(2023)

↗ 58 Harvard International Review, The Complicated Legacy of Rare Earth Mining (2023)

↗ 59 European Commission, Buildings and construction (2022)

↗ How we develop built environments needs to change urgently and profoundly

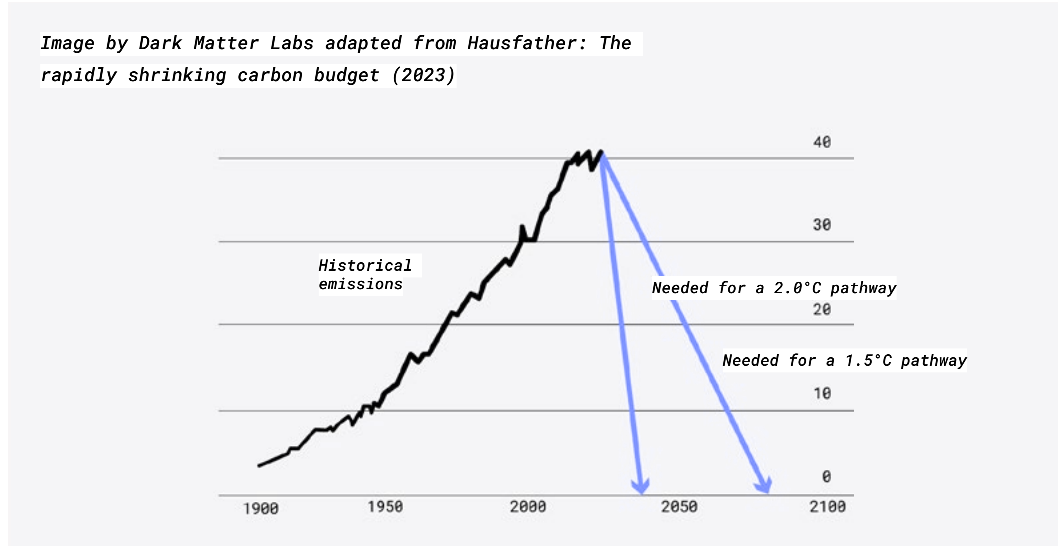


ILLUSTRATION:

Global CO2 pathways needed to stay within the remaining carbon budgets, Adapted from:

↗ Hausfather, The rapidly shrinking carbon budget (2023)

↗ IPCC, Special report summary for policy makers (2023)

↗ The role of Europe

The imperative for Europe to spearhead global environmental stewardship and innovation has never been more pronounced. Given its historical carbon footprint—one of the most significant on a global scale—Europe, particularly Northern European nations, bears a unique dual responsibility.

These countries have not only been voracious consumers of the planet's resources historically, but many continue to do so at an unsustainable rate.

The urgency for Europe to redefine its economic models and consumption patterns is multi fold, and it includes Enabling global sufficiency by significantly reducing its own resource consumption and carbon emissions; Pioneering new economic paradigms; Leading by example that prosperity can be decoupled from environmental degradation; Leveraging demand-side power as a powerful tool in reshaping global supply chains; Facilitating a just transition while moving away from its traditional unsustainable economic models, amongst others.

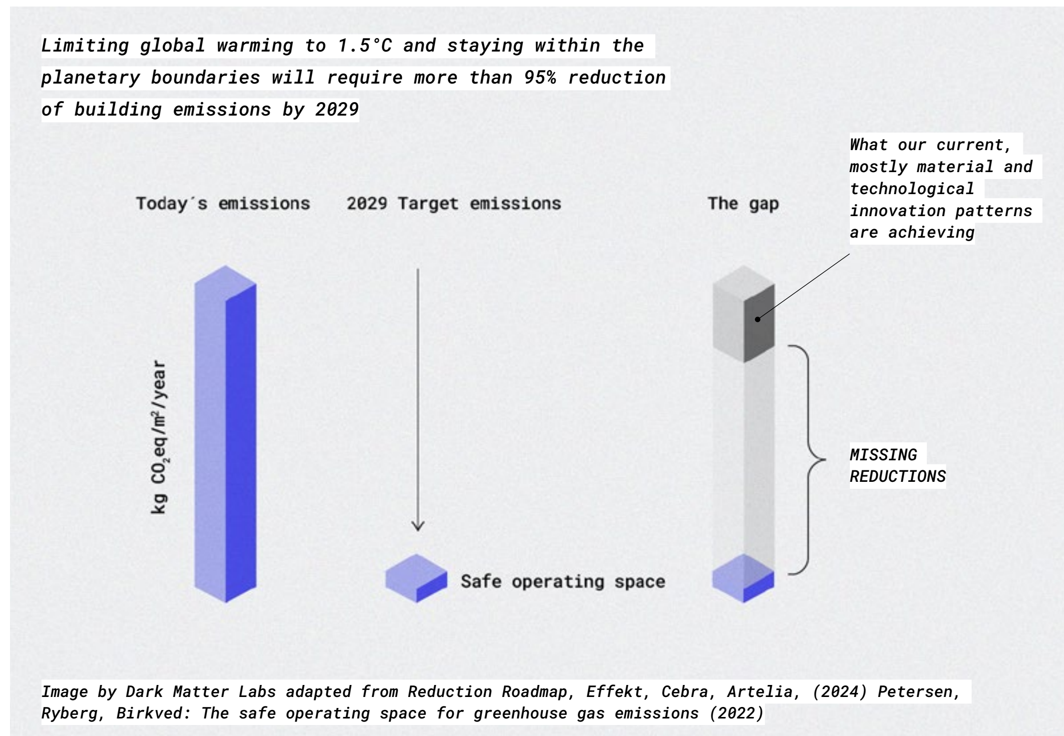
Europe's leadership in this transition is not optional but a necessity for the health of our planet. The continent's actions must set precedents and offer blueprints, and ultimately contribute to a global effort to combat climate change and environmental degradation.

↗ European carbon budget could run out in two years

The EU's total remaining built environment carbon budget for a 50% chance of limiting warming to 1.5°C is around 6 Gt CO2e[62], apportioned by population and current sector emissions share.

In a business-as-usual scenario, the European construction sector will exceed its allocated carbon budget for limiting global warming to 1.5°C in 2026, for 1.7°C in 2029, and for 2.0°C in 2031.[63]

Limiting global warming to 1.5°C and staying within the planetary boundaries will require around 95% reduction of building emissions by 2029 [64]



↗ 60 Sizirici et al., A Review of Carbon Footprint Reduction in Construction Industry (2021)

↗ 61 UNEP, Global Alliance for Buildings and Construction, Tracking progress (2024)

↗ 62 Pierre Friedlingstein et al., Global Carbon Budget 2022 (2022)

↗ 63 Circular Buildings Coalition, Towards a Circular Economy in the Built Environment (2023)

↗ 64 Petersen, Ryberg, Birkved: The safe operating space for greenhouse gas emissions (2022)

ILLUSTRATION:

The carbon footprint reduction needed for European countries to get within the planetary boundaries,

Visualisation by Dark Matter Labs based on:

↗ Reduction Roadmap, Effekt, Cebra, Artelia, (2024)

↗ Kuittinen, Building within planetary boundaries, Buildings and Cities (2023)

↗ Petersen, Ryberg, Birkved: The safe operating space for greenhouse gas emissions (2022)

↗ SHIFTS

Foundational shifts needed for the new economy

Current climate and resource constraints don't allow for optimisation or reductionism of existing models. They require a revolution in our approach to civilisational development.

In this chapter we explore those foundational shifts.

ILLUSTRATION:

We are a multitude,

Visualisation by Dark Matter Labs, adapted from various sources

↗ World health Organisation, One health (2017)

↗ Mang, Reed, Regenerative Development and Design (2012)

↗ United Nations, Sustainability (1987)

↗ Shifting from extraction to regeneration

↗ A transformative shift from extraction to regeneration

A radical U-turn is required in our developmental patterns if we are to achieve goals associated with a 1.5°C or 2.0°C temperature rise.

Our current theory of economy is built on transaction and extraction.

The polycrisis demands a radical theoretical overhaul, moving us towards and returning us to regenerative relationships with the world around us.

As humans, we need to recognise our entanglement with and dependency on flora, soil, water, space and time. We must share resources and environments with other species, demonstrating fluidity in how we relate to them. This necessitates a shift towards ecological relations, the growth of biodiversity and environmental values and acknowledgment of the importance of One Health in the very deep codes of our economy.

ILLUSTRATION:

Contrast of current conventional practices and the needed regenerative practices

Visualisation by Dark Matter Labs, adapted

↗ Bill Reed, Regenerative Development and Design

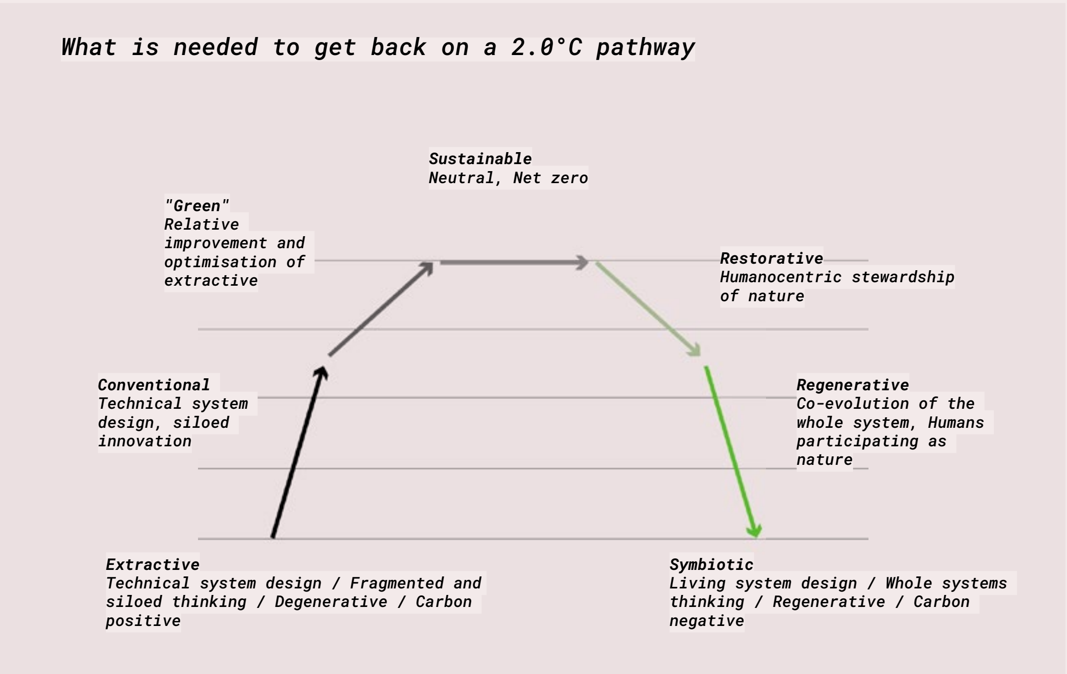
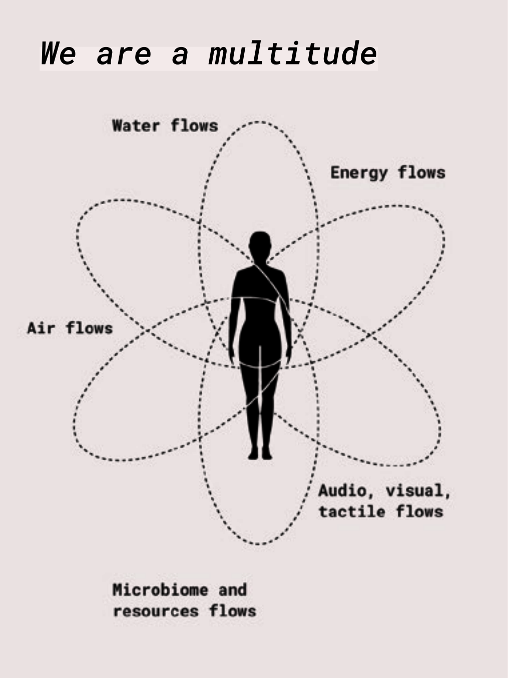


Image by Dark Matter Labs adapted from Reed: Regenerative Development and Design



↗ Transcending humanism

The western civilisation worldview, based on Humanism, has been the basis of our deep mindset code for centuries, alongside Enlightenment altering our theories of classification and separation.

That is why even our most progressive theories still position humans as apart from rather than a part of nature, disregarding our entangled coexistence.

To recast the future and address our real-world challenges, we must reimagine ourselves and remake our symbiosis with the world. We need a fundamental shift in understanding we are not individuals, but a multitude; we are not surrounded by water, air, microbiome, nature, energy. We are all of that, and all of that is us.

Regenerative and symbiotic world views have been present in many global cultures. Our economy needs to learn from it, embed them into its deep codes, ending extraction and evolving regenerative patterns.

How do we replace notions of dominion, separation and control with an approach centred on collectivity, symbiosis and care?

↗ Regenerative indicators

Terms like regeneration and regenerative have been trending, yet remain complex to define, let alone measure.

The choices we make in shaping our built environment impact natural ecosystems across multiple levels – from local scale biodiversity, to bioregional soil health, to global mineral extraction, deforestation and the impact on freshwater ecosystems.

Restoring and regenerating these natural systems, at the necessary speed and scale, requires implementation of regenerative practices that are both locally adapted and globally connected.

Living systems are dynamic and interdependent, in a state of constant evolution, generating an entangled array of values.

Measuring the impact of regenerative practices on living systems must therefore recognise entangled systemic value flows. Current economic approaches fail to account for this complexity.

Regenerative indicators could be used to measure the state of socio-ecological systems, helping us better understand how we can live in symbiosis with nature.

This would move us beyond notions of sustainability, enabling us to create healthy, counter-extractive communities and bioregions. It could guide municipal investments in the built environment and be integrated into planning policies, ensuring that ecological and social impacts are accounted for within and beyond the city boundary. Such policies would need to account for both direct (production) and indirect (consumption) impacts across technical and biological nutrient cycles.

Today, there's no standardised approach to accomplish this, and it is complex to develop and implement these indicators. However, they are crucial for holistic understanding and actions.

Existing assessment methods only focus on minimising our negative impact, while we need to move beyond the zero and start planning for regenerative positive impact of our actions.

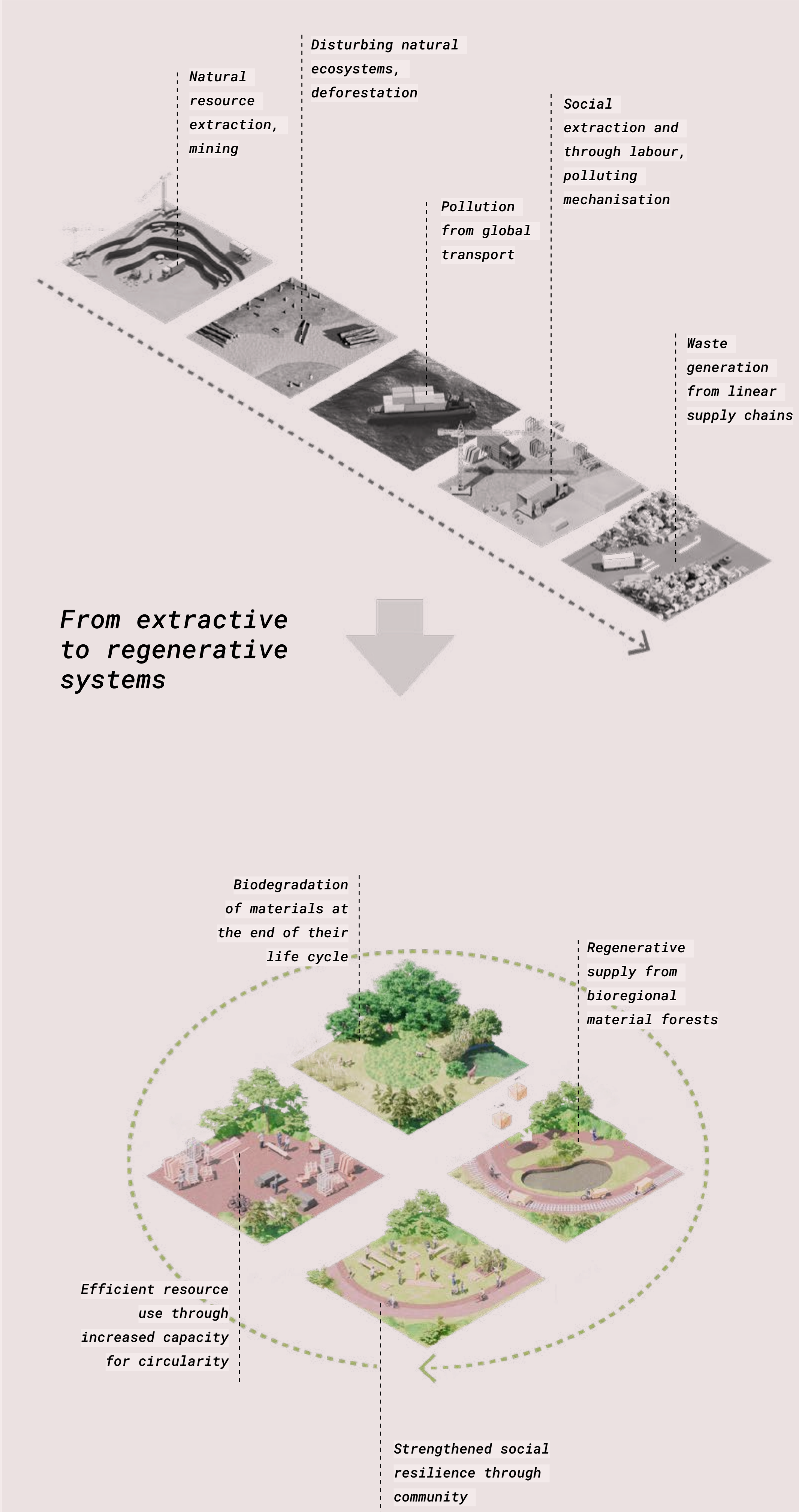


Image by Dark Matter Labs

↗ Albrecht, Van Horn, Exiting the Anthropocene and Entering the Symbiocene (2016)

↗ Scharmer, From Ego-System to Eco-System Economies (2013)

↗ Reed, Mang, Regenerative Development and Design (2012)

↗ Pascual et al., Diverse values of nature for sustainability (2022)

↗ Design for Planet: The Big Picture Indy Johar & Kate Raworth (2019)

ILLUSTRATION:

From linear global material supply chain to local regenerative material supply loop,

Visualisation by Dark Matter Labs

↗ Shifting from balance sheets to value flows

↗ Dr Iain McGilchrist: We are living in a deluded world (2023)

↗ Shifting from static assets to dynamic agencies

Our current economic contractual landscape has reduced entanglement to single point optimization and notions of assets, ownership and extraction. But our understanding of value should recognise the primary importance of dynamic and entangled relationships.

Example 1: Currently, the only way we value a tree in our economy is through its use as timber, because that is the only way a tree can be valued in an extractive linear model.

As all the other ecosystem services and benefits are unvalued, trees aren't a popular investment in urban areas, even though most of our cities have to change their canopy cover by up to 40% to deal with climate adaptation.

Once we start to account for the risks and benefits of having trees in urban areas, we can introduce fundamentally different financial concepts.

A shift towards seeing multiple capital outcomes, on an example of planting a tree

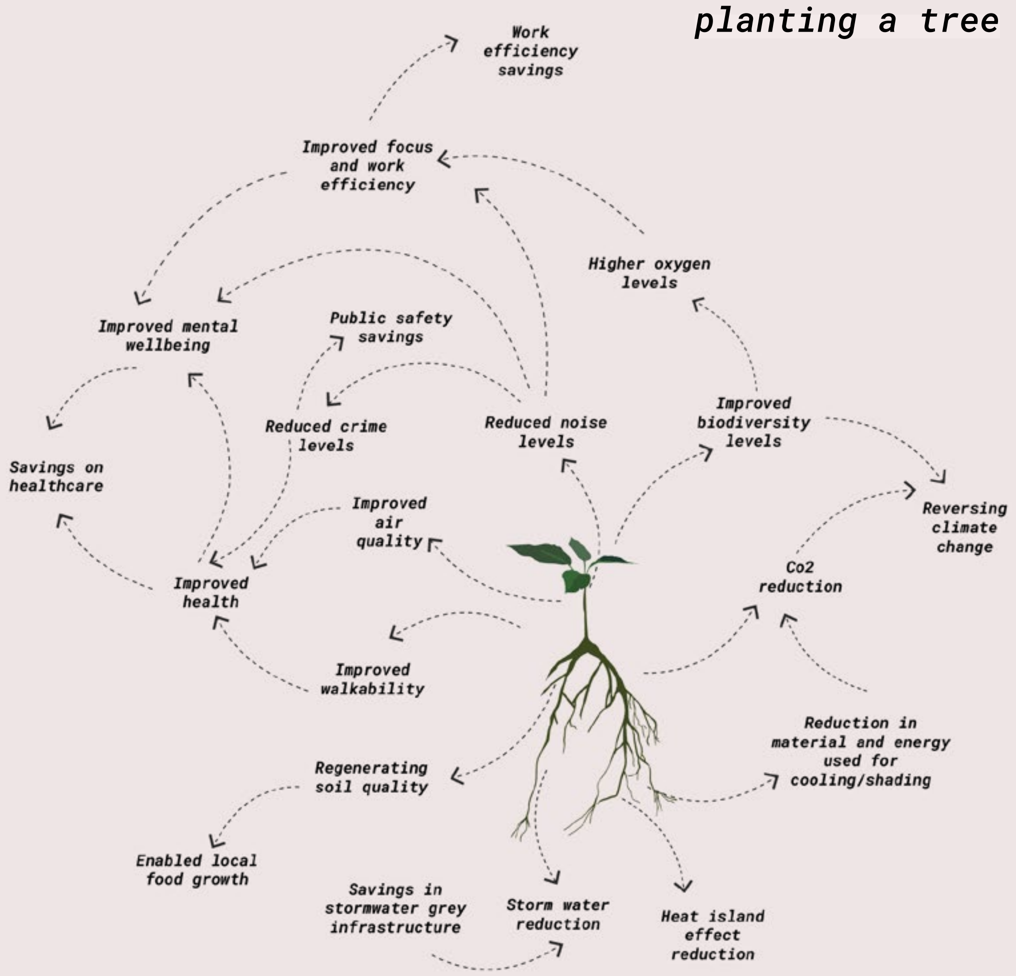


Image by Dark Matter Labs

ILLUSTRATION:

Visualising a shift towards seeing the world through multiple stakeholders and multiple capital outcomes, on an example of planting a tree

Illustration by Dark Matter Labs

These can factor in the value of clean air and low noise pollution, as well as their effects on cognitive performance and productivity, cooling and heating capacity, mental health and comfort, heat island mitigation, carbon capture and sustainable water drainage. This presents a systemic perspective on value.

Example 2: A house should be understood not just in relation to the people who live in it, but in terms of the goods and products that flow through it, the nature, animals and vegetation that surround it, and the water and energy flowing through it.

So far, our extractive investment models privatised the value and dispersed liabilities and externalities. Instead, we need to recognise the flow of value and build capabilities around capturing and accounting for it.

Example 3: A kitchen table involves lumber derived from trees and nurtured by the soil. It is subjected to processing and transportation before becoming a table used for eating, playing, drawing and work. The table is intrinsic to numerous social, economic, cultural and emotional value flows. Over time, the table may enter different homes with different value flows, or it will be recycled and transformed into materials for new tables, chairs or paper. In turn, these will eventually be composted, returned to the soil and transformed into new value flows.

We need to shift the way we capture and measure values, focusing less on objects, assets and liabilities and more on value flows.

Understanding entangled systems' value enables different forms of investment and financial models.

↗ AI computation and value flows

Artificial intelligence computation capabilities allows us to understand and account for value across flows as opposed to value across a balance sheet. It also enables a fundamental shift in understanding and accounting for a multi-stakeholder and multi-capital worldview. It builds capacity for multi-currency, multi-beneficiary frameworks.

This capacity to value spillover effects and shared benefits unlocks a new understanding of value and governance.

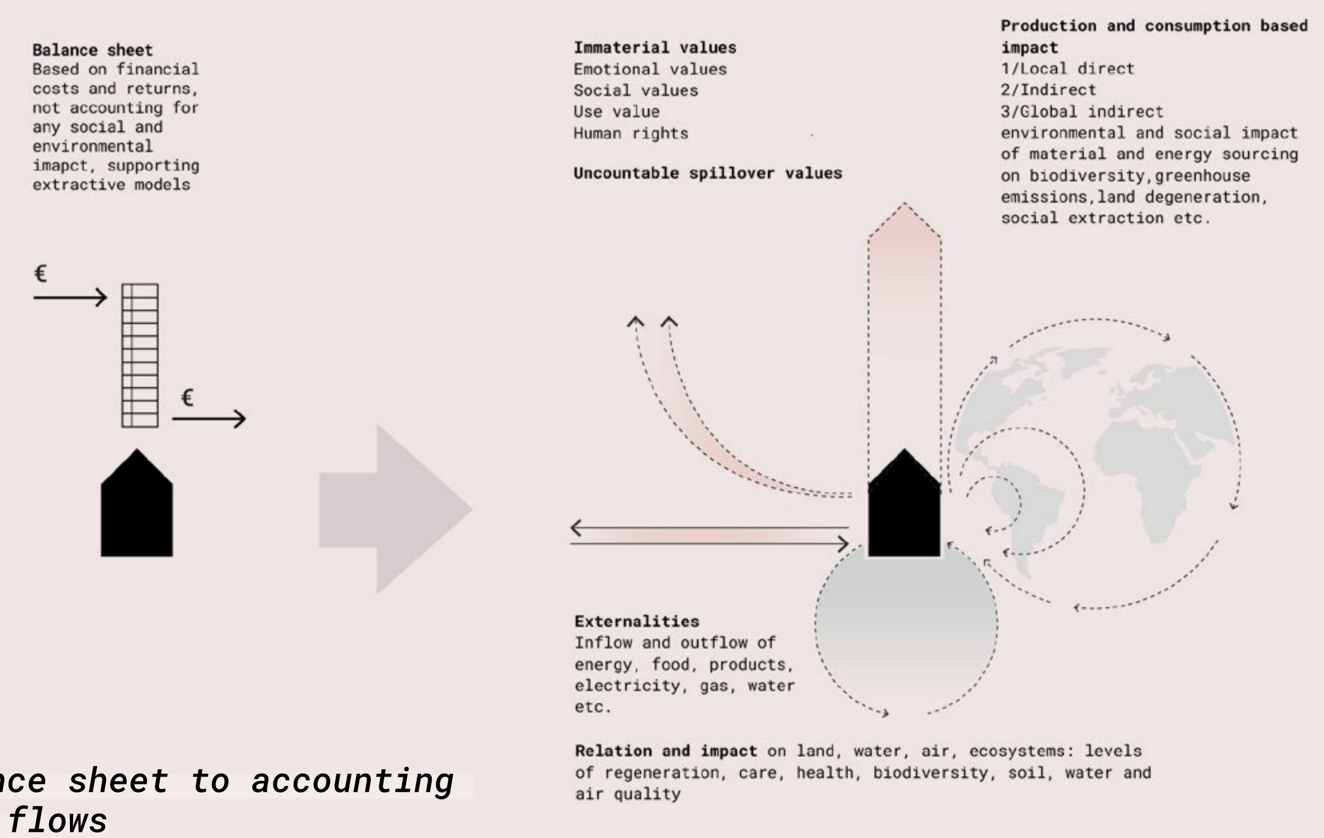
↗ Shifting from objectification to freedom and self-sovereignty

Theories of ownership currently underpin our societal institutions and have contributed to extraordinary scales of harm, because they rely on objectification, separation and control.

Property rights are intrinsic to the many planetary challenges we face, enabling the privatisation of value extraction, normalising its consequences and reinforcing inequalities that arise from the monopolisation of scarce resources.

How can we acknowledge the selfhood of flora and fauna, water systems, minerals and land, moving away from dominion over them?

How can we bring to an end the objectification and commodification of life?



From balance sheet to accounting for value flows

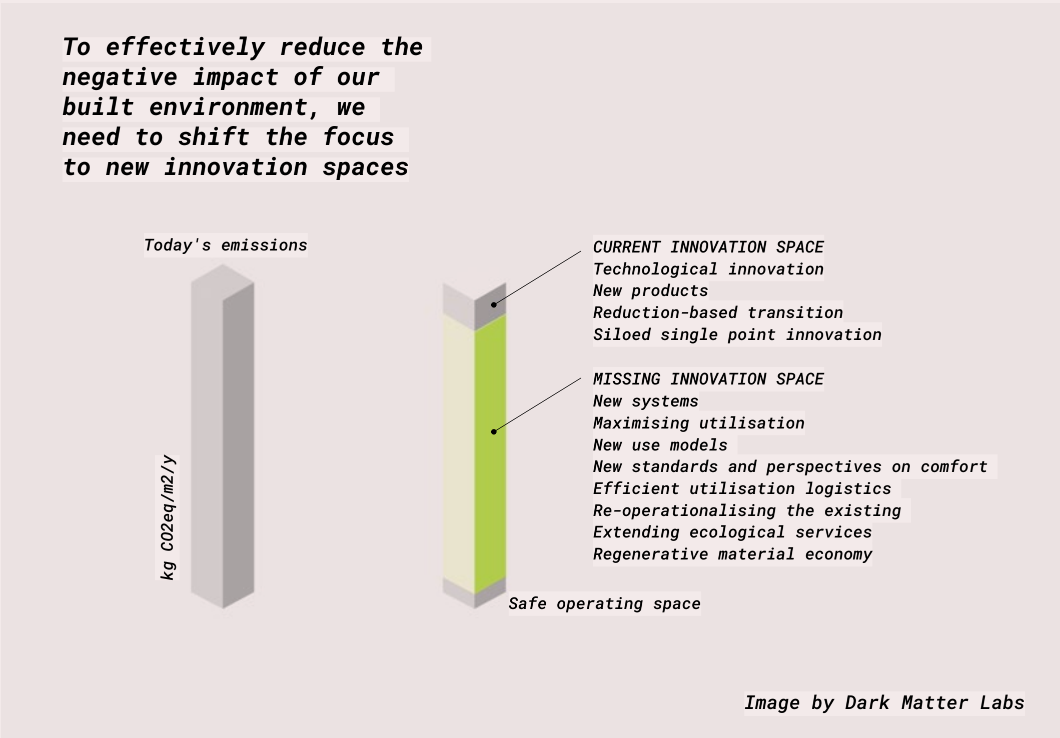
Image by Dark Matter Labs

ILLUSTRATION:

Visualising a shift From balance sheet to accounting for value flows, on an example of a house

Illustration by Dark Matter Labs

↗ Foundations for a New Bauhaus Economy



↗ Shifting innovation spaces: To effectively reduce the negative impact of our built environment, we need to shift the focus to new innovation spaces

A new economy for our built environment evolves around a variety of hybrid and interacting models.

1. M^{C}: Shifting comfort

In providing comfort, we have been depending on extraction of resources, other species, biodiversity and ironically ourselves.(P 8 ↗)

We need to decouple the economy of comfort from extraction, in times when climate change increases the need for those services.

Pathways in driving this shift include participation and care models, increasing social values, shifting humane relation to nature, a shift from technological to ecological services providing comfort, an increase in social and physical activity, a shift from the building scale to other scales, such as city-scale nature-based infrastructures and micro-scale furniture or clothing.

2. M^{U}: Maximising utilisation

Maximising the utilisation of our existing resources, spaces, and infrastructures is one of the most transformative actions we can undertake in a context of resource shortage, carbon emissions crisis and labour crisis. That is especially relevant in the European context where our resource and space use inefficiencies are massive(P 9 ↗).

Unlocking this latent capacity promises significant advancements in social justice and decoupling the space and use creation from extraction and pollution.

This develops a range of strategies from full utilisation of existing building stock, sharing models, flexible space use, with instruments such as open digital registries, smart space use platforms, smart contractsetc.

3. M^{T}: Next generation typologies

Next typologies are no longer governed by the principle that form follows function. Instead, they transcend traditional asset classes based on programmatic use, as a new asset class valued for the optionality, flexibility, use efficiency and value creation they provide.

Decoupling value creation from extraction, systemic inefficiencies and carbon emissions (P 9 ↗) here happens through focusing on social capital- such as radical sharing and cooperation models, and intellectual capital- such as new innovation models and new design typologies.

This requires new instruments such as gifting economies, citizen-underwritten insurance schemes, new policies for building typologies, innovative building regulations etc.

4. M^{O}: Systems for full circularity

Even though we have comprehensive knowledge on circularity, current levels in Europe are extremely low(P 10 ↗), thus this work focuses on the systems unlocking it and instruments driving its advancement on the ground.

Apart from a comprehensive understanding of the craft (design for disassembly, development of city-scale material components networks, use of non-composite materials), we need the institutional economy and systems enabling circularity.

That includes instruments such as material registries, material passports, financing mechanisms, design regulations, all developed simultaneously to unlock the new systems for circularity.

5. M^{R}: Bioregenerative material economy

Long-term future of our material economy is bioregenerative. This transition needs deep understanding of systems impacts, avoiding further global biodiversity and land degeneration (P 10 ↗)through green growth.

This shift requires a transformation in land use for materials, moving from “green belts” to permaculture and regenerative methods, from supply chains to local supply loops. This requires developing new local material forests, zero-carbon local transport, non-polluting construction methods, and the policy, operational, and financial innovation for a successful implementation of a fully biocompatible material economy.

IM∞: Immaterial values growth

The first part of this paper concluded that our current growth models are degenerative (P 8 ↗), driven by extraction of materials, energy, land, other species, other humans and ultimately ourselves, resulting in environmental, social and health degradation.

The previously explained five pathways encompas a tendency of decoupling our economy from extraction, driven by the growth of immaterial values.

Decoupling our economy from material, energy, land, and species extraction will be driven by growth of care, participation, collective intelligence, new forms of logistics and other immaterial values.

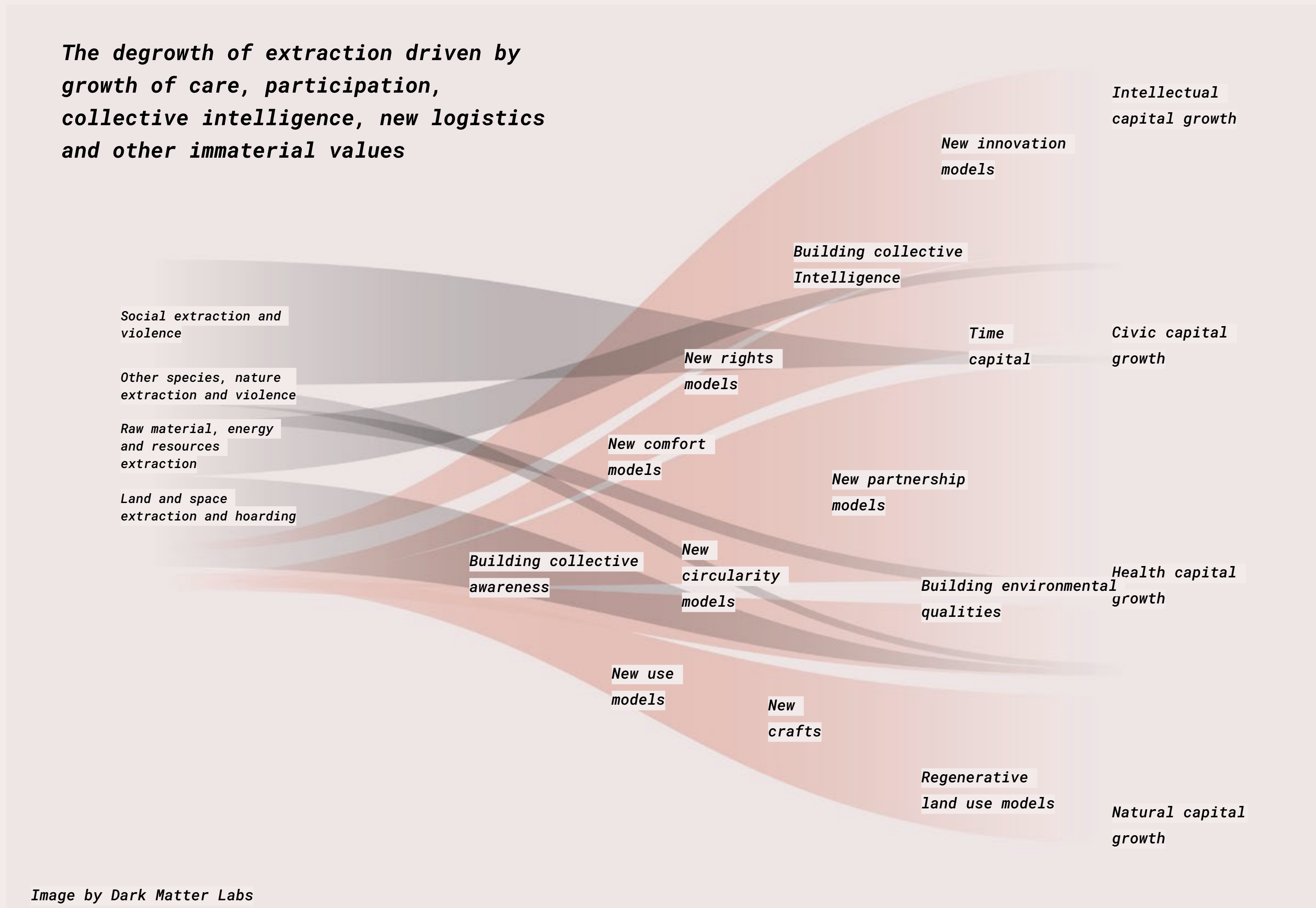


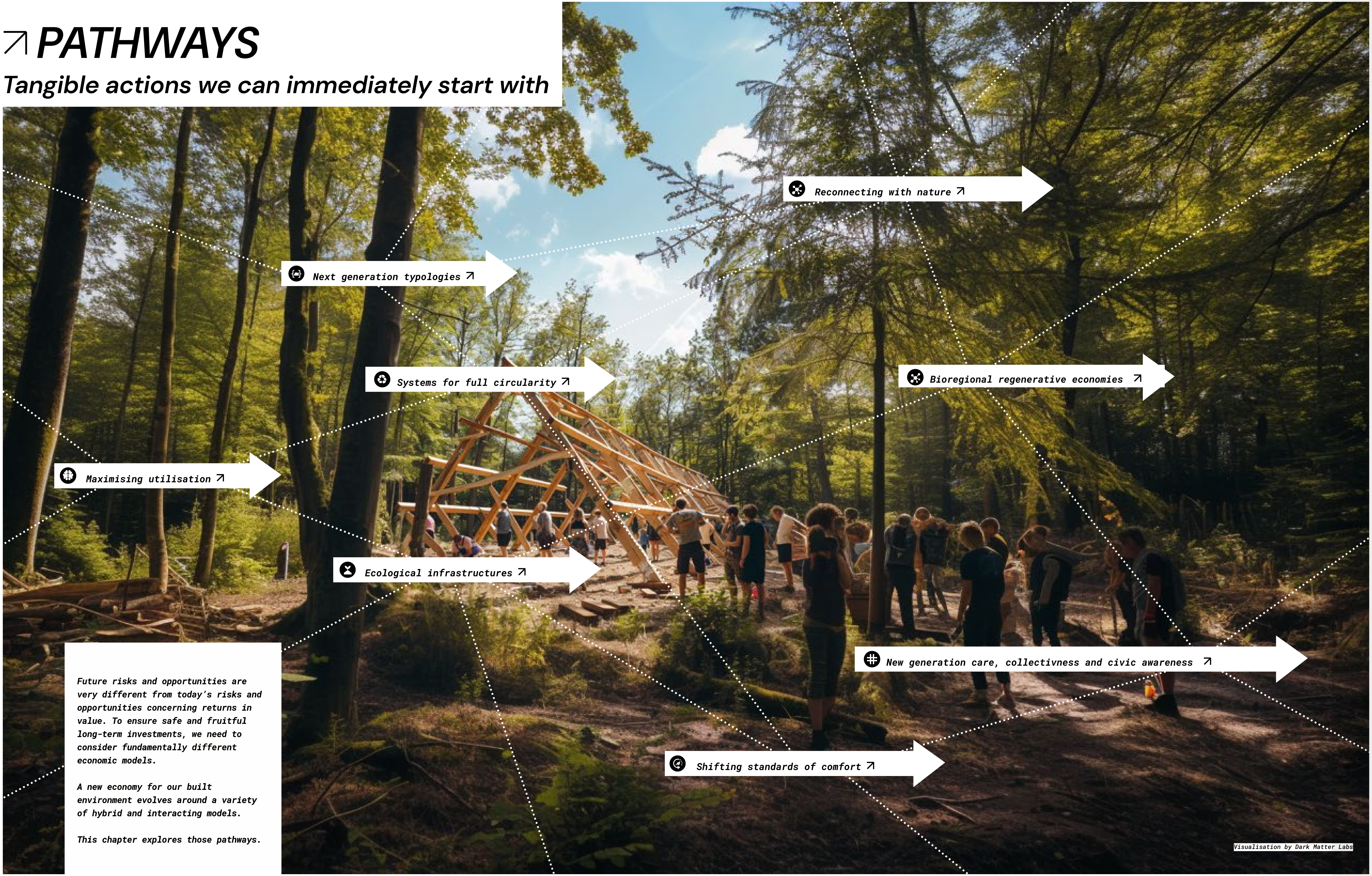
ILLUSTRATION:

The degrowth of extraction by growth of care, participation, collective intelligence, new logistics and other immaterial values

Illustration by Dark Matter Labs

↗ PATHWAYS

Tangible actions we can immediately start with



Future risks and opportunities are very different from today's risks and opportunities concerning returns in value. To ensure safe and fruitful long-term investments, we need to consider fundamentally different economic models.

A new economy for our built environment evolves around a variety of hybrid and interacting models.

This chapter explores those pathways.

Visualisation by Dark Matter Labs

Mc: Shifting comfort

↗ European comfort standards play a significant role in climate degradation

Our comfort standards increasingly rely on mechanical and technological solutions, moving us away from innate patterns, alienating us from our natural surroundings.

This has a dramatic impact on energy use, which remains largely dependent on the burning of fossil fuels. There is a direct correlation, therefore, between our comfort standards and worsening climate effects.

For our collective good, it is essential that we decouple our wellbeing from resource extraction and environmental degradation.

↗ Our built environment is neither comfortable nor healthy

Everything we've built around us is nowhere near the quality we need to thrive. In the pursuit of comfort, we have developed technologies and services that place demands on land, materials and energy, while generating significant waste and pollution.

In addition to the environmental impact, our overconsumption and dependence on technology, energy and resources have a detrimental impact on our mental and physical wellbeing. Innovations intended to ease and improve our lives often have the reverse effect.

Noise pollution, air pollution, light pollution, detachment from natural ecosystems and habitats and constant enclosure in indoor environments all negatively affect our physical and mental health.

We need to reconnect with what it means to be human and understand that behavioural patterns we've developed might be both harmful to the individual and the environment.

This mindset shift in what we actually need will change how we use the built environment, how we relate to it and what we expect from it.

↗ Revising what is comfortable and healthy

We will need to revise our understanding of comfort? What makes us happy? What makes us thrive? What makes us healthy? What makes us feel safe? What prolongs and increases the quality of our lives?

Studies of longevity and health illustrate the importance of social interactions, physical movement, alignment with natural weather patterns and connection to nature. Current service provision relating to comfort don't align with these human needs.

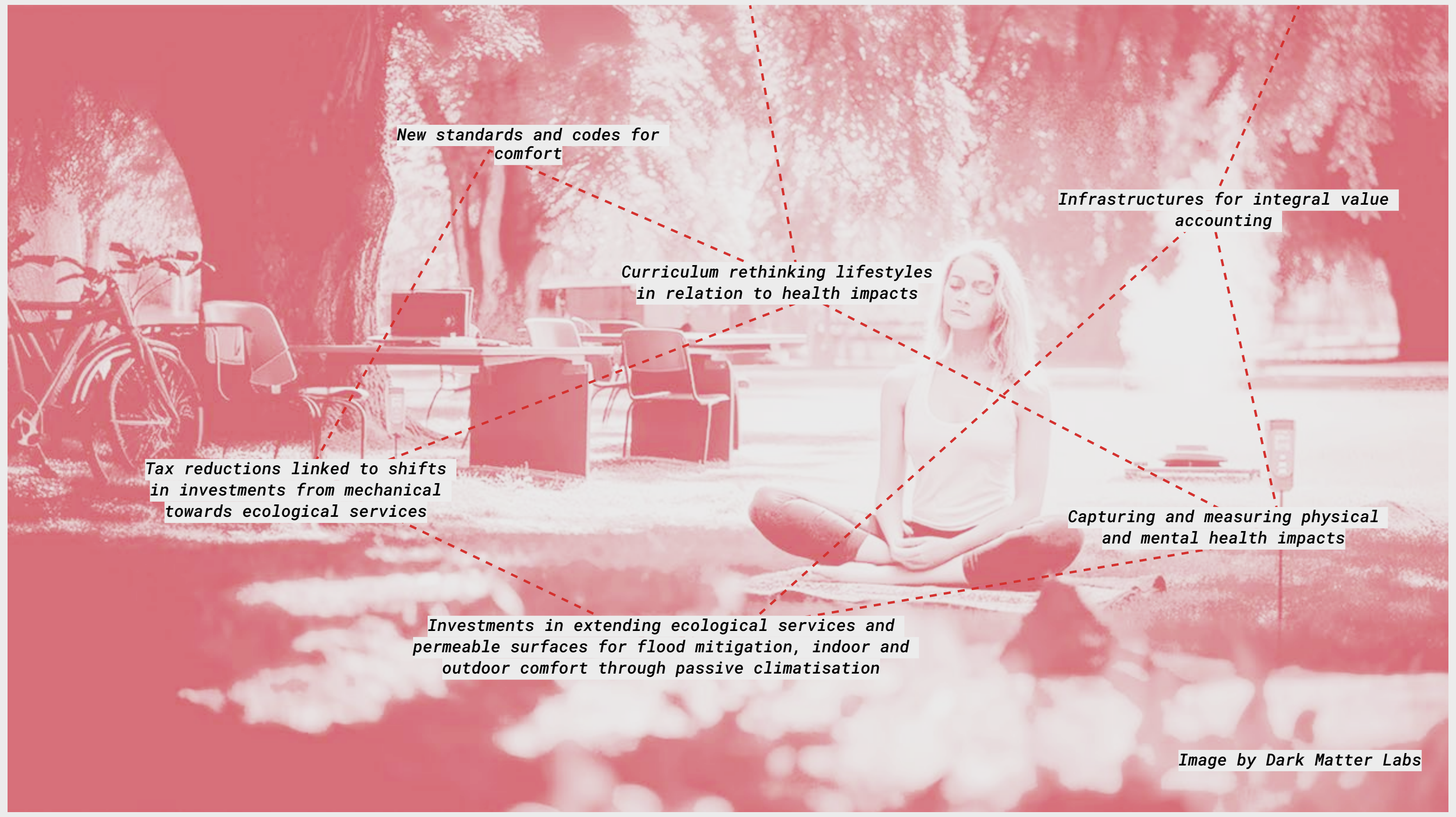


Image by Dark Matter Labs

VISUALISATION:

New standards and perspectives on comfort

by Dark Matter Labs

By reimagining comfort, we can decrease energy consumption, material use and carbon footprint.

This doesn't entail constraining or reducing comfort, but focuses on improving health, social and wellbeing standards.

Example 1: A varied remote working offers and concepts are more effective than electrical vehicle production in meeting people's mobility needs for a daily commute. It minimises energy consumption and pollution, with beneficial effect on mental and physical health.

Example 2: Dining in company increases the experience of joy, safety and longevity, resulting in increased wellbeing. Shared rather than private kitchens can enable these beneficial social experiences, while decreasing energy demand, pollution and waste.

Example 3: Soil improves biome, human health and mental health. De-asphalting urban spaces would reduces material carbon footprint, while incentivising biodiversity, climate mitigation and creation of carbon sinks in urban areas.

↗ New comfort economy

Changing our value systems and raising awareness of healthy urban environments could have a significant impact on resource and energy use.

If the shift in awareness is achieved, that will subsequently drive the economic demand for services that deliver comfort. Models of integral value accounting could drive a regenerative economy. This would involve accounting for long-term and complex impacts, as well as intangible social and natural values.

A new comfort economy should be based on a shift from technological to ecological services , as well as an increase in social and physical activity.

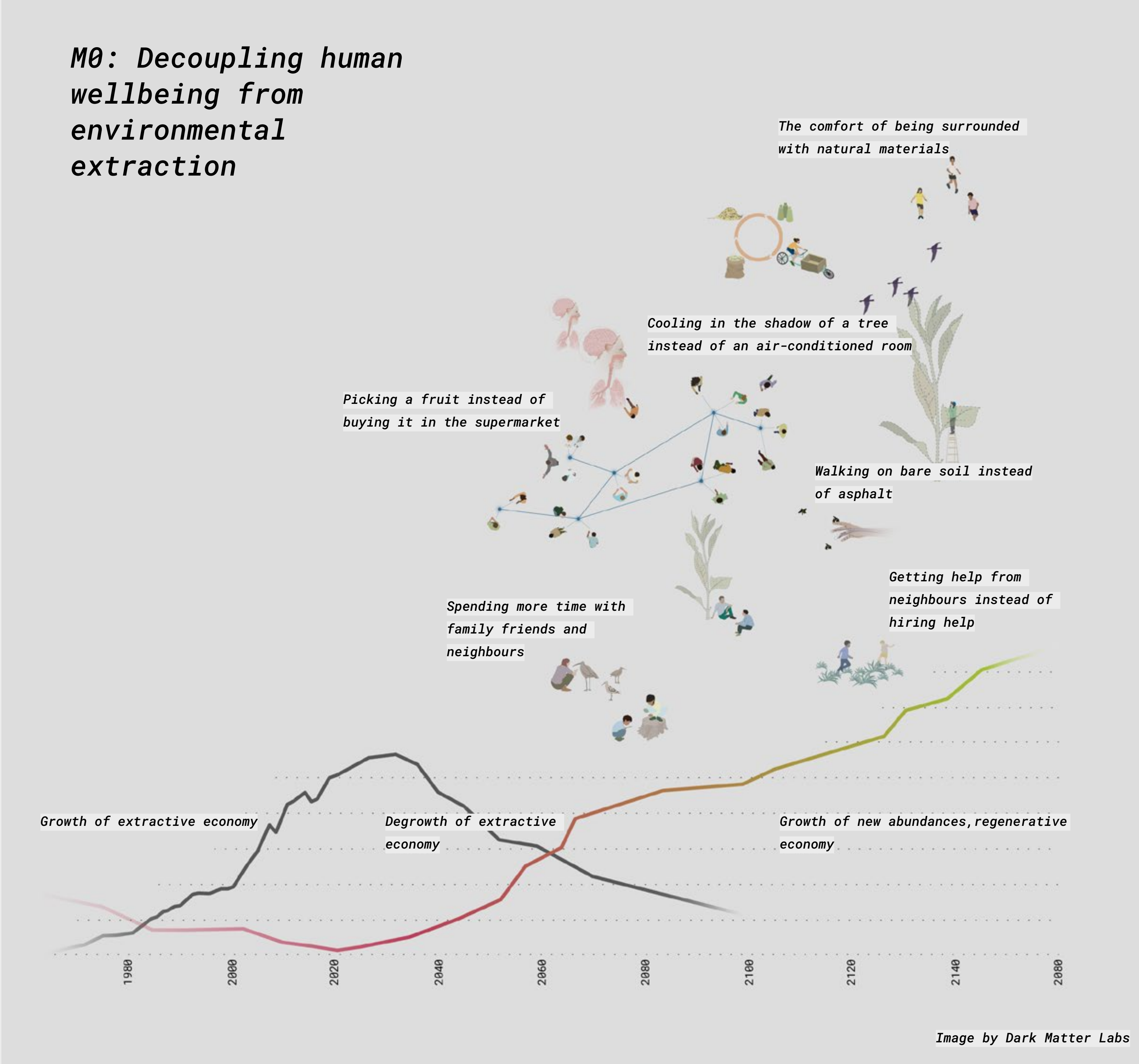


Image by Dark Matter Labs

↗ Soper, Post-Growth Living: For an Alternative Hedonism (2020)

↗ Jackson, Prosperity without growth (2009)

↗ Hickel, Degrowth: a theory of radical abundance (2019)

↗ Sisto, Crucial factors affecting longevity

↗ Sleep foundation, The Best Temperature for Sleep (2023)

↗ European Commission, Playing my part in energy saving action (2022)

↗ Dark Matter Labs, Cornerstone indicators (2023)

ILLUSTRATION:

Decoupling wellbeing from environmental degradation

by Dark Matter Labs

VISUALISATION:

Efficient utilisation of urban building stock and programable buildings

by Dark Matter Labs

M^U: Maximising utilisation

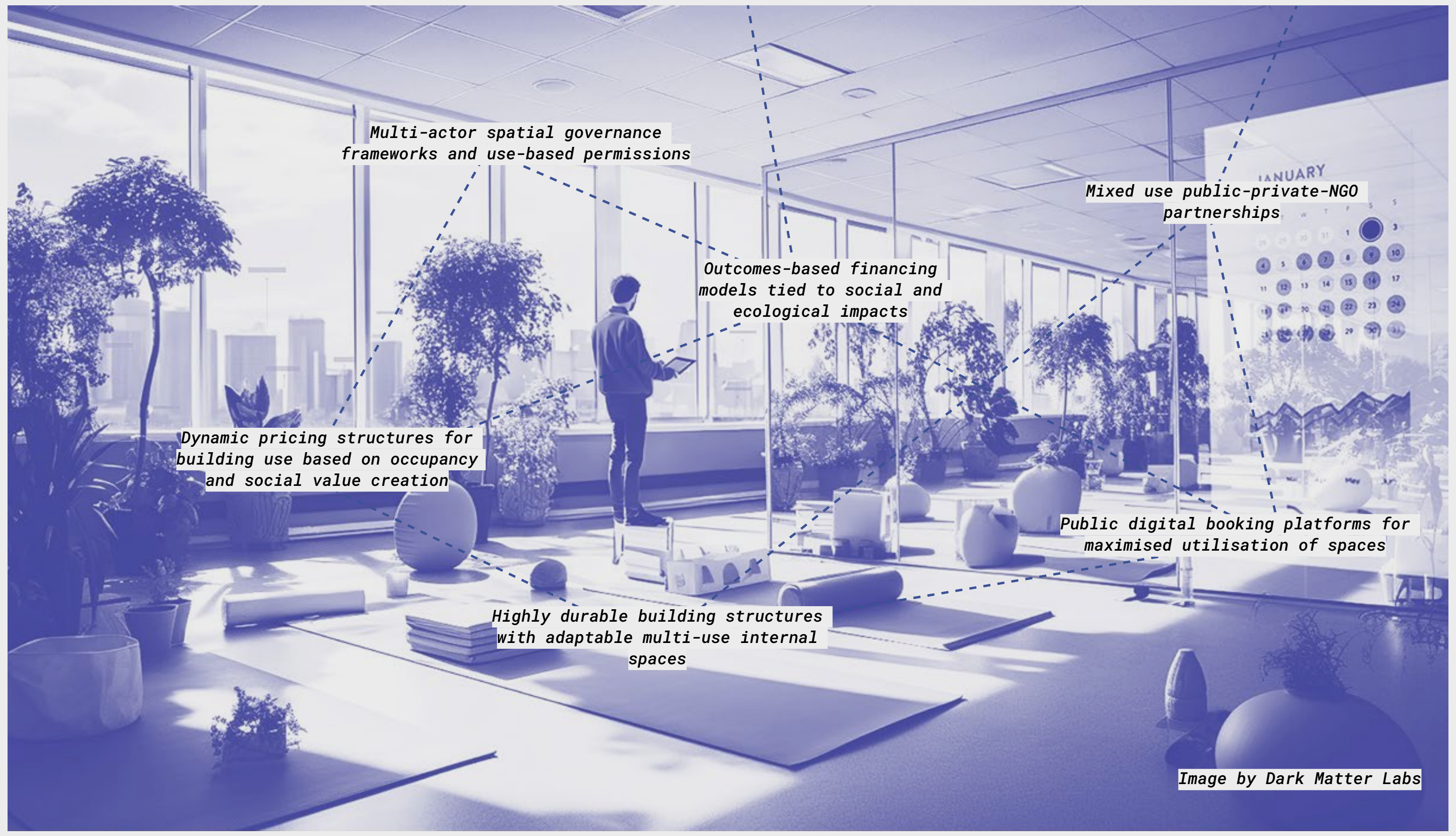


Image by Dark Matter Labs

↗ New economy for real estate development

Currently, ca 18% of European housing units is vacant. Public buildings such as schools, municipal offices and churches are occupied about 20% of the time. On average, office space is used 35% of the time. Road vehicles infrastructures take up to 80% of public space.

Upcoming moratoriums on new construction imposed either through regulation or driven by occupier demand, could profoundly reshape the operating landscape for real estate developers. Most cities will not be able to add to existing real estate.

Upcoming moratorium on new-built requires a shift towards business models that re-operationalise existing real estate.

Maximum utilisation of currently vacant spaces, adaptive reuse, lightweight rooftop extensions, retrofitting and building on former industrial areas and parking lots.

↗ City-scale re-operationalisation models

Technological and material innovation on a single building scale is not enough. To achieve a needed reduction of the negative environmental impacts, cities must re-operationalise their existing building stock.

A new economy can be established based on new understanding of innovation, value and production chains.

Mandatory use of vacant spaces, flexible use of existing buildings and sharing models all could reduce the need to construct new buildings and infrastructure, helping cities achieve their decarbonisation goals.

Cities will have to develop city-scale integrated value balance sheets, end-of-life sinking funds differential discount rates on materials depending on their recyclability level and carbon treasurie.

↗ Place as asset class

The landscape for investment, particularly in urban renewal development, is transforming. The challenge arises in translating nove concepts into practical investment and business strategies within the current system.

There is a critical gap between novel strategies and traditional financial models to drive them.

There is a pressing need to re-evaluate investment models. We must recognise the need to account for new types of values, such as social, heath, natural values. Despite their lack of direct financial quantification, these assets are crucial for the progress.

Reimagining value in shaping investment decisions will pave the way for urban regenerative development.

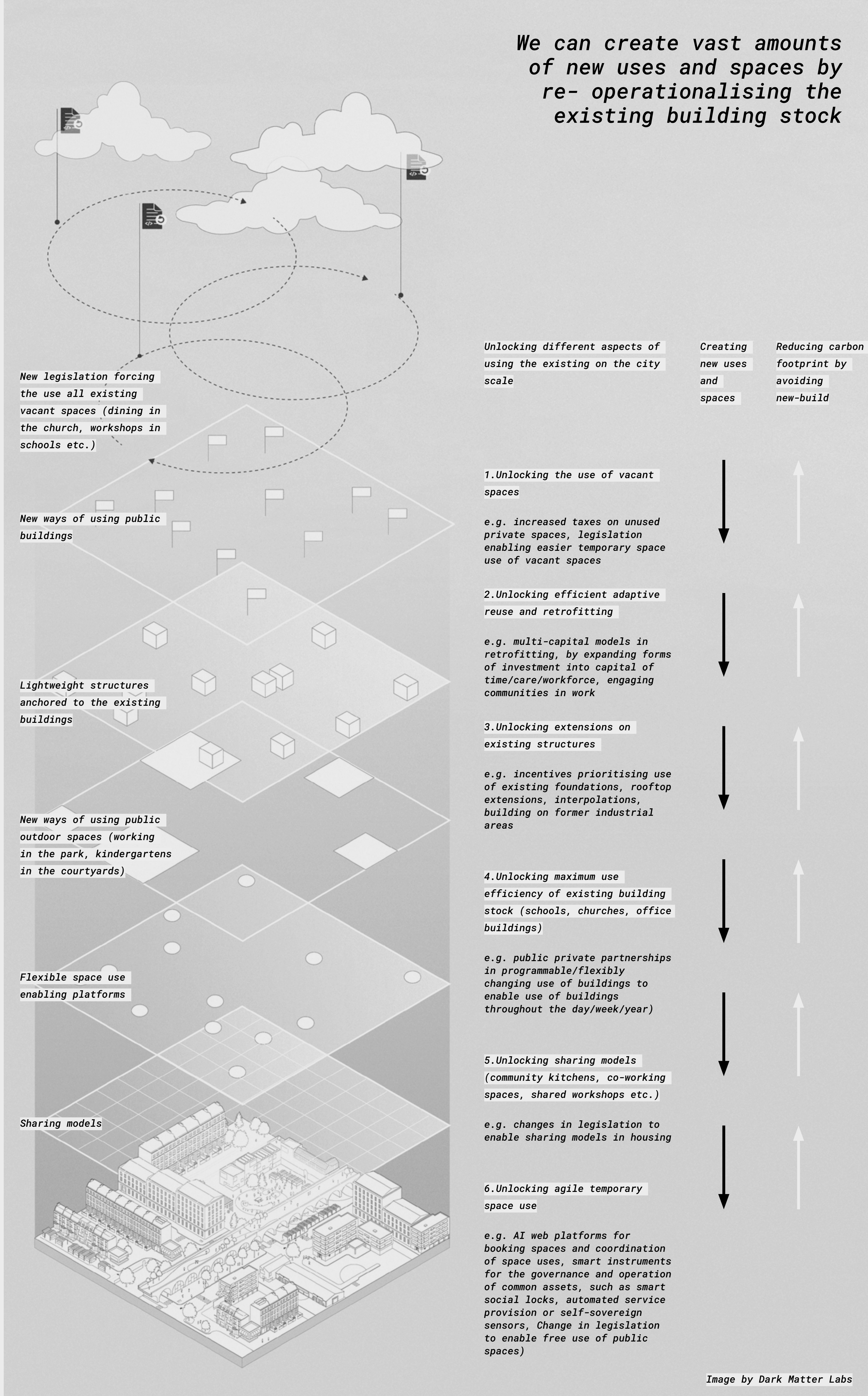


Image by Dark Matter Labs

↗ Normative, The circular economy & carbon reduction targets (2024)

↗ Charlotte Malterre-Barthes, A Global Moratorium on New Construction (2021)

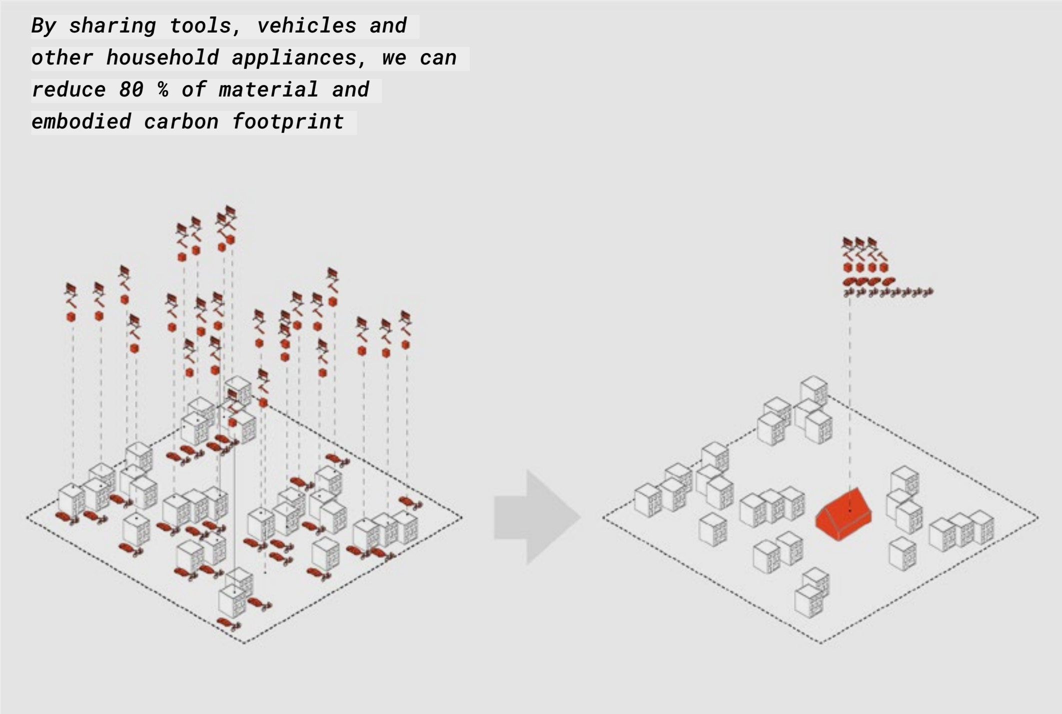
↗ URBACT, Waking Up the Sleeping Giants (2018)

ILLUSTRATION:

We can create vast amounts of new uses and spaces by re-operationalising the existing building stock

by Dark Matter Labs

M^T: Next typologies



↗ Access to spaces and assets is unequal and inefficient

We heavily underutilise spaces like housing (49%), public buildings (20%), and offices (35%), as well as products like cars (5%) and household appliances (5%). Yet we continue to build and develop new products, mostly privately owned and underutilised, causing further environmental damage.

We move towards a new category of buildings, beyond the traditional 'form follows function' paradigm, embracing rapid programmability

↗ Programmable architecture as a next generation asset class

This shift would extend the life of material investments. In addition, it would significantly cut down on embodied carbon, waste and inefficient use.

Implementing such a transformative approach necessitates a fresh valuation theory that appreciates the nuanced risks associated with traditional asset classes designed for specific program uses. Moreover, it calls for the development of innovative planning regulations that support quick adaptability, working in tandem with building codes that accommodate various uses while ensuring safety across different functions.

The core objective of this workstream is to develop next-generation asset codes tailored for programmable built environments. This requires a collaborative effort to redefine how buildings are valued, regulated and designed to meet future needs sustainably.

By focusing on flexibility, sustainability and efficiency, this initiative aims to lay the groundwork for a new era of construction that prioritises the longevity and adaptability of the built environment, addressing both environmental and societal shifts.

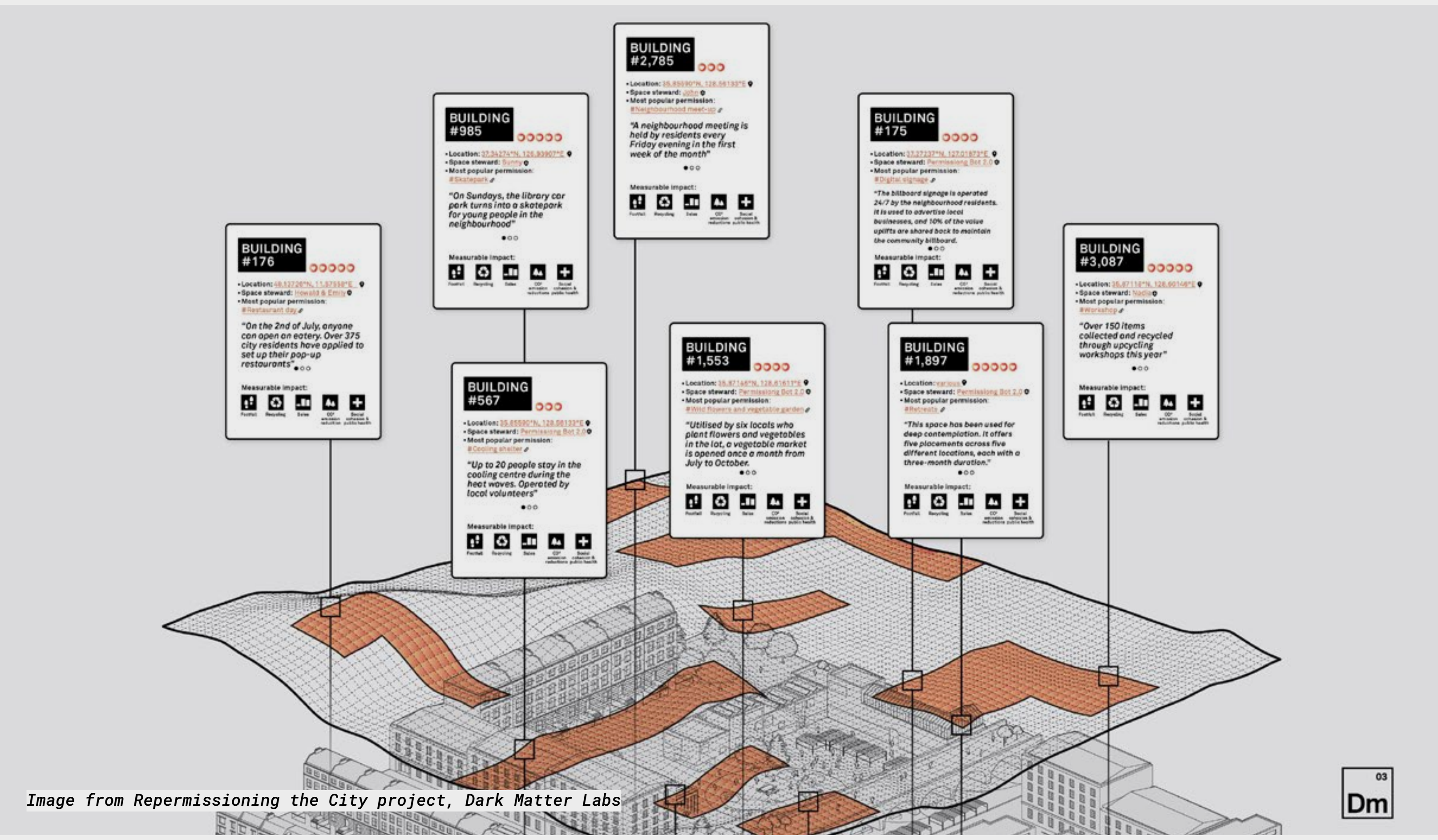


Image from Repermissioning the City project, Dark Matter Labs

VISUALISATION:

New use models visualised on an example of a neighbourhood community room

by Dark Matter Labs

Image by Dark Matter Labs

↗ New models of public space use

Spaces have tended to be viewed as static, monofunctional objects. We need to see spaces and buildings as platforms allowing for frequent adaptation. This could result in their constant and multifaceted use.

Advanced public-private partnerships will play a vital role in urban transitions, co-investing in new generation mixed-use development, urban regeneration and climate mitigation.

Outdoor spaces can be deployed as platforms for temporary space use, allowing for frequent adaptation and constant utilisation. We will need to develop smart instruments for the governance and operation of common assets, such as smart social locks, automated service provision and self-sovereign sensors.

What if we could foster reciprocal, stewardship-based agreements and perceive space as a foundational civic asset capable of generating positive outcomes for an entire city?

How might we harness the capabilities of citizens to shape urban environments and create opportunities for emergent uses that have the potential to revitalise our cities?

↗ New use and governance models

Operating in a materially constrained future requires us to incentivise how spaces and resources are shared.

Community kitchens and living rooms, co-working spaces, laundry rooms, saunas, workshops and other facilities could reduce the scale of homes, removing operational redundancy and delivering luxuries accessible to everyone.

It requires a profound shift in mindset from individual to collective ownership and other use and governance models, an increased sharing economy platforms to enable better utilisation of resources and spaces.

This could enable entirely new support structures for common care. For example, shared community spaces could reduce loneliness among the elderly, provide community support to children and reduce the stress of working parents, generating new social and care infrastructure.

Shared transportation services like carpooling and shared vehicle ownership will mitigate the material, energy and embodied greenhouse gases of privately owned vehicles.

↗ Public-Private partnerships for new urban landscapes

The future development of urban infrastructure demands an approach that reimagines the roles of housing, neighbourhoods, workspaces and the intermediary third spaces that connect them. It also encompasses the creation of secondary and tertiary infrastructures, such as data systems, procurement frameworks and investment programs for aggregated demand-and-supply-side innovation.

A future economy for our urban development calls for pioneering forms of collaboration. These alliances are essential for coordinating and steering the development of dynamic ecosystems, fostering innovative business models that sidestep the pitfalls of rent-seeking. Such models are designed to harmonise various capital forms, ensuring they can be effectively mobilised to support these forward-thinking strategies.

This initiative aims to partner with local authorities to explore new demand models and establish novel partnerships for a transition-oriented urban landscape economy.

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ILLUSTRATION:

Unlocking cities' growing underutilised spatial assets, Re-permissioning the city

by Dark Matter Labs

M⁰: Systems for full circularity

↗ Future risks of inadequate circularity

As current material supply chains are challenged by scarcity of resources, political instability and price volatility, raw material extraction will become riskier.

Current recycling and upcycling methods include the addition of virgin materials, heterogeneous material compositions and polluting processes, only extending the extraction instead of stopping it.

Circularity levels remain extremely low (7.2%) and are declining, while material recovery rates across the EU are far from acceptable.

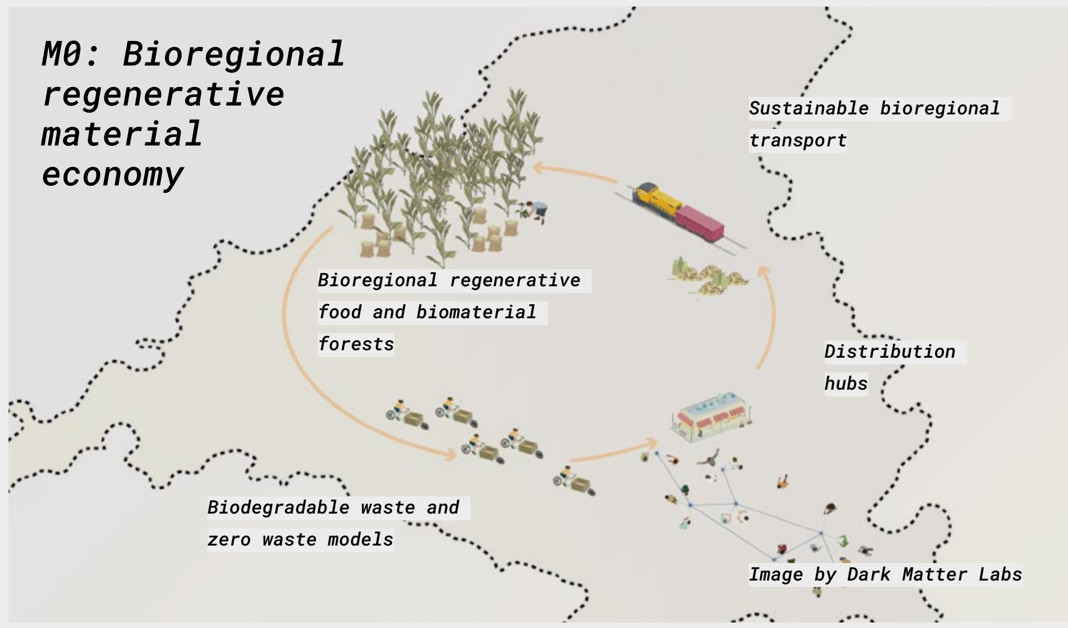
Sadly, there is not much to be proud of when it comes to European circularity at a scale that is needed.

For full circularity, we need massive infrastructural changes in our logistics, legislation and financing sectors.

VISUALISATION:

Infrastructure for full circularity

by Dark Matter Labs



↗ The economy of deep circularity

We must shift from a material extraction economy to one that combines durability, circularity and biodegradable materials through regenerative practices, prioritising biodiversity and regenerative land use.

This requires structural investment in new capacities for material innovation, non-degrading land use, bio-design, systemic learning and craft.

This is a future which will also require us to transition our labour economy in terms of both skills and automation. We need to establish a new generation of polytechnics at the intersection of craft, technology, digital manufacturing, bioengineering, botanics and other disciplines.

We'll have to build new effective infrastructures for circular logistics and in-between uses. How do you hold and store materials? How do you develop quality assurance and certification where digitalisation is critical?

Achieving a deep circularity will require new institutional economies such as integrated value material balance sheets, city-scale material registries, material banks, end of life sinking funds, differential discount rates on materials depending on their recyclability level, carbon treasuries, quality assurance and certifications.

We may have to develop new capabilities for storing, disassembling and processing materials, as well as for building components. Transport and logistics must become more local and circular. We will need to design for infinite life spans and full adaptability and reuse, detoxification technologies for the circular use of materials.

↗ Material registries

Interoperable data registries containing secure shared data-sets for buildings and infrastructures across a city, region or country, would enable a range of stakeholders to identify the quantities, specification, location and condition of materials contained within the built environment.

This would help city planners set requirements for localised material reuse; architects to specify locally available secondary materials; operators to monitor component condition and building performance; and contractors to access disassembly guides and verified data on component specification and condition, to certify secondary materials and better facilitate their reuse.

This data could enable more accurate material accounting at the city-scale; enabling more accurate monitoring of material flows, and analysing and verifying carbon storage in bio-based materials.

City-scale Material registries enable regulation of construction and use of buildings based on their performance, and taxation of assets that are underutilised or nonbeneficial to public value.

↗ Bioregional banks

Bioregional banks can drive the decentralization of financial resource governance and the transition to a regenerative economy, as the connective tissue between financial resources and on-the-ground regenerators.

They enable strategic multi-sourced capital flow to aggregated portfolios of systemically coordinated projects on the ground. In return, regeneration benefits can flow back to investors.

Bioregional Financing Facilities would drive decentralization of financial resource governance, move the distribution of financial decision-making authority from a centralized top-down authority toward local self-determination.

It would catalyse the transition to a regenerative economy; a shift from dependence on extractive economy towards place-based circular economy, regenerating cultures and ecologies.

Regenerative economies will look different in every bioregion, marking a move away from the current monoculture economy to more diverse economies that are driven by community needs and ecological contexts.

Regenerative economies enable people in a place to decide collectively what they value, map those capitals in their bioregion, and invest holistically in their own regeneration.

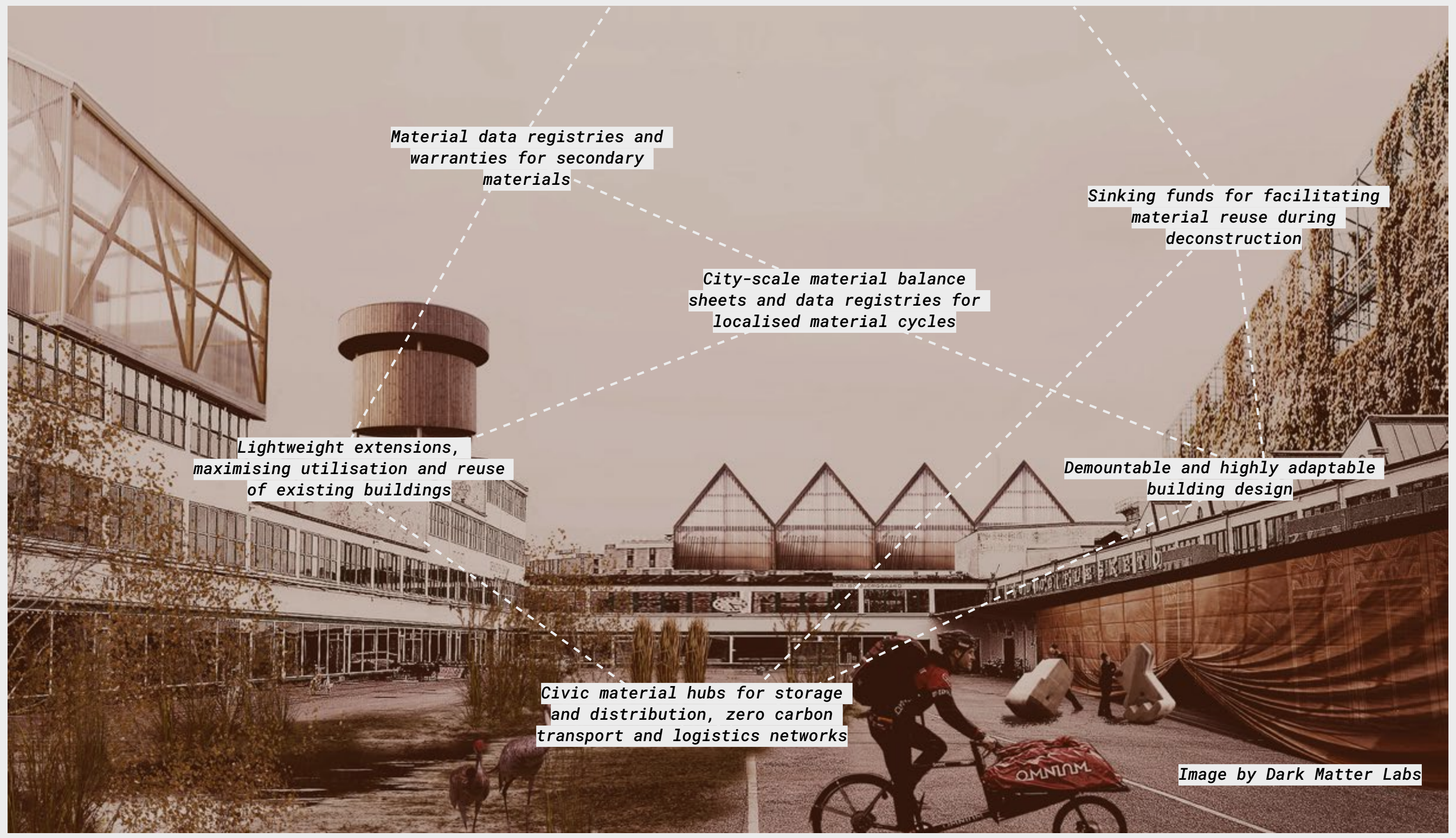


ILLUSTRATION:

Bioregional regenerative material economy

by Dark Matter Labs

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↗ Material Cultures, Arup, Circular Biobased Construction in the North East and Yorkshire (2021)

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M^E: Ecological infrastructures

↗ Risks and liabilities of the future

The risks and costs of tomorrow are very different from the risks and costs of today. Risks associated with climate change are rapidly increasing and will continue to do so.

European cities face overheating, droughts and water shortages mostly in the European south, while northern cities face higher temperatures for which they are not designed to tolerate, storms and flooding from both rivers and rising seas. In addition, declining air quality, noise pollution and higher stress levels associated with alienation from nature all contribute to lower cognitive functions, depression and other mental health issues.

Heat island effect and urban flooding, the most problematic climate effects, are directly caused by urban building materials like concrete, plastics and asphalt. These materials add to carbon emissions and inhibit natural resilience to climate events.

Cities rely on grey infrastructures to adapt to these climate events and the risks associated with them. During critical weather events, this infrastructure is at risk of collapse, resulting in significant additional losses and risks.

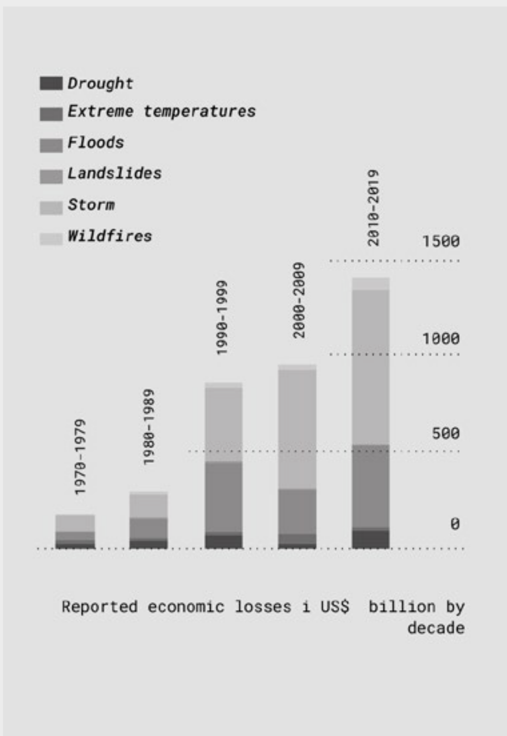
↗ European Environmental Agency, Urban sustainability (2023)

↗ MIT, Urban Heat Island Effects Depend On A City's Layout (2018)

ILLUSTRATION:

Reported economic losses caused by extreme weather events

↗ World meteorological organisation, Economic costs of weather-related disasters (2023)



↗ The value-at-risk perspective

The prevailing model of asset valuation, which relies heavily on historical data and recent comparable transactions, has become inadequate in a world of high risk and volatility.

The need to integrate a value-at-risk perspective into valuation processes is evident, particularly during periods of significant transition.

Introducing a Value-at-risk addendum to traditional valuations could enhance transparency regarding the risks associated with assets, facilitating better decision-making and enabling a clearer differentiation between assets based on their risk management and mitigation strategies.

Developing such a protocol as a complementary component of accounting practices could alter market dynamics by emphasising the creation and valuation of assets that are resilient to a broad spectrum of risks. This shift towards acknowledging and accounting for VaR in asset valuations promises to improve the quality of financial reporting and investment decision-making, as well as introducing a more risk-aware and sustainable approach to development in an uncertain world.

Value-at-risk assessment leads to more informed, resilient investment decisions, particularly in a market environment where understanding and mitigating risk is critical.

↗ Shifting investments from grey towards green and blue infrastructures

Increasing grey infrastructures moves us away from the resilience of natural systems, exacerbating the risks faced by our cities.

Ecological services will enable systemic cooling, flood risk management, microbiome quality, neighbourhood bio-digesters, local material and food forests, and improved comfort and wellbeing, among other benefit, need to be systematically implemented in our cities, mitigating the effects of heat waves, flash floods, pollution, noise and soil contamination.

We will need to integrate, leverage and accelerate low-tech ecological innovation models integrated with civic collective care capabilities.

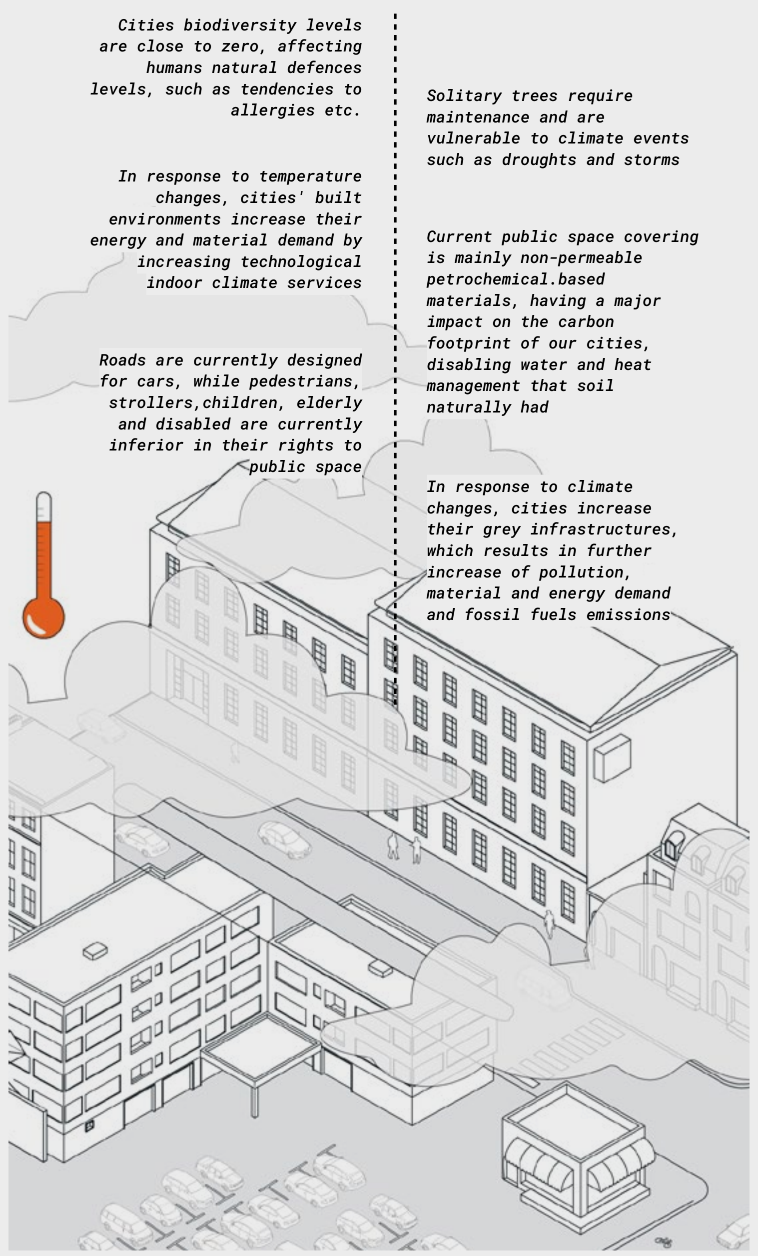
To combat climate change in cities, we should shift from traditional materials like asphalt, cement, and plastics. Instead, we should integrate rewilded urban forests, water features, and permeable biogenic roads.

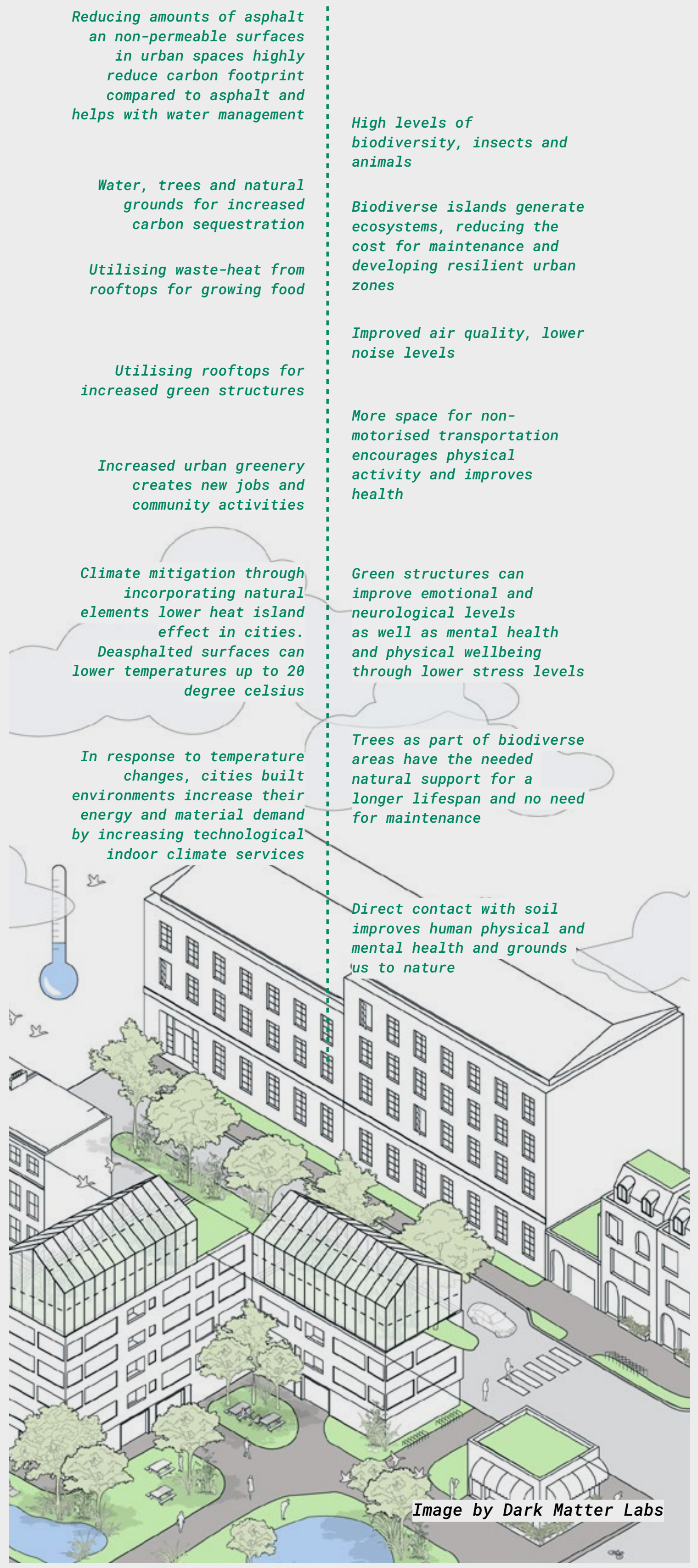
Replacing asphalt with soil-based surfaces offers multiple benefits: it absorbs rainwater, reduces heat, supports biodiversity, and enhances well-being. Soil surfaces also drastically reduce urban carbon emissions due to their lower embodied carbon and carbon sequestration abilities, lowering temperatures by up to 20°C compared to asphalt.

Urban forests have cooled European cities by 2.9°C on average, reducing energy consumption and carbon emissions by minimizing the need for air conditioning. This approach improves noise and pollution levels, citizen health, safety, and productivity.

We need to start seeing nature as a serious investment and a resilient solution for our future climate risks.

Dematerialising public spaces infrastructures and focusing on nature as infrastructure:





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↗ Dark matter labs, Trees As Infrastructure, Platform to value and invest in nature (2019)

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ILLUSTRATION:

Grey urban infrastructures VS nature based urban infrastructures

by Dark Matter Labs

↗ ALLIANCE BUILDING

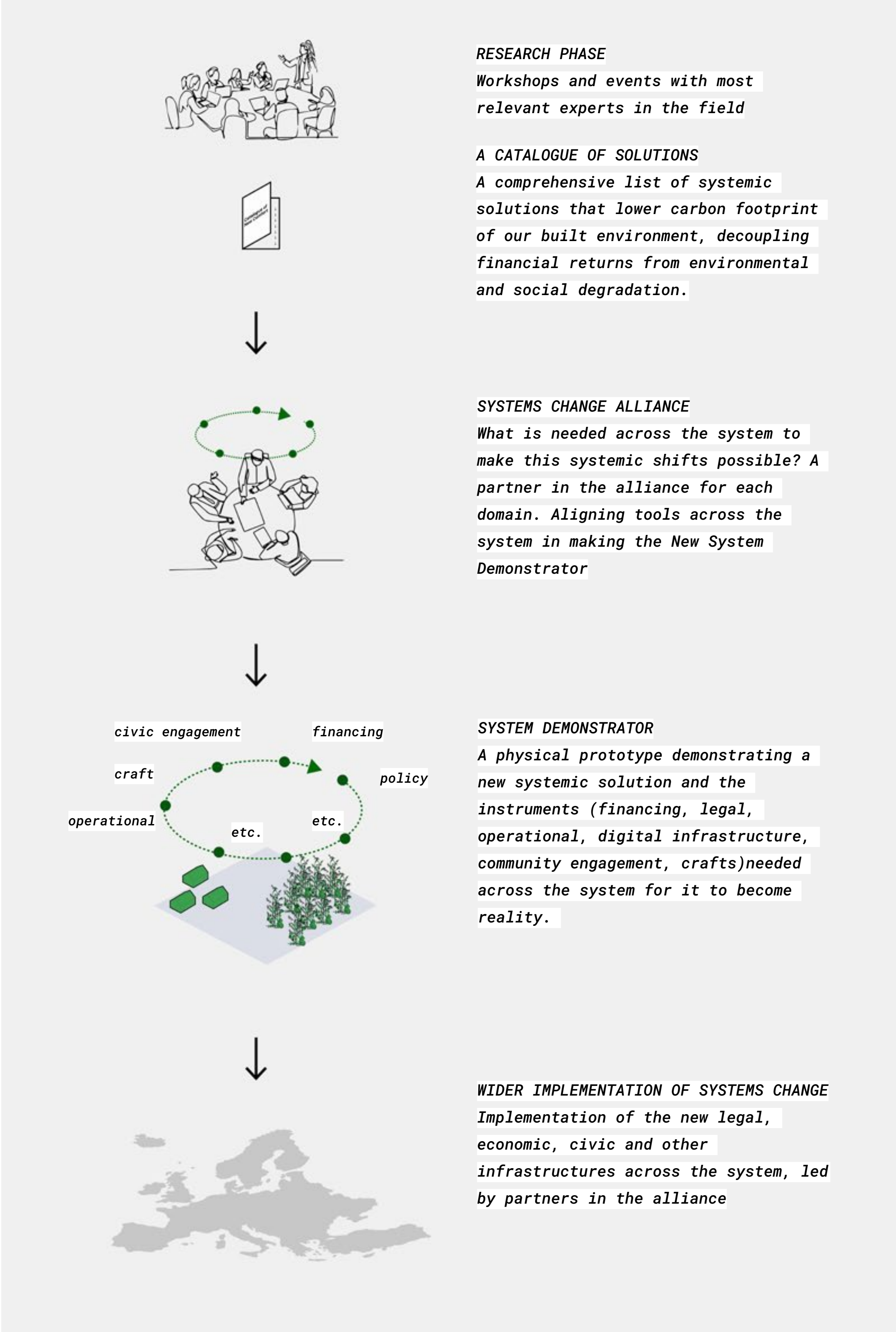
Structuring collective action for change

To establish a market and a policy landscape for the next generation of built environment it is essential to rally a diverse range of actors ready to pioneer and navigate this evolving landscape together.

This chapter develops a process plan for collectively driving these new pathways.

↗ How are we building a mission

The goal is to create a cohesive ecosystem that not only anticipates future needs but also collectively drives the market and policy landscape transition.



Mission development Process diagram

↗ Alliances for economic transition

Establishing a market and a policy landscape for the next generation of built environment is dependent on the informed investor and policy makers community. It is essential to rally a diverse range of investors and Municipal actors ready to pioneer and navigate this evolving landscape together.

Creating such a community involves constantly informing and engaging stakeholders about the risks of continuing business and policy as usual, as well as the potential of new urban environments.

Establishing clear guidelines, case studies and success stories will be crucial when illustrating the feasibility and benefits of such investments and encouraging a broader participation in this new market.

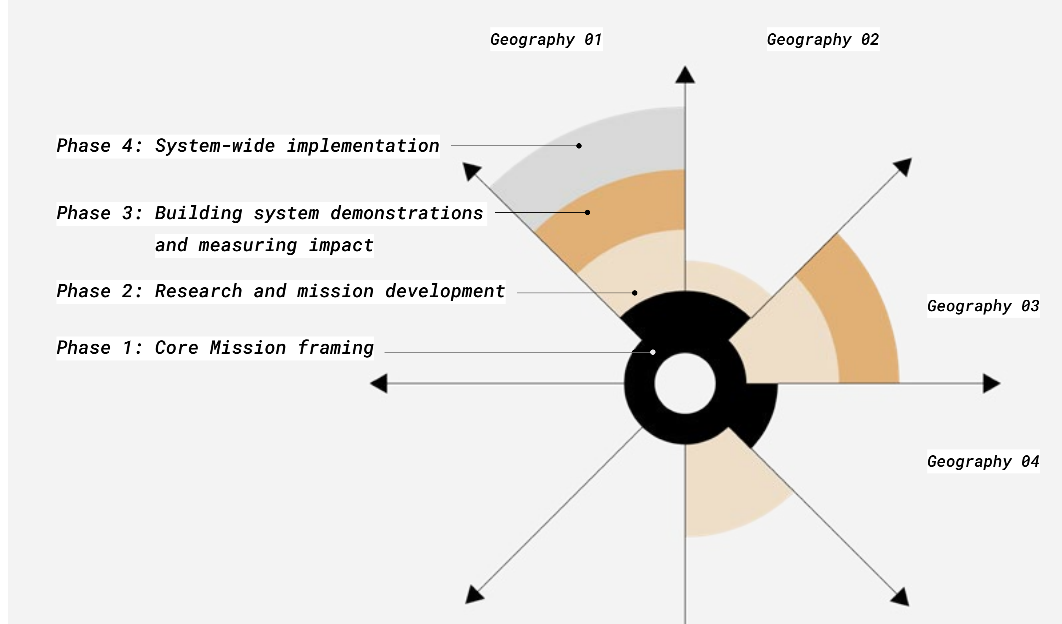
↗ Future urban developers

Real estate developers will adapt to the new reality and new constraints, and contribute to environmental regeneration and climate change mitigation by developing and operating a diverse network of digital and physical infrastructure assets.

For example, they can become stewards of construction materials and their carbon sequestering value by owning newly formed local forests and managing circular material flows across a network of assets.

They can re-operationalise existing office buildings and urban landscapes to create new work infrastructures without building new.

This shift requires a transition to structured economic systems of value, where the premium is no longer a building but an aggregate of economic, social and environmental values generated in an area.

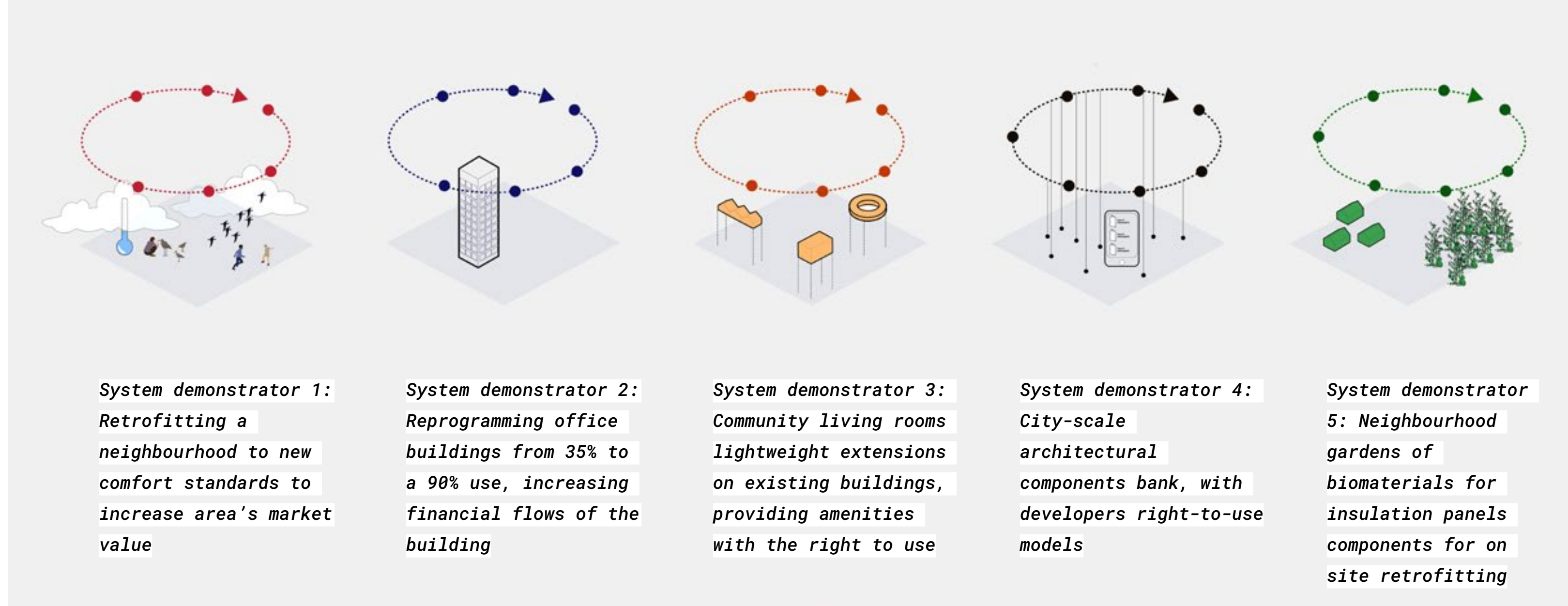


Building Mission Alliances across Europe

↗ System demonstrators

We face a future in which innovation cannot be siloed. The accelerating effects of future changes require speed and agility, as well as an ability to continuously re-design our systems. It requires a quick innovation at the intersection of systems domains, and a rapid impact calculation.

For example, a typical street of the future may be a temperature-balancing urban forest, communal eatery designed to alleviate both food scarcities and loneliness, or a remote co-working landscape. All of this must be enabled by new institutional instruments, and financed by new financing models How can we demonstrate future concepts, measure and validate their true impact?



An example for a System demonstrator for each of the five pathways

System demonstrators deploys multiple interventions, in a form of exception within the current system: including investments and procurement; policy and regulations; behaviour, culture, and values; infrastructure and technologies, and together demonstrate a new system.

Because of its small scale, it also enables the much needed integral value accounting, quantifying values such as social, natural or health benefits.

System demonstrators build the capacity for an agile systems redesigning, which is key to resilience to the future unforeseen changes.

At the heart of system demonstrators are new models of partnerships and multi-partner accountability frameworks, all with the objective of empowering an agile systems change innovation capability.

System demonstrator is not a product or a single solution. It is a generator of a large scale societal change.

An Invitation

How do we demonstrate future cities and bioregions, together with the policy, legal, regulatory, financial and governance innovation that will be required?

How do we create the capacity to structurally change the market, when we have become accustomed to tinkering at the edge of it?

How do we create the next generation alliances that will deliver the scale of investment necessary for the transition of our entire region?

This work will be maningful only if we evolve it through dialogues with partners pioneering new ways together.

We are aware that many of the solutions and directions covered in the paper already exist on the ground across Europe and we explore initiatives and organisations implementing them.

Building on the findings in this paper, we are developing an Alliance Building Paper, developing pathways, defining clearer action plans and building Alliances in various geographies across Europe. Alliance Building paper will be published at the end of 2024.

We are committed to a collective effort and look forward to join forces with actors on the same mission, so please get in touch:

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desire an irresistible circular society

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