



OPPORTUNITY

13

SCOPE **TRANSITIONAL**

UNCERTAINTIES

Technology, Nature

MEGATRENDS

Saving Ecosystems

TRENDS

- Biomaterials
- Cross-sectoral Partnerships
- Net Zero
- Repurposing Assets
- Urban Design

SECTORS IMPACTED

- Agriculture & Food
- Automotive, Aerospace & Aviation
- Chemicals & Petrochemicals
- Consumer Goods, Services & Retail
- Education
- Health & Healthcare
- Infrastructure & Construction
- Manufacturing
- Materials & Biotechnology
- Travel & Tourism

What if cities mirrored nature?

MOTHER CITY

Nature-inspired solutions, guided by biological sciences and advanced machine intelligence, are used in early urban planning to transform cities into becoming sustainable and self-regenerating with lower maintenance costs, for optimal impact.





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WHY IT MATTERS TODAY

In 2021, the World Health Organization (WHO) reduced its recommended limits for air pollutants in order to protect public health.⁴⁰⁰ While not legally binding, these guidelines provide benchmarks for global cities. As per the WHO, 99% of the global population breathe air that exceeds the WHO guidelines and nearly 7 million people die from combined indoor and outdoor air pollution each year.⁴⁰¹

Biomimetic innovations are technologies that imitate nature.⁴⁰² For some 3.8 billion years, animals and plants have the natural prototypes for countless solutions to enable us to live sustainably on Earth.⁴⁰³ Technologies that draw from nature's innovations have already been created. In 2023, a Boeing 777F was modified with AeroSHARK, a surface film that mimics shark skin to improve aerodynamics, fuel efficiency, and reduce emissions.⁴⁰⁴ In their innovation efforts, Airbus – inspired by the way geese fly – piloted and entered a multi-party collaboration to test the operational feasibility of planes flying safely in close proximity on long-haul flights, potentially reducing emissions by up to 5%.⁴⁰⁵ Biomimetic solutions can also be macro-scale. Not without challenges, Lavasa Hill Station, the first planned hill city in India, was meant to feature buildings that mimic a tree's taproot to address water scarcity in the dry season and drainage systems that mimic harvester ant nests to prevent flooding during the monsoon season.⁴⁰⁶



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Biomimicry offers opportunities to discover fresh, disruptive design solutions.⁴⁰⁷ Biomimetic innovations have already been driving advances in various fields, including, but not limited to, aerial vehicles⁴⁰⁸ and robotics.⁴⁰⁹ Derived from nature's forms, functions, and systems, biomimetic design is more likely to be nature positive.⁴¹⁰

Biologists form part of the engineering team drawing on natural ecosystems and nature-inspired solutions for new urban and/or infrastructure planning⁴¹¹ early on in the construction process⁴¹² or in reconfiguring existing infrastructure. The integration of biomimicry improves sustainability, enables self-regeneration, and potentially reduces ongoing maintenance costs. Advanced machine intelligence drives optimal redesigns, and simulations depict the most effective steps needed.

BENEFITS

Nature-inspired transformation accelerates net-zero goals, creates new entrepreneurial markets,⁴¹³ and, when included in design and planning, enhances biodiversity, conserves natural resources, and improves air quality, making communities bioinspiration hubs.

RISKS

Nature-inspired engineering and infrastructure solutions, when not thoroughly planned, implemented, or managed, can negatively impact on the environment and biodiversity, potentially endangering species. Complex designs may be costly and minimally effective in terms of sustainability and climate action.



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