Adaptation, Diversity, and Digitalization

Fostering sustainability and resilience through unconventional partnerships.

Foreword

As our cities grow and expand, more individuals are exposed to the cataclysmic effects of climate change. Extreme heatwaves, storms, and precipitation are increasingly common, and those most vulnerable are facing the brunt of the impacts. In an era defined by pressing climate challenges, adaptation has become the lifeline that urban environments urgently require.

Adaptation can be defined as the proactive approach of modifying urban environments, buildings, and infrastructures to prepare for, and overcome, the challenges posed by climate change and environmental shocks. As extreme weather events become more frequent, it has become imperative to adapt our cities and communities to withstand and recover from these challenges effectively.

Nonetheless, the path to achieving resilience is fraught with great risks and pitfalls. This thought piece will show how a number of adaptation strategies have failed, and some have even worsened outcomes for marginalized communities. In order to prevent any wastage of valuable resources and ensure an equitable distribution of benefits, organizations must plan with care and caution before making any investments.

We also highlight the importance of taking a more holistic and inclusive approach to adaptation. We explore the value of unconventional cross-sector partnerships and discuss how technology – particularly AI, machine learning, and data-driven insights – can serve as an ally in our pursuit of sustainable growth. In doing so, we hope to inspire others to commit to building a more resilient future and leave a lasting legacy of positive change for generations to come.

Piet Dircke
Global Director, Climate Adaptation

Adapting urban environments for future challenges

Scientists have been calling on world leaders to mitigate the impact of climate change since the twentieth century. In 1958, geochemist Dr Charles David Keeling provided the first evidence that carbon dioxide levels were rising. This landmark discovery helped lay the foundation for an extensive body of climate research in later decades, such as the world's first computer model of Earth's changing climate and the hockey stick graph.
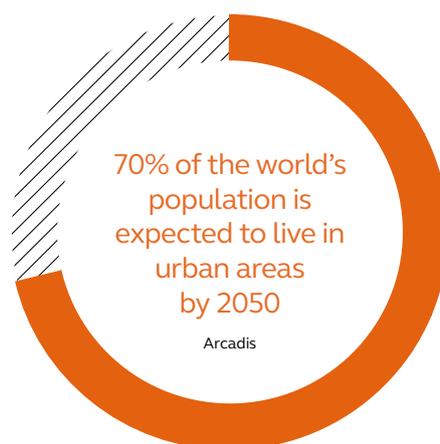
However, despite the wealth of evidence supporting the urgent need for action, a combination of complacency and apathy means legislative progress has been slow. As a result, mitigation alone is no longer good enough. The serious impacts of climate change are already being felt worldwide: droughts are getting worse, farming is becoming more difficult, and weather extremes such as severe storms are becoming ever more frequent. On top of this, many of the changes are irreversible, such as ocean acidification and the melting of Arctic ice. Even if we were to achieve significant reductions in greenhouse gas emissions immediately, the effects would continue to unfold for decades.

70% of the world's population is expected to live in urban areas by 2050

Arcadis

As we look to the future, it's clear that cities will also undergo significant transformation. More than 21.5 million people are currently being displaced by climate-related events every year, with many relocating to cities. This is leading to a growth in urban populations, with approximately 70% of the world's population expected to live in urban areas by 2050. With rapid urbanization comes a pressing need to confront the issues posed by climate change.

In the face of these challenges, adaptation emerges as a key component of our collective responsibility to protect communities, livelihoods, and ecosystems. This involves modifying urban environments, buildings, and infrastructures to prepare for and overcome the impact of extreme weather events, which are becoming more frequent and severe.

Adaptation is most effective when it's viewed in parallel with social and ecological needs. By blending practical engineering and design principles with creative flair, we can discover adaptive measures and solutions that not only address sustainability but also enhance the overall quality of life for urban residents. We can create communities that emerge stronger and more resilient than before, capable of thriving even in the face of adversity.
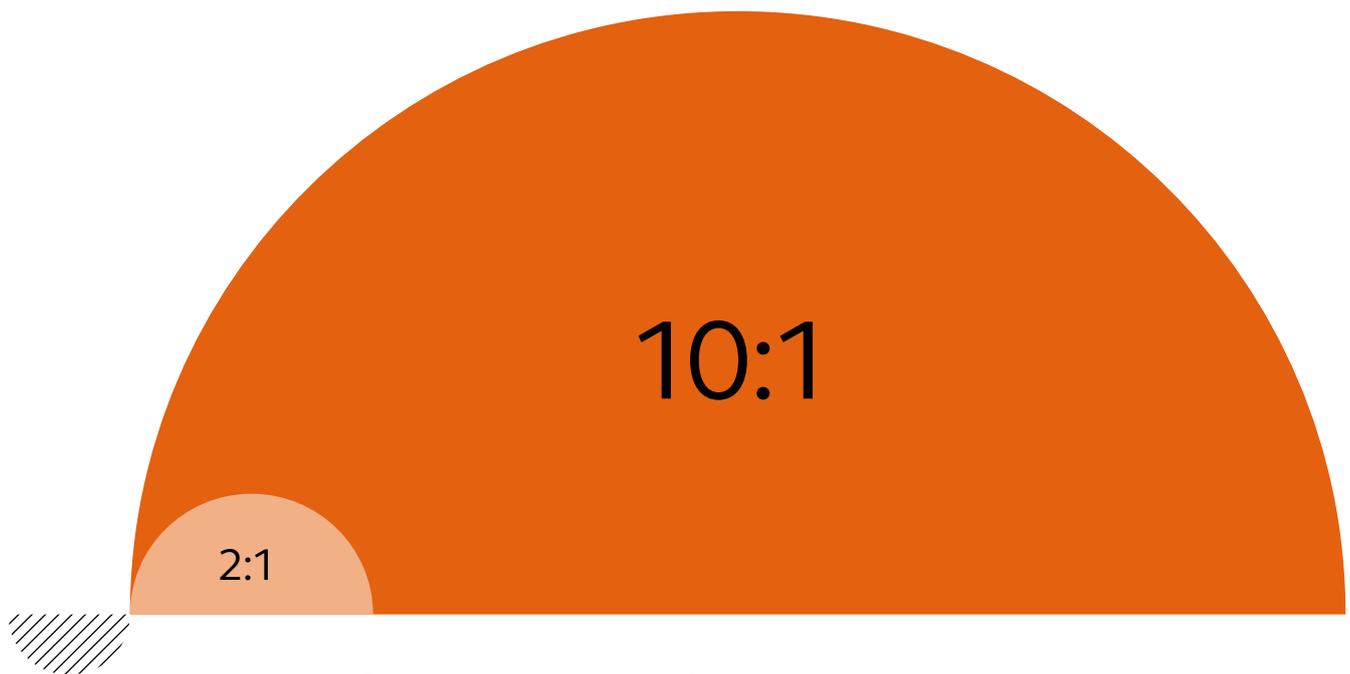
For example, a hybrid solution was developed in the Netherlands to provide coastal resilience. In the resort of Katwijk, sand dunes were developed that covered a hidden dyke, which doubled as a parking garage. Such adaptations serve a dual purpose – addressing the challenges of rising sea levels while providing practical amenities for the community. In doing so, we reimagine existing infrastructure and create sustainable, resilient spaces that benefit both the environment and the people.

The economic case for adaptation

Adaptation is not only justified from a humanitarian and environmental standpoint but also from an economic one.

10:1

2:1

Benefit-cost rations of 2:1 to 10:1 or higher
for returns on adaptation investment

It is estimated that every $1 spent on disaster risk reduction could save between $4 to $11 in losses from various climate-related events, such as flooding, wildfires, and storm surges.

Furthermore, research conducted by the Global Commission on Adaptation has highlighted the significant returns on adaptation investment, with benefit-cost ratios of 2:1 to 10:1 or higher in some cases. The report also suggests that investing $1.8 trillion before 2030 in five key areas – early warning systems, climate-resilient infrastructure, improved dryland agriculture, mangrove protection and restoration, and water resource resilience – could generate $7.1 trillion in total net benefits.

Climate-resilient infrastructure can also help reduce the severity of economic downturns triggered by climate-related disasters. Evidence shows that businesses and households in areas vulnerable to climate disasters are less likely to make long-term investments and take entrepreneurial risks. This can have a dampening effect on growth and development. Reducing the likelihood of this possibility through adaptation can help stimulate economic activity and recovery in vulnerable communities.

Overcoming complacency to drive meaningful progress

Extreme weather is becoming increasingly common in countries across the world.

In 2022, there were 18 major climate disasters in the United States alone, resulting in a total of $165 billion in damages. Despite this fact, Americans see climate change as a low-priority national issue, placing it 17th out of 21 in this year's Pew Research survey.

Even when the impact is personal, as it was for many Australians during the destructive 2019-2020 bushfire season, a surprising number of people remained unmoved – approximately one-third of those directly affected saw "no connection" between the fires and climate change.

Apathy and complacency have hindered our ability to take decisive action. Even the language used to describe the crisis fails to capture the true urgency of the situation. Terms like "global warming" have often led to inadequate responses, reinforcing the need for a deeper understanding of the emergency we face. While governments undoubtedly play a significant role in tackling climate challenges, the power to drive change also lies with individuals, businesses, and society as a whole.

We can do so in three main ways.

1. Firstly, we can push for necessary transformations at all levels of governance by voting for leaders who prioritize sustainability.

2. Secondly, we can engage with local authorities and advocate for sustainable policies.

3. And lastly, we can all make more sustainable choices in our daily lives, which could inspire others and sustain a bottom-up movement for change.

Businesses have a slightly different set of responsibilities. In order to drive meaningful progress, senior decision-makers must shift away from reactive funding and regulatory driver approaches and move toward proactive investments in sustainable solutions. Instead of waiting for disasters to strike and reacting to crises, we must invest in long-term planning and action. By doing so, we can protect vulnerable communities and help them respond effectively when facing the impacts of climate change.

Community action during times of crisis

In 2005, the people of Kashmir, Pakistan experienced a 7.6 magnitude earthquake. The local community pulled together to save lives and provide care to the vulnerable. In such cases, an over-reliance on technology or digital channels for communication is proven to exclude marginalized communities.

Diversity, Equity, Inclusion and Belonging (DEIB) and the adaptation gap

How can DEIB help organizations address global sustainability disparities?

Climate change affects everyone. But the opportunities and resources required to tackle sustainability and adaptation challenges are not distributed evenly across the globe. Wealthy countries typically have more resources to tackle climate challenges, whereas less affluent countries may lack the capacity to do so.

Paradoxically, even though high-income countries are the primary contributors to climate change, low- and middle-income countries will experience its effects most severely. This leads to an adaptation gap between countries of different income levels – a problem that's expected to worsen in the coming decades.

According to the United Nations, low- and middle-income nations receive only 34% of the total climate finance directed towards adaptation. In addition, it is estimated that adaptation costs for these countries are five to 10 times greater than the financial support they're currently getting. This disparity highlights the importance of prioritizing DEIB in our efforts to build climate resilience.

However, many cities lack the planning and infrastructure needed to address these inequities, leaving marginalized communities at even greater risk. Even when adaptation strategies are implemented, there's a lurking concern of maladaptation. This usually occurs when an intervention intended to address the effects of climate change in one place backfires – sometimes even increasing the likelihood of negative outcomes elsewhere.

This phenomenon is harmful for multiple reasons. Firstly, it diverts resources away from more effective and ecologically beneficial strategies, resulting in wasted time and resources. Secondly, maladaptation can exacerbate existing inequalities by disproportionately impacting marginalized people. Lastly, it produces a false sense of security, which further encourages complacency and apathy.

To avoid causing harm to vulnerable areas and communities, organizations should adopt a holistic, long-term mindset. Whether it's improving transportation connections, building new infrastructure, or optimizing existing resources, embracing DEIB principles and considering diverse perspectives ensures that adaptation initiatives are more inclusive and sustainable. This approach moves beyond a one-size-fits-all strategy and takes factors such as neurodiversity, cultural diversity, language accessibility, and physical accessibility into account.

Fijian seawalls: a case of maladaptation

Coastal communities in Pacific Island countries are particularly vulnerable to rising sea levels. However, recent efforts to build seawalls in Vanua Levu Island, Fiji, have backfired as they ended up preventing stormwater drainage, exposing communities that live there to even more hazards. In addition, the seawalls shifted vulnerability to people elsewhere along the coast due to changes in sediment distribution, harming the marine ecosystem in the process.

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United Nations

Digitalization as a catalyst for sustainability

Enabling sustainable decision-making with AI and Machine Learning

Digitalization, especially in the context of artificial intelligence (AI) and machine learning (ML), offers a promising avenue for fostering a more inclusive approach to adaptation.

AI and ML enable us to explore vast amounts of historical data and gain insights into the climate challenges that various communities have faced and will face in the future. Using tools such as predictive modelling, we can make effective data-driven decisions and manage mobility challenges in the face of climate events such as hurricanes and flooding. Such tools are also particularly useful for identifying patterns and disparities, which allow decision-makers to preemptively allocate resources and ensure that vulnerable communities receive the support they need.

Furthermore, combining virtual reality with predictive modelling allows us to create digital twins. This helps us visualize and plan for more sustainable outcomes, while enabling us to create places where we can live, work, and play without harming the planet. In this case, digitalization can make sustainability easier to adopt, which is essential if the world is to collectively act in a meaningful way.

Reducing water wastage with AI

AI has the potential to offer numerous benefits to urban areas, including reduced water wastage and improved demand prediction. At Arcadis, we're witnessing encouraging trials in Canton, Ohio. Through the integration of data sources and AI modelling, we have developed digital twins that simulate the city's water distribution network. This technology identifies leaks in real time, which helps reduce water loss by allowing for prompt intervention.

> *"The greenest building is one that is already built."*
>
> *Carl Elefante, former president of the American Institute of Architects*

Balancing digitalization with the traditional

Digitalization has ushered in a new era of possibilities for enhancing sustainability efforts. However, as we embrace more online solutions, there's a need to balance our reliance on digital spaces with the preservation of natural ones.

The allure of screens and virtual interactions can inadvertently disconnect us from our immediate surroundings. To truly promote sustainability, digitalization should not replace our connection with nature; it should enhance it. New technologies can even empower us to rediscover and uphold traditional practices, like using locally sourced materials and embracing environmentally-conscious methods.

It's time to refine success beyond traditional growth metrics. By prioritizing human well-being and the environment, we can create a better world and contribute positively to our surroundings.

Construction contributes to 1/3 of the world's overall waste

European Commission

Not every problem requires a new solution, and money alone cannot solve complex climate challenges. Rather than reflexively pouring funds into new projects, we must consider the true needs of communities and the environment. As former president of the American Institute of Architects Carl Elefante says, "the greenest building is one that is already built." This is because construction itself contributes to a third of the world's overall waste; even new buildings designed to be 30% more energy-efficient than the average building would take decades to overcome the negative environmental impact of their construction alone.

Consider instances where communities need better transport connectivity. Before building a new bridge or railway, it's important to explore whether there's pre-existing infrastructure that can be repurposed. Can organizations optimize existing routes to meet community needs while reducing carbon and protecting the environment? If construction is necessary, how can supply chains and procedures be improved to meet net-zero aims?

Unconventional cross-sector collaborations for sustainable transformation

Meaningful sustainable transformation requires collaboration among diverse stakeholders, including governments, businesses, academia, and civil society. By pooling together their expertise, perspectives, and resources, these cross-sector partnerships can drive innovative solutions and create shared value for everyone involved.

Such partnerships already exist, and they're delivering excellent results. For instance, the 50L Home initiative engages in water and energy conservation through unconventional collaborations between cities, water companies, washing machine manufacturers, civil society groups, and more. Another notable example is the 3Keel project, which facilitates cooperative efforts between a range of stakeholders, such as Nestlé and Anglian Water.

These projects showcase the positive outcomes of DEIB-focused adaptation efforts. By committing to a more holistic and inclusive approach, we can create resilient communities that not only withstand environmental shocks but also foster social cohesion, economic growth, and overall well-being for all citizens.

Waiting for governments to act independently is no longer a viable solution; unconventional partnerships will deliver where regulation has failed, and pave the way for a more sustainable and equitable future.

Overcoming challenges in initiating sustainability conversations

Stakeholders today grasp the importance of sustainability. Nearly all of the world's top 250 companies (G250) report on their progress – a marked improvement from the past decade.

However, asking the question "how do we actually take action?" is still far from easy. While ethical and environmental considerations are vital starting points in these conversations, we also cannot overlook the significant role that finances play in environmental, social, and governance (ESG) decision-making.

Involving capital markets can provide the necessary impetus for action. A market-driven approach that puts a price on carbon emissions can incentivize sustainable choices, facilitate progress, and increase stakeholder buy-in. Adopting this approach allows organizations to improve their bottom line while enhancing their sustainability.
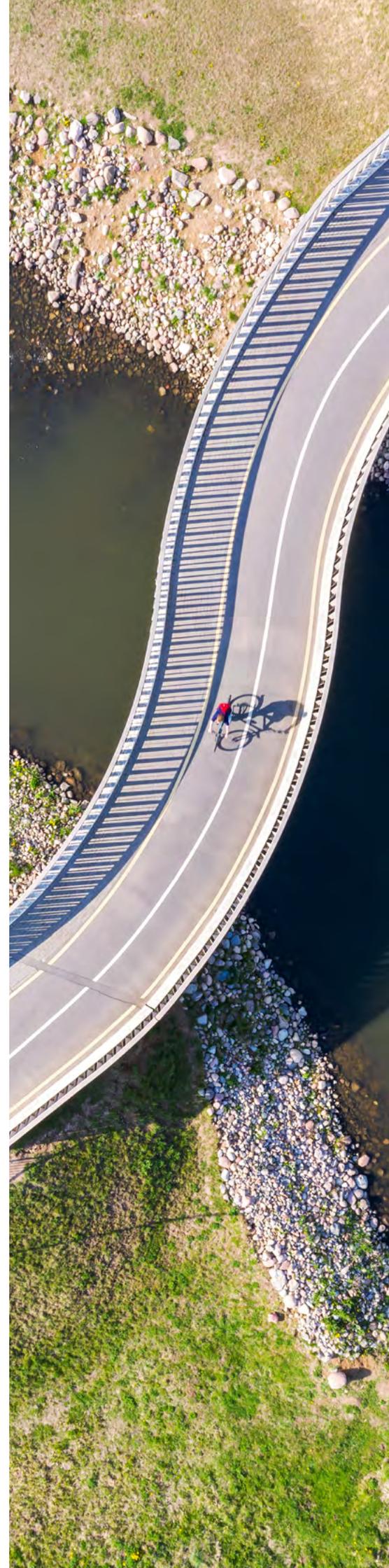
Inspiring progress:

Examples of sustainable development in cities

Several cities and regions around the world have made impressive strides in sustainable development. These success stories should serve as inspiration and motivation for others to join our journey in creating a more climate-resilient world.

Marker Wadden, the Netherlands

Lake Markermeer, one of the largest freshwater lakes in Western Europe, lies in the centre of the Netherlands.

The lake was cut off from the North Sea in the 20th century, and a series of land reclamation and flood protection projects has led to a rapid decline in fish and bird populations in recent years. The lake has few natural shores, and its waters are extremely turbid as wind and waves churn up the accumulated sediments from the relatively shallow lake floor (4m deep).

By constructing islands, marshes and mudflats from the sediments that have accumulated in the lake in recent decades, 'Marker Wadden' will form a unique ecosystem that will boost biodiversity in the Netherlands. Improving the ecosystem will also create opportunities for economic growth afterwards, as the expansion of cities near the lake, such as Amsterdam, Almere, and Lelystad, will be able to continue without having a major negative impact on the biodiversity of the lake. Visitors will be welcome to the area with the addition of leisure and education opportunities to the first and largest island.

The Big U, New York

The devastation caused by Hurricane Sandy was an awakening for climate change sceptics in the US, particularly in New York.

Sandy brought the concept of resilience to the forefront of the urban planning agenda, not just for rebuilding New York City, but for cities everywhere.

One such project was the Big U, a protective flood protection system around Manhattan stretching from West 57th street south to The Battery and up to East 42th street. Driven by the needs and concerns of its communities but also driving the sustainable development of a greener Manhattan waterfront, the Big U protects 10 continuous miles of low-lying geography that comprise an incredibly dense, vibrant, and vulnerable urban area.

The project demonstrates how the innovative integration of state-of-the-art flood protection solutions can provide local community-driven benefits. These benefits have been identified and discussed in close collaboration with the community and local stakeholders and relate to the economic, ecological, and recreational advantage of a protective system. As the prime consultant firm, Arcadis provided technical support for the benefit cost analysis, detailing of the flood proofing concepts and contributed to the various community workshops and professional stakeholder meetings with city and state agencies.

Ahmedabad, India

Extreme heat is an under-reported threat, yet sustained exposure can dramatically increase the risk of mortality and illness.

Some people in the city of Ahmedabad, India are even more vulnerable due to intersecting factors such as poor quality housing, lack of access to water, and limited mobility.

To address this, a coalition of academic, local government, health, and environmental groups worked together to establish a Heat Action Plan. This plan involved painting the roofs of low-income houses with reflective white paint and developing an intra-agency early warning system (with new processes to gather and process local climate data). As a result, heat-related mortality was reduced significantly – with an estimated 1,190 deaths avoided per year on average. Overall, the plan's success has inspired over 100 other cities and districts in India to adopt similar frameworks.

Mexico City, Mexico

Mexico City faces critical challenges related to water resources management and resilience due to external supply dependence, urban expansion, aquifer overexploitation, and inefficiencies in the water system. Climate change exacerbates these vulnerabilities, leading to reduced water availability, water quality degradation, and flooding risks.

In response to these challenges, the city is focusing on community-based adaptation, disaster risk reduction, and ecosystem-based adaptation.

This includes investing in rainwater harvesting systems (SCALL), which are designed to reduce the negative impact of floods, promote the use of green technologies, and guarantee the inclusion of Mexico City's most vulnerable groups.

Sydney, Australia

A lack of national commitment to climate change adaptation in Australia has led the people of Sydney to take matters into their own hands. To protect the city from extreme weather, the Sydney Climate Adaptation Strategy was developed. This strategy takes an inclusive and collaborative approach, by establishing a scientific reference group and a citizens' panel for democratic engagement.

The city's efforts are paying off. Several measures to mitigate the urban heat island effect have been realized, such as the planting of over 10,250 trees and the drought-proofing of public parks.

The time to act is now

There's a clear and urgent requirement for organizations to adopt a transformational approach that embraces adaptation, DEIB, and digitalization as the key pillars of a sustainable future.

By fostering unconventional partnerships and leveraging digital tools, we can drive sustainable growth, redefine metrics for success, and create resilient communities that thrive amid environmental challenges. Governments, businesses, and individuals must come together to build a world that leaves no community behind.

Arcadis is the facilitator of these partnerships, bringing together multidisciplinary, cross-sector stakeholders for mutual benefit.

We help organizations design for a planet-positive future and navigate the range of choices available to businesses, so they can improve their bottom line while also enhancing sustainability.

About Arcadis

Arcadis is a global leader in design and consultancy, specializing in both natural and built assets. With our market sector insights and collaborative approach encompassing design, consultancy, engineering, project management, and more, we forge partnerships with clients to deliver exceptional and sustainable outcomes across the entire lifecycle of their assets. Our team of 36,000 professionals operates across over 70 countries, generating €4.2 billion in gross revenues (based on 2021 full-year pro forma results). We support UN-Habitat with knowledge and expertise to improve the quality of life in rapidly growing cities around the world.

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